Releaf Baltimore

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To all of the government workers, scientists, and volunteers who have worked to preserve and increase the tree canopy in Baltimore City or your home cities, thank you. You are our heroes.

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FORWARD

The Environmental Science and Studies (ESS) Senior Seminar class is taken by students who are completing their academic major and getting ready to graduate. The course consists of a semester long project. The course objective is for the students to bring to the project the knowledge, skills and abilities they have developed through their academic study and use them to address a specific environmental question or problem that someone in our community would like addressed. This year we partnered with Ms. Anne Draddy, the TreeBaltimore Coordinator for the Baltimore City Department of Recreation and Parks. Ms. Draddy is leading the critically important effort to increase the urban tree canopy in Baltimore City through the establishment of new trees, as well as managing and preserving the current urban forest. In light of the current budget crisis we hoped to provide help and support for TreeBaltimore and provide information that would help them in their efforts to raise funds to support their activities.

The challenges associated with 'Releaf Baltimore' [as the project was eventually titled] led the students to consider a range of topics including the economic, social, environmental, health and educational benefits that urban forests can provide. We also became aware that there was a strong disconnect between the well described benefits of trees for urban areas, the previously reported positive response to trees among many urban residents and the low density if not total absence of trees from some Baltimore neighborhoods. If there is so much good known about trees and people like them, there had to be some yet unexplored reason why there weren't more trees in the City. This led the students to complete a survey of residents' opinions about trees.

The students have become aware of the difficulties inherent in something apparently as simple as 'just planting a tree' and hope that their findings and suggestions are of benefit to TreeBaltimore and the residents of Baltimore City.

The students are responsible for this project. They explored the issues and pulled the information together. I provided limited guidance and help as requested.

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I. Introduction to Urban Forestry in Baltimore City

Trees are much more than just a vital part of natural ecosystems; they play an extraordinarily important role in even the most 'unnatural' of settings, including the urban landscape. The benefits of urban trees include healthier, happier, and safer communities as well as energy savings, improved air quality, reduced runoff and a decrease in water pollution [reviewed below in Chapter II]. Once municipalities have realized the multidimensional importance of trees they start to take action; in 2006 Baltimore set a goal to increase its tree canopy within the City to 40% (City of Baltimore, 2008).

Residents of Baltimore say they like trees [see Chapter IV below], but they also indicate that trees can present challenges to them as residents. Residents expressed concerns about the 'mess' trees can create as well as damage that can be caused by their roots. Here we discuss the benefits of increasing the tree canopy within Baltimore as well as the challenges and various issues associated with such an effort. We include our thoughts about mechanisms that could be employed to increase tree canopy and address some of the challenges that such an increase can present.

History of Urban Forestry in Baltimore

Urban forestry efforts have existed in the City for many, many years. In 1827 William Patterson offered several acres of land for public use; this space subsequently became Patterson Park in 1853 (City of Baltimore, 2010). This apportionment of land for public enjoyment can be seen as the beginning of the urban forestry movement in Baltimore. Urban forestry initiatives continued throughout this time period, and in 1860 the land that would eventually become Druid Hill Park was purchased for development as a public recreational area (City of Baltimore, 2010). Forestry efforts such as these continued and many city ordinances and laws were passed to protect urban trees from various stressors and sources of damage. For example, Ordinance No. 154, which was passed in 1912, forbade city residents from tending to, altering or removing street trees without a permit from the City Engineer (DNR, 2010a). The Roadside Tree Law, passed in 1914, provided for the proper care and protection of roadside trees near urban thoroughfares (DNR, 2010a). Regulations such as these served to help Baltimore City maintain urban tree populations and protect these populations from harm. Through urban forestry efforts and the passage of legislation, urban trees gained substantial protection from the threats that urban settings can impose upon them. Despite these efforts to maintain a larger urban forest, Baltimore's urban forest has nevertheless been losing ground. In recognition of this problem of a declining urban forest, Baltimore City has recently made its reestablishment a priority (DNR, 2010a). Recent efforts to promote and develop Baltimore's urban forest have included, among other initiatives, creating the TreeBaltimore program. This program is tasked with maintaining the remaining urban trees.

In addition, the program seeks to educate citizens on the importance of the urban forest (City of Baltimore, 2010).

These efforts require funds that are not always readily available. Recent financial setbacks have resulted in major budget cuts for programs like TreeBaltimore. These budget cuts have reduced TreeBaltimore's ability to help the City increase its urban canopy. If the canopy is increased, the benefits to Baltimore City would be widespread. The City would find itself socially and economically revitalized, re-energized and reinvigorated. In a "Releafed" Baltimore, all locations within the City would become more desirable for living, working, and raising a family. Residents would be prouder of their communities as well as their City. This increased pride in the City would translate into a stronger and more vibrant Baltimore for future generations.

II. Benefits of Urban Trees

Social Benefits

Urban forests make living in urban areas a healthier and more satisfying experience (Baris et al., 2009). Trees are always beneficial to the environment, however, in urban areas, their benefits go well beyond their obvious environmental benefits. For instance, urban trees can dramatically improve the health and well-being of urban residents. Trees have been found to reduce crime. In addition, they can get children and their families more involved in their communities (Kuo and Sullivan, 2001). Trees planted in urban areas have the ability to positively affect the physical, emotional, and social aspects of urban life (Baris et al., 2009).

Nature has a positive effect on children's development and their ability to focus (Kuo et al., 2001). These benefits can help foster habits that carry on into adulthood, helping make children more responsible citizens. The Attention Restoration Theory maintains that nature can help improve concentration, which helps in treating children diagnosed with Attention Deficit Disorder (ADD) (Kuo et al., 2001). Children that are diagnosed with ADD lack the ability to concentrate. This can negatively affect their social skills, family relationships, and academic success (Kuo et al., 2001). Although it can be treated with medication, medicating children suffering from this disorder can cause other health problems (Kuo et al., 2001). Kuo et al. looked at the relationship between ADD symptoms in children and exposure to green areas. They report that children with ADD exhibit less severe symptoms when exposed to green areas (Kuo et al., 2001). The results of the study demonstrate that children with ADD who were exposed to green, natural areas experienced less severe symptoms than when they were exposed to a variety of other settings. The study also showed that these children were calmer overall when they were exposed to nature on a regular basis (Kuo et al., 2001).

Nature affects children with ADD in a variety of ways, including helping to improve their ability to focus. A study was conducted by taking 17 children diagnosed with ADHD on walks in different settings such as parks, residential neighborhoods, and downtown areas (Kuo and Taylor, 2009). After the walks, the children were tested on their ability to concentrate on a particular verbal task (Kuo and Taylor, 2009). The results of the study showed that the children were able to concentrate better after walking in the parks and that their level of concentration was comparable to the level achieved through medication (Kuo and Taylor, 2009).

High school aged students are also positively affected by the presence of nature in their immediate environment (Matsuoka, 2010). A study conducted in Michigan demonstrated that high school students who were attending schools with a large number of trees and bushes present had higher rates of graduation and lower incidences of violence than students attending schools without greenery (Matsuoka, 2010). In order to have a positive effect on the students, the natural settings needed to have trees and bushes, not just open, grassy areas (Matsuoka, 2010).

The presence of nature has the ability to affect not only the psychological well-being of children, but it also can improve their physical health (Bell et al., 2008). For instance, exposure to nature has been found to influence a child's Body Mass Index (Bell et al., 2008). The participants in the Bell et al. 2008 study had checkups every two years. The researchers looked at their BMI in relation to how much greenery surrounds the participants' residences (Bell et. al, 2008). The study found that those participants living in areas with higher amounts of greenery had lower Body Mass Index values than those who lived in less green areas. The study also found that those participants who lived in more natural settings were at less of a risk to gain weight over the two year period (Bell et al., 2008). The study suggests that neighborhoods that are greener provide children with a variety of areas where they are able to play and exercise. This leads to healthier body weights and helps to create an overall healthier lifestyle (Bell et al., 2008).

Having trees planted close to where people are located for significant periods of time, such as near homes, schools, and businesses, can have both physical and mental benefits for the community. (Ulrich, 1984 as cited by Henderson-Willson et al., 2009). When recovering from a physical impairment or illness, those patients who are located near green spaces or natural areas have better or faster recovery times and/or use less pain medication as a result of their being able to view the natural area (Ulrich, 1984, as cited by Henderson-Willson et al., 2009). Research using a survey of attitudes indicates that even the suggestion of a natural vegetated area induces a better attitude than looking at other examples of urban life, such as construction (Ulrich, 1984 as cited by Baris et al. 2009). Those that took part in the survey report that viewing nature produced a feeling of relaxation (Ulrich, 1984 as cited by

Baris et al., 2009) as opposed to looking at stark urban settings. Living in an urban setting, especially when there are not natural settings available to help increase relaxation, is reported to be detrimental to people's health (Kaplan and Kaplan, 1989 as cited by Henderson-Willson et al., 2009). The lack of an area to relax in, an environment which would include natural features, can lead to increased stress and agitation (Kaplan and Kaplan, 1989, as cited by Henderson-Willson et al., 2009).

In addition to the lack of greenery and nature, urban areas also have a constant presence of noise pollution (Donnerstien and Wilson, 1976). The impact of noise on concentration was studied by asking subjects to perform a simple test while being submitted to different levels of noise (Donnerstien and Wilson, 1976). The authors reported that the subjects displayed negative reactions such as anger when exposed to the higher noise decibel. This level of noise decibel is similar to the type of noise pollution present in urban environments (Donnerstien and Wilson, 1976). Although it is known that the presence of tree belts helps to mitigate the amounts of noise pollution present, the amount that noise is reduced depends upon the density of the tree belt and the size and type of tree used (Fang and Ling, 2001).

Nature plays a role in helping people to have healthier lifestyles (Grinde and Patil, 2009). According to the Biophilia hypothesis, people need natural spaces; when people don't have the ability to visit a green area and are stuck in an area devoid of greenery, they are more prone to develop unhealthy habits (Grinde and Patil, 2009). Biophilia as described by Grinde and Patil (2009) suggests that humans are connected with nature in unexplainable ways and are therefore affected in unknown ways by its presence and absence. This theory implies that when humans are in unnatural habitats, such as an urban area without trees, the people will have significantly more health problems than those who live in areas with trees (Baris et al., 2009). The Biophilia hypothesis explains how trees help to reduce levels of stress, which indirectly reduces levels of violence and crime (Kuo et al., 2001).

It has long been assumed that heavy tree cover and high levels of crime go hand in hand (Kuo and Sullivan, 2001). The idea behind this assumption is that reduced visibility gives criminals more places to hide and more opportunities to sneak up on their victims. While the assumption is understandable, it nevertheless fails to hold up to scrutiny. For instance, recent studies show that trees can either increase and decrease crime depending on the size and location of the trees (Donovan and Prestemon, 2010).

A study by Kuo and Sullivan, which focused on 98 apartment buildings with varying levels of tree and grass cover in a poor Chicago neighborhood, showed a negative relationship between the number of police crime reports and the amount of nearby vegetation. The study found that as vegetation cover increased, crime reports decreased (Kuo and Sullivan, 2001). A more recent study on the effects that

trees can have on crime was conducted in Portland, Oregon. The study details the effect of not just the presence of trees in general, but also how the location and size of the trees effect crime rates. It was found that large trees in lots and on streets were associated with a decrease in crime rates, while smaller trees and shrubs on lots were associated with an increase in crime rates (Donovan and Prestemon, 2010). These results can be explained by the Routine Activity (RA) theory, which is a model of crime motivation (Chamard, 2007). The RA theory suggests that three key conditions must be met before a crime can occur; there must be a potential crime, a potential victim, and a lack of an effective authority or guardian (Donovan and Prestemon, 2010). Having trees in public areas can increase surveillance by neighbors and therefore limit potential crimes. In addition, trees in public right of ways are associated with lower crime rates because of the increase in foot traffic on treed streets (Donovan and Prestemon, 2010). The ability of criminals to exploit vegetation as cover depends on the amount of cover as well as the size and location of the cover (Donovan and Presemon, 2010). Planting larger trees further from a house reduces the amount of cover available to criminals and can also increase surveillance.

The defensible space theory has also been used to explain why trees have a negative effect on crime. This theory proposes that the design and aesthetics of a neighborhood can have a strong effect on community ties and crime rates (Kuo, 2003). Areas with trees located directly outside of housing developments have been shown to foster a greater sense of community (Kuo et al., 1998). If trees cause people to spend more time outside in the community, the residents are more likely to socialize and watch out for each other, promoting stronger community ties. In addition, another factor associated with an increased sense of community is pride in one's surroundings. People who spend time outside of their homes feel a sense of pride about where they live and will do more to protect and take care of it. This sense of pride can translate to less crime as community awareness makes crime more difficult (Kuo et al., 2001). Stronger community ties and increased awareness leads to a safer place for families to live and thrive, which is a goal of all cities.

Environmental Benefits

Urban forests not only provide social benefits to the urban community, they also provide a variety of environmental benefits. Urban tree cover can decrease the urban heat island effect, sequester carbon dioxide, improve air and water quality, and reduce unwanted noise. Increasing the urban tree canopy can serve to increase these benefits, therefore contributing to a city's overall health.

The urban heat island effect describes the phenomenon where the air temperature within the city is higher than in the surrounding areas (EPA, 2010b). The heat island effect can be attributed to the

structures that 'are' the urban environment. Pervious surfaces, unlike impervious surfaces (roadways, sidewalks, rooftops, and driveways) absorb moisture when it rains. High temperatures can lead to evaporation of the water from these moist surfaces, and this evaporation 'cools' the surface (EPA, 2010b). A moist pervious surface exposed to heat will become warm, but as it warms it will also cool by evaporation. In contrast, an impervious surface will absorb the heat and reflect it back into the surrounding air (EPA, 2010b). A city consisting of one million or more people, can have a 1.8-5.4°F higher air temperature in the city than in the surrounding areas (EPA, 2010b). At night, however, when the surrounding areas cool, the temperature in an urban area does not cool readily. Urban temperatures can be as much as 22 degrees warmer than the surrounding rural areas. This is due to the previously heated, impervious surfaces of the city radiating heat all night long (EPA, 2010b).

The heat island effect can have a range of negative consequences, including increased energy demands (for air conditioning), air pollution, greenhouse gas emissions and decreased water quality. Both air pollution and carbon emissions are increased indirectly by urban heat islands as a result of increasing power plant emissions as residents try to cope with the additional heat. The concentration of ozone, a detrimental air pollutant, is increased by higher air temperatures (EPA, 2010b).

The decrease in water quality is due to hot urban surfaces increasing the temperature of storm runoff. This is known as thermal pollution, which can be stressful to aquatic life. By degrading air quality and making the environment more physically stressful, the heat island effect also impacts human health. It is important to note that the young and elderly are especially sensitive to heat extremes and air pollution (EPA, 2010b). Therefore, although the heat island effect keeps the city a little bit warmer in the winter, (EPA, 2010b), it has an overall negative effect on a city.

Trees and vegetation are a natural way to help cool the environment (EPA, 2009a). Air and surface temperatures are reduced by the shade that is provided by plants. In addition, the naturally occurring evapotranspiration that occurs in all plants also helps decrease these temperatures (EPA, 2009b). Evapotranspiration is a plant biological process which involves both the processes of transpiration and evaporation. Transpiration is the movement of water through a plant. Much like how we sweat through pores on our skin, vegetation transpires water from their roots to the pores on their leaves. Water vapor escapes through leaf pores called stomata due to evaporation. The evaporation process, which involves turning liquid water into water vapor, makes use of the heat in the air, thereby cooling the air (EPA, 2009a). This process can reduce summer temperatures by 2-9°F. The shade that trees provide can keep surfaces from becoming up to 20-45°F hotter than air temperature during the hottest part of the day (EPA, 2009a). In order to achieve such temperature reductions, trees and other vegetation need to be strategically planted around buildings (EPA, 2009a). The most effective ways to

reduce building temperatures is to plant trees and vegetation on the west side of these buildings, so that they are shading windows and parts of the roofing structure (EPA, 2009a). It is important that the trees are planted on the west side because the air temperature is hottest in the afternoon and the sun is on the west side of the building during that time.

Atmospheric carbon dioxide (CO_2) became an issue of concern when it became apparent that the vast amounts of anthropogenically released carbon dioxide were potentially altering the global climate (EPA, 2010a). Because of their high population densities, cities are a major source of carbon dioxide that is being released from vehicles, heating and cooking fuels, energy generation plants, etc. (EPA, 2010a). Urban forests are able to reduce atmospheric carbon dioxide concentrations created by cities across the U.S. These forests uptake carbon dioxide and store it as wood and other support tissue (USDA, 1996). More carbon sequestration occurs in larger, healthier trees (USDA, 1996). Trees greater than 32 inches in diameter have a carbon uptake of about 49 kg per year (USDA, 2008). However, trees that are less than three inches in diameter have a carbon uptake of less than one kg per year (USDA, 2008). When selecting types of trees to plant in a city, it is important to consider the size of the tree at maturity so that its maximum carbon uptake can be evaluated.

The trees in Baltimore City are important carbon sinks. The amount of carbon absorbed annually by trees in the City is estimated at 14,900 metric tons, with an estimated carbon storage capacity of 527,300 metric tons (USDA, 2008). While these numbers are impressive, the carbon emission rate is so high in Baltimore City that the City emits the annual carbon storage capacity within 54 days (USDA, 2008). This situation is very similar to nearby Washington D.C. The Washington D.C. urban forest contains an estimated 1.9 million trees with a canopy cover of 28.6% (USDA, 1996). The amount of CO_2 removed from the atmosphere is estimated to be 16,200 tons per year, whereas the overall carbon stored in tree tissue is 526,000 tons (USDA, 1996). The D.C. urban forest has an annual carbon storage capacity that is equivalent to the amount of carbon that is emitted by the city in just 57 days (USDA, 1996). Although urban forests are only able to off-set a small amount of anthropogenic carbon dioxide, when used in conjunction with other means of sequestration, they can help meet a city's carbon emissions reduction goals.

Studies have shown that urban forests throughout the United States decrease concentrations of certain detrimental pollutants (carbon monoxide [CO], nitrogen oxides [NO_x], sulfur dioxide [SO_2], ozone [O_3], and particulate matter with a diameter smaller than 10 microns [PM_{10}]) within cities and thereby help cities meet EPA regulatory standards for air quality (Nowak et al., 2006). Although the biogenic emissions of trees play a role in the formation of tropospheric ozone, it has been shown that urban forests decrease local ozone concentrations more than they increase them (Nowak et al., 2000). Urban

forests can help mitigate air pollution by lowering air temperatures (by tree evapotranspiration and shade provided), removing air pollutants (via dry deposition), and reducing power plant emissions (by lowering building energy consumption) (Nowak et al., 2006).

Gaseous and particulate pollutants can be transported from the atmosphere to soil, water, and vegetation via a process known as dry deposition (Seinfeld, 1986). Dry deposition includes the depositional effects of forests. In theory, dry deposition is affected by many biological, chemical, and physical factors inherent to the pollution, vegetation, and the general environment (Lovett, 1994). Scientists quantify depositional processes by integrating as many of those factors as possible into computer models. Here we describe some of the key factors involved in the depositional processes.

Particle size plays a large role in determining pollutant fate. Derivatives of sulfur and nitrogen pollution such as sulfate and nitrate (Manahan, 2000) can exist on particulates with a diameter greater than or approximately two microns (Lovett, 1994). These particles tend to readily fall out of the air due to the force of gravity. If they land on a tree, they can adhere to the surfaces, but will not be taken up through the leaf stomata (small openings in the leaf surface that regulate gaseous exchange). The particle (if lipophilic) may diffuse through the outer layer of the plant, but will generally not (Nowak et al., 2006). Therefore, most of the particulate matter removed by forests is simply the tree surface area intercepting pollutants.

