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An Interactive Qualifying Project

Submitted to the

Greater Worcester Land Trust

Creating a Resource to Identify Priorities for Conservation

And to the faculty of the

Worcester Polytechnic Institute

March 4, 2004

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March 4, 2004

Greater Worcester Land Trust
Mr. Colin Novick
172 Shrewsbury Street
Worcester, MA 01604

Dear Mr. Colin Novick,

We have enclosed our final report for the Greater Worcester Land Trust. During the past seven weeks we created a database to improve priority identification for land conservation and performed the requested analysis.

We appreciate the experience that you have given us, and we thank you for all of your help. We hope that this project is very useful for the Greater Worcester Land Trust, and we look forward to working with you again.

Sincerely,

Elizabeth Hansen

Kristen Kane

Beth Lorusso

Zachary Orcutt

Abstract

The project for the Greater Worcester Land Trust was proposed to help identify conservation priorities and perform a chronological analysis of open space. Through interviews and analysis, we identified the important criteria for defining a priority. We collected relevant data and compiled it into a database. The database aids organizations in identifying priorities and also allows conservation organizations to compare their attributes. We connected the database to GIS for further analyses. Our analysis compared open space from 1938 to 2001.

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1 Introduction

Land conservation is an increasingly important issue today in America (Levin, 2003). In order to secure the future health of natural resources, maintain the scenic landscape, and provide for healthier ecosystems, the nation must act to conserve land (Georgia Land Trust, 2002; Hardy, 2002). Although conservation is a nation wide issue, more densely populated areas have a greater tendency to lose their natural habitat (Hardy, 2002). This has been the case for Massachusetts, which is the third most densely populated state in the United States. In fact, "the rate of development remains higher than the growth of the Commonwealth's population" (Hardy, 2002).

Population growth and urban area growth has increased rapidly in the past decade (Glaeser & Shapiro, 2001). Contributing factors include: increased demand for housing developments; and job and industrial development.

One option to control development and its negative effects is to conserve open space. The lack of attention devoted to conservation can potentially harm the quality of life in the world (Ehrenfeld, 1972). However, by increasing open space, research has shown a corresponding improvement in health, environmental benefits, and social benefits.

Open space plays an effective role in the community's health (Sherer, 2003). Strong evidence shows that people who have access to parks experience improvement in health, both physically and psychologically (Sherer, 2003). For one, people exercise more when there is access to parks and other open space areas designated for public recreation. A 1996 report by the U.S. Surgeon General found that engagement in regular physical activity reduces the risk of a variety of diseases such as heart disease, hypertension, colon cancer, and diabetes. Moreover, there is improvement in the muscles

and joints as well as weight loss (Sherer, 2003). Additionally, the 1996 report showed that increased physical activity can have positive effects on a person psychologically. The results can lead to decreased cases of anxiety and depression, and improve mood and well-being (Sherer, 2003).

Research shows that not only do parks improve health by promoting physical activity but also the natural surroundings of the park itself can improve the health of an individual. One study done in a Pennsylvania hospital discovered that patients who had contact with the natural world had fewer health complaints (Ulrich, 1984).

Conservation of open space provides substantial and vital environmental benefits. Green area allows generation of oxygen, controls air pollution and soil erosion, and recycles water. Trees and soil also act to remove and filter pollutants from the air and ground water (Sherer, 2003). In an area with contiguous forest stands, the trees can remove 0.05% to 15% of pollutants in the air. These pollutants include ozone, sulfur dioxide, particulate matter, nitrogen dioxide, and carbon monoxide. Furthermore, the leaves and roots of the trees, and associated soil, remove polluted particulate matter from water before it reaches the sewers (Sherer, 2003).

In addition, parks and open spaces play a role in benefiting society and communities (Sherer, 2003). They offer more recreational opportunities, provide neighborhoods with a strong sense of community, and have been connected to a reduction in crime rate in urban areas (Sherer, 2003). This link is said to be due to the fact that facilities provide youth "with a safe environment to interact with their peers, and fill up time with which they could otherwise get into trouble" (Sherer, 2003, p. 23). Support is evident in a 1990 program in Florida called Success Through Academics and Recreational Support (STARS) which consequently decreased juvenile arrests by 28

percent (Sherer, 2003).

The importance of conservation and the profound effect it has on communities should not be underestimated. In this fast paced world of development and technology, it has become increasingly important to create a balance between the amounts of space designated for conservation with the amount of space allocated for development (Ehrenfeld, 1972). Experts recognize the need to protect natural surroundings from uncontrolled urban growth (Beatley & Manning, 1997). Uncontrolled growth can lead to urban sprawl. Worcester was deemed the 25th most sprawling metropolitan area (Flint, 2002). Organizations dedicated to conservation have been established to protect open space and maintain a balance between development and conservation.

Several organizations in Worcester were established to preserve open space in the Greater Worcester area. The general goal of these organizations is to acquire land that is considered viable open space and prevent urban development. Each organization identifies what they believe to be the most important parcels, and focuses on their acquisition. Each organization has different strategies in determining the attributes that define a priority for land conservation. However, there has never been a compilation of the relevant data to create an extensive, centralized, main resource of all the important attributes for the conserved and open remaining land. Without a compilation of information about all of the important attributes, it is not possible to perform any analysis of the data to systematically identify a priority for conservation. Additionally, with such a compilation it would be possible to compare priorities among the different organizations.

The purpose of our project was to provide Worcester conservation organizations a resource for identifying conserved and remaining open parcels of land. The resource also

provides a systematic method of comparing the priorities of the different organizations. We accomplished this by first attaining the most important attributes in identifying a priority. After identifying these characteristics, relevant information was gathered and organized into a database to be used to examine what attributes of land are favorable for conservation. Our next goal was to store geographical information into the database in order to analyze the trends and patterns of development in Worcester. This was accomplished by chronologically mapping aerial photographs. By understanding where open space has been affected throughout the City, one can better prioritize for future conservation. Both the database and the chronological analysis are influential elements in determining how prioritizations of individual parcels are obtained. Our approach was effective because it gained and utilized the information in a way that would assist these organizations. In the future, this will aide in allowing easier identification of the most critical parcels to conserve in the Worcester area.

Background Chapter

2.1 Introduction

In this chapter, we provide the necessary background information regarding our project. First, we discuss the general topics of conservation and preservation, and the tensions between them. Second, we discuss how development pressures affect urban life, and consequently how and why development needs to be controlled. Third, we focus on how conservation is regulated and the tools employed to implement these regulations. We then discuss specific conservation organizations in Worcester, Massachusetts, and we finish by discussing the computer-based tools that we used to complete our project.

2.2 Conservation vs. Preservation

2.2.1 Conservation

In our project, we focused on conservation, therefore it is important to distinguish and define conservation. In this section, we also discuss preservation, which is a term that often fails to be differentiated with the term conservation.

The dictionary defines conservation as "the maintenance of environmental quality and resources or a particular balance among the species present in a given area. In modern scientific usage conservation implies sound biosphere management within given social and economic constraints, producing goods and services for humans without depleting natural ecosystem diversity, and acknowledging the naturally dynamic character of biological systems" (Allaby, 1998, p 92).

Gifford Pinchot, who was the first chief of the Forest Service, advocated the wise use of natural resources. Pinchot considered conservation to be a form of development by using the existing natural resources, but also preventing waste in the process (Pinchot,

1910). "The first great fact about conservation is that it stands for development. There has been a fundamental misconception that conservation means nothing but the husbanding of resources for future generations. There could be no more serious mistake. Conservation does mean provision for the future, but it means also and first of all the recognition of the right of the present generation to the fullest necessary use of all the resources with which this country is so abundantly blessed. Conservation demands the welfare of this generation first, and afterward the welfare of the generations to follow" (Pinchot, 1910, p 42).

This view highlights that conservation is not anti-development. Pinchot (1910) argues that conservation is using the earth, and the products of the earth, but without depleting the natural resources. In today's society, development is inevitable and expected. Conservation and its advocates aim to work with development to sustain nature in all its beauty, but compromising also with the inevitable.

2.2.2 Preservation

Land protection, according to preservation, involves maintaining the area in its most natural, untouched state. In this respect, conservationist views contrast with that of the preservationist because the preservationists protect species or landscapes without reference to natural change in living systems or to human requirements (Allaby, 1998). Another difference is that conservationists are willing to compromise with development in order to keep as much of the land as natural as possible but allow change. For example, a conservation organization defines a park as viable, open conserved land. Preservation, on the other hand, prohibits conversion of the land even into a golf course, field, or park because it is altered in response to human requirements.

A group created to advocate preservation and address related issues was Earth

First. It was founded in 1979, and has a front line, direct approach to preservation and environmental issues. The view presented is that "the conservation battle is not one of merely protecting outdoor recreation opportunities; neither is it a matter of elitist aesthetics, nor 'wise management and use' of natural resources. It is a battle for life itself, for the continuous flow of evolution" (Earth First, 1998). Non-violent, direct approach is the chosen method for Earth First.

In some cases, the actions of preservationist groups turn extreme. The Earth Liberation Front is an organization that has the perspective that if the environment is exploited and destructed, all of the earth is affected (Earth Liberation Front, 2004). To protect the environment, the action is to inflict economic damages on those profiting from the destruction and exploitation of the natural environment, while taking precaution to educate the public and not to inflict damage on any animal or human (Earth Liberation Front, 2004).

Despite the differing views of conservationists and preservationists, both possess a universal goal of acquiring land and maintaining a balance between environment and development. Although maintaining this balance is a nation wide issue, particular attention must be given to areas with higher population because they have a greater tendency to lose natural habitats to development (Hardy, 2002). This makes conservation planning especially important in fast growing, metropolitan areas. In addition, we must note that in urban areas, conservation is a more reasonable approach than preservation, due to strong development pressures.

2.3 Reasons to Conserve in Urban Areas

In this section we discuss the importance of conservation regarding the environment, ecology, and society.

2.3.1 Environmental Benefits

Trees and open space in urban areas provide substantial environmental benefits. Aside from obvious aesthetic benefits, trees act to control pollution and save energy. Trees also act as natural air conditioners and control storm water run off and soil erosion.

Trees are capable of controlling air pollution by removing gaseous pollutants through absorption of normal air through the stomates in the leaf surface. A few examples of air pollutants that can be cleansed by trees include sulfur dioxide, a product of coal and petroleum burning, ozone, which are mainly released from the emissions of automobiles and industries, and particulates, which are small particles emitted in smoke from burning fuel and diesel (McAliney, 1993).

Additionally, trees help recycle water and control storm water run off. They absorb and use nutrients for metabolism that pollute streams. Their trunks, roots, associated soil and other natural elements of landscape filter polluted particulate matter out of the flow toward storm sewers. In addition to reducing water pollution, trees help communities by intercepting rainfall; trees slow the rate at which the water flows. This results in a flow of water that is spread over a greater amount of time, and the impact of a storm on the storm facilities is lessened. This saves the community the energy and money it would take for the facility to handle greater amounts of water during a storm, with higher concentrations (Beattie, 2000).

Trees are also important because they contribute to the environment by lowering

air temperatures. Transpiring water and shading surfaces accomplish this. This leads to cooler cities, allowing for natural air conditioners, reducing the amount of man made air conditioners, which pollute the environment.

2.3.2 Economic Benefits

In addition to environmental and aesthetic benefits, numerous studies have also shown that green space can improve economic sustainability (Trust for Public Land, 2003). The community's urban forests and open space have a strong affect on the community and its visitors. Growing evidence supports that green space enhances community's economic stability by attracting homeowners, businesses, and tourists (Alexander, 2004).

As discussed in section 2.3.1, open space controls pollution and storm water run off. This control not only aids the environment, but also helps the community economically. By saving mechanical energy to control storm water run off, the community saves money in costs of running the facilities (Beattie, 2000). The trees that act as natural air conditioners reduce the need for conventional air conditioners, saving electricity.

Economically, there is evidence that open space positively affects property values. Crompton (2000) found that 20 out of 25 reviewed studies indicated an increase in residential property values. Repeated studies have confirmed that people prefer to buy homes close to parks, open space, and greenery (Trust for Public Land, 2003).

In addition to residential property values, commercial property values are also positively affected by open space. One of the main factors that companies look at when choosing a commercial location is the quality of life, which is influenced by open space,

parks, and greenways (Trust for Public Land, 1996). Increased property value produces increased property tax value, which generates city revenue.

Open space also has been found to attract the public to an area. A park often becomes one of a city's signature attractions, a prime marketing tool to attract tourists, conventions, and businesses (Trust for Public Land, 2002). This brings in city revenue. Attracting visitors is not the only thing that brings revenue to a city. People linger and shop longer in an area lined with green spaces (Alexander, 2004).

Ultimately, it is evident that trees, parks, and open space are sound financial investments for a city (Lewis, 2002). In addition to providing money, the community experiences other societal benefits (Trust for Public Land, 2003).

2.3.3 Social Benefits

Urban planners and conservationists believe that creating green space in urban areas improves health, provides diverse recreational activities, and improves overall quality of life (strong sense of community). Studies have also shown a corresponding reduction in crime rate and increased traffic safety (Trust for Public Land, 2003; Alexander, 2004).

Open space plays an effective role in the community's health (Sherer, 2003). Strong evidence shows that people who have access to parks experience improvement in health, both physically and psychologically (Sherer, 2003). People exercise more when there is access to parks and other open space areas designated for public recreation. A study published by the Center for Disease Control and Prevention found that access to parks for physical activity led to a 25.6% increase in the percentage of people exercising on three or more days a week (Kahn & Ramsey, 2001).

A 1996 report by the U.S. Surgeon General found that engagement in regular

physical activity is known to reduce the risk of a variety of diseases such as heart disease, hypertension, colon cancer, and diabetes. Moreover, there is improvement in the muscles and joints as well as weight loss (Sherer, 2003).

Additionally, the 1996 report showed that increased physical activity can have positive effects on a person psychologically. The results can lead to decreased cases of anxiety and depression, and improve mood and well-being (Sherer, 2003). This occurs in both the workplace and home. Research has found that access to nearby nature was connected with lower levels of job stress and higher levels of job satisfaction. Specifically, workers who had a view of natural elements from their desk, such as trees and flowers, reported less stress and more job satisfaction than other workers who had no outside view (Leather, 1998).

Physical health and medical recovery is influenced by exposure to greenery (Ulrich, 1984). Research has shown that patients recovering from surgery who could see a small stand of trees from their hospital bedroom window recovered faster and needed a decreased amount of painkillers compared with other patients with a view of a brick wall (Ulrich, 1984). This suggests faster recoveries due to exposure to nature may aid the economy by decreasing the durations that patients rest in hospitals. This would produce a snowball effect; for example, the hospitals can give more personal attention to its patients, and the hospital bills are not as high for the individual patient.

Crime rates are also associated with open space. Research supports the widely held belief that community involvement in neighborhood parks is correlated with lower levels of crime (Trust for Public Land, 2003). "In neighborhoods where collective efficacy was strong, rates of violence were low, regardless of sociodemographic composition and the amount of disorder observed" (Sampson & Raudenbush, 2001, p. 2).

Collective efficacy is the unity of residents in a neighborhood with collective expectations to informally and socially control the public open space in the neighborhood (Sampson & Raudenbush, 2001). Thus, open space in neighborhoods correlates with the levels of crime.

The reason to conserve and the profound effect it has on communities has been discussed and should not be taken for granted. Beyond all the economic, social, and environmental benefits of conservation, it must also be noted that conservation must be implemented for the sole reason to control and check uncontrolled development. For these reasons, interest in open space has increased in the past decade (Glaeser & Shapiro, 2001).

2.4 Development

Although interest in city parks and open space has increased in the past decade, development has increased at a higher rate and therefore the necessary actions need to be taken as soon as possible to prevent further negative consequences (Glaeser & Shapiro, 2001). There are many factors that contribute to the increased development such as population growth and house and household size.

2.4.1 Factors Influencing the Rate of Development

Population growth and urban area growth have increased rapidly in the past decade. Some cities in the nation experienced a 20% population increase since 1990 (Glaeser & Shapiro, 2001). "The median growth rate for cities in the 1990's was 8.7%- more than double the median growth rate of the 1980's" (Glaeser & Shapiro, 2001). It has also been recorded that urban and suburban population doubled between 1950 and 1990, yet the developed acreage actually quintupled to over 60,000 square miles

(Mitchell, 2001).

Loss of land to development, particularly loss of wildlife, is driven intensely by residential development (Sherer, 2003). Intense development pressures are not only associated with population, but household size. Even if house and lot sizes are fixed, a smaller number of people per household drive up per-capita resource consumption. In developing countries, declining household size, and resulting demand for land, fuel, and construction materials, is seen as a greater threat to biodiversity than population growth (Liu, 2003). In addition to household size, the size of the house is also a factor. Larger house and lot sizes also increase the demand for land, and result in even more land consumed per person (Sherer, 2003). These development pressures directly affect urban areas and the community.

2.4.2 Implications of Urban Development

Such implications of development can have adverse affects on a given area. For example, cities are not only expanding due to these pressures, but trees and green space are not given the maintenance and management they need. The "nation's urban areas suffer from a lack of substantive natural resource management" (National Association of State Foresters, 2002). For the more extreme case, uncontrolled development can prevent conservation of trees and green space all together. As urban areas expand, prime agricultural land and habitats such as wetlands and forests are transformed into land for housing, roads, and industry (World Resources, 1997). Thus, natural land and green space is irreversibly lost.

Uncontrolled growth is also a major contributor to urban sprawl. Urban sprawl occurs when spread of development outpaces population growth (Ewing, Pandell & Chen, 2002). There are many factors that contribute to sprawling, which include: "a

population that is widely dispersed in low density development, rigidly separated homes, shops, and workplaces; a network of roads marked by huge blocks and poor access; and a lack of well-defined, thriving activity centers, such as downtowns and town centers" (Ewing, Pandell & Chen, 2002). These conditions, in turn, produce more problems that are associated with sprawl such as lack of transportation choices, relative uniformity of housing options or the difficulty of walking (Ewing, Pandell & Chen, 2002).