Gaseous pollutants (O_3, NO_2, SO_2, and CO) may enter the leaf via the stomata (Escobedo et al., 2009; Lovett, 1994). Entry into the leaf via the stomata is regulated by the opening and closing of the stomata, which is dependent on several factors including leaf moisture, external humidity, exposure to sunlight, and plant physiological properties which vary with species (Baldocchi et al. 1986; Lovett, 1994). Upon entering the stomata, gaseous pollutants will move into the intercellular spaces where they may be absorbed by water to form acids or react with the cell surfaces in the inner leaf cells (i.e. the mesophyll cells) (Smith, 1990). The tendency for pollutants to be taken up by the mesophyll will depend upon the surface area of the mesophyll and the solubility of the specific pollutant (Baldocchi et al. 1986).

Gaseous pollutants, like particulate matter, can be intercepted by the tree and leaf surfaces. Both gaseous and particulate matter can either be absorbed by the outer layer of the plant (absorption is generally more important for gases), re-suspended in the atmosphere, washed off by rain, or fall to the ground along with leaves and twigs (Nowak et al., 2006). The positive impacts of urban forests on air pollution are quantified using models which calculate the mass of air pollution removed per unit of vegetated area.

Urban forests influence air quality in both negative and positive ways. For example, trees emit biogenic compounds known as VOCs (Volatile Organic Compounds) which are implicated in the

formation of tropospheric ozone (Chameides et al., 1988). However, many studies are showing that in spite of this potential to increase ozone levels, urban forests can help to reduce ozone levels through the lowering of temperatures, dry deposition of pollutants, and reduction of anthropogenic emissions of pollutants (through cooling and resulting reduction in energy use) (Cardelino and Chameides, 1990; Nowak and Dwyer, 2000; Taha, 1996). Lower air temperatures will decrease the quantity of VOCs emitted by trees, as well as moderate the conditions which contribute to ozone formation (e.g. higher air temperatures) (Nowak et al., 2000).

Through urban forest management, the negative effects of urban forests may be mitigated. For example, tree species differ in their emissions of VOCs. Therefore, choosing low-emitting species may be an optimal management practice. However, it is unclear from modeling studies whether selecting specific species for planting will affect ozone levels or not (Nowak and Dwyer, 2000; Taha, 1996).

The results of an extensive modeling study have shown that average pollutant reduction (pollution removed from deposition/total pollutant concentration) over the course of a day during the in-leaf season is less than one percent (Nowak et al., 2006). Although this effect is small, the actual amount of pollution removed annually on a nationwide basis is calculated to be on the order of 10^6 metric tons. The highest rates of removal due to dry deposition are seen for ozone, sulfur dioxide, and particulate matter (Nowak et al., 2006). In urban areas with 100% tree cover, average air pollution reduction during the day time of the in-leaf season were about two percent for those pollutants.

Nowak et al. (2006) explain several deficiencies of the model used in their studies which may lead to conservative estimates of pollution removed by vegetation. Urban forests prevent mixing between air at ground level and air above the canopy, potentially keeping more polluted air from mixing with less polluted air (Nowak et al., 2006). In one study, a 40% decrease from the above-canopy ozone concentration was observed below the urban forest canopy (Bytnerowicz et al., 1999). As long as excess pollution sources are not coming from below the canopy, urban forests can protect ground-level air from above-canopy pollution. Furthermore, estimates of deposition used in the models are based on homogenous canopies, but much of the actual canopy is not taken into account (Nowak et al., 2006). Therefore, the authors point out that modeled deposition estimates are likely lower than what actually occurs (Nowak et al., 2006).

The extent of Baltimore City's impervious surface cover plays a large role in the conditions of the waters flowing out of the City. Although impervious surfaces are economically important and make up the City's infrastructure, they cause environmental degradation by altering the natural hydrological processes and contributing pollutants to streams and storm sewers. According to the most recent

National Water Quality Inventory, runoff from urban areas is a main factor in the degradation of estuaries, including, presumably, the Chesapeake Bay (EPA, 1996).

Water quality is strongly related to urban runoff (Xiao et al., 1998). Typical storm drainage systems were designed to channel water away from roadways and buildings during storm events to avoid flooding. As the water is transported over impervious surfaces, it will wash off surfaces and carry with it a variety of pollutants such as pesticides, fertilizers, bacteria, and heavy metals (Escobedo and Seitz, 2008). These pollutants subsequently end up in streams and sewer systems, contaminating the water.

By altering the hydrological functions found in naturally vegetated landscapes, impervious surfaces will greatly increase stream discharge during precipitation events. It has been estimated that, because of impervious surfaces, a city block will generate nine times the amount of runoff of a forested area of similar size (EPA, 1996). Flooding will occur much more often in urban streams that are surrounded by impervious infrastructure than in a natural, forested watershed. As a result, stream banks will erode and simultaneously release more contaminants into waterways (Xiao et al., 1998).

Researchers have proposed that urban forests can be an effective means of managing storm runoff in urban environments (Escobedo and Seitz, 2008; Nowak and Dwyer, 2000; Xiao et al., 1998). A forest canopy will intercept rainfall and temporarily store it until the water evaporates or falls (Escobedo and Seitz, 2008). Some of this rain may be absorbed into the soil below the tree, further reducing runoff (Escobedo and Seitz, 2008). According to recent research, a mature deciduous tree (a tree that loses its leaves during the winter) can intercept 500–700 gallons of water per year. Mature evergreen trees (which retain their leaves year round) can intercept more than 4,000 gallons per year (Cappiella et al., 2005). A study conducted in Baltimore, Maryland showed that heavily forested areas could reduce total runoff by as much as 26% (Neville, 1996). The reduction of runoff volume and rate during small storm events should decrease the overall amount of pollution going into streams (Xiao et al., 1998).

Noise is a major complaint in an urban environment and has been found to cause irritability and aggression in people (Donnerstein and Wilson, 1976). Trees have been proven to help mitigate acoustic (noise) energy (Fang and Ling, 2003). The ability of a tree belt to absorb noise was found to be associated with the density, height, length, and width of trees (Bucur, 2005). These factors were found to be more important for the noise absorption than the leaf size and branching pattern (Fang and Ling, 2003). The larger the size of the scattering devices (trunk, branch, and leaves), the more easily the frequencies can dissipate (Bucur, 2005). The lower the frequency, the larger the wavelength becomes, making it harder for a tree to absorb and disperse the sound (Bucur, 2005). Further evidence indicates

that lower visibility through tree belts increases the scattering effect of sound due to higher density of trees (Fang and Ling, 2003).

Economic Benefits

Increasing the number of trees in an urban environment has been proven to positively impact the economic well-being of a city in a variety of ways. Trees allow the city and its residents to save or make money by increasing property values (Wachter, 2005), decreasing energy costs in homes and city buildings (Kuhns, 2008), increasing tourism (Deng, 2010), and improving the environment by sequestering carbon and removing pollutants from the atmosphere.

One of the easiest ways to increase a home's value is to plant trees on the property surrounding the home (Wachter, 2005). When a community has many homes with trees, there is more buyer appeal increasing the value of all homes within the entire community (Wachter, 2005). In the New Kensington neighborhood in Philadelphia, Pennsylvania, homes that were located within 50 feet of a newly planted tree went up in value 9% (Wachter, 2005). Therefore, a standard row house in Philadelphia priced at $35,000 would then have an increase in value of $3,400 (Wachter, 2005). It was also noted in New Kensington, that homes located adjacently or facing vacant lots that transformed into green areas increased in value by 30% (Wachter, 2005). When lots became green areas with trees, a standard house would have a $13,000 increase in value (Wachter, 2005). If a home was located within a quarter mile of a park, the home would have an increased value of 10% (Wachter, 2005). Therefore, the presence of trees and other vegetation has an immense impact on the community and their homes; in New Kengsington the community's value as a whole was increased by $12 million due to the presence of a denser tree canopy (Wachter, 2005).

Tourism is a major source of revenue for many cities and there is evidence that a city with more trees is more appealing to tourists; an increase in urban canopy can increase the amount of tourism in that city (Deng, 2010). A study prepared in Savannah, Georgia found that urban forests located within a city significantly contribute to an improved experience of tourists (Deng, 2010). An enriched tourist experience leads to increased tourist satisfaction, which, in turn, leads to destination loyalty of tourists to that city (Deng, 2010). The issue of trees as determinants of destination loyalty should not be overlooked; destination loyalty means tourists will likely come back and visit multiple times (Deng, 2010). Destination loyalty is also important because if someone really enjoys visiting then they will likely spread the word to their family and friends, and more people will be encouraged to visit (Deng, 2010). According to Deng, urban forests themselves act as the main attractor for many visitors and were seen as complimentary to other tourist attractions in the city (Deng, 2010). This suggests that if there are

more trees in a city, it will be more attractive for people to visit thereby increasing the city's revenue from tourism (Deng, 2010).

Tourists respond positively to treed landscapes, which can result in a major increase in revenue for the city and the city's business areas (Deng, 2010). When a tourist visits a city that provides a dense tree canopy as well as commercial districts that are aesthetically pleasing through the presence of trees, the tourists feel more inclined to make purchases (Deng, 2010). When customers are pleased with their shopping experiences, they become loyal customers when revisiting the city (Deng, 2010).

A national study by the University of Washington was created to develop an understanding of public perceptions of trees in business districts (Wolf, 1999). The study was done with survey questionnaires, which were taken from a variety of city districts throughout the United States (Wolf, 1999). The survey asked the subjects to rate three given retail areas with varying levels of vegetation (Wolf, 1999). The ranking was based on a scale of one to five, where 1 ranked as the least preferred surrounding area and 5 as the highest preferred area (Wolf, 1999). There were four categories involved in the survey; amenity and comfort, interactions with merchants, quality of the product, and maintenance and upkeep (Wolf, 1999). The overall ratings for the business districts with the most vegetation were significantly higher than areas with small amounts of vegetation (Wolf, 1999). For the category of amenity and comfort, ratings for tree lined areas were 80% higher than barren areas (Wolf, 1999). There was also a 30% higher rating for quality of products in shaded areas than areas that were not shaded (Wolf, 1999). Those surveyed also stated that customer interactions with merchants, such as customer service problems, were ranked 15% higher for vegetated areas over non-vegetated areas (Wolf, 1999).

Trees play a role well beyond their aesthetic benefits; they can even save homeowners money on their gas and electric bills (Kuhns, 2008). In Baltimore, the average monthly electric and heating bill for a household is $359.29 which is substantial (Crowe, 2010). However, with careful planning and proper site location, trees can reduce this bill (Kuhns, 2008). Trees can provide homes with shade or wind barriers, which in return prevent heat from entering a home in the summer and cold air from entering in the winter (Kuhns, 2008). This allows for a decrease in heating costs in the winter and a decrease in air conditioning costs in the summer by up to 25% (Heisler and Simpson, 2001). While the cost savings is considerable, it should also be noted that by reducing energy use, trees are reducing the carbon footprint of the residents and the community as well.

Deciduous trees are the primary trees selected for shade for the summer months (Kuhns, 2008). Deciduous trees create a direct cooling effect around the home due to the evaporation of water from the leaves of the trees in addition to blocking the sun's rays (Kuhns, 2008). Deciduous trees are best in

the summer months because they provide the most leaf cover to homes and driveways (Kuhns, 2008). Evergreens are also used for shade, but are more efficient when the sun is not directly above them due to their lower hanging branches (Kuhns, 2008).

After choosing the best deciduous or evergreen tree to provide shade, the correct location to plant the tree must be determined (Kuhns, 2008). Deciduous trees need to be planted in several locations around the home in order to decrease the amount of heat entering the home (Kuhns, 2008). In the summer months of June, July and August, trees must shade the home during different times of the day (Kuhns, 2008). For shade from 7:00 a.m. to 11:00 a.m., deciduous trees need to shade the house walls that are east-facing where as for shade from 3:00 p.m. to 7:00 p.m., west-facing walls of the home must be shaded (Kuhns, 2008). The trees should be planted 10 to 20 feet away from the home (Kuhns, 2008). For early morning and late afternoon shade and cooling effects, small deciduous trees or small evergreen trees with low hanging branches should be placed on the northwest and northeast side of the home (Kuhns, 2008). Trees can also be planted on the south, southwest or southeast to provide additional shade, but must be placed close to the house in order for the branches to extend over the roof (Kuhns, 2008). In order to avoid winter shading, trees placed on south of the home should be selected to have low dense crowns and should be planted around the home at a distance of at least two and a half times the mature trees height (Kuhns, 2008). When planting trees around a home, paved areas also need to be covered by shade (Kuhns, 2008). This is important to remember because dark surfaces such as pavements absorb light energy and emit heat into the air above the home; light colored pavement can reflect the light energy away from the home (Kuhns, 2008).

During the winter months, cold air can seep into a home through small holes and can pull heat away from the home from its outside surfaces (Kuhns, 2008). There can be a decrease in heating costs if cold winter winds are blocked by trees (Kuhns, 2008). During winter months, the most efficient trees for a windbreak are evergreens because they provide leaf coverage and have crowns that extend to the ground (Kuhns, 2008).

Evergreen trees should be planted upwind of the home in west, northwest, north-facing locations of the home (Kuhns, 2008). These trees can be planted in straight rows or curved rows and should be planted far enough apart so when at maturity, each crown edge touches the tree next to it (Kuhns, 2008). The trees can be in either one to two dense rows or several less dense rows (Kuhns, 2008).

The City and its residents can economically benefit from the presence of a dense tree canopy. The economic value of trees has been calculated for Baltimore City and is estimated to be $3.4 billion (Nowak et al., 2008). This value is the compensatory value, not ecological or societal; it is an estimate of

tree replacment cost or compensation to tree owners for tree loss based on the direct economic benefit received from the trees (Nowak et al., 2008). The value is derived from savings on heating and cooling, increased property values, reductions in pollution, reductions in adverse health effects from pollution, and increases in aesthetics of the City (Nowak et al., 2008). Baltimore City can reduce its budget for pollution mitigation projects with the presense of a denser tree canopy. The reductions in pollution can save Baltimore money because the City government will not have to pay for as many other pollution mitagation measures since the trees will already be doing some of the work. Reduced pollution also limits adverse health affects associated with high levels of pollution such as asthma and allergic reactions, which can save Baltimore residents money on their medical bills. Trees also increase the aesthetic appeal of cities and can stimulate Baltimore's economy by increasing shopping in commerical and business districts (Wolf, 1999) and increasing tourism to Baltimore (Deng, 2010). The Baltimore tree canopy has stored 527,300 metric tons of carbon, which has saved the City over $10.7 million (Nowak et al., 2008). The amount of new carbon absorbed by trees yearly is estimated at 14,900 metric tons with a value of $219,000 (Nowak et al., 2008). The trees also reduce energy costs of building with an estimated net energy saving of $3.3 million per year (Nowak et al., 2008). Trees account for 95.4% of the total removal of pollution from the City (Nowak et al., 2008). The current tree canopy cover removes 701 metric tons of pollution, which saves the City an estimated $3.7 million by eliminating other means needed to remove the pollution (Nowak et al., 2008). These facts and figures provide many reasons why trees are very important to Baltimore City. A denser tree canopy can save the City and its residents money, but because the trees are also benefiting the urban environment of Baltimore and making it more livable trees make Baltimore City a nicer place to live and visit.

III. Challenges of Increasing the Urban Tree Canopy

Identifying Feasible Locations to Plant Trees

One of the challenges that the City of Baltimore is going to have to overcome in order to increase its tree canopy is identifying suitable locations in which to plant trees. The land cover types of Baltimore City and their potential to be utilized to increase tree canopy, are presented in Figure 1. The figure depicts that 27% of Baltimore City currently has tree canopy, and that 44% of the current land cover use presents opportunities to increase tree canopy.

O'Neil (2009) identifies four primary land cover types in Baltimore City: Existing Urban Tree Cover (UTC), Possible UTC Vegetation, Possible UTC Impervious, and Not Suitable. As of 2007, 27% of Baltimore City already has UTC (see Figure 1) (O'Neil-Dunne, 2009). An additional 44% of Baltimore City can theoretically be used to increase UTC (O'Neil-Dunne, 2009). This 44% is broken down into two

categories: Possible UTC Impervious (21.5%) and Possible UTC Vegetation (22.5%). Possible UTC Impervious refers to impervious surface such as sidewalks that can be modified to plant trees, excluding roads and buildings. Possible UTC Vegetation refers to land that is currently covered in vegetation, such as grass and shrubs that do not currently contribute to UTC (O'Neil-Dunne, 2009). This is found in areas

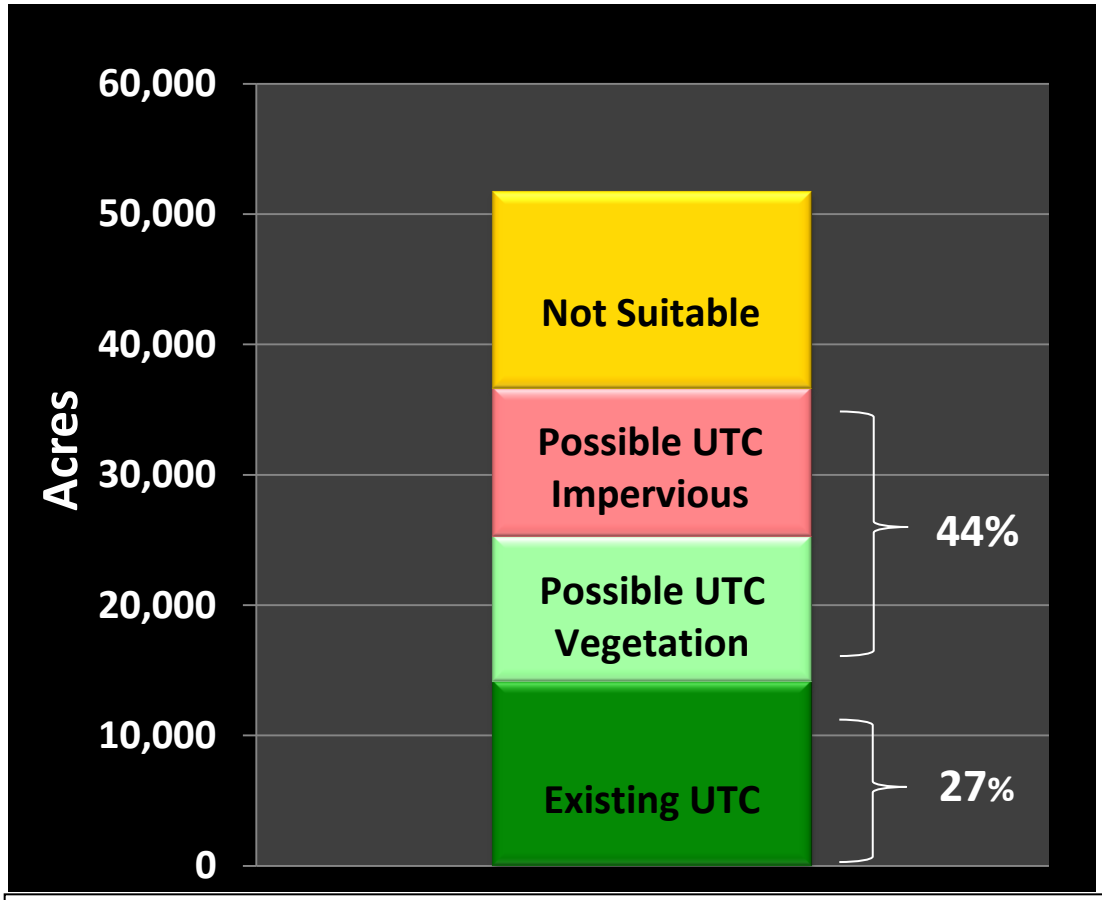

Figure 1: Baltimore City's land cover potential for urban tree canopy consisted of four primary land cover types in 2007: Existing Urban Tree Cover (UTC), Possible UTC Vegetation, Possible UTC Impervious, and Not Suitable for planting (O'Neil-Dunne, 2009).

such as athletic fields, cemeteries, hospitals, and schools (O'Neil-Dunne, 2009). An evaluation of Baltimore City's land cover potential indicates that only 29% is not suitable for UTC (O'Neil-Dunne, 2009).

The challenge then lies in identifying which land use types are most suitable for planting trees and actually establishing trees in these areas. Data show that the areas that are currently considered Possible UTC Vegetation and would have the greatest impact in increasing urban canopy are residential and exempt commercial areas (O'Neil-Dunne, 2009). Residential and exempt commercial areas each make up 7% of total Possible UTC Vegetation land space in Baltimore City, so if both residential and exempt commercial land use areas were to be completely utilized for UTC, they would theoretically raise

the overall UTC 14%, for a total of 41% UTC in Baltimore City (O'Neil-Dunne, 2009). Doing this would move the City above its goal of increasing canopy to 40%.

To increase UTC by planting in Possible UTC Impervious areas of Baltimore City, the areas with the most potential would include industrial, exempt commercial and commercial land use areas (O'Neil-Dunne, 2009). Industrial, exempt commercial, and commercial land use areas cover 6%, 5%, and 4% of all of Baltimore City, respectively (O'Neil-Dunne, 2009).

A challenge that presents itself to those trying to increase UTC in Baltimore City is that the majority of this land that is appropriate for tree plantings does not belong to the City. Baltimore City cannot simply plant trees in these areas; rather the landowners themselves must want to participate in increasing Baltimore's tree canopy. Landowners and businesses must be involved if UTC is to be increased in Baltimore City.

Trees growing in different land use areas within the City exhibit different mortality rates (Nowak et al., 2004). This poses a challenge because trees growing within different land use types require different levels of maintenance and care. A breakdown of land use types and their associated mortality rates (shown as percents) are as follows: Transportation (i.e. next to roadways and traffic medians) (20.2%), Industrial (i.e. industrial parks and parking lots) (10.6%), Urban Open Areas (i.e., parks, golf courses, and cemeteries) (8.2%), High Density Residential (i.e., high-density residential units with more than 19.8 dwelling units per hectare) (6.0%), Forest (i.e., forested areas not used for wood products and harvest) (5.9%), and Low-Medium Density Residential (i.e., 0.5-19.8 dwelling units per hectare) (2.2%) (Nowak et al., 2004). (See Table 1 below for a full description of each land use type.) Not only do the land uses have different associated mortality rates, some of the land uses with the largest amounts of land available, such as industrial land use, exhibit relatively high mortality rates (Nowak et al., 2004).

Challenges of Being an Urban Tree

A tree growing in an urban environment, such as a street tree, faces higher levels of stress compared to rural and park trees (Leuzinger, 2010). These stresses include such things as heat reflected from buildings, physical harm from pedestrians and vehicular traffic, poor soils, chemical contamination in soils, disease, pests, and pollution. These factors combined produce an inherently difficult environment in which urban trees grow. Urban trees are subject to different sources of stressors which need to be addressed by those planning on increasing urban tree cover (Dixon, 1977; Herms, 2009; Johnson and Sucoff, 1999; Leuzinger, 2010; Spirn, 1984; Wilson, 2010).

Table 1: Land use description and associated percent tree mortality associated with plantings in those areas in parenthesis (from Nowak et al., 2004)	
Land use and (percent mortality)	Description of land use type
Transportation (20.2%)	major transportation routes, highways and railways, and airports and water ports
Industrial (10.6%)	retail and wholesale services areas; manufacturing and industrial parks, including associated yards, parking areas, warehouses, and research laboratories.
Urban Open (8.2%)	urban areas where use does not require structures or urban areas where non-conforming uses characterized by open land have become isolated. Included are golf courses, parks, recreation areas (except areas associated with schools or other institutions), cemeteries, and entrapped agriculture and undeveloped land within urban areas.
High Density Residential (6.0%)	attached single unit row housing, garden apartments, high-rise apartments/condominiums, mobile home and trailer parks. Areas of more than 90 percent high-density residential units with more than 19.8 dwelling units per hectare.
Forest (5.9%)	forested areas including brush areas that do not produce timber or other wood products, but may include cut-over timber stands, abandoned agriculture fields, or pasture. These brush areas have such vegetation as sumac, vines, roses, and tree seedlings.
Medium-Low Density Residential (2.2%)	detached single-family/duplex, attached single-unit row housing, yards, and associated areas. Areas of more than 90 percent single-family/duplex units and attached single-unit row housing, with lot sizes of less than two hectares but at least 0.05 ha (0.5-19.8 dwelling units per hectare).

Urban areas exhibit a phenomenon known as Urban Heat Island Effect in which urban areas are subject to warmer temperatures compared to those of rural areas (EPA, 2010c). This is caused by heat absorbing surfaces such as pavement and rooftops and the release of Green House Gases from emissions (EPA, 2010c). The structure of the city itself consisting of tall buildings and small streets restrict the circulation of air throughout the city decreasing natural cooling (EPA, 2010c). Urban Heat Island can result in temperatures up to 22°F higher in urban areas compared to rural areas (EPA, 2010c). Urban trees must be able to tolerate this increase in temperature.

Using salt to de-ice roads and sidewalks during the winter is a common practice but it has an impact on trees and vegetation that is often overlooked. While salting roads after snow or ice storms is necessary, it presents a challenge to urban trees. Salt accumulates in soils and can cause physical harm if directly applied to trees (Johnson and Sucoff, 1999). Physical contact of salt with trees can cause scorching of the leaves or needles, change in leaf color, bud damage, and branch damage, resulting in a decreased photosynthetic ability (Johnson and Sucoff, 1999). Trees damaged by salt exhibit reduced hardiness in the spring; their leafing rates lag behind unstressed trees (Johnson and Sucoff, 1999). In the

fall, trees exposed to high salt concentrations during winter drop their leaves earlier (Johnson and Sucoff, 1999). Overall, as salt concentrations build in the soil, trees become less healthy, growth rates slow and natural leaf growth and drop cycles are disrupted (Johnson and Sucoff, 1999).

Soil condition is typically unknown prior to planting of street trees (Wilson, personal communication, 2010). Typically, soils are not amended when trees are planted; the goal is to put the tree in the ground and allow it to develop a strong root system in place (Wilson, personal communication, 2010). In a situation in which the soil has been amended prior to planting , the roots of the tree grow most densely in the area of the good soil and do not expand into the surrounding soil; the trees do not become well established under these circumstances (Wilson, personal communication, 2010). Therefore a tree must be able to survive in a given tree pit regardless of soil quality.

Urban soils also typically suffer from compaction as a result of heavy traffic and the sheer weight of the city's infrastructure (Spirn, 1984). Compaction of soils results in decreased movement of water through capillary action due to reduced pore space in the soil, making it harder for a tree to acquire water (Spirn, 1984). Compaction also inhibits soil organisms which aerate, oxygenate, and add nutrients to the root zones at pit sites, further reducing soil quality (Spirn, 1984).

Impervious surfaces are surfaces that prevent water from infiltrating the soil. Roads, parking lots, and buildings are all examples of impervious surfaces. The extensive amount of impervious surfaces seen in urban environments hinders the infiltration of water into the soil from which it can be absorbed by trees (O'Neil-Dunne, 2009; Spirn, 1984). Instead of going into the ground, rain water falling onto impervious surfaces runs out of the city through drainage networks thereby decreasing the water available to trees. Urban trees must be able to tolerate dry soils (Spirn, 1984).

Street trees have minimal room for growth. Trees are typically planted in four feet by four feet pits in the middle of sidewalk (Wilson, personal communication, 2010). These pits may be a suitable size when the tree is initially planted, but a tree will outgrow the pit as it becomes larger and can cause physical damage to surrounding structures such as sidewalks and roads (Wilson, personal communication, 2010). These pits generally contain poor soils, and are surrounded by impervious surfaces that limit water availability for the tree. Tree pits are also typically located in areas of heavy traffic, which leads to compaction of the soil, which in turn, further reduces water availability and soil organism activity (Spirn, 1984).

Underground utilities can cause damage to trees both immediately, when they rupture, and again when the utility needs to be repaired (Wilson, personal communication, 2010). A rupture, such as in a steam pipe fracturing, can overheat the roots of a tree and kill several trees along the course of the pipeline (Wilson, personal communication, 2010). Further damage can occur when this line is repaired.

Excavation is usually required in cases of faulty underground utilities, and this can cause irreversible harm to a tree's root system (Wilson, personal communication, 2010).

Sidewalk and road maintenance can also significantly harm trees (Jim, 2003). Repair crews often cut a vertical line along the edge of the sidewalk, cutting all roots along that path (Jim, 2003). This causes loss of any roots on the repair side of the tree and can result in a loss in nutrient and water gathering capability, along with a loss in structural support (Wilson, personal communication, 2010). Sidewalk/roadway and utility repair can lead to a decrease in the tree's health and/or cause the tree to fall over (Wilson, personal communication, 2010).

In both natural and urban settings, trees are subject to damage caused by pests. Pests cause damage to all parts of trees and can severely impact the health of trees (Dixon, 1977). Common tree pests include aphids and leaf eating insects that attack the tree and decrease the tree's photosynthetic ability (Dixon, 1977). Interactions between native tree species and native insects are usually not detrimental to tree health, as these species have been interacting for long periods of time (Dixon, 1977). A significant threat does however come from invasive species such as the Emerald Ash Borer (EAB) (Herms, 2009). This invasive beetle, native to Asia, specifically targets ash trees, and can cause death of infested trees within 2-4 years (Herms, 2009). The current protocol for trees infected with EAB is to cut down ash trees within a mile and a half radius of the infected tree and to chip them into pieces no larger than one square inch (Dupont, 2007). This is a significant threat to Baltimore's urban canopy since ash trees are the dominate tree species found in Baltimore City (City of Baltimore Urban Forestry Management Plan, 2008).

A significant challenge to urban trees is the constant threat of disease. Disease can cause harm to all parts and functions of trees and result in decreased health and death (Berry, 1998). In some cases, a pathogen can remain in the soil after it has killed its host tree and infect newly planted trees (Petritz, 2002). A number of diseases can be easily controlled by either pruning infected areas or applying fungicides; however, this can be both time consuming and costly depending on the type of disease and level of infection (Berry, 1998). Nonetheless, disease can be detrimental to tree species such as in the case of the Chestnut Blight Fungus which was responsible for the virtual extinction of the American Chestnut (Dickenson, 1998).

Citizens' Attitudes Towards Urban Trees

A major challenge facing urban forestry initiatives is people's attitudes towards trees. Some citizens are simply anti-nature and would rather not deal with trees (Wilson, personal communication, 2010). City residents may have also had negative experiences with trees, such as tree roots impacting

utility lines, sidewalk and car damage, and issues with bugs and animals (Wilson, personal communication, 2010). Trees may damage water pipes and electrical lines, attract insects such as the Gypsy moth, and provide a haven for rats (Battaglia, 2010). As a result of their apathy towards trees, people may thoughtlessly break entire trees or branches; some people have even been known to use trees as attack dog-training tools (Wilson, personal communication, 2010). Unintentional damage is also common; people will often hang signs on trees or damage trees as they cut grass and weeds that are growing close to trees (Wilson, personal communication, 2010). Lawn mowers and weed whackers can damage tree bark, making the tree vulnerable to infection (Wilson, personal communication, 2010).

Our survey results [see Chapter IV] indicate that the main complaint Baltimore City residents have against trees is that they are "messy." The surveys also revealed that damages to utility pipes and cars, as well as the various costs associated with trees (including maintenance costs and costs resulting from tree-related damages), were additional sources of complaints. Results from an earlier survey indicate that Baltimore City residents also claimed to dislike trees because they attract rats, birds, and insects and release allergy-inducing pollen (Battaglia, 2010). Dead trees were another major concern mentioned by Baltimore City residents in the earlier survey; some individuals wondered why they would want new trees in their neighborhood, when these newly planted trees would also, most likely, be left to die (Battaglia, 2010). Some citizens feared that planting more trees would enhance their neighborhood and lead to rent increases, which in turn can force people to relocate to more affordable areas (Battaglia, 2010).

Even when citizens do plant trees, they may not provide these trees with proper care. Residents may not water a newly-planted tree for the required period of two years (Wilson, personal communication, 2010). They may also fail to investigate underground utility lines prior to planting a tree; this could pose a problem for the sapling's expanding root system (Wilson, personal communication, 2010). Additionally, attempts by citizens to amend poor soil can prevent tree roots from expanding their root system, leading to death of the tree due to lack of nutrients and water associated with a compacted root system (Wilson, personal communication, 2010).

Health Issues Associated with Trees

There is conflicting information regarding the connection between trees and human health. Since trees release pollen, they could potentially have a negative impact on asthma sufferers (Lovasi et al., 2008). In addition, since living trees emit Volatile Organic Compounds (VOCs), urban forests have the potential to slightly increase ozone concentrations in areas surrounding forested areas (Nowak and Dwyer, 2000). These higher ozone concentrations could exacerbate asthma symptoms (Stieb et al.,

1996). However, there is also evidence to support the idea that trees decrease cases of asthma (Lovasi et al., 2008). A study conducted in New York City found that areas with greater numbers of trees had lower instances of childhood asthma, although asthma-related hospitalizations were not impacted by neighborhood tree density (Lovasi et al., 2008). These results remained constant even when possible confounding factors, such as neighborhood population densities and nearby pollution sources, were included in the calculations (Lovasi et al., 2008). Although there is no definite link between urban trees and asthma, there is a popular belief that trees can have a negative impact on this illness (Van Dellen et al, 2008). This belief adds another component to the negative opinions about increasing tree canopy.

Budget Challenges

The cost of planting and maintaining trees is also a challenge for Baltimore City. Over two years, planting and caring for one tree is estimated to cost $323.26 (Recreation and Parks, 2009). In order to successfully increase the tree canopy to 40 percent, Baltimore City would have to plant between 750,000 and one million trees (Baltimore Tree Trust, 2010).

In the 2010 fiscal year, TreeBaltimore, a mayoral initiative run out of the Baltimore City Department of Recreation and Parks responsible for increasing the tree canopy, planted a total of 7,798 trees with a budget of $300,000 (Dixon, 2010). TreeBaltimore received this same budget in 2009 (Dixon, 2010). The Department of Recreation and Parks' 2011 budget is $30,353,725, down from $31,163,833 and the Urban Forestry programs' budget has been cut from $4,210,882 to $3,261,179, a cut of 27% (Rawlings-Blake, 2010). As a result of this cutback, a moratorium has been placed on city-funded street tree planting (Rawlings-Blake, 2010). The two-person TreeBaltimore staff is funded by Recreation and Parks and funding for the purchase of trees comes from city capital dollars. All other funds for outreach, education and organizing are from grants, which includes one from Constellation Energy (Draddy, personal communication, 2010).

Damage from Trees and Personal Liability

It is difficult to ascertain Baltimore City's policies regarding damage caused by trees on city property. In the absence of details it appears that the City assumes responsibility for personal property damage caused by fallen city trees; however, it is a case by case problem usually settled through litigation (Letteron, personal communication, 2010). This uncertainty could pose a problem for citizens concerned about damages from trees and limit the enthusiasm for trees in some areas. Concern about responsibility for personal property damages resulting from a tree falling over and damaging a car or

house could influence a resident's feeling about trees. People viewing street trees as accidents waiting to happen might make it difficult for the City to plant more trees.

The "mess" created by a tree's falling leaves and branches is a major concern of citizens living nearby trees. The Baltimore City Charter contains various regulations that pertain to the maintenance of trees on public property, however, fallen leaves, nuts, fruits etc. are not a City maintenance issue. All of these laws are found in Division V subtitle 53 of the charter. Section 53-2 gives the Department of Public Works authority over street trees in the City. The Department of Public Works is "authorized and directed to regulate the planting, protection, and controlling of all trees planted and to be planted in streets, lanes, or alleys of Baltimore" (Baltimore City, 2010). Section 53-12 of the charter states "No person shall spray, mulch, fertilize, or otherwise treat, remove, destroy, break, cut, or trim any tree, or any part thereof, in any street, lane, or alley without first having obtained a written permit from the Department of Public Works," however property owners do have the right to prune a tree to accepted standards whether it belong to their neighbor or the City, back to their property line (Letteron, personal communication, 2010). This applies to both tree roots and branches encroaching on personal property. Residents of Baltimore City must learn to take the bad with the good and accept small problems such as lawns with leaves without accountability for more damaging problems posed by street trees in order to receive the many benefits trees pose.

IV. Survey of Baltimore City Residents

There is an extensive literature supporting the positive influence urban canopy has on a community. Tree canopy provides environmental benefits by reducing the impact of pollution produced by human activity as mentioned in Chapter II of this paper. There is also an increase in the value of homes when trees are part of an urban setting. In spite of the extensive amounts of information supporting the value of trees in urban settings and their ability to improve communities, there are parts of Baltimore City that have a very low tree canopy. The disconnect between the reported value of trees and the actual abundance of trees in Baltimore City led us to undertake a survey to probe the thoughts and attitudes of the community about trees to help see whether there were unknown reasons for this discrepancy. If trees are so wonderful for a city, why aren't all citizens in Baltimore City planting them?

Methods

Members of the class, in groups of two or more, visited select supermarkets in Baltimore City that we thought would draw residents from the surrounding community. In addition, a few surveys were completed by individuals walking through a commercial area. We were granted permission by the

store managers before starting the survey. The survey activity was started on September 9, 2010 and completed by September 26, 2010. Our sampling occurred during the week, as well as on a Sunday. Surveys were conducted between the times of 11 am and 3:30 pm. We attempted to balance our activity at the selected stores so as to not bias sampling. Our survey instrument was approved by Towson University's Institutional Review Board for Protection of Human Participants and all participants were read and offered copies of an informational letter regarding the research. A copy of the informational letter is presented in Appendix A-2.

When class members would go out to sample they would stand in front of the grocery stores with the surveys and informational letters. We would approach individuals on their way into or out of the store and ask if they would be willing to fill out a survey regarding trees in Baltimore City. The individuals that agreed to take the survey were read and given the informational letters that allowed them to contact the responsible parties or Towson University if they wanted more information about the survey. The survey contained informational, choice and open-ended questions and was used to gather feedback on the opinions and previous knowledge of Baltimore City residents about trees. A copy of the survey questions is included in Appendix A-1.

Once the surveys were completed they were numbered and the data compiled into a spreadsheet. The collected data is presented in Appendix A-3. Residential information was recorded for all subjects who provided that information. Yes/No answers were recorded as such. We organized the open-ended answers by combining responses [i.e., how would having trees make your street or neighborhood nicer?] into categories. Graphs were developed from this data. A last question asking whether the surveyed individuals were familiar with the TreeBaltimore program was asked at the request of Anne Draddy.