The increase in development and the negative effects it brings has revived the nation's interest in parks and other means of conservation. U.S. voters have repeatedly shown their willingness to raise their own taxes to pay for new or improved parks. In 2002, 189 conservation funding measures appeared on ballots in 28 states. Voters approved three-quarters of these, generating $10 billion in conservation-related funding (Sherer, 2003). Citizens acknowledge the need to resolve the problem of uncontrolled development

The possible implications of development must be taken into consideration when designing an urban or suburban area. Based on this information, it is evident that urban and conservation planning as well as conservation maintenance must be carefully implemented to alleviate development problems.

2.5 Resolutions to Development and Urban Sprawl

Resolutions to development and urban sprawl include conservation and sustainable growth policies. Another resolution is governmental regulations, and controlling development through zoning.

2.5.1 Conservation

One of the resolutions to control development and its negative effects is to

conserve land. Conservation allows land that is open or undeveloped to be allocated effectively and reduce the negative effects of development. Conservation is especially effective in urban areas. This is because development pressures are higher in areas with a higher population density (Hardy, 2002). Conservation, unlike preservation, works with development to maintain green space. Since development is inevitable, conservation is a promising resolution that acts to control development. The higher the development pressure focused on a piece of land, the greater the chance that if not protected, the open space will be lost to development (Petrone & Gordon, 1994). Conservation ensures a future for the environment and provides the urban community with a sense of nature.

2.5.2 Sustainable Growth

Efficient land planning and management is a resolution to development and sprawl. Sustainable growth is associated with making community decisions that promote sustainable living, stronger communities, easier transportation, and community health, while working against urban sprawl. This is accomplished by making decisions regarding: developing in existing communities, mixing land uses, designing safer neighborhoods, and creating distinctive, attractive, and strong senses of place (Smartgrowth, 2004). This system works as a full community effort. Without the entire community working for the same cause and desire, the system is not as effective.

2.5.3 Governmental Regulations and Tools

Governmental regulations are also important in controlling development and its adverse effects. Regulations and laws will be discussed as well as how they impact conservation and urban planning. This section also discusses the tools that governmental organizations employ in regards to open land.

2.5.3.1 Zoning

Zoning is defined as ordinances and by-laws that are adopted by municipalities to regulate the use of land, buildings and structures to the full extent of the independent constitutional powers of cities and towns. The purpose of zoning is to protect the health, safety and general welfare of their present and future inhabitants (Chapter 40A: 1A, general laws of Massachusetts).

2.5.3.2 Classifications of Land

The laws that the Massachusetts government has implemented concerning the classifications fall into several categories. Refer to Table 2.1 for an explanation of the classifications.

Table 2.1

Class	Type of Land
Class 1	Residential property- used for human inhabitance, with one or more dwelling units. (May include sub-divisions.) May not include motels or hotels.
Class 2	Open space, not classified under chapter 61, 61A, 61B, or under permanent conservation restriction. Not held for the production of income, but maintained in an open and natural environment, which contributes significantly to the benefit of the public.
Class 3	Commercial- property used for business, not necessarily exclusive.
Class 4	Industrial- for manufacturing, milling, processing materials- for profit or non…used for storage, etc. (Chapter 59: 1A, general laws of Massachusetts)
Chapter 61	Forest lands and forest products. Must be 10 contiguous acres. Classified every ten years, for duration of at least ten years. If withdrawal from classification before duration, there is a penalty fee tax (Chapter 60, general laws of Massachusetts).
Chapter 61A	Agriculture and horticulture land- primarily and directly used in raising with intent to sell animals or products of animals (agriculture) horticulture= producing fruit, vegetables, plants… etc. must have min. of five acres devoted to the production (Chapter 60: 1A, general laws of Massachusetts)
Chapter 61B	Open space and recreation- at least 5 acres (Chapter 60: 1B, general laws of Massachusetts)

2.5.3.3 Conservation Restrictions

A conservation restriction is a right that is either in perpetuity or for a certain

period of time (Chapter 184: 31, general laws of Massachusetts). It can be declared in the form of a restriction, easement, covenant or condition, in any deed, will or other mechanism executed by the owner of the land, "appropriate to retaining land or water areas predominantly in their natural, scenic or open condition or in agricultural, farming or forest use, to permit public recreational use, or to forbid or limit any or all" (Chapter 184: 31, general laws of Massachusetts):

- Construction or placing of buildings, roads, signs, billboards or other advertising, utilities or other structures on or above the ground
- Dumping or placing of soil or other substance or material as landfill, or dumping or placing of trash, waste or unsightly or offensive materials,
- Removal or destruction of trees, shrubs or other vegetation
- Excavation, dredging or removal of loam, peat, gravel, soil, rock or other mineral substance in such manner as to affect the surface
- Use except for agricultural, farming, forest or outdoor recreational purposes or permitting the land or water area to remain predominantly in its natural condition
- Activities detrimental to drainage, flood control, water conservation, erosion control or soil conservation
- Other acts or uses detrimental to such retention of land or water areas (Chapter 184: 31, general laws of Massachusetts)

2.6 Worcester as an Example of Open Space Conservation

Worcester is a city susceptible to the pressures of development, as we have discussed above. The City has been negatively effected by overdevelopment and sprawl.

Worcester was deemed the 25th most sprawling metropolitan area in the United States in 2002 (Flint, 2002). The problems that development creates in Worcester and cities all over the nation need to be addressed immediately.

2.6.1 Historical Significance

The development pressures that Worcester faces now have been in place since the population influx of 1848 (Southwick, 1998). With the constant development of new transportation systems, people grew to be increasingly mobile. This was one factor that contributed to urban sprawl. The community began to build homes in the Worcester Highlands, Northlands and Bloomingdale areas (Southwick, 1998). Also, with the advent of transportation, people were able to settle outside of the City areas. This disrupted the localization of the community and dispersed population (Southwick, 1998). Despite the quick effect of sprawl, the residents recognized the need to allocate public space. In fact, Worcester had America's first public park, which was developed in 1854 and named Elm Park (Southwick, 1998).

By the end of the 1920's, Worcester accumulated 1,166 acres of parks, playgrounds, and bathing beaches. The 1920's were also characterized by an increase in population; Worcester was considered one of the fastest growing cities in New England (Herwitz, 2001). Although Worcester placed an interest in land acquisition for preservation and public recreation purposes, overdevelopment continued at a significant rate. Overdevelopment due to population increase began to concern the community in the mid 1980's. The attention resulted from the discovery that the amount of open space had decreased from 50% in the 1960's to 10% in the 1980's (Herwitz, 2001).

2.6.2 Key Players in Conservation

In this section, we introduce the key players of conservation in the Worcester

area. We discuss the governmental agencies, along with the non- governmental organizations.

2.6.2.1 Governmental Agencies

The governmental agencies in Worcester, MA associated with conservation are the Conservation Commission and the City of Worcester Parks and Recreation Department. We discuss what the goals of the agencies are, and how they accomplish these goals.

2.6.2.1.1 Conservation Commission

The Conservation Commission works with the City of Worcester to acquire land with the intention of conservation. The organization seeks land that can be used for passive and somewhat active recreation, or has historical value (Katie Donovan, personal communication, January 23, 2004). The Conservation Commission acquires land through grants or tax titles (Katie Donovan, personal communication, January 23, 2004).

2.6.2.1.2 Worcester Parks & Recreation Department

The Parks and Recreation Department in Worcester has worked with other organizations in the area, such as the Greater Worcester Land Trust, in addition to the state. This association has been established in order to solicit and obtain property that is currently considered open space according to them and the City (Rob Antonelli, personal communication, January 29, 2004).

The Parks and Recreation Department defines open space as land that is both passive and active. This includes such areas that are wooded, a ball field, a park, or land that is acquired for resource purposes (Rob Antonelli, personal communication, January 29, 2004). The Department obtains land by petitioning the City for land that the City owns. Once the land is transferred into the Parks and Recreation Department holdings, it

is also maintained by their department.

2.6.2.2 Non- Governmental Organizations

In addition to governmental organizations, there are many influential non-governmental groups in Worcester that also have an impact on conserving open land. Each of the organizations' goals and accomplishments will be discussed. We will also look at any weaknesses the organizations may have when it comes to successfully acquiring land for conservation.

2.6.2.2.1 Greater Worcester Land Trust

The Greater Worcester Land Trust was formed to aid the City in land use determination. "Preservation of quality open space" is the main goal of the trust. With development occurring at an unprecedented pace, the land trust believes that conservation can complement and intensify urban values (Colin Novick, personal communication, February 3, 2003).

The organization is a private, non-profit entity whose hope is to make progress by working closely with neighborhood groups, municipal government and state agencies. The idea of the trust is to provide landowners with an "alternative in the disposition of their land" (Colin Novick, personal communication, February 3, 2003). They intend to acquire land through outright acquisition, conservation easements (or conservation restrictions), gifts, donations, political lobbying, limit development, and finally by the pursuit of grants (Colin Novick, personal communication, February 3, 2003).

With Worcester being an urban area and development emerging fast, the land trust needed to develop a method to identify which parcels of land to focus on acquiring. They believe that there needs to be a "healthy mix" of land in order to ensure the quality of land in Worcester (Colin Novick, personal communication, February 3, 2003). This

was accomplished by creating a top ten list which was first created in 1987 and then re-proposed in 1996 and again in 1998. The 1998 top ten list is shown below with the name and size of the parcel and whether or not it was saved or is still available open space.

Table 2.2

NAME OF PARCEL	SIZE	OUTCOME
Cascades Park East	41.26 acres	**Saved** (30.86 acres)
Catholic Charities (Parcel K)	85.00 acres	**Saved**
Crow Hill	33.65 acres	**Saved** (27.90 acres)
Higgins Estate	115.17 acres	Outstanding
Kettle Brook North	29.60 acres	**Partially Saved**/Partially Outstanding
Laurel Mountain	126.57 acres	Outstanding
Logan Field Extension	31.03 acres	Outstanding
Poor Farm Brook North	46.73 acres	Outstanding
Stoddard Estate/Brooks	43.62 acres	Outstanding
Wigwam Hill and Coal Mine Brook	47.70 acres	Outstanding

Currently, the land trust is seeking alternate methods to improve how the top ten list is created. There is currently no systematic method that is available to determine the most important parcels of land to conserve. Consequently, there is no systematic method to specify the ten most important parcels for the top ten list. There is a similar problem when it comes to replacing items on the list as they are lost to development or successfully conserved.

2.6.2.2.2 Massachusetts Audubon Society

Massachusetts Audubon Society is the largest conservation organization in New England, concentrating its efforts on protecting the nature of Massachusetts for people and wildlife. Massachusetts Audubon Society protects more than 30,000 acres of conservation land statewide (Massachusetts Audubon Society, 2004). The goals of the organization are to advocate open space, and to obtain and conserve land. The organization obtains the land through purchases from grants and private funds.

2.6.2.2.3 Regional Environmental Council

The Regional Environmental Council (REC) is a grassroots, non-profit organization located in Worcester, Massachusetts. Founded in 1971, the REC has been dedicated to building strong, just, healthy communities and improving the quality of life in Worcester (Shogwert, 2004). The goals of the organization, concerning open space in Worcester, are to advocate open space, and to promote community gardening (Shogwert, 2004).

2.6.2.2.4 Blackstone River Valley Watershed Heritage

The goal of the Blackstone River Valley National Heritage Corridor Commission is to preserve and interpret the Valley's historic and natural resources (Mark Jewell, personal communication, February 3, 2004, Chafee, 1996). Although this organization is not a direct advocate of open space, the relationship in which it is connected to preserving the open space of Worcester, located in the Blackstone River Valley, is important. The commission is involved with advising decisions concerning development and conservation (Mark Jewell, personal communication, February 3, 2004).

2.6.3 Conservation Strategies

This section describes conservation strategies that are implemented in Worcester to control development. We will conclude the section by comparing these strategies to those of other urban areas.

2.6.3.1 Open Space & Recreation Plan

Conservation is one effective strategy proposed to control development. The City of Worcester, in conjunction with environmental groups, proposed an *Open Space and Recreation Plan* in 1994. This was a new and improved plan based on the Open Space plan that was implemented in 1987. The purpose of this plan was to "establish a

framework of specific goals and objectives for open space and recreation which complement(ed) the City's progress in economic development" (Petrone & Gordon, p. 1,1994). This plan marked the first time that recreation and open space interests worked together to develop a plan for the city. The plan also provided a strategy to assess Worcester's open space and recreation needs. It was based on several goals:

- acquire and improve passive and active recreation facilities and open space to support the well being of citizens and workers
- protect Worcester's natural and cultural resources which give it an identity of its own.
- create, protect and preserve greenway linkages, trail corridors, and bikeways connecting recreational, open space, and community resources in and around Worcester.
- target acquisition and development of pocket parks to enhance neighborhood identity and community-sponsored green spaces (Petrone & Gordon, 1994).

Since the implementation of the *Open Space and Recreation Plan*, there have been several open space and recreation regulations that have been adopted. The most notable are:

- wetlands Protection Ordinance
- aquifer Protection Overlay Zone
- cluster Zoning
- site Plan Approval
- open Space Zones
- floodplain Overlay District (Petrone & Gordon, 1994).

The plan also provided non-regulatory accomplishments (Petrone & Gordon,

1994). It established public and private partnerships between the City and conservation related organizations. These included the Massachusetts Audubon Society, Blackstone River Valley National Heritage, Greater Worcester Land Trust, and the Regional Environmental Council (Petrone & Gordon, 1994).

Despite the accomplishments that arose from the plan, there remain faults in the proposed system that prevents close interaction among the city and environmental groups. For example, the representatives of the participating groups meet multiple times over a three year period. With development and the buying and selling of land occurring rapidly in the city, organizational interests are constantly affected. The system of meeting over a three year period limits the effectiveness of conservation because the interest and goals of the participating groups are not noted. Lack of interaction prevents special interests of each group to be acknowledged by the others. Therefore, it is difficult to analyze the community's needs and set priorities for acquiring land.

2.6.3.2 What's left: An Update on Worcester's Open Space Plan

Another plan implemented in 1987 and updated in 1996 by the City of Worcester to acquire, protect, and maintain the natural environment and recreational facilities was the *What's left: An Update on Worcester's Open Space* plan. This plan included 51 open space sites from which ten were chosen as the most critical sites. The city then focused on these to preserve. The list is continually revised based on the previous list and according to the following attributes.

- Tax title property
- MBL number
- Total Area
- Ownership

- Zoning
- Relationship to existing open space
- Cultural and historic value
- Passive recreation value
- Region of the City
- Relationship to existing maps
- Development status and pressure
- Accessibility
- Habitat(s)
- Watershed area
- Water quality
- Physiographic importance
- Ecological importance

The goal of Worcester's top ten list was to show what land proved to be invaluable for open space acquisition. Conservation organizations and urban planners could then conduct appropriate open space planning and direct their conservation efforts accordingly. The top ten list was created by first identifying what characteristics and attributes of the land are most important. The City determined these to be size, whether there were greenway connections, natural characteristics, and development pressure.

Coupled with the *Open Space and Recreation Plan*, the 1996 *What's Left* plan will provide the City, environmental organizations, and residents with valuable information for open space acquisition and preservation. However, like the *Open Space and Recreation Plan* there remains a problem because of the lack of close interaction among the environmental organizations in the City.

2.7 Tools

The need for conservation and improved planning has prompted a desire among the Worcester community, scientists and conservationists, to develop an approach to assess and analyze the trends of development and to recommend conservation strategies (Antenucci, 1991). In this section, we will summarize three different tools that we used to help the Greater Worcester Land Trust and others to assess conservation priorities including: Microsoft Access, Microsoft Excel database, and GIS. These tools are used to store data in different forms and allow users to manipulate the data and query data to answer specific questions. Each tool is useful for different kinds of questions, and the strengths and weaknesses will be discussed.

2.7.1 Microsoft Access

Microsoft Access is a powerful program used to create and manage databases. It has several features to assist in constructing and viewing information. Access is a more involved database program than others such as Microsoft Works. Microsoft Access works to filter, sort, and organize the data. The database can be easily converted to other versions. However, it is a simple database and does not have the capability to produce maps and other visualization tools that were essential to our project (Access 2000 Tutorial, 2002).

2.7.2 Microsoft Excel

Excel provides a simple database function organized in a list. A list is a way of storing data on a worksheet in which there are rows and columns. This tool employs commands that make it easy for the user to add, delete, and find data based on a certain criteria. Data can be sorted in any manner desired and can also be filtered. Filtering

enables the user to work with only a subset of data while temporarily hiding the other data not being analyzed (Swisher, 2003).

While this tool is helpful in organization and facilitates simple analytical tools, the project at hand requires the analysis of land parcels over time to establish high-risk areas. This would be extremely difficult, if not impossible, to accomplish with the needed level of accuracy and validity with only a list.

2.7.3 Geographic Information System

In this section, we will summarize GIS features and uses. GIS is an important and useful tool when planning for land acquisition and use. However, it is important to stress how the design of the GIS system and its output is not the definitive solution to the general problem, yet it is a key component to the overall strategy. The overall strategy and decision making of land management is ultimately the work of the users (Antenucci, 1991).

Many planning tools such as land reallocation and conservation planning that are used today to deal with urbanization problems are successful but are limited and lack available computer based information. Solving such land use problems manually without computer based information make extracting and analyzing land management information very difficult and sometimes inconsistent. It is time consuming and leaves room for greater error (Yomraliogli & Parker, 1992). By addressing conservation with such manual practices, conservationists can have disagreements as to which lands take priority for conservation. Computer based practices allow the analyst to compare parcels of land with more accuracy and in more detail. This allows for better and more reliable results when determining which parcels are most urgent to conserve. To reduce possible error, the computer based tool can visually and quantitatively show which lands are at a higher

priority for conservation. This tool also allows the analyst to produce maps showing particular combinations/separations of features for selected geographic areas, which is very valuable at conveying information (Heit, 1991).