Results

The Towson University students in this class surveyed 216 individuals at various locations in Baltimore City. Surveys were completed at four locations: 69 were obtained in Waverly, 53 in Belair-Edison, 49 in Hampden, and 23 in Canton. Surveys were also conducted in Highlandtown and on 36th Street, but we gathered information from only 15 people in Highlandtown and 7 people along 36th Street. Of those people interviewed, 82 were renters, 128 homeowners, and six individuals did not specify. On average the Baltimore resident had resided in their home for 11.5 years.

Of the 216 people surveyed, 208 residents indicated they liked trees and only six people said they disliked trees. Two people did not respond. Reasons for liking trees fell into six categories: their aesthetics (i.e., attractiveness, community-feeling), their health benefits (i.e., air quality), their impact

on the environment (i.e., stormwater management, habitat for wildlife), the physical comfort they provide (i.e., shade), the emotional comfort they provide (i.e., calmness, safety), and their economic benefits. Of these six responses, the two most prevalent reasons for liking trees were aesthetics and physical comfort (see Figure 2).

The six residents who claimed they did not like trees were distributed evenly among the sampling sites: two residents surveyed in Waverly claimed to dislike trees, and one person disliking trees was interviewed in Belair-Edison, Canton, Hampden, and Highlandtown. Reasons for disliking trees were gathered from all 216 people surveyed, since many people who responded that they liked trees still had reservations about them. Reasons for disliking trees included their messiness (dropped leaves, branches, bird feces, etc.) harm to pipes, harm to cars, and upkeep and maintenance costs. Messiness was the most common reason for disliking trees (see Figure 3).

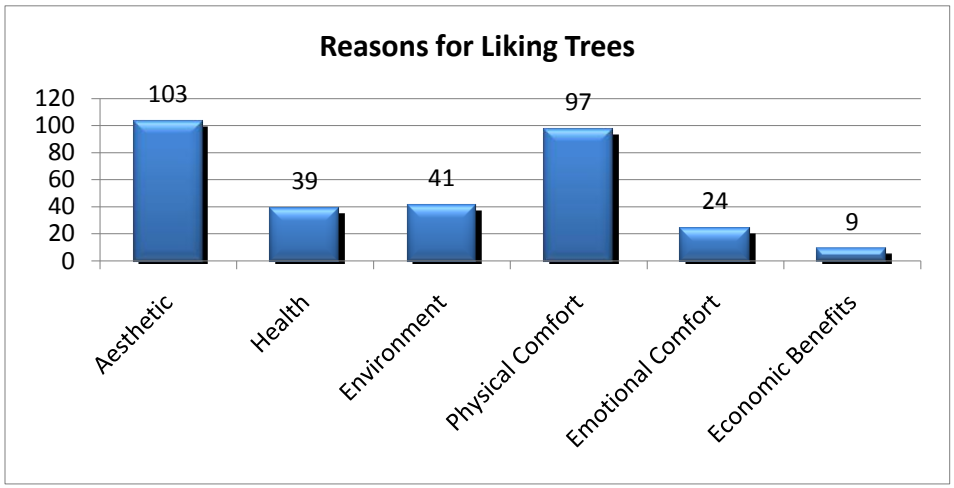

Figure 2: Reasons Baltimore City residents say they like trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

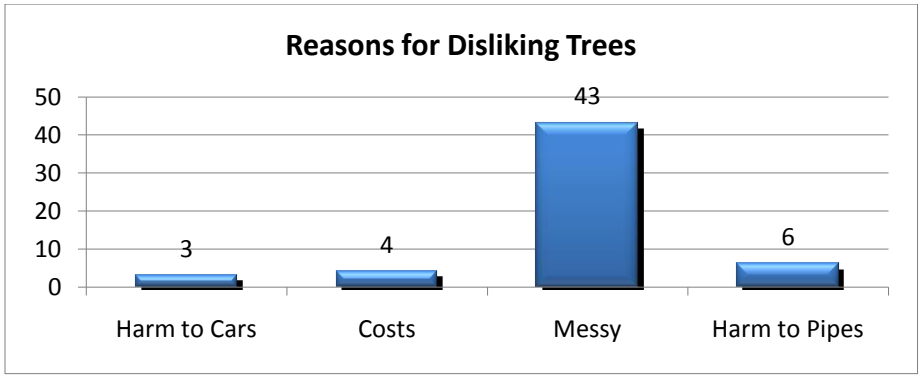

Figure 3: Reasons Baltimore City residents dislike trees, based on results of a survey done at several Baltimore City locations, Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

When asked if they would like to live in a neighborhood with trees, 200 responded yes, five responded no, one was unsure, and ten did not respond to that question. Residents were asked which tree types they would prefer to have on their streets or in their neighborhood: large trees, small flowering trees, or a mixture of the two. Of those asked, 66 percent of residents favored a mixture of the two, 22 percent favored large trees, and 12 percent favored small trees (see Figure 4).

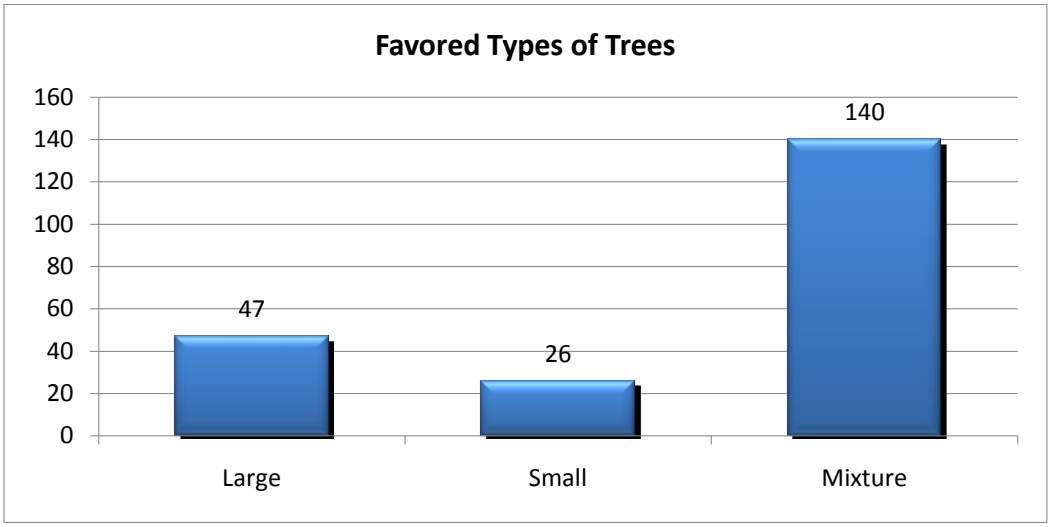

Figure 4: Type of trees favored by Baltimore City residents when they were asked in a survey, done at several Baltimore City locations. The residents were given the option of large trees, small flowering trees, or a mixture of both.

When asked if they would be willing to water a newly planted tree, 190 residents responded yes, 14 residents responded no, and 12 did not answer this question. When asked if they would be willing to protect a tree from harm or damage, 192 residents responded yes, ten responded no, and 14 did not answer. When asked if they would be willing to plant a new tree on their property 168 residents responded yes, 18 responded no, and 30 did not answer yes or no. Those that did not answer yes or no fell into two categories: those who were unsure and those who said they were not permitted to plant a new tree due to neighborhood regulations or landlord regulations. See Table 2 for summary.

Table 2: Baltimore City residents' attitudes about trees as reflected in a survey of 216 residents collected at several Baltimore City locations in fall 2010. Not all individuals answered all questions. See text for details.

Question asked	Yes	No
Would you like to live in a neighborhood with trees?	200	5
Are you willing to water a newly planted tree?	190	14
Would you be willing to protect a tree from harm or damage	192	10
Would you plant a tree on your property	168	18

Residents were asked several questions about their background knowledge about the impacts of trees. When asked if they had heard trees could save money on their electric bill, 143 residents

responded yes, 63 responded no, and 10 did not answer. When asked if they had heard trees could increase the value of one's home, 146 residents responded yes, 56 responded no, 14 did not specify. When asked if they had heard trees could reduce air pollution, 164 residents responded yes, 42 responded no, and ten did not answer. When asked if they had heard trees could keep one cooler by providing shade, 203 residents responded yes, two responded no, and 11 did not specify (see Figure 5).

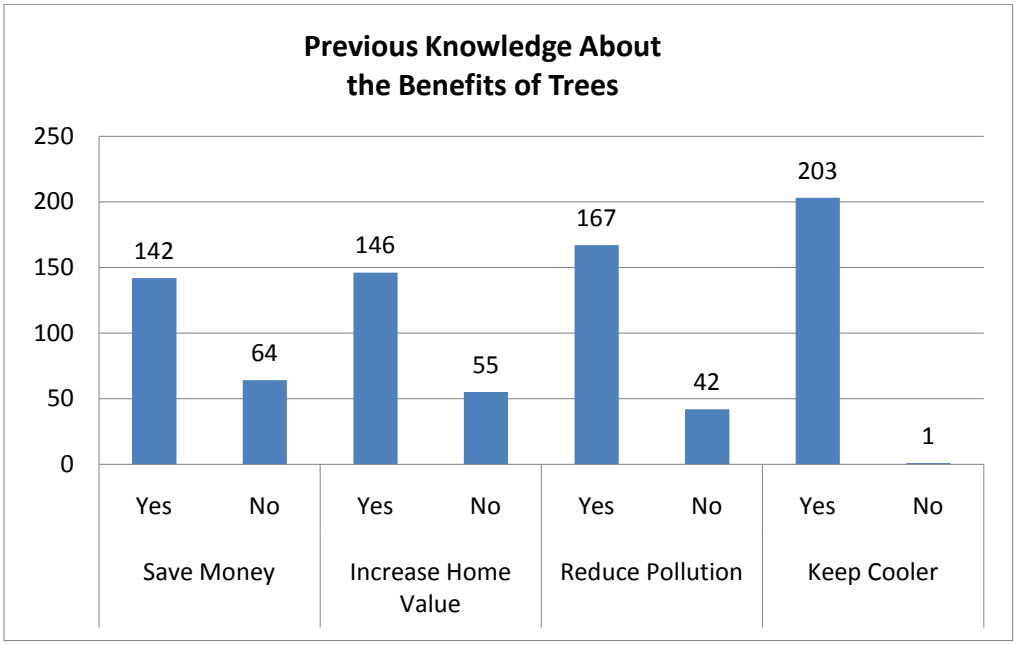

Figure 5: Baltimore City resident's knowledge about the benefits from trees when asked if they knew trees can: save money on heating/cooling bills, increase home value, reduce pollution, and keep a house cooler by shading. These results are based on a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response. Total number surveyed was 216.

Finally, residents were asked if they had previously heard of the program TreeBaltimore. Fifty-four residents responded yes to having heard of TreeBaltimore, 155 responded no, and seven did not specify (see Figure 6). Residents familiar with TreeBaltimore became aware of the program through various sources such as neighbors, community newspapers, advertisement banners, farmers markets, the National Aquarium, and their local Homeowners Associations.

The data we collected was also analyzed by the neighborhoods in which the surveyed residents lived. Below we present results for those neighborhoods represented by at least 8 residents in our survey.

Waverly

Waverly had the largest neighborhood representation with 28 people surveyed. All of the 28 residents surveyed liked trees. As shown in Figure 7, Waverly residents mostly liked trees based on their physical

comfort and aesthetics. Tree canopy data from August 2007 shows Waverly having 26% canopy cover. As seen in Figure 8, when Waverly residents were asked if they had heard trees could save

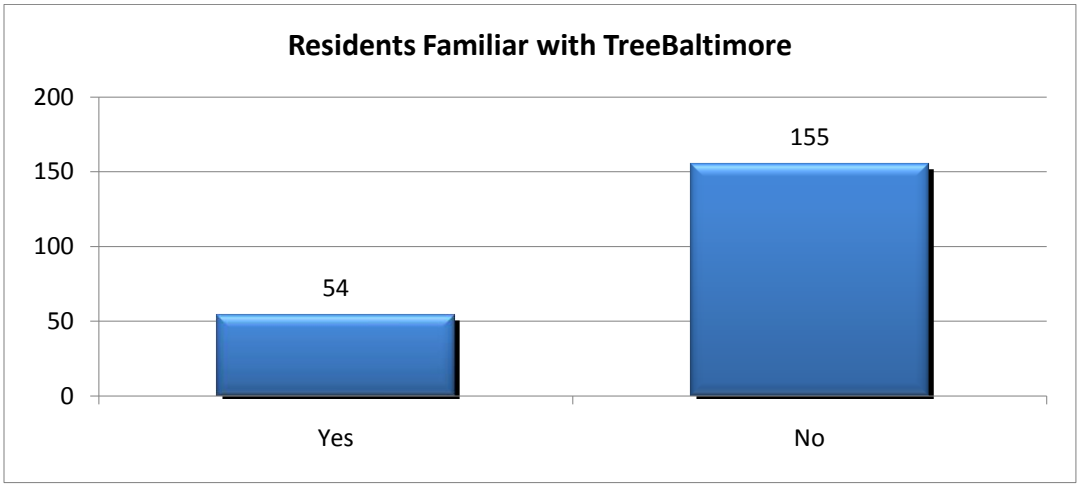

Figure 6: Baltimore City residents' response when asked if they had heard of TreeBaltimore during a survey performed at several Baltimore City locations.

money on their electric bill, 17 residents responded yes, nine residents responded no, and two residents did not respond. When asked if they had heard trees could increase the value of one's home, 19 residents responded yes, seven responded no, and two did not respond. When asked if they had heard trees could reduce air pollution, 22 residents responded yes, four responded no, and two did not respond. When asked if they had heard trees could keep one cooler by providing shade, 24 residents responded yes, zero residents responded no, and 4 residents did not respond. Of the 10 resident that liked trees for their physical comfort, seven of the 10 were aware that trees can save money on electric bills and keep you cooler by shading. Of the 28 residents, 17 indicated they had not heard of TreeBaltimore, while nine responded yes they had and two did not respond.

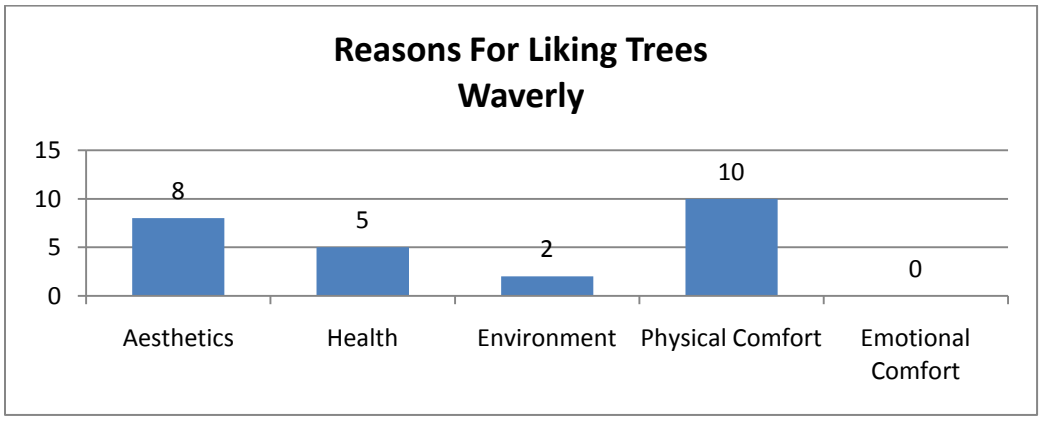

Figure 7: Reasons Waverly residents say they like trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

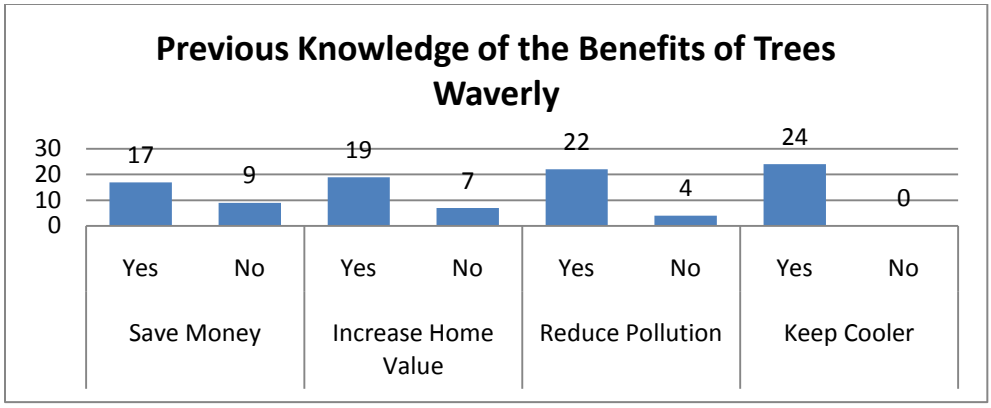

Figure 8: Waverly residents' knowledge of trees when asked if they knew trees can: save money on bills, increase home value, reduce pollution, and keep cooler by shading. These results are based on a survey done at several Baltimore City locations.

Canton

All 11 residents from Canton indicated they like trees. Canton residents liked trees primarily because of the aesthetic improvement and physical comfort they provide (see Figure 9). According to tree canopy data from August 2007, this neighborhood is reported to have 5% tree cover. As seen in Figure 10, when surveyed Canton residents were asked if they had heard trees could save money on their electric bill, eight residents responded yes, and three residents responded no. When asked if they

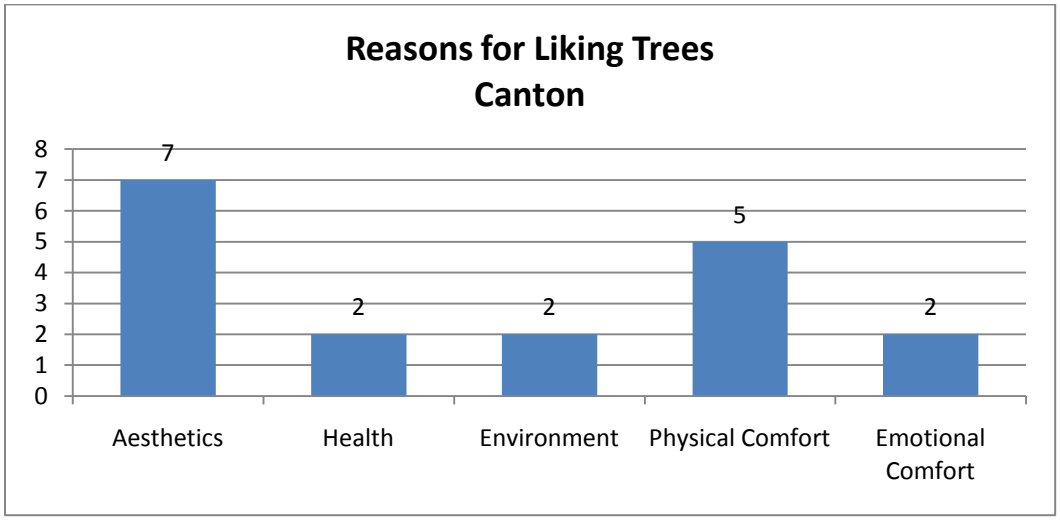

Figure 9: Reasons Canton residents gave for liking trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

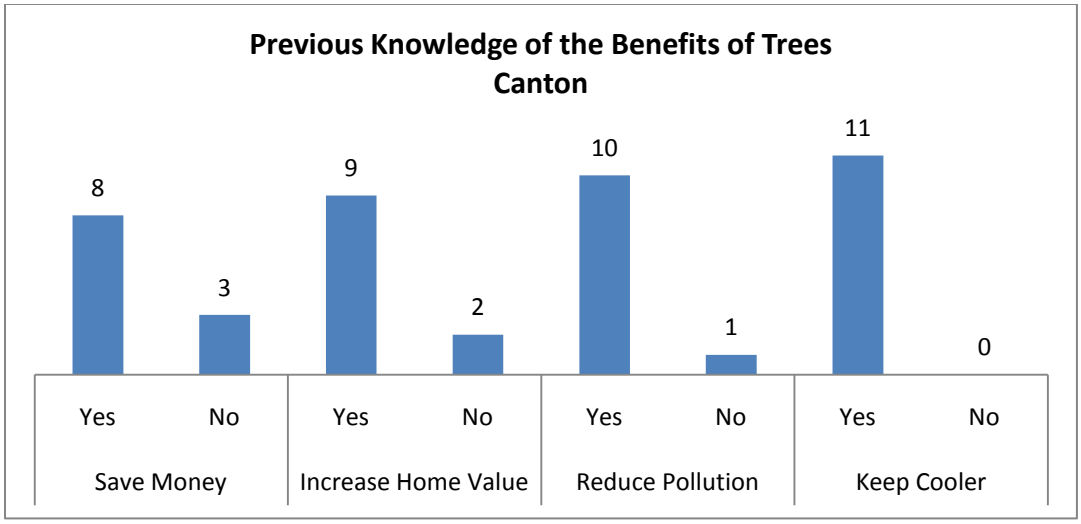

Figure 10: Canton residents' knowledge of trees when asked if they knew trees can: save money on bills, increase home value, reduce pollution, and keep cooler by shading. These results are based on a survey done at several Baltimore City locations.

had heard trees could increase the value of one's home, nine residents responded yes, and 2 responded no. When asked if they had heard trees could reduce air pollution, ten residents responded yes, and one responded no. When asked if they had heard trees could keep one cooler by providing shade, all 11 residents responded yes. Of the 5 resident that liked trees for their physical comfort, four of the 5 were aware that trees can save money on electric bills and keep you cooler by shading. Of the 11 total Canton residents, 9 responded no to having heard of TreeBaltimore, while only 2 responded yes.

Hamilton

Of the 13 people surveyed who lived in Hamilton, 12 residents like trees, and one resident dislikes trees. The one resident that disliked trees did so because trees are messy and cause allergy problems. As shown in Figure11, Hamilton residents mostly liked trees because of the physical comfort they provide and their aesthetics. As of August 2007, Hamilton's tree canopy cover is approximately 34%. When Hamilton residents were asked which tree types they preferred: large trees, small flowering trees, or a mixture of the two, ten of the 13 residents preferred a mixture of the two, three of the 13 residents favored large trees, and none of the 13 residents preferred just small trees.

As shown in Figure 12, when Hamilton residents were asked if they had heard trees could save money on their electric bill, nine residents responded yes, and four residents responded no. When asked if they had heard trees could increase the value of one's home, nine residents responded yes, three responded no and one did not respond. When asked if they had heard trees could reduce air

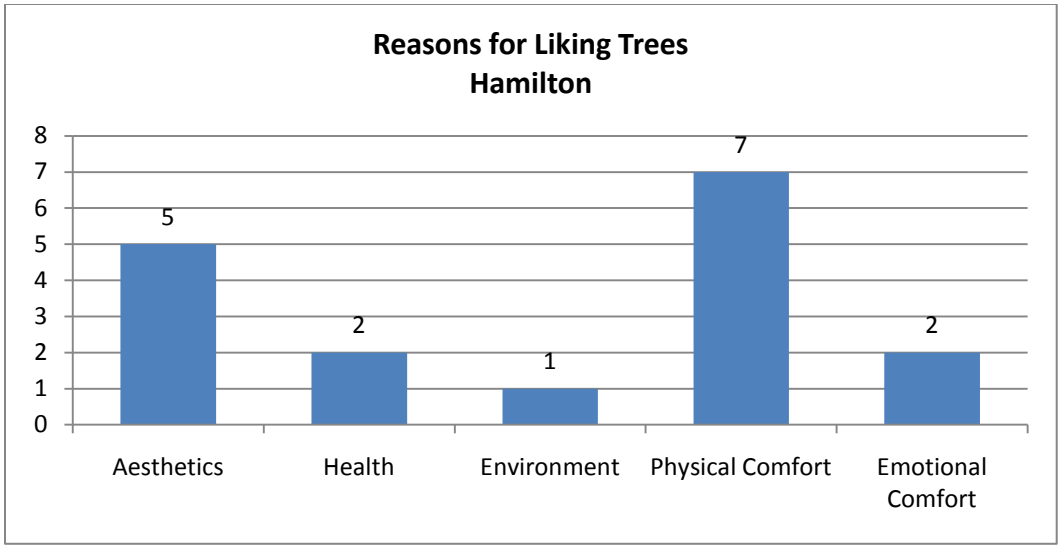

Figure 11: Reasons Hamilton residents say they like trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

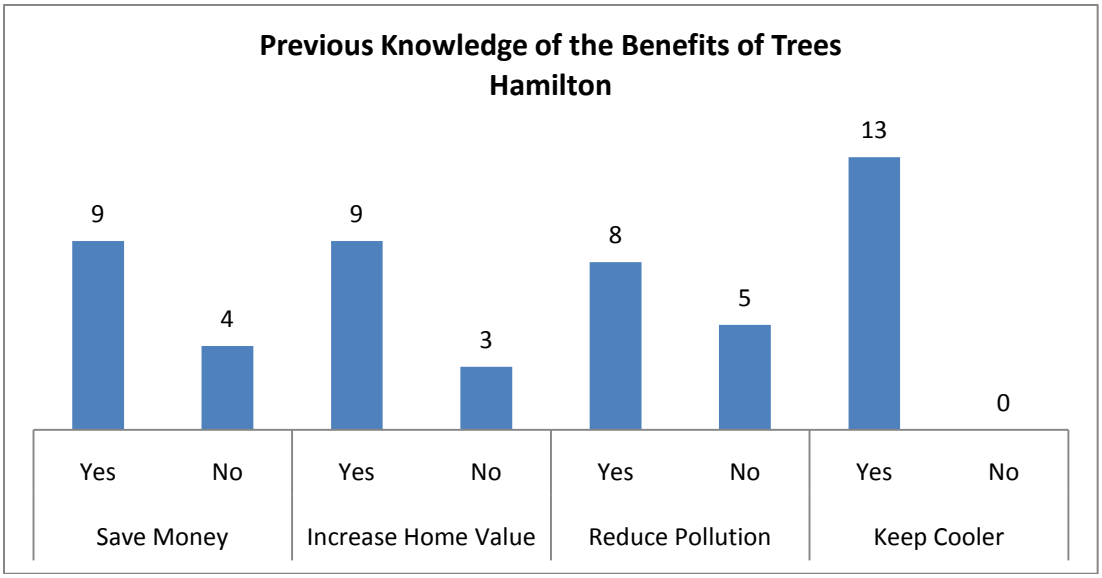

Figure 12: Hamilton residents' knowledge of trees when asked if they knew trees can: save money on bills, increase home value, reduce pollution, and keep cooler by shading. These results are based on a survey done at several Baltimore City locations.

pollution, eight residents responded yes, and five responded no. When asked if they had heard trees could keep one cooler by providing shade, all 13 residents responded yes. Of the 7 residents that liked trees for their physical comfort, five of the 7 were aware that trees can save money on electric bills and keep you cooler by shading. All 13 residents indicated they were not familiar with TreeBaltimore.

Hampden

Of the 16 people surveyed, all 16 residents like trees. As shown in Figure 13, Hampden residents liked trees primarily because of their aesthetics the most. In August 2007, Hampden's tree canopy cover was at 21%. As shown in Figure 14, when Hampden residents were asked if they had heard trees could save money on their electric bill, 12 residents responded yes, and four residents responded no. When

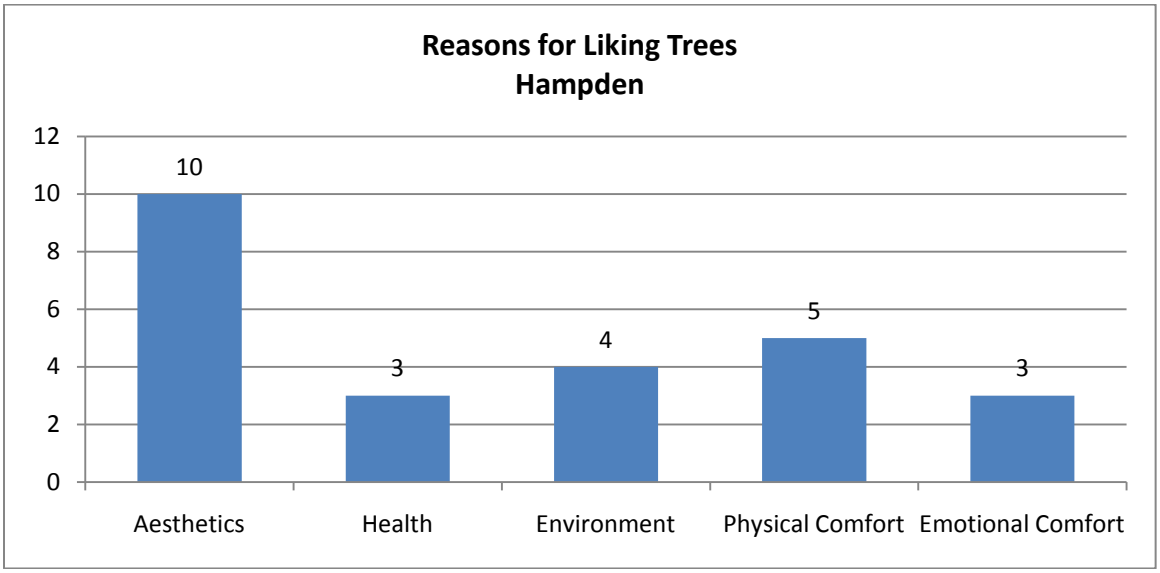

Figure 13: Reasons Hampden residents say they like trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response.

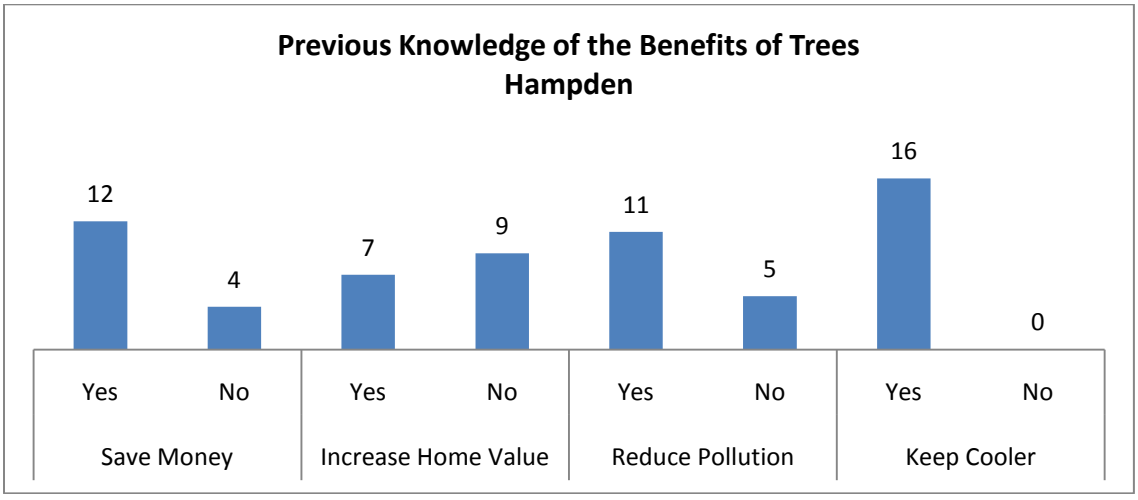

Figure 14: Hampden residents' knowledge of trees when asked if they knew trees can: save money on bills, increase home value, reduce pollution, and keep cooler by shading. These results are based on a survey done at several Baltimore City locations.

asked if they had heard trees could increase the value of one's home, seven residents responded yes, and nine responded no. When asked if they had heard trees could reduce air pollution, 11 residents responded yes, and five responded no. When asked if they had heard that trees could keep one cooler

by providing shade, all 16 residents responded yes. All 5 residents that liked trees for their physical comfort were aware that trees can save money on electric bills and keep you cooler by shading. Of the 16 residents, 13 indicated they had not heard of TreeBaltimore, and three responded yes.

Roland Park

Of the 8 residents of Roland Park that we surveyed, all 8 liked trees. As shown in Figure15, Roland Park residents liked trees based on their physical comfort the most. Tree canopy data from August 2007, shows Roland Park at 62% canopy cover. As seen in Figure 16, when Roland Park residents were asked if they had heard trees could save money on their electric bill, seven residents responded yes, and one resident did not responded. When asked if they had heard trees could increase the value of one's home, 6 residents responded yes, one responded no, and one did not respond. When asked if they had heard trees could reduce air pollution, seven residents responded yes, no residents responded no, and one resident did not respond. When asked if they had heard trees could keep one cooler by providing shade, seven residents responded yes, zero residents responded no, and one resident did not respond. Of the 6 resident that liked trees for their physical comfort, five of the 6 were aware that trees can save money on electric bills and keep you cooler by shading, while 1 resident did not answer. Three surveyed residents of Roland Park had not heard of TreeBaltimore, four had, and one did not respond.

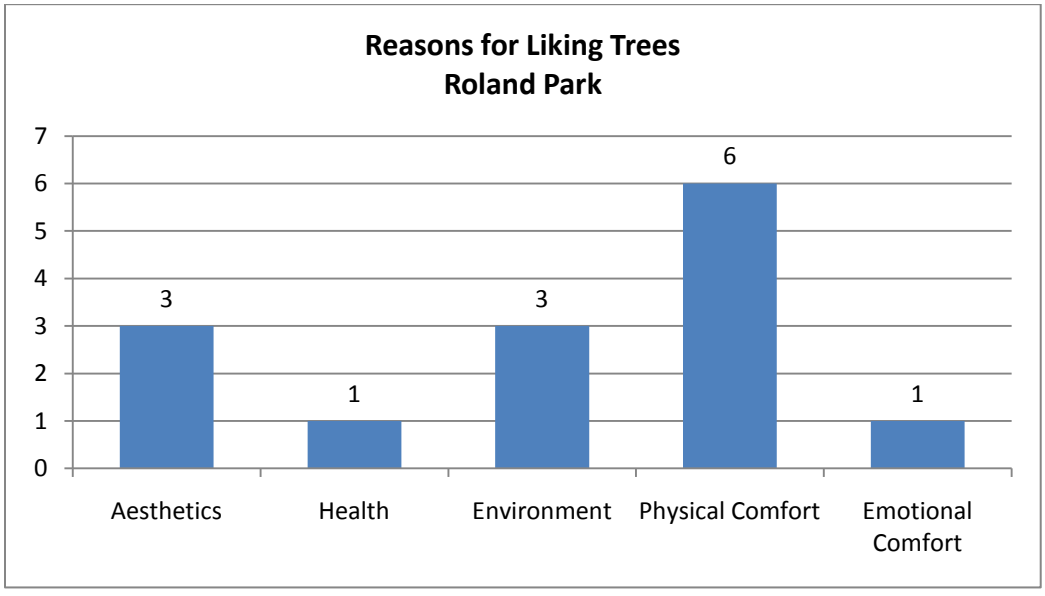

Figure 15: Reasons Roland Park residents say they like trees, based on results of a survey done at several Baltimore City locations. Numbers above bars are the number of responses in that category. Individuals often gave more than one response

Looking at these neighborhood residents, it appears that members from all these neighborhoods liked trees the most based on their aesthetics and physical comfort. It can also be

determined that residents in all of the neighborhoods prefer a mixture of large trees and small flowering trees, as shown in Figure 17.

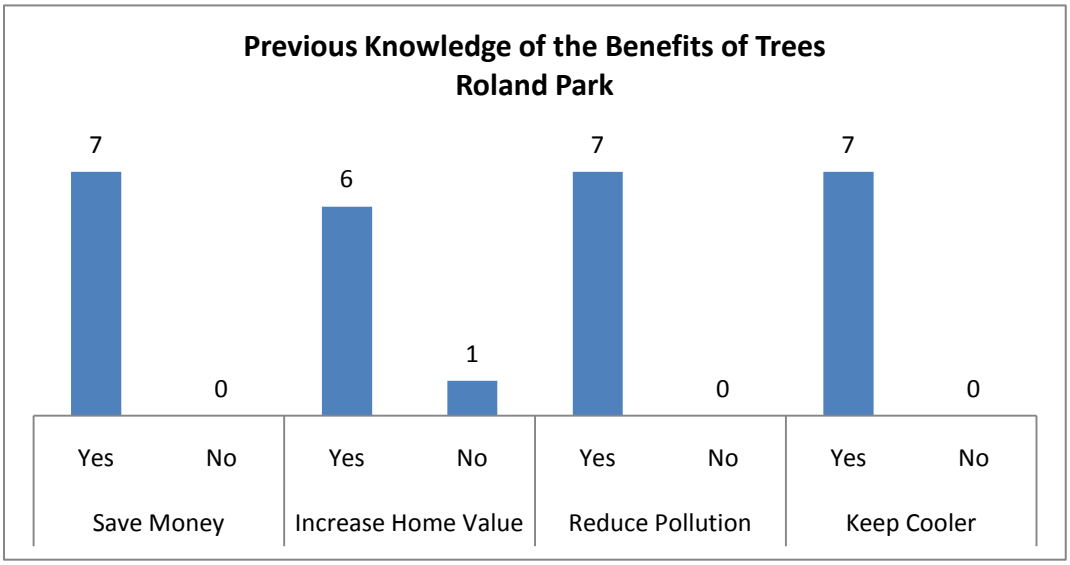

Figure 16: Roland Park residents' knowledge of trees when asked if they knew trees can: save money on bills, increase home value, reduce pollution, and keep cooler by shading. These results are based on a survey done at several Baltimore City locations

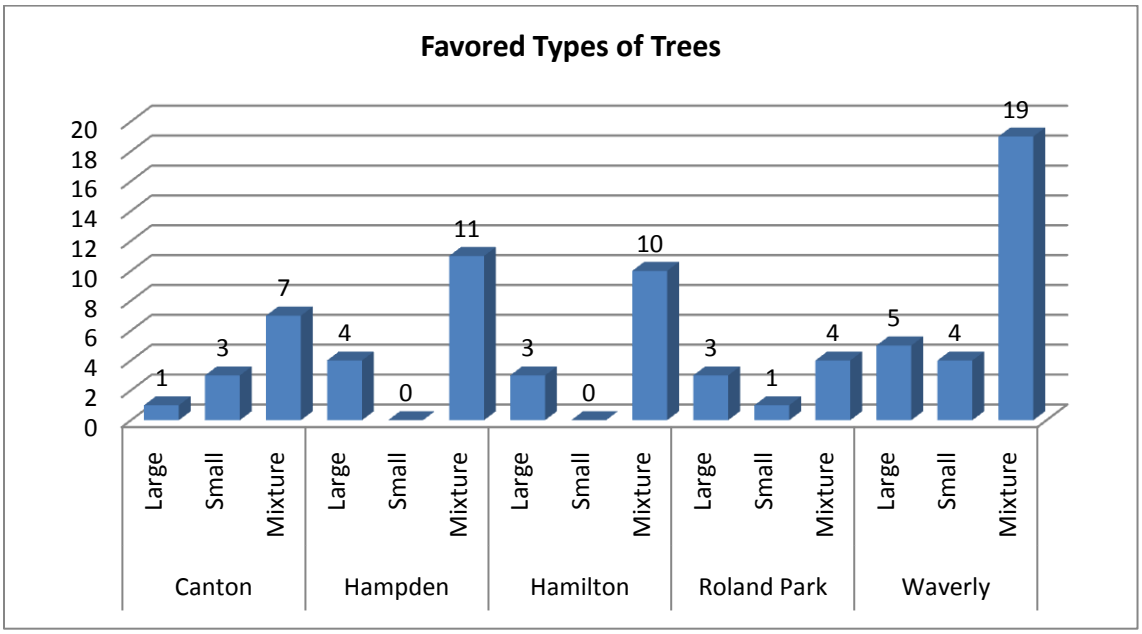

Figure 17: Residents of Canton (n=11), Hampden (n=16, one resident did not respond)), Hamilton (n=13), Roland Park (n=8), and Waverly (n=26) response when asked if they preferred: large trees, small flowering trees, or a mixture of the two. Results are based on a survey done at several Baltimore City supermarket locations.