In order to maximize the benefits of land use and to "establish a reference for further development of land information systems," (Yomraliogli & Parker, 1992, p. 1) a geographical information system is employed that can analyze before and after reallocation of land to ensure a balance in land re-distribution (Yomraliogli & Parker, 1992). In the future, our resource will aid the organizations in identifying priorities.

The second type of data is attribute data, which describes a feature at a particular location. This type of data is expressed in words, text strings, and can also be expressed in numbers. This determines what the object will be labeled on the database and is often called geocodes (Antenucci, 1991). Topology is used to connect attribute data to spatial data. This element links the data to its environment (Delaney, 1999).

Data that are gathered are generally stored in one of two data structures, vector or raster data. For this project, we used only raster data. Vector data are similar to how one perceives information on a map. This data structure is comprised of different entities, which can be points, lines, or polygons (Delaney, 1999). These are defined as geographical primitives. The type of geographical primitive that the users employ depends on the scale. For example, if one is creating a large-scale map, a city may be represented by a dot. However, if constructing a small-scale map, it would be shown as a polygon (Delaney, 1999).

The next form of data structure is raster data, which shows the data collected as cells. This data structure has lower spatial accuracy since the smallest entity is constant; the entity is always a cell (Delaney, 1999). On the other hand, raster complements

computer-based technology and is also compatible with sensed imagery (imagery from satellites, and any data source that shows data varying over a surface) (Delaney, 1999). The aerial photographs that we collected were all in raster format.

One GIS tool that is utilized in our project is the geoprocessing tool, which is designed to manipulate and analyze spatial and attribute data (Antenucci, 1991). This tool allows the user to alter pre-existing data to derive new layers and attribute tables. For example, in our project we created polygons of the open space present on the aerial photographs of Worcester. After creating these polygons of open space, we made them into separate layer to examine how open space has changed over time. To analyze how conservation and development have changed, we used an overlay tool.

Overlay is a very important and common tool used in GIS application and is ideal for creating a secondary database, or generalized layers. Overlay is defined as superimposing one data layer over another layer (Delaney, 1999). This is done to explore the associations and interactions among the data.

In order to use the gathered data in GIS, it must be converted into digital format if it is not in that format already. This conversion process, data input, has the tendency to be tedious, expensive, and time consuming. Some of the most common methods of conversion are digitizing, keyboard entry, scanning, and importing. In digitizing, the user traces the line work onto a map by using a puck, which is similar in appearance to a computer mouse. Thus, the paper maps are digitally traced (Delaney, 1999). Keyboard entry, as the name states, involves typing the data to make a map. Scanning, or automated digitizing, acts similarly to a scanner. However, this method can require a great deal of editing. Lastly, there is importing, in which the data is already in digital format. Examples of data that would be imported are a pre- existent Excel database and

digital map files (e.g. road systems) (Antenucci, 1991). It is important to consider data availability and whether it is in a useable format. This can make a great difference in data collection and organization as well as efficiency and cost effectiveness (Delaney, 1999).

Following data input, the next stage calls for linking the data in digital space to real world space. This process involves registering or georeferencing the digital data and then projecting the data on to a map. This process can be done on an artificial coordinate system or on a real coordinate system, the latter being the standard system and also what we employed in our project (Delaney, 1999). The real coordinate system is based on longitude and latitude and therefore the points used are where it is exactly located on the globe and is compatible throughout the world.

By employing a geographic information system, an analyst can accurately organize a myriad of information. For example, in this project, parcels of land and their attributes can be organized. This information can then be sorted and analyzed to determine the most promising characteristics of land for conservation. In these systems, attributes of the land are linked to a map through some common identifier. The map depicting these parcels can be linked to an attribute data file containing parcel size, ownership data, land use, appraised value, and zoning to name a few. These features can then be overlaid for a spatial analysis of the land. With overlaying, the analyst can see what combinations of attributes one parcel contains, thus determining which parcels contain the most suitable attributes. GIS can also query or analyze the attributes separately and generate a map based on the attribute data (Antenucci, 1991).

The capability to produce maps showing particular combinations/separations of features for selected geographic areas is a very valuable feature. It is especially powerful at conveying information (Heit, 1991). For example, an analyst can input location

questions (e.g. what is the closest park to WPI?), trend questions (e.g. how much land has been conserved in the Greater Worcester area since 1980?), and modeling questions which allow "what if" analyses (e.g. if 50 acres of land is conserved per 1,000 people, how will industry be affected?). GIS has the ability to address these questions and visually convey answers to them.

With the plethora of information that can be stored, retrieved, manipulated, and analyzed in the database, many organizations can benefit from this information. The data can be updated and used as a means to secure a future for valuable conservation lands with conservation strategies that enhance local economies and lifestyles. The goal of the GIS database designed is to ensure current and future integrity of undeveloped land in the Greater Worcester area to provide natural recreation, and to keep lands in their natural state.

2.8 Summary

In this chapter we have discussed the importance as well as the differences between conservation and preservation. With conservation being more likely in a fast growing area, we continued to argue why and how it is beneficial to urban areas. In a city, development is necessary but needs to be controlled. We then discussed the factors that contribute to development, implications of development, and finally the resolutions to the problems created by development. Then we specifically related the above issues to the City of Worcester as well as its history regarding development. Next, we introduced the environmental organizations that are in the City and their goals. Finally, we provided information about the tools we used in our project: Microsoft Access and Excel, and GIS. The following chapter discusses how we completed our project.

3 Methodology

3.1 Introduction

The goal of this project was to develop a resource to aide in identifying priorities for conservation in the Greater Worcester area. We first identified the attributes that were necessary in determining a priority for conservation. After identifying these characteristics, relevant information about them was gathered and then analyzed. We then organized the information into a database to be used to examine what attributes of land are favorable for conservation. This is an influential element in determining how prioritizations of individual parcels are obtained. Our next goal was to store geographical information in the database in order to show trends and patterns in development and open space conservation.

This chapter explains how we identified and gathered the information necessary to achieve these goals. It is organized into the following sections: (1) Interviewing, (2) Archival Research, and (3) Data Analysis.

3.2 Interviewing

The first method that we used was the interview process. We will discuss the purpose of interviewing, the procedure, and how we coded the conversations for further analysis.

3.2.1 Purpose

We needed a strategy to gather information from the participating organizations about identifying priorities for conservation. This information was important because it was used to derive what attributes were necessary to research and to maximize the

functionality of the resource. To gather the information, we had several options: focus groups, surveys, and interviews.

We chose the method of interviewing because it allowed greater flexibility in the type and format of questions, and gave the opportunity to clarify questions and elicit further responses (Singleton, 1993). The information that we were addressing had the potential to be complex and obtrusive, and face-to-face interviews offered the least amount of bias, as compared to surveys, which must have simpler questions for reliable responses (Singleton, 1993). In addition, interviews were favorable compared to surveys because it complemented the smaller sample size. Focus groups also work well with smaller sample sizes, however with conflicting schedules and traveling being an issue, focus groups would not have been feasible for this project. In addition, there is an element of bias that is introduced with focus groups. We did not want opinions to be swayed due to the onset of other presented ideas and opinions.

3.2.2 Procedure

To accomplish the interviewing method, we first chose the sample. The sample was collected by first determining what organizations in the Greater Worcester area were involved with open space. We obtained several contacts and used the snowball process to obtain more contacts. Ultimately, we interviewed six organizations that were related to the project. For the Parks and Recreation Department, initially we attempted to interview Michael O'Brien; however, his schedule prevented a meeting and we met with Rob Antonelli. The organizations involved and the representatives interviewed can be found in Table 3.1.

Table 3.1

Organization	Representative
Blackstone River Valley Heritage Corridor Commission	Mark Jewell
Conservation Commission	Katie Donovan
Greater Worcester Land Trust	Colin Novick
Massachusetts Audubon Society	Debbie Cary
Parks and Recreation Department	Rob Antonelli
Regional Environmental Council	Peggy Middaugh

After gathering our sample, we formulated interview questions to elicit information relevant to the project. To ensure validity and omit biases, the interview questions remained consistent with each organization. We used open ended questions in a funnel effect. In order to ensure that our questions were direct and the language was understandable, and to make sure the instrumentation was valid, we pre-tested the questions with the help of Greater Worcester Land Trust representative Colin Novick, and the WPI advisors of the project, Rob Krueger and Seth Tuler. The final questions are included with the final consent form in Appendix A.

Representatives from the organizations were contacted via phone to schedule the interviews. They were conducted in a formal manner and each one was tape recorded. In each interview, one student conducted the interview and asked the questions, including follow up questions, while another took notes. Each representative was asked to sign a consent form giving us permission to release their name and necessary information in our report and database. The transcriptions can be found in Appendix B. After each interview, a follow-up was made by emailing the transcription to each interviewee to ensure validity and accuracy.

3.2.3 Analysis

Following interviews, open coding was performed on the transcriptions. Most were verbatim with the exception of Deb Cary of Massachusetts Audubon Society, which

contains several superfluous interruptions that we omitted from the transcription. The coding was performed by printing out copies of each interview, and coding each occurrence of a relevant theme, word, phrase, and semantics. Each team member coded the interview, and the results were compared, to obtain the entire range of codes possible.

During open coding, we found various words with the same theme, and we were able to cluster them together under one category to eliminate redundancy. For example, active recreation is defined as a playground or ball park area. Therefore, instead of coding "active" and "playground" separately, we combined then into one category, active recreation. We created a table with the rows consisting of all the reoccurring phrases, words, themes, and semantics. Underneath each row we listed how many times they were said and by whom. This produced specific categories for content analysis. The derived codes can be found in Appendix C.

3.3 Archival Research

Next, we gathered the data that was specified during the interview process through coding. This step was necessary in generating the open land attribute database. Below, we will discuss why archival research was used and how it was performed.

3.3.1 Purpose

We chose the method of archival research because it allowed a clear, systematic approach to retrieving the desired data for our resource. We needed to find the information in a short amount of time, and therefore needed an efficient way of doing so. Archival research was the available option. This method is important to the scope of the project in that it is the method of raw data gathering. Without archival research, there would not be any material for the database.

3.3.2 Procedure

To locate the data, we used several archives, listed in Table 3.2, along with the attributes that were determined from the interview content analysis. Note that several sources are used for each attribute. We consistently used more than one archive for each attribute to ensure validity.

Table 3.2

Attribute	Archive
Acquisition date, year	Registry of Deeds Parks and Recreation Commission Reports
Assessed value	Assessors 2004 Fiscal Data Set
Classification	Assessors 2004 Fiscal Data Set
Conservation Restriction	MassGIS Registry of Deeds
Deed book, page, document number	Assessors 2004 Fiscal Data Set Registry of Deeds Personal Archive from Treasurer Tom Zidelus
House and street of parcel	MassGIS Registry of Deeds Parks and Recreation Commission Reports Personal Archive from Treasurer Tom Zidelus Assessors 2004 Fiscal Data Set
MBL	Assessors 2004 Fiscal Data Set MassGIS Personal Archive from Treasurer Tom Zidelus
Name of parcel	MassGIS Registry of Deeds Parks and Recreation Commission Reports Personal Archive from Treasurer Tom Zidelus
Owner	Assessors 2004 Fiscal Data Set MassGIS Registry of Deeds
Owner	Assessors 2004 Fiscal Data Set Registry of Deeds MassGIS
Owner address	Assessors 2004 Fiscal Data Set Registry of Deeds
Ownership code	Device formulated by Greater Worcester Land Trust
Size of parcel (acreage)	Assessors 2004 Fiscal Data Set MassGIS Registry of Deeds Parks and Recreation Commission Reports Person Archive from Treasurer Tom Zidelus

The archival research first involved establishing the parcels of open space in Worcester. This set was found using the assessor's website and spreadsheets belonging

to the organizations that contained various land holdings which were derived from geographic information of the City of Worcester.

After obtaining this list, we broke the attributes up into categories of information found in the City of Worcester Assessor's 2004 fiscal data sets, the Registry of Deeds, and miscellaneous archives. We compiled the fiscal information into the Access database first. We then verified all data using the Registry of Deeds, which gave actual deeded information. After this was accomplished, each record was verified using all archives.

3.4 Data Analysis

This section discusses the custom analyses that were performed to make a useful database. Multiple analyses were performed based on the participating organizations. Purpose, tools, procedures, and the types of analyses that were performed will be discussed in the following sections.

3.4.1 Purpose

Although a raw database such as Microsoft Office is useful when an organization solely needs a piece of information, our objective was to do an in depth analysis using visual tools through GIS. Our purpose was to provide an analysis that would allow organizations to achieve their goals in conservation. As a result, we discovered what types of analyses would help each participant and conducted the analyses accordingly. Refer to Table 4.2, which lists the interests of each participating organization.

3.4.2 Tools

In order to do an analysis of the attributes, as well as specific analyses for the organizations, Microsoft Office and GIS were employed.

3.4.2.1 Microsoft Access

Microsoft Access was initially used to compile the data. It was chosen due to its ability to filter, sort, and organize the data. It also has a very user-friendly interface capability. The database can be easily converted to other versions, and was requested by several organizations as a template for the resource (Access 2000 Tutorial, 2002). It is a simple database that is not connected with map overlay techniques. Because this technique was essential to the project, the data from Access were imported into a program capable of polygon overlay.

3.4.2.2 Microsoft Excel

In order to import our data into a geographic information system, it needed to be put into Microsoft Excel, and then into GIS. Microsoft Excel, like Microsoft Access, has the ability to filter, sort and organize. This database format is also very user friendly, and was requested by several of the representatives from the organizations (Swisher, 2003).

3.4.2.3 GIS

A geographic information system (GIS) is a computer based tool that was used to import, store, manage, retrieve, manipulate, and analyze the data that were gathered. The goal of employing GIS was to conduct a systematic identification, mapping, and assessment that will allow for short and long range planning, and anticipate the impacts of future development (Delaney, 1999). This method was favorable due to its organizational, sorting, overlaying, and visual capabilities. Additional reasons for choosing GIS are stated in section 2.7.3.

The software that we utilized was ArcView 8.2. We used this software as opposed to other GIS programs because it is what the City and MassGIS employ. If other GIS software programs were utilized, it would have made it difficult to import their data onto our software. The incompatibility would have made data transfer extremely time

consuming and not favorable to our time-intensive project.

The GIS database served as a tool to target areas where open space is decreasing at significant levels. In order to see how land development and conservation evolved over time in the Greater Worcester area, we gathered aerial photographs. The photographs were collected from the USDA Farms Agency, MassGIS, and the Natural Resource Conservation Service (NRCS). We were able to collect a total of six years of aerial photographs which included: 1938, 1952, 1971, 1980, 1992, and 2001. The photographs that we collected were not in digital format; therefore we utilized a scanning technique and converted them into TIFF file format, which is compatible with GIS.

After we completed the scanning process we manipulated the photographs in order to align them with the coordinates of Massachusetts. This was accomplished by georeferencing a major visible intersection or road from the aerial photographs with the current streets of Worcester, which we imported from the MassGIS website. On average, we had to find at least four points to georeference to keep a minimal error level. Aligning the photographs was the first step towards the identification process in allowing us to determine where conservation and development have progressed over the years. The final step in providing a visual presentation of where there is a need for conservation was fulfilled by creating polygons where open space existed. After completing the polygons for each year, they were made into layers. This enabled us to overlay the polygon layers on top of each other in order to see where development and conservation occurred and how they have changed over a period of time. Ultimately, overlaying aided in the identification process to determine where conservation is critical and also operated as a visual presentation for the need for more conservation. This information will be an influential element in geospatial analysis of land preservation and identification of

priorities for the participating organizations.

3.4.3 Individual Analysis

3.4.3.1 Greater Worcester Land Trust

The Greater Worcester Land Trust was interested in a chronological analysis of open space in the Worcester area. This was an important analysis because by understanding the patterns of development, the analyst could then discover which open parcels are at the highest risk to be developed and focus on its conservation. For example, if particular areas of Worcester, or open spaces with particular land characteristics, were quickly depleting due to development, then prioritization could be conducted accordingly. Such analysis would be helpful in determining what parcels of land should be focused on for acquisition.

To accomplish this analysis, we first obtained aerial photographs of Worcester from the years of 1938, 1952, 1971, 1980, 1992 and 2001. We digitized them in ArcView 8.2, and then created layers of all of the open space on each year, and compared each. This was done in order to examine the change in open space over this time range.

3.4.3.2 Conservation Commission

The Conservation Commission was interested in analyses concerning distances between the open and conserved parcels to find contiguous land areas. If we had ArcEditor, this would have been a simple procedure. This can be easily done from the analysis we performed for the Greater Worcester Land Trust. The Conservation Commission was also interested in a collection of all of their deeds. We obtained the deed information, which can be readily accessed on the registry of deeds website.

3.4.3.3 Massachusetts Audubon Society

The Massachusetts Audubon Society requested three analyses. The first was

obtaining a list of tax delinquent parcels. We did not perform this analysis because it was irrelevant to the project, fluctuates often, and would be an inefficient use of time. The second request was to find the surrounding owners. This can also be achieved with our analysis using ArcEditor. The final request was contiguity, which is also obtained through ArcEditor.

3.4.3.4 Parks & Recreation Department

The Parks and Recreation Department was interested in a connection to bike trails. There was no available layer for the bike trails, and we had no access or training in Geographical Processing Systems, which would aid in creating one. The second request was an analysis of the proximity to the other parks. This can be accomplished using ArcEditor.