Discussion

The surveys were conducted to get information from Baltimore City residents about their opinions of trees and understand the basis for those opinions. The overwhelming majority of people surveyed liked trees and would want to live in a neighborhood with trees. It could be argued that the results are limited because of the small sample size; we spoke with only 216 people in a city of over 600,000. With such a large number of people living in Baltimore City, the 216 surveyed may not be an accurate representation of most Baltimore City residents. There is also potential for skewed results due to the locations where the surveys were conducted. The majority were conducted at five supermarkets locations in Baltimore City. There were some individuals who came to the stores from areas outside of the targeted neighborhoods. There is also the possibility that the people being surveyed to not give an honest opinion about their feelings because they felt a certain answer was being looked for by the students performing the survey, or other personal reasons such as not admitted they do not know something. The data we collected gave interesting results and provided some insights about Baltimore City residents' opinions of trees.

V. Our Ideas for Possible Next Steps

After examining why trees are important to an urban environment, we offer the following as possible steps that Baltimore City or specific offices/agencies within the City might want to consider which could enhance development of an increased tree canopy. These are based on our current, but obviously limited, understanding of the programs and policies in place.

Policy

Quite a few urban governments have been able to develop strategies that provide incentives to citizens, agencies, and developers to increase the urban forest cover; these strategies might work well for Baltimore City. Our suggestions are based on creating models from those other urban government policy strategies, such as in Takoma Park, Atlanta and Rhode Island. These suggestions have been selected because they re-define political ownership, integrate an appealing forestry vision, and inspire responsibility for street trees through community, state, and city agency mandates, and community based not-for-profit groups that provide citizens' pride in their stake of the forest canopy.

It is important first and foremost for policy to be developed that will target the reasons citizens of the City dislike trees. Trees are thought to be disliked because they block the line of sight for some drivers as well as road signs, and the trees are viewed to be messy (Draddy, personal communication, 2010, our survey results Chapter IV). It is therefore important to have policies that address these

problems; the neighboring community of Takoma Park is addressing some of these challenges to urban canopy through its Existing Municipal Code.

Takoma Park regulates the placement of trees, in which vegetation that is more than three inches off the surface of the city street cannot be within 20 inches of the corner of a street intersection (City of Takoma Park Municipal Code, 2010). Similarly, vegetation located on private property is not allowed to obstruct streets, sidewalks or traffic control devices (City of Takoma Park Municipal Code, 2010). Both of these regulations carefully place trees around Takoma Park streets and thereby avoid potential conflicts with the public. These ideas can be incorporated into Baltimore City's policy to prevent a source of conflict. For public property, it could be useful to not only regulate trees in front of road signs and intersections, but to regulate them in front of ATMs, power lines, and other important visuals or potentially dangerous situations. These changes to policy would not only avoid possible future problems, but could very well reduce maintenance costs. With careful policy modification, trees might be more readily embraced by the citizens of Baltimore City.

The other reason most people do not like trees is because they are messy and a nuisance. One possible solution to this problem is a policy that directs clean-up crews to go around the City and remove the leaves, branches and other tree debris from public land. It also might be possible to implement cleaning and tree maintenance through local community programs. Baltimore organizations such as the Boy Scouts or the Girl Scouts could become partners and create a new badge to acknowledge achievement for helping in tree planting, maintenance or raking leaves. Not only would these activities directly address the problem of "messy" trees, but getting children and young adults directly involved in planting and caring for trees might change and help inspire future generations. These methods of cleaning up after and caring for trees should not be limited to schools and scouts, but church groups, nonviolent offenders in prisons and juvenile detention centers, and businesses could also become partners to achieve the common goal of a cleaner and greener environment.

Addressing why individuals in Baltimore dislike trees is important, but it is not sufficient. We also need to look at actions cities can take to protect and care for existing trees, as well as promote planting new trees on private lands. For these we examine Takoma Park and Atlanta.

Takoma Park has developed policies to protect existing trees. Takoma Park has adopted a maintenance model in which they have a "Tree Expert" who evaluates and supervises activities involving care for a Tree, which is something Baltimore can implement to help protect and care for the City's trees (City of Takoma Park Municipal Code, 2010). Prior to any activity being performed that would create disturbance near an urban tree, such as construction or redevelopment, Takoma Park requires that a Tree Impact Assessment be performed to avoid extensive damage to a tree (City of Takoma Park

Municipal Code, 2010). In addition, if any tree, public or private, is removed there must be a replacement tree of equal or greater value, planted within six months in that location or another to sustain the tree canopy (City of Takoma Park Municipal Code, 2010). If there is no way to replant, a payment equal to the tree's value must be directed to Takoma Park's tree planting fund. The removal of trees in Takoma Park requires a permit as well. Each of these policies in Takoma Park creates a proactive and sustained system for maintaining the tree canopy.

The Atlanta model also addresses tree maintenance and protection on both private and public property; a similar ordinance would be useful to Baltimore City. This care plan enables certified arborists, employed by the Atlanta Bureau of Parks [BOP], to inspect trees on private property for disease or hazard and determine if removal is needed (Atlanta Code of Ordinances, 2010). The BOP division is responsible to assign tree managers to "privately owned trees" (Atlanta Code of Ordinances, 2010).

The Takoma Park system not only cares for current trees, it also replaces existing trees and funds the planting of new trees; these policies create an environment in which it would be easier to obtain a higher tree canopy. Not only could these maintenance policies be adopted by Baltimore City, but they could be expanded to include such actions as regulating the disposition of the removed trees. For both public and private lands, trees that are cut down and removed from City property could be sold to logging/lumber companies and the capital from those sales can be added to the above proposed tree fund. These actions would help Baltimore regulate the removal of trees, and the trees that are removed would help fund the replanting of additional trees in the future. Any private or public land purchased could be protected by policy in which the new owner could not remove any tree without a permit, and would be required to follow the same guidelines in terms of replacing or replanting the trees or funding of TreeBaltimore. Adopting such a policy could keep an intact tree canopy, while providing for an increase in future canopy for Baltimore City.

Incentives provide another way to promote the protection of trees as well as promote planting new trees. These incentives could range from tax write-offs for private homeowners planting and maintaining trees on their property to incentives provided by utility companies to reward, through discounts, homeowners with trees planted around their house. Private homeowners would have two very good reasons to have trees, i.e., their aesthetic appeal as well as to save money. If urban citizens can see direct benefits from tree canopy on their property, it would help make trees more acceptable and in fact desired by the populace of Baltimore City.

The Atlanta Tree Ordinance covers both public and privately planted trees. The Atlanta Tree Ordinance gives the mayor the right to formulate agreements with the city's private property owners in

order to obtain “easements to plant trees on such property” (Atlanta Code of Ordinances, 1992). Essentially, the city of Atlanta plants trees on private property through a signed agreement stating that the property owners will not damage or remove the trees. If the property owner(s) want to remove these city-planted trees, a minimum of two years notice must be given (Atlanta Code of Ordinances, 1992). In addition, the agreement hands maintenance responsibilities over to the property owner and ensures that the city is not liable for any damages caused by the tree (Atlanta Code of Ordinances, 1992). Baltimore City could create similar policies to attempt to promote further tree plantings on private property.

A third mandate addressed by the Bureau of Parks in Atlanta is under section 3, which proclaims to “establish and revise as necessary standards for the planting and maintenance of trees so as to improve the economic base of the city by improving property values, to enhance the visual quality of the city and its neighborhoods and to improve public health by lessening air pollution and the incidence of flooding” (Atlanta Code of Ordinances, 1992). The Atlanta Tree Conservation Commission also created a Tree Trust Fund which receives a fee equal to the value of a tree removed when replanting is unsuitable or undesired by a homeowner or developer. Atlanta Tree Ordinance also requires developers to plant street trees in each of their new developments (Atlanta Code of Ordinances, 2010; American Forests, 2010). The components of the Atlanta ordinances that could be applied in Baltimore City are those that address plantings on private lands and the mechanism to provide funds for replanting. These regulations also protect existing trees by forcing them to be replaced if an area is developed and trees are removed.

Creating a “Greening our Cities” License Plate to Fund Tree Plantings

Creating a Maryland state license plate in support of urban trees for Baltimore City, or any city, could provide a source of funds to support larger urban forestry goals and programs and some of the above-suggested policies. Some of the above suggestions such as creating a tree planting fund for Baltimore City, engaging Baltimore City employees in leaf cleanup activities, coordinating activities of the scouts, etc. will incur costs; fundraising through license plates may offset those costs. Creation of urban license plates would need to be supported by City leaders. A design from the license plate could even be a contest for school children to further promote urban forestry and allow children to join in the solution. The idea of an urban plate design provides citizens an additional opportunity to support urban forestry programs and become active in financially supporting the growth of urban forest canopy through purchasing of the license plate. If this were to be adopted state wide, a Baltimore citizen could support urban forest in any Maryland city of their choosing; conversely, a citizen from another area

could choose to support growth of Baltimore City's urban forests by purchasing the "Greening our Cities" plate designating Baltimore City as the recipient site.

Proceeds from the sales of "Greening our Cities" plates could address environmental education about the value of urban trees, tree planting activities, and workforce training in tree maintenance. Each city receiving funds could decide how to spend them as long as they contribute to enhancing their local urban tree canopy.

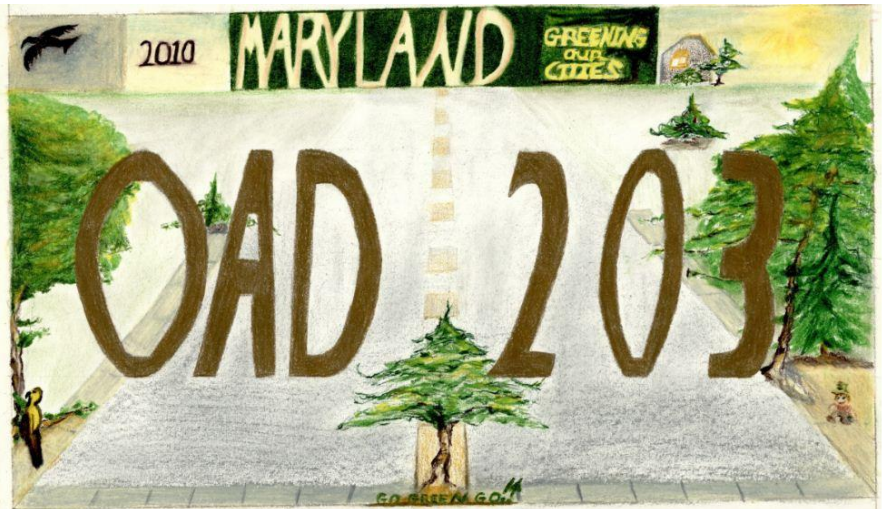

Figure 18: Example "Greening our Cities" license plate to support forests.

Education Programs

Education programs can be a critical part of increasing the tree canopy coverage in Baltimore City. Children who learn that trees play an important role in "greening" their city and who are actively involved in the planting process will become the future generation of Baltimore City's leaders and taxpayers who understand the importance of trees. These educational and hands-on learning experiences can be accomplished through interactive educational programs held within the City's public schools.

The Parks & People Foundation of Baltimore has already implemented environmental education programs that aim to get urban youth involved in "environmental stewardship activities" (PPF, 2010). The different programs are all a part of the foundations "Green Career Ladder," as the Parks & People Foundation provides an "age appropriate progression in environmental stewardship, literacy, outreach and action" (PPF, 2010). The programs offered by the foundation cover a large range of student age groups; anyone from elementary school students to students who have already graduated from college can become involved. The ultimate goal of the "Green Career Ladder" is to eventually have students acquire full-time employment in some type of "green" career (PPF, 2010). The programs provided by the

Parks & People Foundation are successful because they get Baltimore's students involved with nature as they engage in the current activity in the program as well as in the years to come.

Tree plantings are a way to get school-aged children involved in increasing the canopy coverage. However, simply having trees planted on school grounds is not enough; the children who attend the school must actually be involved in the planting process—the trees that are planted must be 'their' trees. This type of hands-on involvement will ensure that students feel a connection with the trees being planted. Allowing the children to participate in the plantings will make them feel as though they are an important part of the planting process. Including the newly planted trees in the science and mathematics curriculum of Baltimore City schools can further enhance the connection because students will learn the environmental benefits and the importance of trees. Teachers can also include the trees in science projects where students can measure the growth of the trees each month and graph their growth; the students can learn how to properly maintain the trees and study how trees affect air and water pollution. If children help plant trees and understand their importance in the City then they will remain interested in these trees in the future and will be more willing to take part in the care and maintenance of "their" trees.

These students should also be responsible for taking care of their trees. Handing over some of the responsibility of tree maintenance to the students will give these children a greater sense of ownership of the trees. Since they themselves are responsible for the well-being of the trees, they will be much more likely to truly care about what happens to them. In addition, giving students some responsibility will emphasize the idea that trees do not just grow on their own; proper care and maintenance are needed to ensure that trees are given the best possible chance to grow successfully.

Including tree plantings in the science curriculum is just one way to get children involved, Baltimore City can also establish a tree planting competition between the City's public schools. The competition would help increase the number of trees planted by providing incentives to the schools that plant the most. A tally of the total number of trees planted by each school could be kept and an overall winner declared at the end of the planting season. Competition has the potential to bring out the best in the students, and it certainly gives them an additional reason to be involved in the planting process. The Baltimore City school system requires each student complete a certain number of community service hours each year. For instance, middle school students must complete 50 hours of service a year, and while the number of hours required of high school students is not specified, students are expected to continue with their service during their years in high school. These community service requirements provide another opportunity for students to be involved in improving and maintaining the tree canopy. Some portion of the required number of hours students have to complete could be designed to be

focused on tree plantings or helping with tree maintenance. Tree plantings and/or maintenance on school grounds or around the community can become a part of the community service projects performed by these students. In addition, a community service project that involves students raking leaves for the elderly could be implemented. If this type of project were to become a reality, students would be able to complete community service hours while also helping to address the "messy" leaf issue, one of the major problems that Baltimore City residents had with increasing the tree canopy.

Informing Baltimore City's students of why trees are an asset to an urban environment would be an important next step towards increasing the tree canopy. Students should learn why trees are beneficial from an ecological, economic and social perspective. It is one thing to get children to help plant trees; it makes the event more fun for everyone. It is an entirely other thing, however, for these children to understand exactly why they are planting trees, that creates a cadre of tree proponents. When students understand the importance of trees they will be much more likely to remain interested in caring for and protecting those trees.

Umbrella Program

Throughout Baltimore City and Baltimore County there are multiple programs that share the common goal of increasing the tree canopy of Baltimore City, with the "official" agency responsible for increasing tree canopy in Baltimore City being TreeBaltimore. However, not all of these factors currently work in cooperation with each other. If more cooperation and coordination were in place there could be more public awareness about the tree canopy issue and more efficient use of funds. While the efforts of all of the groups are applauded, focused energy might provide for greater success.

Some of the most prominent programs in Baltimore City and County are TreeBaltimore, The Growing Home Campaign, Tree-Mendous Maryland, The Parks and People Foundation, Hampden's Clean and Green Committee, Tree City USA, The Waverly Improvement Association, and the Baltimore City Forest Board. The Growing Home Campaign is an initiative started by the Baltimore County Department of Environmental Protection and Resource Management (Cohen, 2010). This program does actively cooperate with TreeBatlimore (Cohen, 2010) and the goals of the Growing Home Campaign are the same as TreeBaltimore's. However, the Growing Home Campaign only focuses on private property (Cohen, 2010) whereas Tree Baltimore, although seeking to promote planting on private property, focuses on plantings on public property, such as street trees – the areas where the City has control. The Growing Home Campaign has support from Baltimore County, Harford County, the City of Baltimore, Honeywell, the US Department of Agriculture and Forest Service, the Maryland Nursery and Landscape Association and the Chesapeake Bay Trust and offers $10 coupons for the purchasing of certain trees

from participating nurseries and other tree retailers in Baltimore County and the surrounding areas (Cohen, 2010). The Growing Home Campaign also supplies constituents with informational resources; educating them about what types of trees to buy, care instructions and the benefits of growing trees on their property (Cohen, 2010).

The TreeMendous Maryland program is a government program under the Maryland Department of Natural Resources (DNR, 2010b). The goal of TreeMendous is to increase tree canopy on public lands by providing reduced priced trees and shrubs for planting in open spaces, schools and other public lands (DNR, 2010b). In addition, the DNR and their TreeMendous Maryland Program, in coordination with the Maryland Urban and Community Forest Committee, give grants to various communities and schools in Maryland to support planting and caring for trees (DNR, 2010b).

The Parks and People Foundation is a non-governmental and non-profit association that works to create various programs and partnerships in order to increase sustainability in Baltimore City (PPF, 2010). Although this program is separate from TreeBaltimore, they do work with and support TreeBaltimore through their shared goals (PPF, 2010). One of the programs within the Parks and People Foundation is in place to help increase the number of street trees in Baltimore (PPF, 2010). Parks and People promote growing trees on public and private land alike by assisting in the planting process and by giving Neighborhood Greening Grants to buy and plant street trees (PPF, 2010). The grants, typically less than $1,000, are awarded for projects directed towards improving Baltimore City environmentally and are awarded through an application process (PPF, 2010). The Parks and People Foundation's grant program has support from the TKF Foundation, the Maryland Fund for the Environment at the Baltimore Community Foundation, the Cleaner Greener Baltimore Initiative and the US Forest Service (PPF, 2010).

Hampden's Clean and Green Committee is an organization similar to The Parks and People Foundation, but it focuses on one neighborhood rather than the entire city. The Hamden Clean and Green Committee was created by and is under the Hampden Community Council, which is the neighborhood group in the Hampden area of Baltimore City (Hampden Community Council, 2010). One of the sustainability initiatives put in place by the Hampden Community Council is their street tree program, which helps get Hampden community members a tree planted in front of their homes (Hampden Community Council, 2010). In compliance with Baltimore City Codes and Miss Utility, the Hampden Community Council helps plant trees in suitable locations by either creating tree pits or using pre-existing pits in front of houses where the homeowners or renters, with the landlord's permission, have applied to the Hampden Community Council for a street tree (Hampden Community Council, 2010). Hamden's street tree initiative has existed since 2005, therefore it predates the creation of

TreeBaltimore; despite their shared goal, and it shows no evidence of working with or supporting TreeBaltimore (Hampden Community Council, 2010).

A neighborhood program similar to Hampden's Clean and Green Committee is the Waverly Improvement Association, which seeks to improve Baltimore City's Waverly neighborhood. The Waverly Improvement Association is less interested in trees and increasing canopy than it is in improving the Waverly neighborhood area of Baltimore City in general (Waverly Improvement Association, 2010). Although they do not plant trees directly, they do have tree planting events, as well as other neighborhood plantings as part of their improvement campaign (Waverly Improvement Association, 2010). The Waverly Improvement Association appears to be in no way connected to the TreeBaltimore program. It is possible that trees would be a greater component of their activities if they were more aware of the major positive impacts that trees can have on a community.

Tree City USA is a non-governmental program that receives some federal support from the National Association of State Foresters (Tree City USA, 2010). It also has support from Arbor Day Foundation (Tree City USA, 2010). The goal of Tree City USA is to "inspire people to plant, nurture, and celebrate trees" (Tree City USA, 2010). The Program helps promote urban trees through various efforts, which includes education directed towards both city officials and the general public, and more importantly they give financial assistance (Tree City USA, 2010). The financial assistance is through grants given to Tree City USA communities that must be put towards tree and forestry programs (Tree City USA, 2010). Any community in Tree City USA may apply for the grants. Becoming a part of Tree City USA is regulated through requirements that the city must have a "tree board or department, a tree care ordinance, a community forestry program with an annual budget of at least $2 per capita, [and observe] Arbor Day" (Tree City USA, 2010). Baltimore City has been part of the Tree City USA program for 26 years and won the Tree City USA Growth Award in 2005 for going beyond the four standards of admittance to the program (Tree City USA, 2010).

The Baltimore City Forestry Board is a program established by a law created by the DNR in 1943 in Maryland counties; the Baltimore City Forest Board held their first meeting in 1987 (Black, 2010). The Board is a group of volunteer members who seek to increase the tree canopy of Baltimore City in coordination with the Maryland Department of Natural Resources' Forest Service (Black, 2010). The Baltimore City Forestry Board's goals are:

> to improve the management of Baltimore's urban forest growing along its city's streets and in its parks, facilitate school tree plantings, promote informational and educational

> activities about the City's urban forest resources, [and] work closely with, and assist the Baltimore City Forestry Division with its Mission (Black, 2010).

The Baltimore City Forestry Board has fewer than 20 members and has a budget of under $5,000 (Black, 2010). The Forestry Board works with the Baltimore City Forestry Division. The goals of the Board and TreeBaltimore are the same, and they are aligned as part of the City's government (Black, 2010). However, the Forestry Board has its own budget and agenda (Black, 2010).

Each of these programs and grassroots groups, essentially share the same goals as TreeBaltimore. However, each group is working on its own agenda to achieve these goals. By not having an umbrella organization that encompasses these non-governmental and governmental agencies, there may be public tussles among them leading to confusion among citizens of Baltimore City, but most importantly, there may be multiple budgets involved, none of which are being used as efficiently as possible.

However, one non-profit organization currently seeks to become the type of umbrella program that could maximize the efficiency all of all these groups and the resources at their disposal. The Baltimore Tree Trust is part of the Baltimore Community Foundation. It has the following plan:

> State and local governments, as well as regional non-profits, have programs to increase the tree canopy. The Baltimore Tree Trust will offer a much larger platform for these initiatives by marketing additional programs, educating and mobilizing residents and institutions, creating partnerships and scale, and raising capital regionally (Baltimore Tree Trust, 2010).

The Baltimore Tree Trust aligns with TreeBaltimore's initiative to increase the tree canopy cover to 40 percent by 2040 (Baltimore Tree Trust, 2010). The organization wants to help plant the 25,000 trees that will be needed per year in order to reach the 40 percent coverage goal (Baltimore Tree Trust, 2010). The Baltimore Tree Trust wants to "serve as an umbrella and leader to mobilize citizens and institutions around this ambitious civic goal" (Baltimore Tree Trust, 2010). The program wants to act as an umbrella not only for the programs relating to increasing Baltimore's tree canopy, but also for all fundraising organizations relating to increasing tree canopy in Baltimore City (Baltimore Tree Trust, 2010). The Baltimore Tree Trust understands the importance of having one single program in order to effectively engage citizens and institutions in the process of increasing the tree canopy and managing the budget (Baltimore Tree Trust, 2010).

Currently The Baltimore Tree Trust is no larger a group than any of the others. It differs in that it is working to be an umbrella program, which has the potential to create collaboration between all the programs. If the Baltimore Tree Trust, or a similar non-governmental group, were to manage all finances of the various groups it could separate the funds from the City's bureaucracy and regulations. Another option would be for TreeBaltimore to work as the umbrella program and with it, use the City's power and name to promote increasing the tree canopy. Both arrangements have strengths and weakness which need to be assessed, but an umbrella program could allow for increased efficiency for expenditure and outreach which will in turn increase Baltimore City's Tree canopy.

Outreach

As mentioned briefly above, outreach could be consistent and cohesive if all the individual organizations embraced the creation of an umbrella program. But, outreach means connecting to the people of Baltimore City. Based on our survey results, awareness of TreeBaltimore was not high among our sample of the City's residents. So the question is how can awareness be raised in Baltimore City?

The United States Forest Service has identified and outlined what they believe are the most important points to develop effective outreach programs. They give the following steps (US Forest Service, 2003):

1. learn about diversity of the population in your area you wish to impact
2. identify specific groups that might be open to specific opportunities
3. cultivate relationships with that group and build trust
4. develop a communications strategy appropriate to the group
5. encourage an Outreach Work Environment to help them to share the goals
6. implement community outreach programs to reach further groups
7. monitor your plan and follow up to make sure it is effective in reaching the goals

The US Forest Service uses these steps when working with smaller groups than a whole city (US Forest Service, 2003). For an urban tree program, they would suggest that after understanding a local population in an area, select one small group, frequently an ethnic group, that based on what they know might be interested and willing to make an impact in urban forests (US Forest Service, 2003). The rest of the steps are focused on that small group (US Forest Service, 2003). Once a group is identified then the challenge is similar to that of the city as a whole, reaching the individuals. The US Forest Service recommends placing announcements of any events in local newspapers, making and distributing brochures or flyers to the group or groups, placing posters or flyers in common areas for the group to

see, putting announcements on the radio, using email or other internet tools to reach the group, and attending local meetings or gatherings of the local groups and try to advocate the event (US Forest Service, 2003). The US Forest Service deployed their outreach plan in Annapolis, Maryland and considers the results a success story, in which good relationships were developed with Hispanic scout groups and church youth groups which then planted and maintained 80 trees in the city (US Forest Service, 2003).

The US Forest Service makes the outreach programs sound simple and the programs they describe are appropriate to small organizations that want to increase the planting of trees. However, most trees being planted will be on private property. Therefore, the question of how to raise awareness is more specific -- how to do you raise enough awareness for individual citizens to plant on their own property.

Atlanta, Georgia has come up with one answer to that question. Many who watch football games have seen the nationally broadcast commercial that promotes charity work by the National Football League and their players; during one of the commercials an Atlanta Falcon player plants a tree. This alone may raise some awareness, in that a sports idol for the city of Atlanta is planting a tree in a local neighborhood. However, appearing in a commercial is not all the Falcons do with trees. Urban tree planting has been a major initiative in Atlanta since 1985, and the Atlanta Falcons work with the urban tree planting program and its goal of increasing the tree canopy (NFL charities, 2010). For the 2010-2011 seasons the Atlanta Falcons have teamed up with Trees Atlanta to create a ticket package called “Trees and Tickets”; this program allows fans purchasing certain season ticket packages, of which they sell about 100 per year, to save thirty percent on ticket prices as well as promote tree planting through their purchase (NFL charities, 2010). For each ticket purchased, the Falcons will give $10 to Trees Atlanta, and the fans are allowed to pick the type of tree they wish to be planted (NFL charities, 2010). Arthur M. Blank, Atlanta Falcons Owner and CEO, had the following to say about the program, “This promotion allows us to benefit one of our long time non-profit partners, and to get our fans involved in supporting them at the same time; We’re proud to partner with Trees Atlanta in this unique promotion’” (NFL charities, 2010).

The NFL is also working in Arlington, Texas, the home of this year’s Super Bowl, to promote urban tree programs. For the past three years, the Super Bowl host committee has created a “Trail of Trees,” going to each city that hosts the Super Bowl (Cotten, 2010). In Texas they are working with the Texas Trees Foundation (Cotten, 2010). In the past three years, the Environmental Program of the NFL has planted over 20,000 trees in the host cities of the Super Bowl (Cotten, 2010).

Both the Atlanta Falcons and the NFL are strong supporters of planting urban trees. There is no reason to think that if asked, our Baltimore Ravens wouldn't be pleased to do the same. The Ravens are Baltimore's premier sports team with a large fan base, especially within the City. Although the Baltimore Ravens have supported TreeBaltimore, which they call a "Great Organization," and have worked with Tree Baltimore alongside the Parks and People Foundation to plant trees on the Gwynns Falls Trail for Earth Day 2010, and once again in October 2010 in a service project with CSX Transportation and City, they might be able to be engaged in another way. The Ravens could be involved in increasing outreach and can be a strong force in reaching the general public to plant on their private property (LeGrande, personal communication, 2010). A program similar to that in Atlanta would not only bring in funds for a program but also raise awareness about the importance of trees for the City's citizens. Football is just one idea, but the focus doesn't have to be on football. Other famous athletes, politicians, and other idols in the Baltimore area could be asked for assistance in promoting trees in Baltimore.

Non-government agencies can play a key role in outreach in the city as well as an important role in the creation of the umbrella program. NGOs occupy a special place in communities and have the freedom to address specific local needs. One interesting program is the Rhode Island Tree Council that was created in 1991. The Rhode Island Tree Council can be used as a model for a Baltimore City NGO, either in terms of the umbrella program or working as a volunteer-based separate program.

The Rhode Island Tree Council, a non-profit, uses funds and gifts as they become available for tree plantings (Rhode Island Tree Council, 2010). The Rhode Island Tree Council involves members, professional consultants and volunteers who work to increase the public's awareness of the benefits and value of trees (Rhode Island Tree Council, 2010). They consider themselves a networking group working to bring others with similar interests together (Rhode Island Tree Council, 2010). The Rhode Island Tree Council apply for a received federal funding [through the American Recovery and Reinvestment Act] for a new *Forest Sustainability Project* [FSP] (Rhode Island Tree Council, 2010). Among other activities the FSP has a green jobs development focus (Current, 2010). The FSP created Rhode Island's *Green Team*, individuals with either a college degree or appropriate experience; the *Green Team* implements green activities including coordinating efforts with consultants in crafting forest management and tree care plans that increase tree plantings and mobilize volunteers and workers (Rhode Island Tree Council, 2010).

The pride that accompanies actively participating in a non-governmental organization [NGO] community has been shown to make a difference for tree planting efforts (Martinez and McMullen, 2004). Volunteers working with NGOs can reduce the amount of operation funding a governmental

program needs by providing free tree planting services. Studies conducted on volunteer activists have shown that they remain active in their efforts to change conditions as long as they believe their activism creates changes in the political system (Martinez and McMullen, 2004). Professionally skilled, environmentally minded volunteers who are active in NGO's often run entire environmental programs and have historically won the establishment of declared national forests and created park trails that attract support for forest preservation (Martinez and McMullen, 2004). Participants in environmental NGO's stay energized due to the personal prestige and experience gained through public and political activism (Martinez and McMullen, 2004). The ability to increase NGO volunteerism depends on having properly trained staff, funding for staff, and time to train and recruit member volunteers (Martinez and McMullen, 2004). Citizens active in NGO programs have been a force for change (Martinez and McMullen, 2004); Baltimore City has environmental NGOs that can be engaged to involve the Baltimore public to assist in increasing the City's tree canopy.

Outreach to the public is critically important and TreeBaltimore should continue its bus advertising campaigns and possibly expand to the other advertisements the US Forest Service mentioned, such as newspaper advertisements and radio advertisements. In order to interest people in planting trees on their property, they need to become aware of the importance of trees in the ecology, economics, and social fabric of the City as discussed in earlier chapters. Additionally the goals for increasing the tree canopy would benefit from policy changes-- not just to protect trees already in place, but also to promote plantings on private property, through incentives, a form of outreach that reaches many people. The same message about the importance of urban trees that should be shared with citizens should be shared with children. Starting these outreach programs with children in schools, giving to them the love of trees and the knowledge of the importance of every single tree in the City is of critical importance to future generations.

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Appendix A-1. The survey instrument we used to collect data from Baltimore City residents is presented below.

Neighborhood Survey Form Data Collection Team_____
Date: _____ Location:_____

Might you have a few minutes you can spare to share your opinions with us?
[if yes, read letter and give participant copy of the consent letter]

1. What is the name of the neighborhood you live in?_____
2. What is its Zip Code? _____
3. Do you rent or own your home? [circle one]
4. What street is it on? _____ What block of the street? ____ [house number of 334 would be the 300 block, 1407 would be the 1400 block, etc.]
5. How long have you lived there? _____ Where did you live before that?_____

6. In general, do you like trees Y N

[if yes]

6a. Would you want to live in a neighborhood with a lot of trees? Y N
How would having trees make your street or neighborhood nicer?

6b. What sort of trees would you prefer to have on your street/neighborhood?
a) large street trees b) smaller flowering trees c) a mixture of the two

6c. Might you be willing to [see below] to help create such a neighborhood?
a) water a newly planted tree if it doesn't rain Y N
b) try to keep others from harming the tree Y N
c) plant a tree on your property Y N

[if no]

6d. What is it about trees that you don't like?

7. Have you heard that that trees can
7a) save you money on your electrical and heating bill? Y N
7b) increase the value of your house ? Y N
7c) reduce pollution and reduce incidence of asthma attacks? Y N
7d) keep you cooler in summer by shading your house? Y N

8. Have you heard about Tree-Baltimore? Y N Where?

Thank you very much for your time!

Appendix A-2: The informational letter we read to survey participants prior to asking them any questions. The actual letter used was printed on University letterhead.

September 2010

Dear Participant:

My name is _____ and my partner's name is _____. We are currently taking a college course at Towson University, and as part of that course, we are gathering information from residents in Baltimore City by asking that they complete a very brief opinion poll about trees.

Your answers, if you are willing to help us, will be totally anonymous and totally voluntary. You can stop answering at any time.

If you have any questions about the project you can contact my professor, Dr. Jane Wolfson, at 410-704-4920 or the Chairperson of Towson University's Institutional Review Board for the Protection of Human Participants, Dr. Gartland at 410-704-2236.

Thank you for your time.

Appendix A-3: The raw data from survey used to explore the attitudes of Baltimore City residents about trees is presented below. The data has been divided into two pages. The first page of data for each respondent includes demographics, whether the resident liked trees or not, and their own thoughts of why they like trees. The second page includes any responses as to why the resident doesn't like trees, what types of trees they would like, their own personal education about trees, and whether or not they have heard of TreeBaltimore. The reasons residents' gave for liking/disliking trees were sorted into categories located on tops of charts. See Chapter IV for details.