3.4.3.5 Blackstone River Valley Heritage Corridor Commission

The Blackstone River Valley Heritage Corridor Commission was interested in analysis of the trails in the Blackstone River Valley, and a creation of a vernal pools layer. We did not perform these analyses. The first analysis was not performed because it was out of the area that we were working in, and required Geographical Positioning Systems. None of the members in our group have had any training in GPS, and there is no access to the devices. We did not create a layer of vernal pools because we did not have the expertise to locate and classify them.

3.4.3.6 Regional Environmental Council

The Regional Environmental Council requested one analysis, which was to find the accessibility of parcels to the inner city community. This was not an analysis that we were able to accomplish due to the lack of our knowledge base, and the requirements of finding such accessibility.

4 Analysis

4.1 Introduction

The purpose of our project was to provide conservation organizations in the Worcester area with a resource for open space identification and prioritization. In this chapter, we present the data that we acquired, beginning with the initial objective of determining the attributes. This led to the compilation of the centralized database, and subsequently to the final objective of analyzing the data.

4.2 Determination of Attributes

The first objective that we encountered was to identify which attributes were important for determining the most important parcels to conserve in the Worcester area. Here, we present our sources, the data that we collected from them, the coding of our interviews, the attributes determined, and the implications of the attributes.

4.2.1 Sources

Our sample, which included six sources, is organized in Table 4.1. Table 4.1 consists of the organization and its representative that we interviewed.

Table 4.1

Organization	Representative
Blackstone River Valley Watershed	Mark Jewell
Conservation Commission	Katie Donovan
Greater Worcester Land Trust	Colin Novick
Massachusetts Audubon Society	Debbie Cary
Parks and Recreation Department	Rob Antonelli
Regional Environmental Council	Peggy Middaugh

The sample was interviewed and the verbatim transcriptions are found in Appendix B. We organized general information from the interviews in Table 4.2. This

information includes the organizational goals, each organization's definition of open space, desired analyses, and the format that they prefer the data. The coded attributes are contained in Appendix C.

Table 4.2

Organization and Representative	Definition of Open Space	Goals Regarding Open Space	Form of Data Desired	Analysis of Data
Blackstone River Valley Corridor Commission Mark Jewell	Align with state	Give comments with regard to foundation's ten year plan	Web-based Whichever is most universal (Microsoft Excel or Access)	Trails layer Vernal pool layer
Conservation Commission Katie Donovan	Areas that can be used for passive and somewhat active recreation Possibly historical land	Look for larger parcels Use top ten list	Microsoft Excel GIS is alright	Collect the deeds Distances between the parcels (landlocks)
Greater Worcester Land Trust Colin Novick	Undeveloped land Permanently preserved	Protect existing open space in urban environment More habitat related than people related Top ten list	On a CD or DVD GIS	Chronologically tag parcels and analyze how development and conservation evolved Proximity searches
Massachusetts Audubon Society Debbie Cary	Unaltered, undeveloped in any way Passive and somewhat active recreation	Enhance the protection of open space through a variety of ways Advocating and acquisition	GIS connection Website Microsoft Access or Excel	Tax Delinquent Property Surrounding owners Contiguity

Parks and Recreation Department Rob Antonelli	Land that can be used for passive and active recreation	Maintain and obtain	Microsoft Access or Excel PDF file GIS is used	Connection to bike trails Proximity to other parks
Regional Environmental Council Peggy Middaugh	Public space where people can enjoy the outdoors	Acquire, build, maintain, parcels for community gardens and pocket parks in inner city	Microsoft Access	Accessibility of parcels to inner city community

It is important to note that the organizations' definitions of open space are very similar. For the majority, open space is an undeveloped parcel that is conserved for possible passive and active recreation. Despite this fact, the important attributes and analysis discussed hardly remain uniform even among the organizations that have similar open space definitions. Without a centralized database to compile the information into, the attributes and systems of prioritization among the organizations remain difficult to access and analyze. This observation proves that an easily accessible database with the capability to perform multiple analyses would be extremely helpful in comparing priorities of the different organizations. In addition, this would allow the organizations to cooperate together to improve conservation and conservation planning.

4.2.2 Attribute Definitions

The attributes that we coded from the interviews are organized in Appendix C which contain the attributes, how many times they were stated and by which organization. We observed that there is a similarity in the amount of times the organizations stated the active and passive recreation, acreage, ownership, and deed information. Even though some of the attributes were not mentioned by all of the organizations, we still included them in our final list. This is because some of the

organizations strongly focused on specific attributes to determine what parcels are most urgent. Thus, we believed it to be beneficial to their organization if the attributes were included in our database.

We chose the attributes that were requested from the organizations that were most significant for our project. Below we list the final attributes that were chosen for our database.

- Name of Parcel
- Location of Parcel
- Acreage
- Map Block Lot Number
- Deed Information
- Acquisition Date
- Acquisition Year
- Owner Information
- Classification
- Ownership Code
- Conservation Restriction
- Hyperlink to GIS
- Management
- Assessed Value

4.2.3 Implications

The determination of the attributes was important to our project in order to gather the necessary information to be compiled into a centralized resource. This portion of the project was important in tailoring the resource to the needs of the participating

organizations. After determining what data to put into the resource, the next objective was to gather the information requested and create a compilation of the data.

4.3 Compilation of the Resource

Compiling the centralized resource was our second objective. In this section, we present the archives in which the data were found, the database in which they are organized, and the implications of the database.

4.3.1 Archives

Referring back to Table 3.2, where we present the attributes and the archives in which they are located, one may note that most attributes were retrieved from two or more archives whenever possible. This was performed in order to ensure validity.

4.3.2 Database

While we were retrieving the information from archival research, we compiled all of the data in a centralized database, Microsoft Access. The Microsoft Access database includes all attributes labeled in Appendix C. The final compilation of the database is located in Electronic Appendix A. The Microsoft Excel version of the database is located in Electronic Appendix B.

4.3.3 Implications

The database is important for retrieving useful information regarding open space in the Worcester area. Such a centralized database provides those interested in conservation a very user-friendly and time efficient tool to research parcels, their corresponding attributes, and aide in identifying priorities. In addition to creating the resource, we added more functionality by connecting it to geographical information systems.

4.4 Analysis of database

Our final objective was to use the database to provide an analysis that can be used in identifying priorities. By connecting our database with geographical information systems (GIS), we were able to conduct further analyses, such as a chronological analysis of open space. In order to analyze how open space has evolved, aerial photographs of Worcester were needed. In this section, we discuss the aerial photographs retrieved and how they were used for the analysis. Then we discuss the GIS polygon layers that were created, and the relationships between them and the aerial photographs. We finish by discussing the custom analyses of the organizations.

4.4.1 Aerial Photographs

Aerial photographs of Worcester, Massachusetts were connected to GIS through georeferencing in order to analyze the amount of open space in Worcester. Table 4.3 presents the years of aerial photographs obtained and the source from which they were retrieved. The photographs were retrieved in partitions; in some cases there were 70 sections to complete one year. They were aligned together based on the coordinate system by a process called georeferencing. A sample of the 2001 final assemblage is located in Appendix D. A complete view of all of the years can found in the GIS database in Electronic Appendix C.

Table 4.3

Year of Photograph Publication	Location Obtained From
1938	Natural Resources Conservation Service
1952	Natural Resources Conservation Service
1971	Natural Resources Conservation Service
1980	United States Department of Agriculture Farms Agency
1992	MassGIS
2001	MassGIS

4.4.2 GIS Layers

In this project, we worked with two divisions of GIS layers. The first type was the layers that we obtained from MassGIS. These layers of Worcester and surrounding municipalities provided a template from which to start. The GIS layers that we obtained are listed in Table 4.4. A sample of the layers is shown in Appendix E. All of the layers used can be found in Electronic Appendix D.

Table 4.4

Name of Layer	Significance of Layer
Massachusetts attributes	Used for locating bodies of water
New England town boundaries	Acted as a reference for staying within Worcester's boundaries
Town roads	Aided in aligning the aerial photos
Worcester attributes	Aided in aligning the aerial photos One of the sub-layers was used as a visual aid in showing which parcels were owned by each organization

The other type of layer that was important to our project was the polygon layers. A layer was created for each year, which is found in Electronic Appendix E. The analysis of the polygons is presented in Appendix F. They are portrayed as polygons but represent the open space parcels that were present in each year from the aerial photographs.

4.4.3 Custom Analysis

From the polygon layers which consisted of 1938, 1952, 1971, 1980, 1992, and 2001, we were able to analyze how open space evolved over time. First, we compared 1938 to 1952, which we discovered that 1938 had a higher concentration of open space in the area that is currently the airport. As the years progressed, in 1952, there was more development near the airport due to the advent of the airplane, thus reducing open space.

We also noticed a decrease in open space in other areas. This could be attributed to the baby boom that occurred after World War II. An increase in population leads to an increase in development to account for more people. Additionally, we noticed that the open space in the center of Worcester began to deplete. We speculate that people began to develop the center of the City and settle in the less developed, outskirts of Worcester.

Between 1952 and 1971, there was not a dramatic change in the amount of open space conserved, nor was there much of an increase in development. The northeast corner of Worcester, however, lost a considerable amount of open space.

There was also little change from the period of 1971 to 1980. Open space continued to decrease more in central Worcester. We speculate that this is due to an expansion of a developed center and because of the construction of highways, which run through the middle of the city.

Between 1980, 1992 and 2001 there was little visible change in the size, location, and number of parcels. We noticed a minimal loss in open space but did not observe any areas where it increased either. As our research shows, public interest and awareness has increased in the past decade. They realized the United States was growing rapidly and development pressures were increasing. Action needed to be taken in order to restore and maintain land in its natural state. As a result, regulations and tools were adopted and implemented to maintain a check and balance on development, keeping the amount of conservation fairly uniform in the City. Such action has stopped the decrease in open space evident in the previous years. Although it has been able to control development, it does not seem to have worked to increase conservation in Worcester yet. Conservation appears to be at a standstill at this point with little change from 1980 to 2001. Although land is conserved, there seems to be no further acquisition.

The most significant amount of open space decrease is evident in the years from 1938 to 1980. In 1938, there was a noticeable amount of open space centralized in the City. However, by 1980 the amount of viable open space remained only on the outskirts of Worcester. We concluded that this was due to the construction of highways, which mainly run through the middle of the City, and a more mobile community due to vehicles. In both years, however, most of the open space was located at the edges. Also, the size of the parcels decreased as time passed. In addition, we discovered that there was a great amount of land lost to development in the northeast area of Worcester.

With this chronological analysis, we were able to examine how and where open space changes. This is an important analysis because it allows the analyst to follow conservation and development. If it is known that an area in Worcester is progressively losing its open space to development, an organization can focus on acquiring these parcels which are evidently at a high risk to be developed. This analysis shows where the development pressures have been from 1938 to the present day. This is a useful tool for two reasons. It first is a tool for education and to show the public that there is a strong need for conservation. Also, it is a tool to determine which parcels are the most susceptible to development, making them a higher priority to conserve. The most recent year, 2001, is very important because it shows all of the open space that is left to date. From this layer, one may first see the viable open space that is left and then perform many analyses to determine which parcels of open space are more of a priority.

5 Conclusion

5.1 Introduction

The purpose of our project was to create a resource to identify priorities and perform a chronological analysis of open space. This was accomplished successfully. In this section, we discuss our findings from the analyses and our future recommendations for further research.

5.2 Conclusions from Analysis

This section presents our conclusions from the chronological open space analysis. We began with the duration from 1938 and 1952. From this analysis of the years, we conclude that there was an increase in development. Areas that were prone to higher rates of development were the area near the airport and the central region. We conclude that there are many reasons attributing to the development but believe that it is mainly due to the improvements in transportation methods. This allows for a more mobile community and provides the people with more options of settlement. Therefore, the central region of Worcester lost a lot of open space due to an expanding settlement area.

From 1952 to 1971 there was not a significant amount of change in open space. However, we noticed a decrease in open space in the northeast corner of Worcester. From this, we speculate that the population was moving near the lake, thus increasing development pressures in this area.

In the years from 1971 to 1980, we found that the open space continued to deplete in central Worcester. We attribute this to the construction of the major highways and roads. This contributed to a major loss of open space.

Between 1980, 1992, and 2001 there was not much visible change. There was neither a decrease nor increase in open space. Based on the knowledge that we have

gained, we conclude that this is due to laws and regulations that were adopted. During this time, there was an increased awareness regarding conservation and its importance to an urban area. Organizations and the community realized that action needed to be taken to maintain open space and control the fast growing pace of development. With the implementation of conservation laws, the City was able to keep the open space it had but did not increase the amount.

5.3 Future Recommendations

The resource that we created has the capability to perform multiple analyses. However, due to time constraints, we were only able to perform a chronological analysis of open space. The other possible analyses that could be performed easily and without much additional information include: proximity analyses to schools, bodies of water, and other open parcels of land.

With the polygon layers of open space, we attempted to find the percentage of open space for each year. However, this could not be performed on ArcView because it did not have the program ArcEditor, which allows such an analysis. This is an additional analysis that could be performed from the completion of our work.

Our project was phase 1 in a multi step process to improve the identification of priorities, thus improving the top ten list and conservation planning. Building off our resource, the next step would be to focus on individual parcels of open space and determine such things as its topology and biological significance, which would also aide in identifying priorities. For example, if a specialist knew that an endangered bird nested only in a particular tree, they could find where the trees were located in the area, and work to conserve that open space. The attributes identified by such experts as botanists could be added to the database that we have created.

We also believe that it would be beneficial to create a website. We recommend a website that is available to the public, to make the databases and open space analysis accessible to the public and to the conservation related organizations. This will be useful with providing a method for authorized organizations to update the database.

6 Recognition

We would like to recognize the organizations that were helpful to us in completing our project. Following lists the organizations that were helpful to us.

- Blackstone River Valley Heritage Corridor
- Conservation Commission
- Massachusetts Audubon Society
- Parks and Recreation Department
- Regional Environmental Council
- USDA Farms Agency
- USDA Natural Resource Conservation Service
- MassGIS

We would also like to give a grand thank you to the three people who helped us greatly. Without them, we would not have been able to complete our project.

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Appendix A
Final Interview Questions

Interview Questions

Initial Explanation:

We are four students from Worcester Polytechnic Institute, collaborating with the Greater Worcester Land Trust for seven weeks to develop a resource for participating organizations to aid the retrieval of information concerning open space, and to serve as a tool in identification of priorities.

1. What is your organization's operational definition of open space?

2. What are your organizational goals regarding open space?

3. How do you currently prioritize projects concerning open space?

4. What does your organization consider to be important attributes in determining land conservation?

5. Thus far, our database includes mbl, acquisition dates, owner information, parcel location information, deed page and book number…. Are there any other attributes that would be useful to your organization?

6. What data would be of use to your organization to be collected in a compiled centralized database?
    a. Is there any particular data that your organization continuously retrieving that would be of more use in a centralized database?

7. In what format would your organization prefer the data?

8. Does your organization employ GIS?
    b. If not, is the organization aware of the usages of GIS?
    c. If so, which program (arcview, arcmap, arcinfo, mapinfo, idrisi)?

9. What analysis of the data collected, using GIS or Microsoft Office, would be useful to your organization?

Appendix B
Verbatim Transcriptions and Signed Consent Form

Interview Transcript of Interview with Katie Donovan

KK- ok, first question, what is your organization's operational definition of open space?
KD- (pause) is this a test?
Laughter
KK- Basically, what do you consider to be open space?
KD- areas that are- what we look at mostly- we have a lot of areas that are open, but protected open space is different. I don't know if you looked at the Broad Meadow Brook area, there's some parcels that actually open, but they are not protected. But they are open right now. What we look at, as far as open space, is areas that we can preserve and have the public use for passive and somewhat active recreation, like biking. Some of the properties have historic value, such as perkins farm has an amphitheatre. But for the most part, it's really to preserve some areas, instead of paving the entire city.
KK- ok, and secondly, what are your organizational goals regarding open space, which you did mention...
KD- yeah, see what we look to do, back in 1998 was the last update on our 'what's left list' and that was the larger parcels of land, which gets down into some smaller parcels as well, but for the most part, when we look to acquire land, we look to acquire larger parcels. That last one was done in 1998, and what we need to do right now is decide where this function is going to lie, really, and start working on another update. I don't think that we'll have a lot of new parcels to add to the list, but what we will do is, we have a top ten list, and we preserve some of those parcels, and we lost some to development, so what we will do now is look to the rest of the list and make a new top ten. But I think when, in, I think that in 1986 was the first one, 1994 was the second, and the third what's left list- I don't think we are going to find any new land that we haven't discovered at this point.
EH- and when you talk about larger parcels, what is pretty much the cut off?
KD- The last purchase we made was 90 acres of land, and I think everything's been- but I've never been involved with it over 50.
EH- over 50?
KD- There's been some smaller ones- you know, 14 or 15, that somewhat involved through the Greater Worcester Land Trust. When the city gets involved, we buy open space through grants, and we need to match the funds. So when we look at purchasing different lots, it have to be worth the money. A lot of people will ask the same amount for a ten acre parcel that someone else is asking for a 90 acre parcel, and we really need to look at the cost effectiveness of what we're going for.
KK- ok, and how do you currently prioritize projects concerning open space, and even, as you said, you had a top ten list, how do you determine the top ten list?
KD- there was a committee that was actually put together and basically the top ten- it wasn't just the largest parcels, but it was the parcels that we thought we would loose to development, and that is where our top ten list came from. And again, like I said, we did loose some to development, but we managed to preserve three or four parcels that were on there…. Or even partial preservation- some we lost to

development, but they will donate part of the land to open space

KK- and I know you had mentioned acreage as important, but what other important attributes does your organization consider to be important in determining land conservation?

KD- wetlands is a big one- wetlands protection is something that, working with the conservation commission, we look at the preservation open space provides, so protection of wetlands, and as a big issue that some people don't understand is actually that wetlands aren't just nice, they are actually functional, and that's a big issue in the city, we still need places for the water to go. So I think that that's a great function of open space, and well as to provide some protected areas for recreations.

KK- And so far, we have begun to create our database, and we have attributes in it such as the mbl, we have ownership, whether or not there's a CR, acquisition dates, acquisition year, (ZO and EH chime in) management, ownership,

KD- acreage?

KK- yeah, we do have acreage… and just wondering if those, what we have so far, could be useful to you, in our database, and if there's anymore that you could think of…

KD- absolutely

KK- that would be helpful…

KD- that would be so helpful to us, in determining- like I said when there was a split of city departments a few years ago, we lost a lot of staff, and with the budget cuts and lay offs, we just can't replace the people that we once had. So when we do update this, it's probably going to fall on one person's shoulder's, so anything that you can provide would be very, very helpful to the city, and I hope that all of you would actually be around to be involved in that

KK- and also right now, we're working on creating a user friendly access to deeds, and deed numbers in our database, and I know that those things are used a lot by organizations, I don't know that if we did that and created a generalized CD with all that information on that, instead of going to the registry of deeds, and looking up that information it would be right there for you. Would that be helpful, or is there any other information that you would continuously try to gather, or any work that you do that we could?

KD- It would be helpful, absolutely- anything that we have acquired recently, I think we've got, or have acquired, we have a deed on, but…

Tape recorder stopped for individual's privacy rights.

So, is there anything else that you are continuously achieving that would be of more use in a centralized database?

KD- I wonder if there's something that, maybe when you get closer, that we'll go over and you'll probably do this with Colin, but go over, and somethings we have names for, as opposed to a street address and we'll call it something- (EH- a nickname) a nickname, so it may be helpful for you to put in there as well, so maybe once you get closer to finalizing it, we could sit down and look through it.

KK- oh, definitely, yeah. We're planning on keeping everyone updated with our work. Ok, and also, what format would your organization prefer the data?

KD- I work best with excel

(laughter)

As much as I've worked with access, I still can't master it, I don't know about you.

EH- that's what we use, but we can export it.

KD- ok, that would be wonderful.
KK- and does your organization employ GIS, or is acquainted with GIS?
KD- yes, we have one GIS staff person at the present time, and we have the former GIS manager consulant with the city until they have a replacement for him. I'm linked into part of the- we can link to, certain departments can link through into and actually pull up any information we want off the GIS, so I'd have information like that if you would ever need it.
KK- do you know which program it uses?
KD- Its arcview, but I can't say that's gonna stay like that when the new manager comes in.
KK- alright, and what analysis of the data collected, using GIS or Microsoft Office, would be useful to your organization?
KD- how do you mean?
KK- meaning, for instance, you said that you were interested in wetlands…
KD- right
KK- so I don't know, we could do a type of analysis where looking distances from wetlands, you know, just an example, you know, I don't know, distances from wetlands and comparing that over years as we overlay years how land has progressed, and see how that works. That's just an example, I don't know…
KD- I don't know how much information we have on our GIS to give you for wetlands. We have some areas, but they don't generally show up, so I don't think that would be..
KK- ok..
KD- I don't know if this is possible, but I would be interested in looking at distances between parcels, you know, because I know that one thing that we are trying to accomplish through part of the tax title takings is land that's landlocked we may be able to acquire someday, and it would actually link two pieces of open space, so we're trying to work some contiguous parcels. So I'd be interested to see the parcels in between- obviously not throughout the entire city, but if there were some areas grouped on the same side of the city, what it would take to actually link the two parcels.
KK-ok
KK- so are we all set?
There's one more thing question- Colin had mentioned that you had acquired aerial photographs, throughout time- of Worcester, and I was wondering if that was true, if you have those.
KD- I have an aerial, I can look up aerial stuff on the GIS. The aerial photos that I had access to before, when I worked at OPCD on Main Street, I don't know where those are. DPW does have some, and I actually have some wetland maps from massGIS that maybe very helpful to you, but they're in their aerials, they're not in topos, but it's for the entire city, and it's got all the streets, and if I knew I was going to get it back, I would let you borrow it.
EH- we can even, if you have it on a CD, burn it.
KD- I don't know if I've ever got it on a CD, but I could request it from MassGIS
KK- yeah, that'd be fine
EH- do you have any more questions, anything else that you'd like us to take care of for you?
(laughter)

EH- wait, maybe I shouldn't have asked that…
KD- no, you really shouldn't!! no, I think just probably, as you go along, if you could just keep me updated, and if I think of anything…

Transcription of Deb Cary

EH- What is your organization's definition of open space?

DC- Umm, unaltered, undeveloped in any way. So, actually, that's not our definition, it would be parks and conservation areas. But, potential parks and conservation areas too. So I think open space is a very broad term. And, when we look at Worcester's open space plan, it identifies parcels that could meet multiple outdoor recreational needs, some passive, and some active. So once, it's been acquired as a park, it may be turned into a soccer field it still is classified as open space is the point. So it has been altered in some way.

EH- But still you're interested in open space that can be used for passive and active recreation.

DC- Umm, exactly.

EH- Mmm great! Question 2, what are your organizational goals regarding open space?

DC- Well, Mass Audubon has a particular focus on significant wildlife habitat. And, our statewide goal is to enhance the protection of open space through a variety of ways. Often in both acquiring land directly ourselves but also working with other organizations, citizens, and private individuals to protect their land. So and pushing the state and the federal government to do everything that they can too. So we're both, we're advocates for land protection. We're also acquirers, you know, in some cases; we're actually fundraising directly to acquire a piece. Umm, mass Audubon, recently completed an update report called Losing Ground.

EH- We got that

DC- Ok, so you probably have that. Ok, so that pretty much, the reason we did that is that's our goal is to help save open space. But, and the way to do that is through collaborative efforts across the state. And that's here in Worcester; it's very much done on a collaborative basis.

EH- Question 3, how do you currently prioritize projects concerning open space?

DC- it's we look at a number of overlays, you're familiar with GIS mapping, and at this point, we're doing an update, umm, anyway, in Worcester, it all depends I mean, statewide probably have layers, where we try to really support other priorities like habitat, overlay, there's something called the biomap, that the state has produced and that

overlays priority areas for protection depending on the species, the types of species, the rarity of the species that live there. That is a factor for us. Umm, also is a factor is how large an area is. What is it connected to? The biomap overlays are very useful and what we're doing as an organization in each of our sanctuaries is looking at each sanctuary overlaying that information and that is guiding us as to what we feel we should add to each of our sanctuaries. But, I don't think that our priority setting goal is there, because also a priority would be to work with the nature conservaty or get our members in a town to help support efforts. So um, there's one, we can be parcel specific relative to our own sites, but on a broader level, you know, we really support the kind of analysis the statewide open space plan did which is to highlight areas for further protection. Um, so I think the way mass is going to proceed is by this kind of team effort where all the major land organizations are working together. Umm, and here in Worcester the open space planning effort has traditionally provided the forum for reviewing parcels and ranking them and Worcester has had in the past a top ten list and it kind of makes sense to keep that current and up to date so it's crystal clear, oh yea we got to get that Nights' of Columbus land b/c it's such a key link like that's the most recent land that's been targeted for acquisition and just received state funding. Well it's a beautiful project because it has all these multiple goals. It's active and passive recreation being achiev! ! ed. Itquote s a trail linkage; it's on the shores of a water body. You know, it builds on existing open space and expands a green way, so when you say, well how do you establish a priority, I just listed them. The fact that it met all those key goals pushed it up on the priority list.

EH- So basically, you look at biological diversity of species, acre size, connection with water, whether or not there are parks or trails, whether it can be used for active or passive recreation

DC-Right, what the public access ability now, or is there potential. And in to their credit, when Worcester did their update, in 87 they produced a very extensive open space plan. Which to me was sort of a blueprint for a lot of what's happened since then. Like we're now up to about a thousand acres of new, protected park and conservation land. And you can trace back to that original, not that that was the first plan, the city had done, but that plan was done with a lot of help from biologists and people with expertise, who had that ranking system. I remember, we looked at each parcel and they looked at a little over a hundred parcels. And of that they picked 53. and each one of them, was ranked. It was quite a good system. And those things that we just listed, was what we ranked them on. And that was really helpful. You know having a clear plan, a plan isn't inactive, a lot of people think planning is not doing something. It's the opposite. I like to use blueprints because you know; you always have blueprints before you build something. It's not that they just sit around. And the same with, it's not conceptual, you have to have them. And then you know what you're going for, and that helps you attract the resources cause then you get funding to go for the priority piece on your plan.

EH- Question 4, what does your organization consider to be important attributes in determining land conservation?

DC- Yeah, I would just say those same ones. You know the biological significance as determined through the biomap project. Umm, you know the types of species that are found there. The umm, what water resources are connected to the site. And the potential

for public access. And the ability to um, is it, you know, the size and can it be added to too. Is it a key link, you know, between two areas?

EH- Thus far, question five, our database includes MBL numbers, acquisition dates, and years, owners, management, whether or not there's a CR, acreage, and is there anymore Beth?

DC- This is for land that has already been protected, right?

EH- Right. Are those attributes something that you are interested in?

DC-Yes, but I'm also interested in past stuff, is who appraised value, assessed value, and then you want to know how that was acquired. Sounds like, what you're listing is Green Hill Park or Broad Meadow Brook, you know, you list all the parcels that make up that designated area. And they're all very complicated, but if it's easy enough to pull that together, it would be really helpful. What I was going to say is, see I'm more interested in all that for the future, you know like a parcel that we want to acquire. Umm, would be more, what's it's appraised value, who are the surrounding owners, who owns it now, where do they live.

EH- Alright, so beginning again, question five A, is there any particular data that your organization is continuously retrieving that would be of more use in a centralized database?

DC- Umm, well, presumably for Worcester, any tax delinquent property. We would love to be updated regularly, not just on tax title, cause that's once the city's given up on somebody, and they've tried to recoup taxes. Then over five to ten years, they'll take the property, and then it becomes what you call tax title and then the city's free to dispose of it or sell it or auction it off. In many cases, that's how Worcester has gotten conservation land, because we've said, oh well, don't auction that, transfer it to the Conservation Commission, because it's a public resource, and that's really the best public benefit from that asset. If you think of the land as an asset, and the city's going, hmm, what should we do with this asset? Then you could sell it for money, but that's kind of a short term immediate gain whereas the conservation argument is well it's actually more significant as conservation land because it has all these attributes or it's on our open space plan and that's how Broad Meadow Brook was created. Much of the land here was tax title. Perkins Farm came that way, and there are several other examples around the city where conservation land has come from tax title land. So in anticipation, it would be great if we knew who wasn't paying their taxes, you know, and then we'd know the parcel and know that there was potential. We might even be able to approach the land owner, and say hey, stop worrying about your back taxes and why don't you just give it to the city for conservation.

EH- Question six, in what format would your organization prefer the data?

DC- Umm, well, mapped is the best way…physically mapped with parcel outlines overlaid. So we can see it. But a print version. And then a website, a city website, where we can go and get updated. Or a local resource, i.e. the Greater Worcester Land

Trust, where we could say, hey, what about this parcel blah, blah, blah.

EH- At this moment, we're using Access, or do you prefer out of those two just for the raw database, Access or Excel?

DC- Either one, I'm not that familiar with either one, but we use them here, and I know that they're both pretty well known.

EH- Alright, and you've given us some other good ideas too.

DC-Yea, I would just say, whatever is most universal for the most people. But either one of those seems like most people use.

EH- Question seven, does your organization employ GIS?

DC- We do.

EH- If so, which program?

DC- Um, I think we're doing ArcView. And right now, I know somebody's using 3.2, although it has much higher. So what I would say is, it's probably good to keep it at a, I don't know, just don't be so far ahead that only those of us with advanced systems can read it.

EH-Ok, and question eight. What analysis of the data collected using GIS or Microsoft Office, would be useful to your organizations?

DC-Well, I think everything that we've listed, you know. Especially for the ones that have been targeted, being able to have all that data readily available for the remaining open space sites in the city would be really useful. I mean, we're just doing parcel planning here at Broad Meadow Brook, and I kind of thought that I knew most of the parcels around the sanctuary, that I needed to know, and I don't. And that's what the GIS modeling did, is that they matched aerials with GIS with lot lines and ownership. It was great, because I didn't know that was owned by so and so or looks like we should put those together, we learned so much.

Interview with Rob Antonelli

Kristen Kane- First Question- what is your organization's definition of open space?
Rob Antonelli- We use a number of different mechanisms, it's both uh, passive and active recreation, uh, it's wooded area, it's ballfields, it's anything along the lines of space that does not- that is used for some sort of park purpose or conservation purpose or resource purpose. And that's pretty much the way we look at all- most of our land, in regards to how we operate, and what we do with it. One of the things, well, some people wouldn't say that a ballfield wouldn't be considered open space, but in essence it really is, because you aren't building houses or condominiums or other things on that area- it's there for a recreational purpose

which allows multi-use for families to, you know, just enjoy, a nice day- not like today, but eheh

(laughter)

RA- but enjoy a nice day here and there, so it is a broad range.

KK- 2nd question- what are your organizational goals regarding open space?

RA- We've uh, we continue to 1, maintain open space, 2, we continue to look to purchase open space. We've worked with the Greater Worcester Land Trust, and the city and the state to come up with a- buying a parcel of land called the Nights of Columbus parcel and the fent parcel. So we've worked with them to really go out and solicit and obtain property that is currently considered open space or what we consider open space. So we both maintain it, we take care of it, and we go after it and try to purchase up more, so the city has the availability of additional open space.

KK- Three, How do you currently prioritize projects concerning open space?

RA- Most of our priorities are based on uh, renovations to facilities, with the exception of the Nights of Columbus parcel, where we purchased a facility. Most of our funding and our mechanisms are used to renovate the facilities. And we do a review of all of our facilities and say, which ones are in the worst shape, and what we need to do to address these concerns, and how much is it going to cost to address that kind of thing. So most of what we do is, look at trying to both maintain what we have currently have, but also renovate so that we have something better down the road.

KK- What does your organization consider to be important attributes in determining land conservation?

RA- I think all land- there's important attributes in any kind of land that you have- whether it's hilly, and you're dealing with locations like Cascades, where you have great waterfalls, great trails, to locations like Crompton Park, which is pretty much flat, with the exception of one sort of mound, over in one corner, where there's baseball fields, and everything else. We really look at is as being an area for people to gather, to be able to see both nature and be able to participate in active and passive recreational activities.

KK- Thus far, our database includes mbl numbers, acreage, management, ownership, lot number, site name, is that all of them? What other attributes would be of use to your organization to be collected in a compiled centralized database?

RA- Whether or not it's- what it's classification is… there's a classification through the state of Massachusetts, or the commonwealth of Massachusetts, that states that if it's designated as a park, it falls under article 97, which is a park protection article in the state law. If it's a playground, it falls under a separate type of law and regulations- with an article 97, you need to have home rule that goes from the city to the state legislature- you need a 2/3rd vote of the state legislature to approve the sale or reuse of park property for anything other than park purposes. So if I wanted to, you know, build a condominium on the other side of this road here, I would have to go to state legislature, and approve that, whereas if I wanted to build a baseball field there, I wouldn't have to go to state legislature for that. So whether it's a park or a playground, or how it was officially deemed by the city would be a great benefit also.

KK- Is there any particular data that your organization is continuously retrieving that would be of more use in a centralized database?

RA- Um, we're always looking at acreage, we're always looking at um, what the- anytime we do a renovation, we're always looking at trying to figure out whether it's an article 97, or a playground or a parkground, or so. Besides that the only, other thing we look at is just what we have at each location- you'll see on the list that I gave you that it gives you a good idea of what's at each location, um, so just to update that would be, to make sure that we still- I do it by memory, sitting here, trying to go through each one. But uh, to maybe have somebody else take a look at that also would help too. But, there could be others- I would talk to the commissioner a little bit more about it, and see if has anything else and I could get back to you on that, but I think at the minimum the article 97 stuff, and just taking a look at those locations- I don't know if you plan to go visit any of the sites or look at them or whatever, but if do, that'd be great. If not, we can work it out from there.

KK- In what format would your organization prefer the data?

RA- Doesn't really matter. Excel, Access if fine. Uh, we all use those, so that's fine. What we'd probably end up doing is once we get the data is put it into a pdf file, so that, what I don't want to do is have someone have the ability to make changes to it without you know, authorization, or whatever- so that'd be my only concern. And we can do that on our end, in regards to the pdf file, so, we can do that.

KK- Does your organization employ GIS or is acquainted with the program?

RA- yes, yes we are, we are acquainted with it, we do use it. The city has, at this point, dropped a good portion of their staff for GIS, so they're a little lacking in that area, but I have a number of staff in our project management division that have at least a basic understanding of how to use it, and that kind of thing. Whether they can program in it is probably different story. But they do have good knowledge to go and there and pull stuff out, put layers on and all the other stuff.

ZO- what we'd use it for just like a visual aid, what we'll have is all the conservation land will be different colors, everything will be easier to see where everything is, and how you can like connect different areas if you get different lots between areas, just expand

RA- And that is exactly what we did with the Knights of Columbus it was a, it is a great expansion piece because it allows us to go pretty much from Mill St. which is near where the Elks club is on the west side off of Main St. almost all the way around we have gone almost ¾ of the way around the pond over there, so we have really made great strides in trying to really make almost like a complete circle around the pond which is a great asset for both the community and for us, so we are excited about that

KK- Do you know what program you use in GIS?

RA-That I don't

KK-ArcView, ArcMap?

RA- Which one?

KK-ArcView or ArcMap, MapInfo

RA-I think it is ArcView, but I will double check for you, actually hold on

Alright I will get back to you, just remind me before you go and I will uhh check that

KK-What analysis of the data collected either using GIS or Microsoft Office, would be useful to your organization?

RA- One more time

KK- What analysis would be useful?

RA- What analysis, umm, I think the analysis of what is still out there, I like the analysis of where like you have already talked about, who owns what, and what is still, what is under the GWLT, what is under the Conservation Commision, what is under parks, what is under all those different entities, and there could be some ability to connect to bike trails those kinds of things that we would be able to add into that, I think that that sort of analysis to sort of be able to take an overview look of all that, cause I think we have some of that but we don't have a complete updated listing of any of that stuff, so that analysis to see what's there and what's still available would be good, but umm, or what parcels might be available in and around where our facilities are and where would be able to maybe purchase and expand, do those kinds of things, would also be a great piece, so that kind of stuff, the other issue would be to take a look at it, and sort of see if there is space, you know, if there is a house that's you know in bad condition that would be able to be used to put in a playground or you know smaller pocket parks, you know maybe the size of a house lot, small house lot, where in a neighborhood that doesn't have anything close by we would be able to put in a small park into it, a small playground slide, swings, that kind of thing, so anything along those lines would be great, when you are looking at that as a whole

KK- That is all of our questions do you have anything to add?

RA- That is it? Quick

Interview Transcript from Interview with Mark Jewell

MJ- But we've had a lot of successes, with TPL, for example- they just protected- did a limited development project in Uxbridge, and they gave, say, 60 acres... they donated to the state park- it bordered the state park, so they just gave it, and they had the option to build, I don't know how many houses- five or something, along the road, as a limited development part of it. But they protected all this, about sixty acres of wetlands along the river, and donated it to the state park, so it was great. So htings like that. But then of course you have people applying for graveling permits, and other things all over. So we don't have authority of those types of issues- that's a local issue, I mean, if zoning allows a gravel pit to be operated, then it's up to the municipality to, if they don't want it, it's up to them to change their zoning, or what have you. So we really don't step in as like, a heavy handed federal type of thing, so we really try to stay our of local issues, and just kind of look out for, and when we make our review comments, they are pretty sensitive to those kinds of issues.

ZO- How do you currently prioritize projects concerning open space, like when you get the money from the government, how do you decide which money goes where?

MJ- That's a good question. Through our call for proposal, that we put out and people apply to us for various projects, not just open space- it ranges from; they want to restore a historic building, to put up a sign at their trail head, to printing brochures, you know- wide range. There is a prioritization process for that award system, and basically, in a nutshell, it has to meet the goals in this ten year plan. If it doesn't help us attain this, it's gonna rank pretty low. Open space is huge in here. For example, this is a great example. Two years ago, we didn't have a round last year,

so two years ago was the last time we went through this. We had, like, five organizations- a couple different land trusts, and a couple different municipalities, like, five separate entities that came in and applied for trail development money- they wanted to build a trail in their particular area, or whatever, dadada, so in that case, it was determined by the staff here, that there needed to be a coordinated plan- we didn't just want to fudge hodge podge trail projects around that didn't connect, and didn't- whatever. So instead of funding all those, we brought those people all together, and went together, and created the trails and greenway report, a vision for the Blackstone valley. So starting with this planning document, it kind of gave everybody a roadmap of where we wanted to go. And it through a public process- there was multiple public meetings and hearings and people drew on maps and created this thing. So now we have this vision. So now it's up to the municipalities to go out and apply for the grants, and do the footwork, and do the groundpounding that needs to be done to make it a reality. You know, we help in anyway we can, obviously, but that's one example of all these- of us trying to bring all these people together. Another one is, I don't know if you've heard of BERCA, it's pretty new- Colin might mention it to you. It's the Blackstone River Conservation Alliance- it's this organization tha! ! t's formed- headed, with some funding from us- it's kind of headed up by the Medaconnit land trust, but what they've done is something similar to what you're trying to do, and you should definitely talk to them, the Medaconnit Land Trust, Susan Spears- if you haven't already, but what they've done, is created an umbrella organization, so now this Blackstone River Conservation Alliance, in this region- under it, are all the land trusts, and people like us, and DCR, and however else wants to be apart of this goings-on. And so, they're attempting to do kind of what you're doing- they wanna bring in all this information together, so that there's a map of this region that shows open space. And then prioritizes them, so you know, if priority #1 is a parcel around lake manchog, then everybody knows about it. And everybody lets the state know that that's a priority. Then hopefully the state, or the local land trust, or the municipality- someone can move on protecting that. So it's trying to bring everybody together to prioritize parcels, as opposed of this land trust prioritizing their parcels, and the Grafton land trust prioritizing theirs, and so on. So we kind of helped them with a little bit of seed money, get their organization started, and they had a couple meetings, and everybody seems to be into. But you should definitely talk to them- Susan Spears is her name. And I have her number here, and I can give it to you, and you can ask Colin about it as well, and he'll give you his two cents on it as well.

ZO- So what does your organization consider to be important attributes in determining conservation land?

MJ- Um, again, I'd have to say, the same as with- align with the state- with DCR, and DEP. Certainly, you know, wetlands are huge. We have a lot of historic landscape too- like the Canal is a national historic district. But a lot of people don't even know it's in their backyard. Literally, I spoke to Eastern Connecticut University, to a freshman college class in geography, and there was a kid from Milville in the class- he didn't even know there was a Canal in Milville, you know- one of the best preserved lock in the whole Blackstone Canal, from Providence to Worcester, is in Milville.

EH- and he didn't know about it?

MJ- No, and so, you know, there's a lot of education, a lot of protecting, of resources like that, but you know, to get more back to your question specifically, I think again, we align with the state with how they prioritize it. Jennifer Howard, I don't know if you've been turned onto her yet, but she's the DEM, well now DCR of statewide greenway planner- she's out in amherst, and she's great- she's fabulous- she works with Julius Fabos, on the Greenway consortium, they're huge- they do all of new england, they're like greenway development in New England- they're trying to do huge bystate projects, and that's through the landscape architecture division/ department at Umass. But um, yeah, you definitely want to talk to Jennifer Howard. She'd be a welcome information.

EH- snowball effect always works.

MJ- yeah, definitely. And Colin knows all these people too

ZO- So thus far, our database includes mbl numbers, ownership, management, acquisition date, assessed value, whether or not it's a CR. What other attributes would be of use to your organization to be collected and compiled in a centralized database?

MJ- I think that the municipality, name, and then whether or not the municipality has passed the community preservation act- that's huge. There's three in this region that have passed the act- there's Grafton, Upton, and Mendon. Are you all familiar with the community preservation act?

ZO, EH- yeah.

MJ- So, that would be good to know, cause that's a funding source, that's huge. Not only is it a funding source, it shows municipal commitment to open space, recreation, and historic preservation. They are willing to vote to raise their own taxes, so that would be good to know. The CR, or anyother form of restriction- historical restriction, or any other form of restriction- historical restriction... I think it would be good to know if it's on the state's acquisition plan...

ZO- like their top ten list?

MJ- yeah, which they try to keep pretty quiet, cause if they didn't, everyone would just jack their prices up. But I've seen the map- they do have a map of priorities for the state to acquire.

EH- Now is it easily accessible?

MJ- ergh, but Jennifer Howard might be able to help you out there... but there is the- the state has, whether or not they release it- they do have a list of parcels that they are interested in. Generally they border state parks, or other parcels.

End Of Side One

MJ- if you had that list next to these other lists you know you would say oh well this parcel seems to be a high priority and then if you get all these land trusts going after it, cause it's at number one on the list and you don't know that the state's also looking at it, it would help if you knew the state was involved cause then you could approach them for funding and maybe they'd be fine with giving you ten grand to put a CR on it, verses trying to get a million bucks to buy it or whatever, so what else..... knowing whether or not the title's clear is helpful, cause we've run into that before.... where a road way was here constructed here, but then later in life it was moved over here, so the five feet of land that now is not state roadway owned, is supposed to revert back to the original owner but that original owner is owner unknown, you know it just complicates things, so... anything to make it simpler, I'm just trying to think off the top of my head, title but those are all legal issues,

acraege, whether or not it's got a CR, size, what'd you say, MBL
ZO- yea
MJ-What's that?
ZO-Map Block Lot
MJ-Ok, Yea, do you have owners name, and all that kind of stuff
ZO- Yea that is all the deed stuff
MJ-Yea basic stuff, if I think of anything else
EH-Yea that would be great,
MJ-OK, Colin would be pretty good at that as well figuring out what the best information is, yea he deals with that on a daily basis, I don't always....
ZO- So is there any particular data that your organization that is continuously retrieving that would be of more use in a centralized database?
MJ-As it refers to open space, I don't think so, cause we're you know, we have this overarching responsibility, and then all the project managers like myself, have a bunch of projects, so each ones different, so we don't have, they're all different... there's nothing that I'm working on this project that I'm gonna need to retrieve for this project. (Gestures) This is a sign project, and this is a trail development project, and this is a landscape architecture....
EH-Very irrelevant
MJ-Basically, since I've been here, almost three years, the major open space projects that have come up, have come up either on an emergency basis, or have been in the works for awhile. So they were started long ago before I was even here and they just kinda now coming to flourishion, but like the one in Grafton, I don't know if Colin mentioned it. I can't even pronounce it, the Honomesset Indian Prain Village, but ehh, Mass historic there's this site, 200 acre site in Grafton that Mass historic has said is definitively the location of the Indian Prain Village which is like out of control, like huge, and umm of course now DCR is interested, we got, the Grafton land trust told us about it, we got TPL involved, Grafton, lucky for us, is a community preservation act community, put up a half million bucks from their community preservation account which is just unheard of, and DEM came in with a couple hundred thousand, whatever they did all of a sudden, and bam we got this awesome piece of property, we, the town, the state, which we've funded, for example. In order to help that project I think we gave them 25,000 to conduct the archaeological study, that needed to be done, I can't remember if that was UMASS or Boston University, but you know, we funded that, and we didn't fund this buying land, we can't do that, but we kind of partner as best we can, and that was a project that came up pretty quick, I mean I got a phone call from Grafton Land Trust they said this private owner wanted to sell it to a developer for 2 million bucks, and he's like 'we have this letter from Mass historic that says this is like ridiculously important property, and we are gonna lose it to a developer, you know what do we do?' So you know we start making phone calls, and we got TPL here in a meeting in like a week
EH- And they are all out in San Francisco
MJ- Yea there head quarters, but they have one in Boston
EH-Oh ok
MJ-So that was great, that was huge success, you know in our minds. But it took a lot of partners, so..... if the town wasn't interested, then you would have trouble, if the state wasn't interested you would have fallen through, if the Grafton land trust

hadn't been keeping up to speed on all the land sales in town it would have been another issue. That was a pretty successful project

ZO- In what format would your organization prefer the data to be in?

MJ- I don't think we have a preference, if it is web-based that is great, I don't think we would ever have a problem with excel or you know if you could have a fancier interface on the web, then excel, then you know, I don't think we have a preference, at least I don't, as long as it is retrievable.... Being able to search, like if someone called me and said 'Bob Smith owns fifty acres in Upton', can I go in and search by name, if all I know is Bob Smith, that'd be handy

ZO- Does your organization employ GIS?

MJ-I will say yes, but very limited, we have it but we try not to use it. What I mean is that, when we need it, like for example, on this.....on one of the maps here, we hired that out, we'll hire a consultant to do it, because we have a limited staff, and limited staff time so to dump a lot of hours into making something pretty basic, with open space parcels here, it is just not cost effective. So we'll hire the consultants to do our GIS. We have it here, 8.3 or whatever, and they've sent me to training and stuff like that, but I don't use it very often, here in the office. Number one is consultants will create files, on their version of ArcView and then have all the extensions and do all the fancy stuff, and we dont have all the extensions here, so we can't even read it, you know half the time, but we will keep it on a CD just in case we have to pass it on to another consultant or whatever for a future project, but we do have it. There are one or two people in the office who understand it, and can talk half way intelligently about it, but we umm have a lot of partners and a lot of consulting firms, who use it, so we usually just call them up

ZO- so you use ArcView 8.3

MJ- yea that is what we have right now, but only on one computer, mine

ZO- What analysis of the data collected using GIS, or Microsoft office, would be useful to your organization?

MJ- Say it one more time?

ZO- What analysis of the data collected using GIS or Microsoft office, would be useful to your organization?

MJ- That's a good question. Did Colin talk to you all about the buildout analysis?

EH- No, not really

MJ- Ask him to talk to you about that. The buildout analysis. That was a bystate effort- cost a lot of money. Um, in Rhode Island, Massachusetts, it covered this area that we're talking about- the Blackstone Valley, and that was tons of GIS data- tons. Like, just, tons. And what they looked at is they some modeling- they did, given the current zoning, given the current development pressures, you know, when all the residential zoning is built out, when all the industrial development is built out, what does this place look like? And they- We used to have a map here... and it's online... like at DEM, Rhode Island DEM, and probably at DCR- Mass DCR website as well. Out in the lobby where all the junk is we might have a pile of posters. And it's just tons of online data. And actually, they gave out a CD- the mass dataviewer- it's the free... it looks like arcview when it's on your screen, but it's a little free CD, called the dataviewer, and it has all the data on it... I should get you one of those. Colin should have one of those.

EH- yeah, he should, yeah...

MJ- But that's huge amounts of data, and CMRPC is the other state organization that

does all the GIS for this region- not only this region, but this region, they have a GIS department, two guys there that are really knowledgeable... but I'm trying to think...

EH- Now what is that buildout analysis have to do with analysis that would be good for your organization?

MJ- Well, it gives you the big picture, it lets you know that, hey, you know... the town of Douglas Massachusetts, if things keeps going the way it's going, they're gonna have state forest, and a bunch of Walmarts and Home Depots, cause that's all they're zoned for. But it went into other things, like resources, like water, um, you know, aquafers, I think, well heads, and all kinds of environmental data as well. I didn't pay attention to it, it actually, that project just finished up, and announced it and released all the data and everything, like, a couple months before I started working here. But that's a tremendous, and I think we helped fund part of that, but the state's funded a lot of that. But, yeah, definitely ask Colin about the buildout analysis. Um, you can probably search it on the internet too, if you find it. Um, Rhode Island GIS, that's where you should go to- that website, rigis, I think, dot com...

EH- And Massachusetts has one too

MJ- same thing, massgis.. I think it might be there too. I think Romney's trying to cut that department... but anyway..

(laughter, from EH)

MJ- That's the thing, they don't update their data very often, and that's frustrating, but, whatever..

EH- Now that analysis has already been performed, are there any further analysis that you could think of that would be interested in...the future?

MJ- The one layer I'm interested in, for myself, because I'm the outdoor rec planner here, is a trails layer... which is obviously connected to open space.

ZO- Right...

MJ- And I haven't found a good one yet... and we have the land trusts are doing a decent job at getting out on the trails and actually trying to GPS them, even though they're doing it on horseback, it's a little too fast, so you don't get really accurate... but whatever, better then nothing. So, they're out there, doing that, and they're giving their data to CMRPC, and so CMRPC is slowly, you know, adding this informaiton to their database, as they do their trail feasibility studies, and what have you. Um, so it's a lot better than it was two and a half years ago- that data layer, but no one has it but CMRPC. Cause they don't- they're not in charge of updating Mass GIS, so you know, but that's- that'd be helpful for me, you know, an updated, accurate trails data layer, um, and obviously an open space layer, all the layers, we put on these maps- now this is Rhode Island right here, Burbil, Northsmith, Oldsmith, and Gloucester. This is the midstate trail, if you're not familiar with that, well, in Massachusetts, it's called the midstate trail, it's called the northsouth trail here in Rhode Island, 78 miles in Rhode Island all the way to the ocean. That exists today, same thing with the midstate in Massachusetts- it goes all the way up to the New Hampshire border. It exists, but, you know, I know our office uses vernal pools, like to have an accurate vernal pool layer, would be, I know helpful for our biologist, um, on staff... so anyway...

EH- great, just trying to make this useful for you.

MJ- Rhode Island again... but yeah, we run into the problem of people saying, 'well is that permenantly protected open space, or is it just, like, default open space?' So

having a criteria like that on your database would probably be helpful too. Which I guess you would know if it's a CR, it would tell you, but, you know, whether it's in chapter 61A, or

End of tape

Transcription of Interview with Colin Novick
Interviewed by Elizabeth H. and Zach O.

E.H. Question 1 What is your organizations definition of open space Colin?

C.N. Our definition of open space, intriguing, this is more intriguing then I would have thought. Well there are two different categories depending on how you look at it, we look at open space as anything that is currently not developed and that could even include a neighborhood block where everybody has a house on the outside edge but there is so much back land in the middle. That and its in a natural condition but even that could be considered open space umm but that's sort of more the category of land that we're hunting. The other way we think of open space is in terms of what has been preserved and in which case it would need to be something that was permanently preserved either by being held by a conservation organization being subject to article 97 being held by the state org. municipality for open space purposes or it would be subject to conservation restriction where the development rights have been severed. So its sort of depends on whether or not we're hunting or whether or not it's that which we consider to be protected. Sorry to make this fuzzy. Its overkill, but that's the way I think of it and that's pretty much; the way we look at it. It will actually mean different things when we say open space depending on not if we're having a discussion about potential land to protect or whether or not we're talking about that which we're claiming has been protected. Just to make it as completely confusing to the outside world as possible.

E.H. ha-ha ok Question 2 What are your organizational goals regarding open space?

C.N. Our goals are to try to protect existing open space in the urban environment and whenever possible to have open spaces within a reasonable walking distance of any neighborhood. I believe that ah at one point in time the trust for public land and talking about urban goals where everyone should live within 5 to 10 minutes walking time within an open space or a park or a community garden. Ah so that would be that another thing is that on the fringes of Worcester our goals are a little bit more habitat related a little less necessarily people related and we are looking to preserve large tracks of open space which actually could support ahh particular wild life populations like deer, turkey, grouse, um or even migratory animals like bear or migratory birds and butterflies. So in the urban core we're looking to have open space with proximity to open space to neighborhoods where people live more towards the outer rim of the city we're looking for larger blocks of land that could sustain viable ah wild life populations.

E.H. Alright Question 3 How do you currently prioritize projects concerning open space?

C.N. for a long time we ran off of the city's open space top ten list uh which was a list developed by the Worcester conservation commission and was endorsed by the city council where they had hunted down the 50 most valuable open spaces in Worcester and picked 10. That pretty much was our shopping list for looking for open space. Of the original 10 I think 8 either have 8 are gone either they have protected or they have been developed and the current open space list is no longer current. So this point we started to chase after organizationally based goals as opposed to municipally set goals. Umm we're we have been trying to encourage the city to update the top ten list so that we can go back to the shopping list mentality. In the meantime we're chasing after neighborhood preserves which are sort of that idea of urban open spaces within living distance of people, walking distance rather. Ah and the other is to try to look for the larger tracks of land and either consolidate them by picking up other parcels around already existing parks and open spaces or look for new connections. The other thing is that we've been starting to develop a new goal but we haven't completely enacted it which is to try connect, interconnect open spaces in Worcester by preserving land along stream corridors or to preserve land linearly that would allow for pedestrian trails. Umm so the idea is interconnecting existing open spaces and that something that we've been slowly trying to develop. Umm and that's another organizational goal with respect to open space and that's more trying to work within the constraints of ah a fairly built out urban core.

E.H. Great. Question 4. What does your organization consider to be important attributes in determining land conservation?

C.N. Umm, well develop ability is one of them. If the land is completely undevelopable for instance if it is a giant swamp um or if it's a massive cliff we are less interested because there is less threat to it over the course of time. Umm anything which would have a diverse topography is usually visually pleasing anything that could support large enough to support wildlife populations is intriguing. I guess it is easier to describe what we're not interested in rather than what we are interested in. if someone was doing a subdivision plan and there were tiny scraps of you know 100 ft sections along the back lot line between a couple of houses that we would be interested in it doesn't serving a public purpose and it doesn't serve any wildlife purpose. So ah the other thing is that we also try to avoid things which are known to be environmentally contaminated unless we could develop some kind of a plan either with the state, the fed, or the city to have a cleanup a brownfield clean up as part of the protection of the parcel. I feel like I'm giving a muddled answer on that one but.

E.H. Now question 5, thus far our database includes MBL numbers, acquisition dates, owners, management, location, appraisal information, deed information, and whether or not there is a CR, are those helpful to your organization?

C.N. Yes although in a technical sense I'm not sure if appraisal… appraisal, appraisal, I think the technical term for what your looking for is the assessed value. I think that is what you have and you want to be careful about that because an appraisal is

current market value and an assessed value is municipality's best guess as to what how much they are gonna claim its worth to tax you. Um and as a general rule assessed values are always less than appraised values so you just want to be careful about that one technical term. Ah it would probably be assessed values that you guys would be working with that would be the stuff that the city would be able to provide you with. Ah the other thing that isn't in your list that would be useful is a thing called class in ah GIS and it's always a three digit number and it is a land use code. For instance uh just to prove how absurd my mind is, uh land use code 130, 131, and 132 all correspond to vacant uh property in a residential district which are sort of neat code things if I remember right 901,902, 903,904, 905 are more municipal or government owned. Having that three digit code next to all the different properties would be helpful cuz it gives you a hint as to who owns it and what its taxable rate is and stuff like that and it's already in the existing GIS dataset so it would be a matter of keeping it and not pulling it out.

E.H. Alright and the second part of that question, is there any particular data that your organization is continuously retrieving that would be of more use in a centralized database?

C.N. ahh, well if you guys were going to try to have digital files that corresponded to all the deeds for all the conservation properties. It is theoretically possible to have a ah I don't know if this makes sense but ah have a hot link from the parcel or from the attribute table to the actual deed document so in theory you could actually go to the property and click on it and have the deed pop up. Um something like that would be useful because more often than not the deed is something that we're usually looking for. Ah yeah I mean, the only other things, there are other things that we need to have associated with those properties but their datasets that don't exist yet like it would be great to go over and try to get some biologists, botanists, and wildlife people to associate different kinds of plant, animal, bird communities with the mutual properties so when you pulled it up you knew if there was a specific wildlife value associated with it.

E.H. Question 6, in what format would your organization prefers the data?

C.N. ah, digital, on a cd I guess or a DVD, either way works fine.

E.H. Ok, Question 7, does your organization employ GIS?

C.N. Yes, it's ArcView 8.2 or 3 whenever I get around to it.

E.H. ha-ha Question 8, what analysis of the data collected, using GIS or Microsoft Office, would be useful to your organization?

C.N. umm, what we'd probably would end up doing is taking that dataset and replacing the city's out of date open space dataset so that what we try to do a project analysis for the city. We first of all start out with a better baseline ah and then at that point we'd probably start to do things like proximity searches like for instance all the things which are within 5 minute walking distance from open space and figure out which sections of the city are still vacant. Ah and whether or not there

are and then at that point what we'd probably do is we start to try to look at what open spaces exist in or near those those holes. Um that's one thing that would immediately happen the other thing that would happen would be proximity of open spaces to ah existing major water ways and ponds particularly because we're trying to interconnect open spaces through the preservation of land along waterways. Ah so that would also be sort of another, mostly proximity searches I think.

E.H. Another analysis just as a follow up for your significant needs um, you needed as you have told us before chronological analysis.

C.N. Oh well yeah, yeah for a couple different reasons. The first of which is that when questions come up with respect to the projections of ConComm properties or Parks properties, there is a black hole um when you go to the city's records the city doesn't record the book and page for any of its own properties. So the original transfer disappears um at least within the city records its still at the Registry of Deeds but its much much harder to find if you guys have already done the homework and know where that connection is that would be huge. and the year alone is a huge clue to when that is going on the year is also important to us in terms of making a case for open space and the progress of open space and the community's efforts on open space over the course of time sort of hitting the road demonstrating to the public the value of open space and this community's efforts, the timeline in chronology would be huge. Um because there is a significant gap between probably like 1920 and probably like 1970, I would say very little happen over 50 years and that kind of thing is fairly compelling because during that 50 years you also end up with a large development of single family tract housing. So it's sort of an unanswered shot across the bow in terms of land use reform. Um the other thing that is interesting we could correspond that to existing open spaces to see where the pressures are and where the most recent pressures are and what remains where there you could also take the chronology and figure out how desperate people are in terms of building because the city of Worcester has ah topography lines and its hard to build on slopes and you could sort by slopes and we could figure out as open space disappears and you know you are forced to do conservation in weirder and weirder locations that you could actually figure out whether or not there is actually a correspondence. Ah like I would be willing to bet that a lot of the open space that were preserved to start with ! ! back in the 1900's were open flat fields. And now we're fighting over hill tops and cliffs and that is partly because people are building on so chronology would be interesting even in terms of where people are building, what is considered important, has the nature of open space changed in terms of what the community wants to protect. Would people care about a big flat open field now, not sure? Would people care about a big old fat rock cliff, strangely enough probably more so. Um that kinda thing would be interesting to look at, but you can only get a sense of that if you look at the dates.

E.H. Great, is there anything else that you would like to put for information for what you are interested from this project?

C.N. The only thing I would want to make sure you are doing was ah having ah an ownership code run throughout. So that much in the same way that right now I can create a map of the city of Worcester with different color codes with different kinds of ownership we can do the same thing with your dataset and sort of replace the city's dataset. Um and one of the failings that their dataset had they didn't always their not always right. Ah there are sort of three city categories there is ConComm, parks, and city of Worcester and sometimes the generic city of Worcester is just that there is a mix up or they weren't sure and your efforts would clarify that. And the other is everything else is listed as sort of non profit land, but that means very different things.

Interview with Peggy Middaugh

Kristen Kane- Ok, so now we have an idea of basically what you do, and what you're looking for, so these questions are just more of us to get an in-depth idea of what you're doing… So first question: What is your organization's definition of open space?

Peggy Middaugh- hmmmm…. I think what we think of open space as more… well I guess I'll just define it as what it is not… more than just places where people can go hiking and you know, large parcels of land, but really small parcels of land. So, in the inner cities areas, the open spaces, places where people can enjoy the outer doors… and there's also sort of potential outer spaces, so a vacant lot that's trashed- I don't think I would define that open space in the context that open space- it conjures up something really nice, but its potential, because it can be really nice- in the future, and that what our organization has done over the years- first we clean them up and then we make them something really nice. Any place where- public space where people can enjoy the outer doors

KK-And second, what are your organizational goals regarding open space?

PM-Um, for us, it would be mostly maintaining the community gardens, and um, and pocket parks in the inner cities to provide spaces for people to be out in nature but also to be apart of a community- to make the community a stronger place, a nicer place to live

KK-And how do you currently prioritize projects concerning open space?

PM- Well for us, it's really based on which one we feel is the most vulnerable, the most likely to be sold for something else in the near future, so how we can protect them.

KK-And so you said you have a list of priorities right now, or working on one?

PM- We do. yes

KK- So how does that work? Based on vulnerability?

PM- How easy it would be to transfer it… So the ones that I explained that are owned by the city- the city does not want to own these parcels anymore- they've made that clear- and if we do nothing, if we just ignore their pleas, they are gonna get them off their- they're gonna get rid of them one way or another- they're gonna use them maybe as a parking lot, or housing or something… but as long as we're working with them, they recognize the need for gardens and open space- so that's sort of an easy one, we have a partnership there, they wanna work with us, likely

to happen, it's really important- gardens, so that's a priority, because we can get those in to a private ownership and kind of.., and as I said the other one that's a big priority how much we're using it and how important an asset it is to our program, so those are some of criteria and the ones where its harder to find the owners, or maybe there's not as many people gardening on it…those have lower priorities

KK- So would you say that you also tend to focus on inner- inner cities like you were talking about or just whatever?...

PM- The community gardens is inner-inner city, and for us protecting the open space, it's the inner city that we're working on.. because honestly, we have gardens at Worcester housing authority properties, but that's public space- that owned by Worcester housing authority, and that's not gonna go anywhere, so, and those are spread around a more, they're not in the inner city, but we're not worried about those, because those are owned by the Worcester housing authority, and they are not going to build on them

KK-and next, what does your organization to be important attributes in determining land conservation,… or in your case it would be deciding what lands to have for gardens- community gardens?

PM- Well, for our case, it would be how accessible, how well it would strengthen the community… we're trying to build strong neighborhoods and make the inner city a much better place for people to live, from building health and strengthening relationships with neighbors, and anti crime- those are all the things we're looking at, and open space plays into that, in that, for example right now, a lot of the abandoned lots, which I'm calling potential open space, are used for drug dealing or prostitution or a lot of negative impact on the community. If you turn that around into a park or a productive use - a garden, those activities go away… so it has a very powerful impact in making the community a much safer and better place to live…

KK- Now I talked to you about our database, too, and so far, in it we have mbl number, ownership, management, acquisition dates, deed, deed numbers, assessed value, an whether or not there's a conservation restriction on it.. and that's what we have so far, and what other attributes would be of use to your organization to be collected in to a database?

PM- hmmm… well, I'm not sure how we would do this, but without, how much we quantify and know it, but which ones are in neighborhoods that look the most healthy.. so we'll have sort of a priority on, like, the community value

KK- So you would look at the income of the community- if it's a low income area?

PM- It's even less tangible then that… if we have a strong community group there, and that community really wants to do something, that is a positive attribute for making that a higher priority, so I guess it's the likelihood of a positive impact on a community- and that changes over time… very volatile… so if we can get something in there while you've got a good strong community group, it helps build those roots.

KK- So if someone in the community were to come see you, that gives that area a priority over other areas

PM- That's right.

KK- So is there any other data that your organization continuously is retrieving that would be of use?

PM- go through the list again…

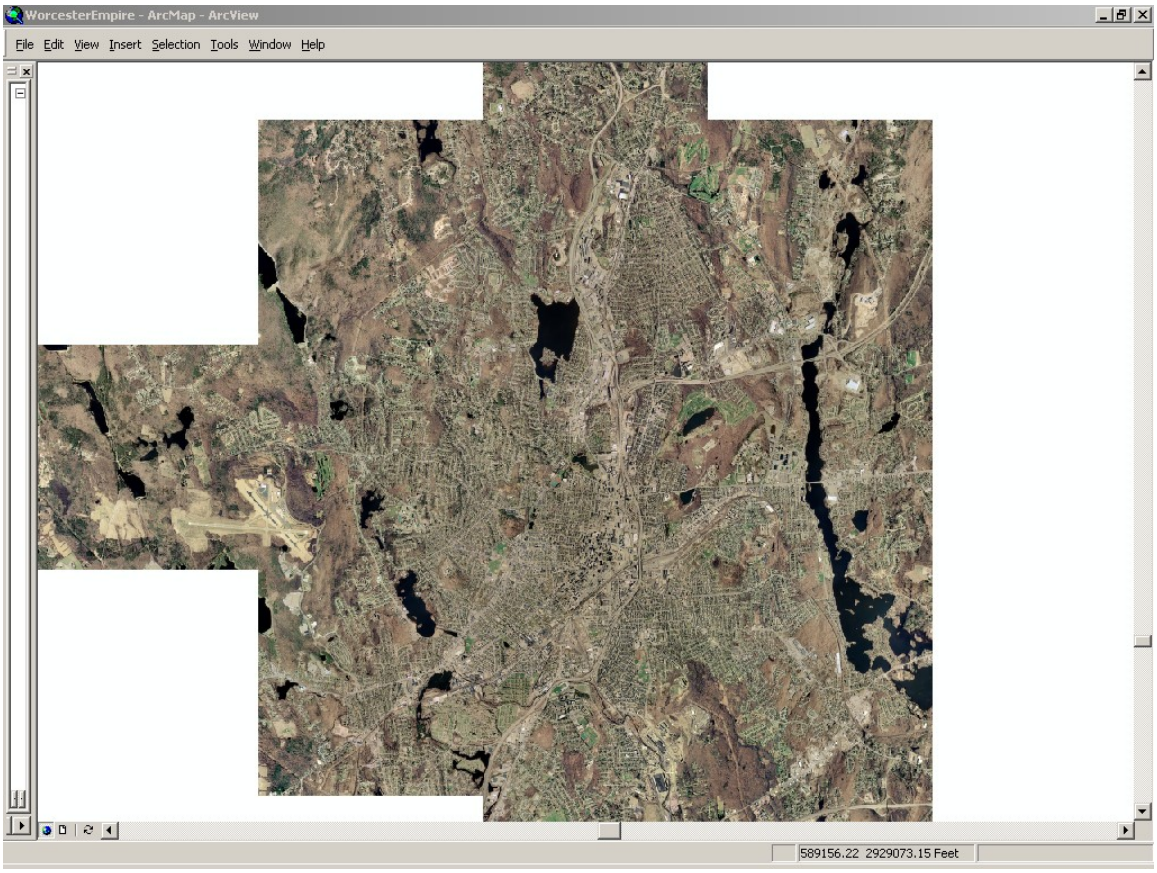
KK- we have mbl number, ownership, management, acquisition dates, assessed value, an whether or not there's a conservation restriction, deed number, deed page…
PM- what about liens?
KK- liens?
PM- if they owe back taxes or if they have any… if anything's been assessed against the property, if they didn't pay their water bill..
KK- We actually talked about that- with Debbie Cary, I didn't know they were called liens though…
PM- Well, I'm not a property person, but one thing is, if you owe fees on something- if you don't pay your water bill, they can place what they call is a lien on your property- so that when you sell, you have to pay that water bill before… But probably a bigger piece of that is if there's any taxes owed… have you keep track of that?
KK- uh, we haven't..
PM- cause that would be a really important one… what are the taxes, the rears on taxes, cause honestly, 50% of the ones we're gonna get are gonna be ones that have taxes on them.
KK- And in what format would you prefer the data?
PM- give me some ideas...
KK- well, access, excel- we're using access right now, but we can put it into excel easily, so basically if your organization uses one or the other more..
PM- we definitely use excel more. As a matter of fact, anything that we send you will be in excel
KK- oh really?
PM- Are you finding people that are using access?
KK- to be honest, most people like excel… some people are familiar iwht both, but when we interviewed, like Katie Donovan, when we interviewed her, she used excel… so people are definitely more familiar with excel, it seems like.. I know I was, before I started this.
ZO- we find it easier for us to filter and organize the data in access first, while we're creating the database, and then we can just open it in excel.
KK- Does your organization employ GIS?
PM- We don't really input… we use the results, but we don't do any analysis with it..
KK- What analysis of the data collected, using GIS or Microsoft office, would be useful to your organization…?
PM- That's a tough one, but it would have more to do with… surrounding property values, and industrial uses of land… is anyone keeping track of what the CDCs are doing- the community development Corp.- are you familiar with them- they do housing in inner city neighborhoods?
ZO- Well I know we have a couple pieces of open space that are owned by the CDC, just I think in local areas, I'm not sure how much that would help you…
PM- See what I think the big competition in the neighborhoods for open space is parking lots and housing, and so, we're working- the CDCs are housing people, and that's what their mandate is, but they are also community development people, so they recognize that having open space is a really important component to having a strong community. So we work very closely with them, but there's always this little antagonistic thing- "well, if you don't protect this, we're gonna put a house on it"… so I guess, just knowing where their properties are, having a good handle of what the CDC lay of the land look like in each community would be helpful, although I'm not quite sure how I'd use that right

now…
It would be helpful to know… I don't know we probably could use it, although it wouldn't be a definitive way of making a decision.. because we're waiting for the community to come to us, and say, 'we wanna do this, we're a strong community, and we're gonna, and so for us to go, and Joel Fontane has been after us to kinda just go find and look at where are all the open parcels, and where are the parcels that are small enough that they're not gonna be in any competition for something else, but that doesn't tell how strong the community is, and
ZO- if the community doesn't want it…
PM- Right, so it's really not a benefit to us just to know where all the parcels are, well, it isn't as a first level indicator, but…..

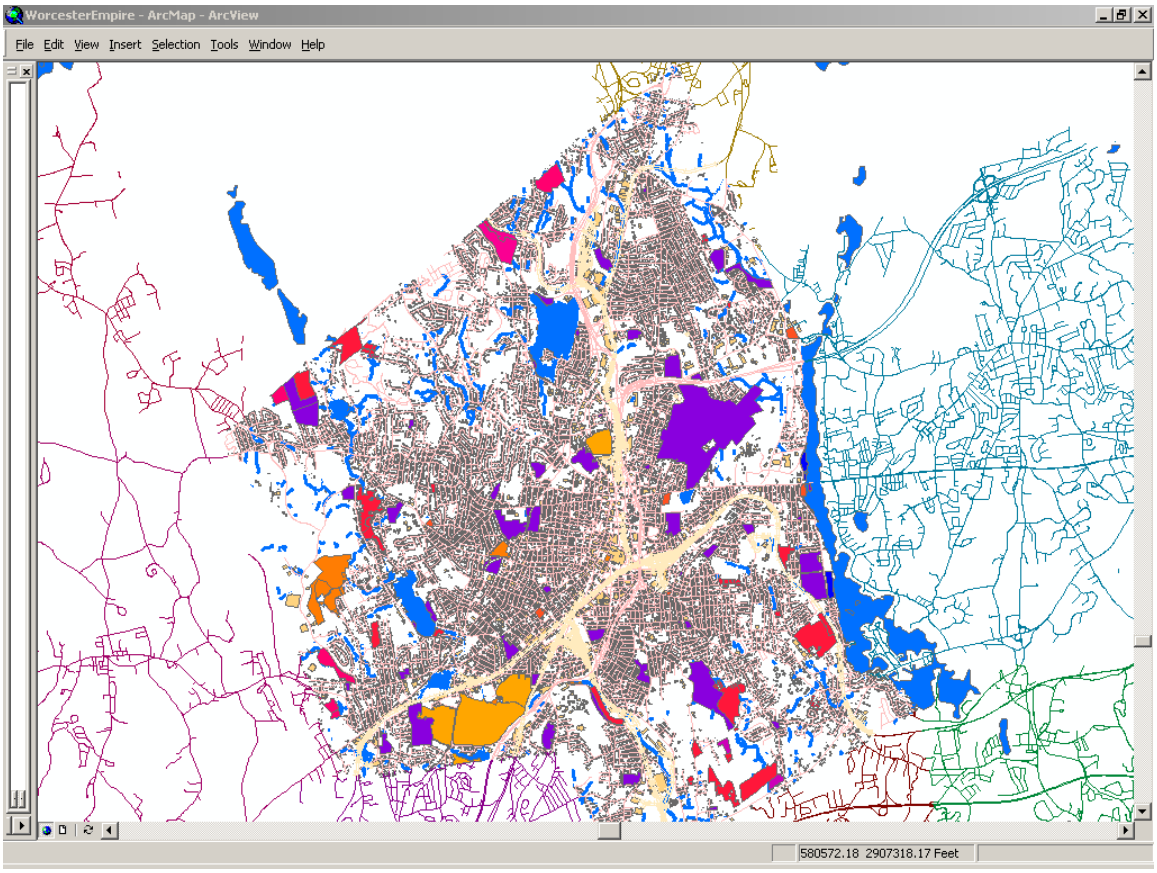
Appendix C
Derived Codes from Interviews

	Blackstone River Valley National Heritage Corridor Commission	Conservation Commission	Greater Worcester Land Trust	Massachusetts Audubon Society	Parks and Recreation Department	Regional Environmental Council
Active Recreation	1	2		3	8	
Passive Recreation	1	2		2	2	1
Topology			3		2	
Classification	1		2		4	
Acreage	1	3	3	2	2	
Ownership	2	1	2	1	2	1
Historic Value	3	1	1			
Wetlands	2	2	1	1		
Conservation Restriction	2	1	1		1	
Deed Information	1	1	5		1	
MBL	1	1	5		1	
Habitat			1	5		
Proximity to Parcels		2		2	1	
Assessed Value				1		1
Tax Title				5		5

Appendix D Assembled Aerial Photographs
2001

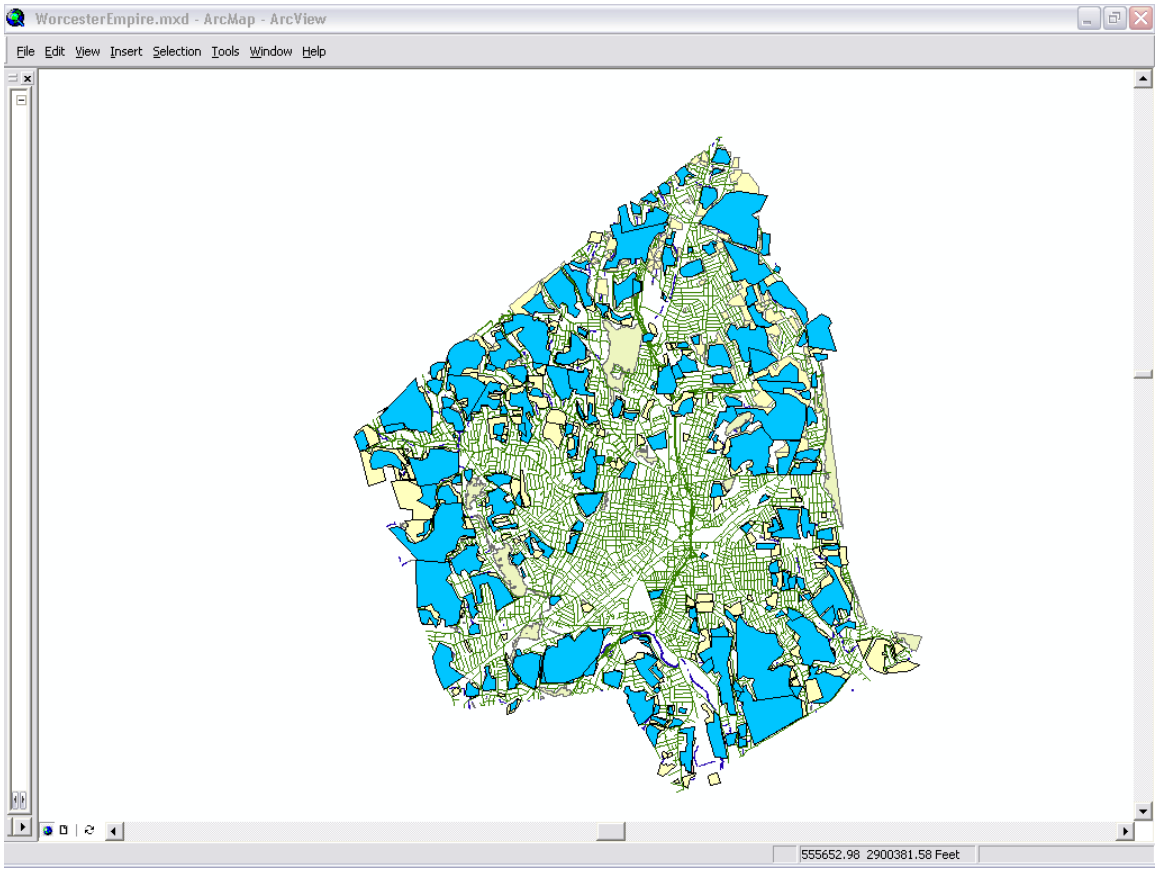


Appendix E Obtained Worcester GIS layers

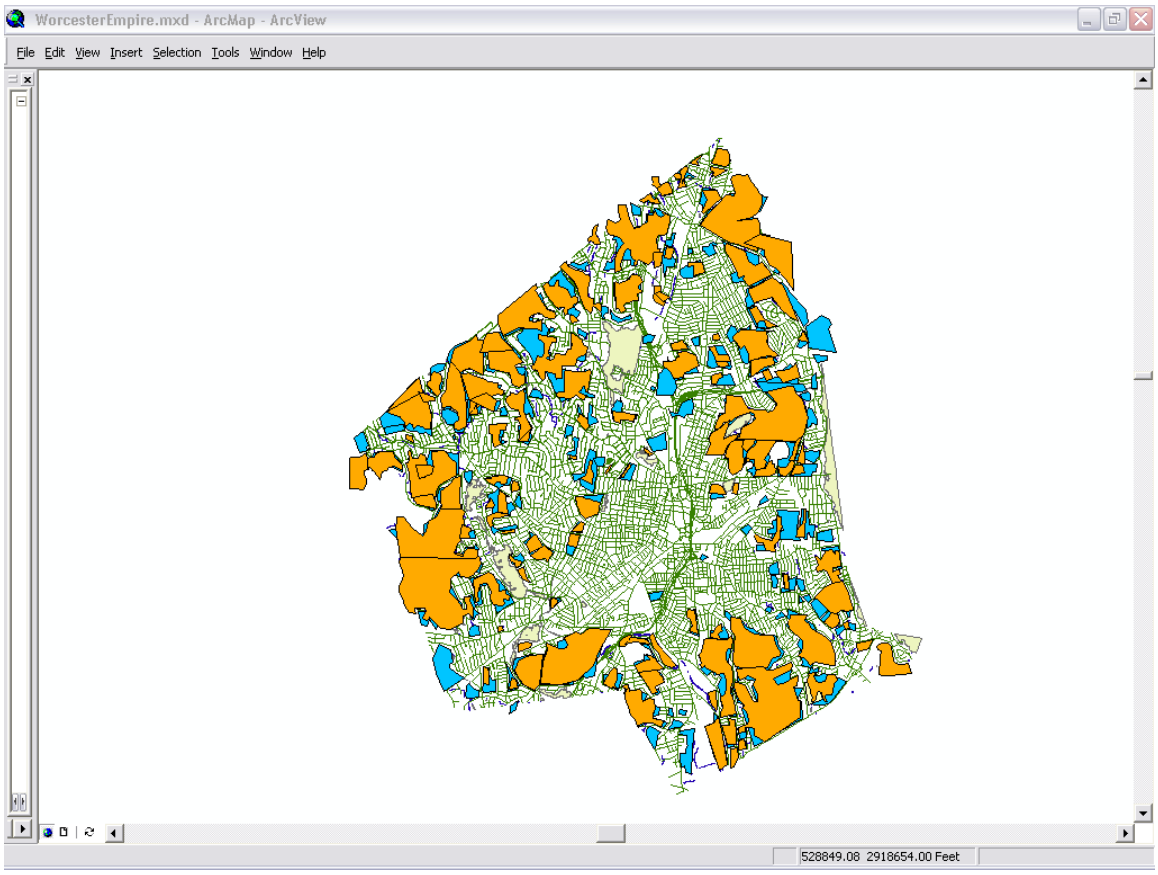


Appendix F Final Polygon and GIS Layers

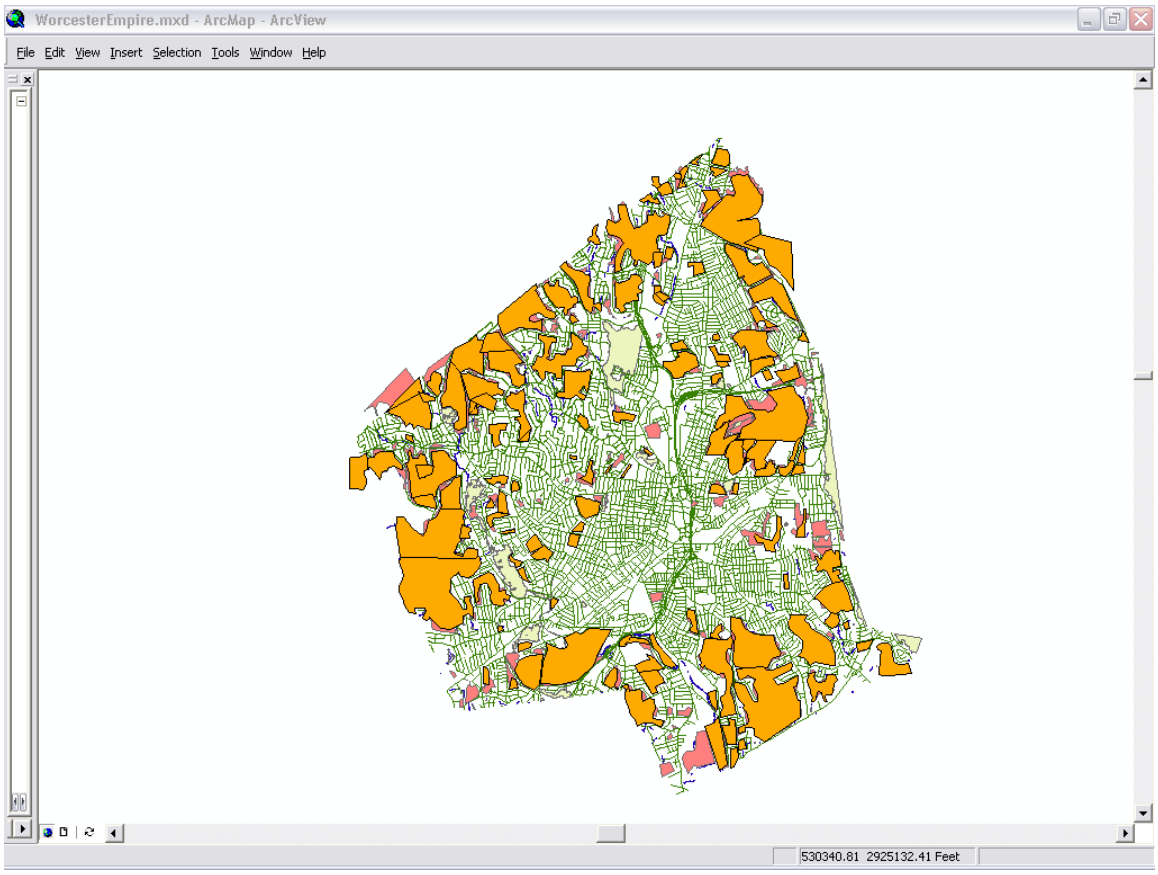
1938 (Tan)-1952 (Blue)



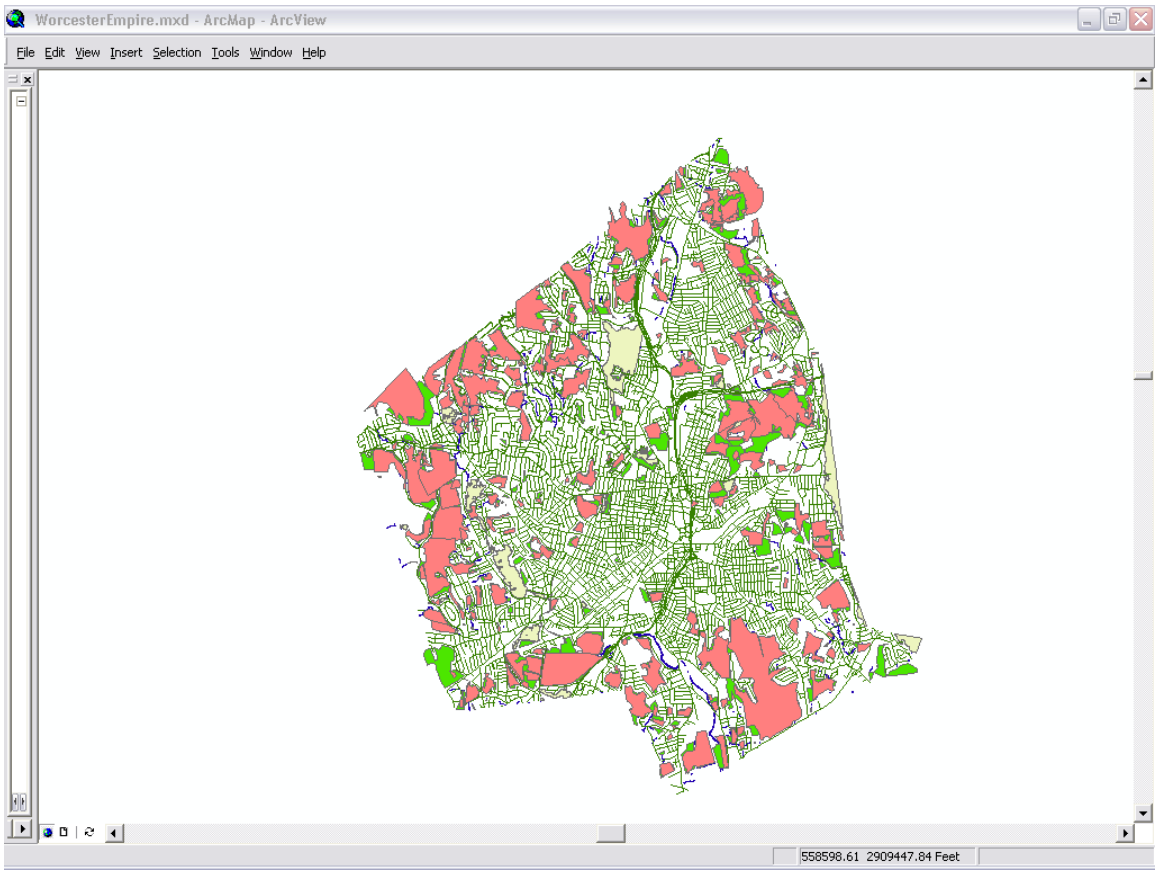
1952 (Blue)-1971 (Orange)



1971 (Orange)-1980 (Pink)



1980 (Pink)-1992 (Green)



1992 (Green)-2001 (Purple)