Survey #	Date	Time	Location	Neighborhood	Zip Code	Rent	Own	Block	Street	Years	In State	Out State	Like trees	Don't Like	Live in neighborhood w/ tress	Aestetic	Health	Environment	Physical Comfort	Emotional Comfort	Money
1	9/9/2010	2:00	Belair Edison	Lauraville	21214	x		2900	Westfield	2			x		x				x	x	
2	9/9/2010	2:00	Belair Edison	Hamilton	21214		x	3200	Parkside	12			x		x						
3	9/9/2010	2:00	Belair Edison	Montebello	21218	x		1800	Chilton	8			x		x	x					
4	9/9/2010	2:00	Belair Edison	Mayfield	21213		x	2200	Mayfield	12			x		x	x	x				
5	9/9/2010	2:00	Belair Edison	Beverly Hills	21214		x	3100	Weaver	15			x		x	x			x		
6	9/9/2010	2:00	Belair Edison	Hamilton	21214		x	3700	Rucker	2.5			x		x	x			x		
7	9/9/2010	2:00	Belair Edison	Morgan Park	21214		x	2400	Overlane	50			x		x	x		x			
8	9/9/2010	2:00	Belair Edison	Morgan Park	21214		x	2300	Montebelo	18			x		x				x		
9	9/9/2010	2:00	Belair Edison	Cecil	21218		x	1800	Cecil Ave.	3			x		x	x					
10	9/9/2010	2:00	Belair Edison	Mayfield	21213		x	2400	Mayfield Ave.	4			x		x				x		
11	9/9/2010	2:00	Belair Edison	Beverly Hills	21214		x	3100	Beverly	16		Mississippi	x		x	x				x	
12	9/10/2010	12:00	Hamden	Medfield	21211	x		4200	Elsa Terr.	16	Carrol County		x			x					
13	9/10/2010	12:00	Hamden	Goven	21212		x		Rednor	7	Bolten Hill		x		x				x		
14	9/10/2010	12:00	Hamden	Waverly	21218		x	600	38th St.	10	Randelstown		x		x				x		
15	9/10/2010	12:00	Hamden	Hamden	21211		x	1400	37th St.	43	Baltimore		x		x/o	x					
16	9/10/2010	12:00	Hamden	Cross Keys	21210		x		Hamlet Hill	20	Bethasda		x		x	x					
17	9/10/2010	12:00	Hamden	Bolton Hill	21217		x	300	N. Lanvale	9		Philadelphi	x		x	x		x	x		
18	9/10/2010	12:00	Hamden	Mt. Washington	21209		x		Greenberry	10			x		x	x			x		
19	9/10/2010	12:00	Hamden	Cedona	21206	x		500	Denview	4	Baltimore		x		x				x		
20	9/10/2010	12:00	Hamden	Medfield	21211	x		1400	Welden Place	30			x		x				x		x
21	9/10/2010	12:00	Hamden	Cross Keys	21210		x		Palmer Green	10		Texas	x		x	x					
22	9/10/2010	12:00	Hamden	Waverly	21218		x	900	Grorsuch Ave.	3	Charles Village		x		x	x			x		
23	9/10/2010	12:00	Hamden	Lake Walker	21212		x	500	Walker Ave	6		New York	x		x		x		x		
24	9/10/2010	12:00	Hamden	Arlington	21215		x	5000	Gist	30			x		x				x		
25	9/10/2010	12:00	Hamden	Hamden	21211	x			Keswick	0	Fells Point		x		x	x	x				
26	9/10/2010	12:00	Hamden	Woodberry	21211		x		Keystone	25	Bolten Hill		x		x	x			x		
27	9/10/2010	12:00	Hamden	Highland Town	21224		x	300	Fayette St.	25	Pulaski Highway		x		x	x	x				
28	9/13/2010	1:00	Waverly	Waverly	21218		x	1100	Gorsuch	15			x		x		x		x		
29	9/13/2010	1:00	Waverly	Waverly	21218	x		800	Homestead	1	Mt. Vernon		x		x						
30	9/13/2010	1:00	Waverly	Waverly	21218								x		o						
31	9/13/2010	1:00	Waverly	Park Heights	21215		x		Resisterstown	25			x		x		x		x		
32	9/13/2010	1:00	Waverly	Mclean	21218		x	1700	Lakeside	1				x	x						
33	9/13/2010	1:00	Waverly	Waverly	21218		x	3500	Old York	40		New York	x		x						
34	9/13/2010	1:00	Waverly	Waverly	21218		x	800	35th St.	38			x		x		x				
35	9/13/2010	1:00	Waverly	Belair Edison	21213		x	3500	Woodstock	8			x		x		x				
36	9/13/2010	1:00	Waverly	Waverly	21218		x	1600	Homestead	20			x		x						
37	9/13/2010	1:00	Waverly	Waverly	21218			800	Grashen	3	Waverly		x		x	x			x		
38	9/13/2010	1:00	Waverly	Pimlico	21215	x		5400	John Quil Ave.	1	Padonia		x		x			x	x		
39	9/13/2010	1:00	Waverly	Waverly	21218	x		3700	Kimble	13			x		x				x		
40	9/13/2010	1:00	Waverly	Waverly	21218		x						x		x						
41	9/13/2010	1:00	Waverly	Mt. Royal	21217		x	2000	Mt. Royal Terr.	25			x		x				x		
42	9/13/2010	1:00	Waverly	Greenmount	21218	x		4800	Greenmount	1	Harford		x		x						
43	9/13/2010	1:00	Waverly	Ednor Gardens	21218		x						x		x						
44	9/13/2010	1:00	Waverly	Edison	21213	x		3500	Dudley	5	Canton		x		x		x		x		
45	9/13/2010	1:00	Waverly	North Wood	21218		x	1600	Shady Side	35			x		x				x		
46	9/13/2010	1:00	Waverly		21202	x		1200	Preston	2	Germantown		x		x	x			x		
47	9/13/2010	1:00	Waverly		21218	x		1800	Cantor Ave.	1	Willington Gates		x		x			x	x		
48	9/13/2010	1:00	Waverly	Edner Gardens	21218									x							
49	9/12/2010	3:00	Highlandtown	Highlandtown	21224		x	240	Eaton	12	Mt. Pleasant		x		x	x					
50	9/12/2010	3:00	Highlandtown	Bel Air	21213		x	3600	Kenyon	5				x							
51	9/12/2010	3:00	Highlandtown	Highlandtown	21224	x		400	Burly	0	Johns Hopkins		x		x				x		
52	9/12/2010	3:00	Highlandtown	Highlandtown	21224	x		500	Linwood	3			x								
53	9/12/2010	3:00	Highlandtown	E. Balt		x		500	Grundy	6	Dundalk		x		x				x		
54	9/12/2010	3:00	Highlandtown	Cedonia		x		5900	Radicky				x		x	x					
55	9/12/2010	3:00	Highlandtown	Highlandtown	21224	x		3400	Baltimore	4	Franklin		x		x	x	x	x			
56	9/12/2010	3:00	Highlandtown	Patterson Park	21224		x	200	Elwood	25			x		x				x		
57	9/12/2010	3:00	Highlandtown	Elwood Park		x		500	Curly	1	Lakewood Ave		x		x	x					
58	9/12/2010	3:00	Highlandtown	Butcher's Hill	21231		x		Chester	20		Georgia	x		x	x			x		
59	9/12/2010	3:00	Highlandtown	Rosedale	21237		x	900	Rosedale	10	Hudson st		x		x	x			x		
60	9/12/2010	3:00	Highlandtown	Highlandtown	21224	x		200	Highland	7		West VA	x		x	x		x	x		
61	9/12/2010	3:00	Highlandtown	N. Baltimore			x	1000	Elwood	20	E. Baltimore		x		x	x		x	x		
62	9/12/2010	3:00	Highlandtown	Highlandtown	21205		x	500	Linwood	29	E. Baltimore		x		x	x					
63	9/12/2010	3:00	Highlandtown				x	1100	Bonaparte	5	Curly		x		o						
64	9/14/2010	2:00	36th Street	Hamden	21211	x			36th	0	Parkville		x		x	x					
65	9/14/2010	2:00	36th Street	Hamden	21211	x		3900	Falls	0	E. Saratoga		x		x	x			x	x	
66	9/14/2010	2:00	36th Street	Bolton Hill		x		1500	Park	2			x		x	x			x	x	
67	9/14/2010	2:00	36th Street	Hamden	21218	x		500	Falls	4	Notre Dame		x		x		x	x			
68	9/14/2010	2:00	36th Street	Mt. Veron	21202		x	1000	St. Paul	26			x		x			x		x	
69	9/14/2010	2:00	36th Street	Hamden	21211	x		3100	Keswick	1				x							
70	9/14/2010	2:00	36th Street	Canton	21231	x		600	Patterson Park	0		California	x		x	x		x	x		
71	9/12/2010	2:00	Waverly	Stadium Place	21218	x			33rd	2	Bel Air										
72	9/12/2010	2:00	Waverly	Old York	21212	x			4704	5	Bonaparte		x		x			x			
73	9/12/2010	2:00	Waverly	Waverly	21218		x	7400		10			x		x						
74	9/12/2010	2:00	Waverly	Northface	21218		x		Tibloy	25			x		o	x			x		
75	9/12/2010	2:00	Waverly	Waverly	21218	x		3600	Old York	0			x		x						
76	9/12/2010	2:00	Waverly	Canton	21224	x		200	S. Clinton	17	Fells Point		x		x	x		x	x		
77	9/12/2010	2:00	Waverly	Charles Village	21218	x		3500	St. Paul	0	Waverly		x		x	x					
78	9/12/2010	2:00	Waverly	Penlucy	21218		x	700	Cator	21			x		x	x		x			
79	9/12/2010	2:00	Waverly	Waverly	21218		x	400	Illchester	42			x		x	x			x		
80	9/12/2010	2:00	Waverly	Northwood	21216		x		Alameda	40			x		x						
81	9/12/2010	2:00	Waverly	Parkview Trails	21244		x	7900	Cantwell	8	Catonsville		x		x	x		x	x		
82	9/12/2010	2:00	Waverly	Ednor Gardens	21218	x		3800	Ednor	17	Owings Mills		x		x	x		x			
83	9/12/2010	2:00	Waverly	Waverly	21218	x		3700	Ellepstic	15	Dundalk		x		x						
84	9/12/2010	2:00	Waverly	Ednor Gardens	21218	x		3600	Rexmere	1	Pikesville		x		x						
85	9/12/2010	2:00	Waverly	Waverly	21218		x	1600	33rd	10			x		x						
86	9/12/2010	2:00	Waverly	Oakenshaw	21218	x		3400	Guilford Terrace	0	Roland		x		x	x				x	
87	9/12/2010	2:00	Waverly	Bel Air/Edison	21213		x	3500	Powclawn	1			x		x	x	x				
88	9/15/2010	4:00	Hamden		21045	x		5000	Morningbird	3	Charles Village		x		x				x		
89	9/15/2010	4:00	Hamden	Gilford	21218		x	3600	Greenway	19	Charles Towers		x		x	x	x	x	x		
90	9/15/2010	4:00	Hamden	Mt. Washington	21209			2400	Kenoak	39	Virgina		x		x	x			x		

Survey #	Other	Harm to cars	Costs	Messy	Harm to pipes	Large	Small	Mix	Water	Protect	Plant	Save money	Increase value	Reduce pollution	Keep cooler	Yes	No	Where?
1						x			x	x	x	x	x	x	x	x		
2						x			x	x	x	x	x	x	x		x	
3								x	x	x	x	x	o	x	x		x	
4								x	x	x	x	x	o	x	x	x		
5								x	x	o	x	o	o	o	x	x		
6								x	x	x	o	x	o	o	x		x	
7								x	x	x	x	x	x	x	x	x		
8							x		x	x	x	x	x	x	x		x	
9						x			x	x	x	o	o	x	x		x	
10								x	x	x	x	x	x	x	x	x		
11								x	x	x	x	x	o	x	x		x	
12						x			x	x	na	x	o	x	x		x	
13								x	x	x	x	x	x	x	x		x	
14						x			x	x	x	x	x	x	x	x		event
15				x		x			x	x	na	x	o	o	x		x	
16								x	o	x	na	o	x	o	x		x	
17								x	x	x	na	x	o	x	x	x		
18								x	x	x	na	x	x	x	x		x	
19					x		x		x	x	na	o	o	o	x		x	
20	Forced to tear down							x	x	x	na	x	x	x	x		x	
21								x	x	x	na	o	x	x	x		x	
22				x		x			x	x	x	x	o	x	x	x		YMCA
23								x	x	x	x	x	x	x	x		x	
24								x	x	x	x	o	x	x	x		x	
25								x	x	x	x	x	x	x	x		x	
26								x	x	x	x	x	x	x	x		x	
27							x		x	x	x	o	o	x	x		x	
28								x	x	x	x	x	x	x	x		x	
29								x	x	o	x	x	x	x	x	x		
30	to many						x		x	x	x	o	o	x	x	x		
31						x			x	x	x	x	o	x	x		x	
32					x	x			x	x	o	x	x	x	x	x		
33								x	x	x	x	x	x	x	x	x		
34						x			x	x	x	o	o	x	x		x	
35								x	x	x	x	o	o	x	x		x	
36								x	x	x	x	o	x	x	x		x	
37								x	x	x	x	o	x	x	x	x		
38							x		x	x	x	x	o	x	x	x		
39				x			x		x	x	x	x	x	x			x	
40								x	x	x	x	o	o	x			x	
41								x	x	x	x	o	o	x	x		x	
42						x			x	x	x	x	x	x	x		x	
43								x	x	x	x						x	
44						x			x	x	x	x	x	x	x		x	
45								x	x	x	x	o	o	o	x		x	
46								x	x	x	x	o	x	x	x		x	
47								x	x	x	x	o	x	x	x	x		
48			x	x												x		
49				x	x			x	x	x	o	x	o	x	x		x	
50				x								o	o	o	x		x	
51		x						x	x	x	x	o	x	o	x		x	
52	x, dog poop, stump hole			x								o	o	o	x		x	
53				x				x	x	x	x	x	x	x	x	x		857 Club
54								x	o	x	o	o	o	o	x		x	
55	x, roots break foundation								x	x	na	x	x	x	x	x		neighbor
56							x		x	x	x	x	x	x	x		x	
57				x				x	x	x	x	o	x	x	x		x	
58				x				x	x	x	x	o	x	o	x		x	
59									x	x	x	x	o	x	x			
60						x			x	x	x	x	x	x	x		x	
61				x	x			x	x	x	x	o	x	x	x		x	
62	x, not in front of door			x				x	x	x	x	x	x	x	x	x		Community paper
63				x					x	x	x	o	o	o	x		x	
64								x	x	x	x	o	o	o	x		x	
65								x	x	x	x	x	o	x	x		x	
66								x	x	o	x	x	x	x	x		x	
67								x	x	x	x	x	o	x	x		x	
68								x	x	x	o	o	x	x	x		x	
69												o	o	x	x		x	
70						x					x	x	o	x	x		x	
71				x			x		o	o		x	o	x	x		x	
72								x	x	x	x	x	x	x	x		x	
73												o	x	x	x		x	
74				x				x	x	x	x	x	x	x	x	x		
75				x		x			x	x	x	x	x	x	x		x	
76	x, fungus, disease			x				x	x	x	x	x	o	x	x	x		
77								x	x	x		x	x	x	x			
78				x				x	x	x	x	x	x	o	x		x	
79								x	x	x	x	x	x	x	x		x	
80	x, bugs							x	x	x	x	x	x	x	x		x	
81						x			x	x	x	x	o	x	x		x	
82								x	x	x	x	o	x	x	x		x	
83							x	x	x	x	x	x	x	x	x		x	
84								x	x	x	x	o		x	x		x	
85				x				x	x	x	o	x	x	x	x		x	
86						x			x		x	o	x	x	x		x	
87								x	x	x	x	x	x	x	x		x	
88						x			x	x	x	x	x	x	x		x	
89								x	x	x	na	o	x	x	x	x		Summer in the sun
90						x			x	x	x	x	x	x	x		x	

Survey #	Date	Time	Location	Neighborhood	Zip Code	Rent	Own	Block	Street	Years	In State	Out State	Like trees	Don't Like	Live in neighborhood w/ tress	Aestetic	Health	Environment	Physical Comfort	Emotional Comfort	Money
91	9/15/2010	4:00	Hamden	Mt. Washington	21209		x	2000	Rogers	35	California		x		x	x					
92	9/15/2010	4:00	Hamden	Hamden	21211		x	3700	Chesnut	11	Homewood		x		x	x	x	x	x		
93	9/15/2010	4:00	Hamden	Roland Park	21210	x		4600	Willomsow	37			x		x				x	x	
94	9/15/2010	4:00	Hamden	Hamden	21201		x	1400	Newport	1	Butchers Hill		x		x				x		
95	9/15/2010	4:00	Hamden	Mt. Washington	21215		x	500	Merville	20			x		x	x			x		
96	9/15/2010	4:00	Hamden	Hamden	21211	x		2900	Keswick	3	Bethesda		x		x	x				x	
97	9/15/2010	4:00	Hamden	Hamden	21211		x	4100	Falls	40	Gorsuch		x		x			x			
98	9/15/2010	4:00	Hamden	Roland Park	21210		x	600	Stoneyspring	21	California		x		x			x	x		
99	9/15/2010	4:00	Hamden	Medfield	21211		x	4400	Newport	20	Erdman		x		x				x		
100	9/15/2010	4:00	Hamden	Pigtown	21230	x		100	W. Hamburg	1	33rd		x		x	x	x	x			
101	9/15/2010	4:00	Hamden	Medfield	21211		x	4400	Graceview	5	Woolserry		x		x	x			x		
102	9/15/2010	4:00	Hamden	Hamden	21211		x	800	Powers	0			x		x	x				x	
103	9/16/2010	12:00	Canton	Canton	21224	x		2300	Essex	0	Bel Air		x		x				x	x	x
104	9/16/2010	12:00	Canton	Fells Point	21231	x		1800	Pratt	1	Baltimore		x		x			x	x	x	
105	9/16/2010	12:00	Canton	Fells Point	21231	x		1800	Pratt	1			x		x				x		
106	9/16/2010	12:00	Canton	Fells Point	21231	x		1800	Pratt	1		Richmond	x		x						
107	9/16/2010	12:00	Canton	Fells Point	21231	x		1800	Pratt	0		New Jersey	x		x			x			
108	9/16/2010	12:00	Canton	Canton	21224	x		2900	Hudson	1	Fells Point		x		x	x					
109	9/16/2010	12:00	Canton	Fells Point	21231	x		2000	Portugal	1	Towson		x		x	x			x		
110	9/16/2010	12:00	Canton	Fells Point	21231	x		900	Washington	1	Towson		x		x	x				x	
111	9/16/2010	12:00	Canton	Canton	21224	x		2900	Hudson	1	Towson		x		x	x	x		x	x	
112	9/16/2010	12:00	Canton	Canton	21224	x		2900	Hudson	1	Fells Point		x		x		x				
113	9/16/2010	12:00	Canton	Canton	21224	x		2900	Hudson	1	Towson		x		x						
114	9/16/2010	12:00	Canton	Mt. Washington	21209		x	6000	Woodcrest Ave.	4	Owings Mills		x		x						
115	9/16/2010	12:00	Canton	Fells Point	21231	x		2000	Portugal	1	Pikesville		x		x	x			x		
116	9/16/2010	12:00	Canton	Federal Hill		x		1200	William			New Jersey	x		x				x		
117	9/16/2010	12:00	Canton	Bay Ridge	21403	x		900	Washington	1		Fairfax,VA		x							
118	9/16/2010	12:00	Canton	Canton	21224	x		2900	Hudson	1	Parkville		x		x	x			x		
119	9/12/2010	12:00	Waverly	Ednor Gardens	21218		x	2900		0			x		x						
120	9/12/2010	12:00	Waverly	Ednor Gardens	21218		x	3700	Montery	20			x		x	x			x		
121	9/12/2010	12:00	Waverly	Greenmount	21218	x		600	29th	2			x		x		x				
122	9/12/2010	12:00	Waverly	Loch hern	21218	x		700	Exeterhall	2	Rosedale		x		x						
123	9/12/2010	12:00	Waverly	Collington Squar	21213	x		2200	Biddle	2			x		x	x					
124	9/12/2010	12:00	Waverly	Waverly	21218		x	600	36th	15			x		x						
125	9/12/2010	12:00	Waverly	Hampden	21211		x	900	33rd	18	Hampden		x		x	x					
126	9/12/2010	12:00	Waverly	Charles Village	21210		x	2700	Guilford Terrace	5	Charles Village		x		x	x	x	x	x	x	
127	9/12/2010	12:00	Waverly	Waverly	21218		x		Hall Ave.	2			x		x		x	x			
128	9/12/2010	12:00	Waverly	Eden Gardens	21218		x	1200	Lakeside	4	Baltimore		x		x		x				
129	9/12/2010	12:00	Waverly	Abell	21218		x	3000	Abell	35		England	x		x						
130	9/12/2010	12:00	Waverly	Charles Village	21218	x		300	Whiteridge	4			x		x	x	x				
131	9/12/2010	12:00	Waverly	Waverly	21218		x	3300	Alameda	40	Dundalk		x		x	x					
132	9/12/2010	12:00	Waverly	Waverly	21218		x	900	Gorsuch	3	Baltimore		x		x	x			x		
133	9/12/2010	12:00	Waverly	Waverly	21218		x			7			x		x						
134	9/12/2010	12:00	Waverly	Waverly	21218		x	31	Ellelise	8			x		x	x					
135	9/12/2010	12:00	Waverly	Resivoir Hill	21217		x	2100	Brookfield	2			x								
136	9/12/2010	12:00	Waverly	Waverly	21218	x		3000	Matthews	5	Pikesville		x		x			x	x		
137	9/12/2010	12:00	Waverly	Charles Village	21218		x	2800	28th	12			x		x	x					
138	9/12/2010	12:00	Waverly	Rolland Park	21210		x			1			x		x	x		x	x		
139	9/12/2010	12:00	Waverly	Waverly	21218		x	800	Dumbarton				x		x	x	x		x		
140	9/12/2010	12:00	Waverly	Charles Village	21218		x	1600	32nd	19	Greenmount		x		o	x		x			
141	9/12/2010	12:00	Waverly		21206	x		5700	Cedonia Ave.	5			x		x			x			
142	9/12/2010	12:00	Waverly		21218		x	1600	29th	3	Chesterfield		x		x						
143	9/12/2010	12:00	Waverly	Waverly	21218		x	600	Parkworth	20		Pittsburg	x		x						x
144	9/12/2010	12:00	Waverly	Waverly	21218	x		900	Montpelier	10			x		x	x					x
145	9/12/2010	12:00	Waverly	Homewood	21218	x		3100	Guilford	1			x		x				x		x
146	9/12/2010	12:00	Waverly	Wallbrook Jct	21216		x	2200	Rosedale	30			x		x						
147	9/12/2010	12:00	Waverly	Towson	21286	x		200	Susquehanna	40			x		x	x	x		x		
148	9/12/2010	12:00	Waverly	E. Baltimore	21218	x			Bartly	3			x		x						
149	9/12/2010	12:00	Waverly	Waverly	21218	x		300	Matthews	1			x		x		x				
150	9/17/2010	1:00	Belair Edison	Laraville	21206	x		2000	Southern	0			x		x	x		x	x		
151	9/17/2010	1:00	Belair Edison	Hamilton	21214		x	2700	Gibbons	5			x		x	x			x		
152	9/17/2010	1:00	Belair Edison	Laraville	21214		x	2700	Stratmore	17			x		x	x					
153	9/17/2010	1:00	Belair Edison	Beverly Hills	21214		x	3200	Moravia	22	PG County		x		x	x					
154	9/17/2010	1:00	Belair Edison	Hamilton	21214		x	5500	Selton	13	Charles Village		x		x						
155	9/17/2010	1:00	Belair Edison	Hamilton	21214		x	2900	Cold Spring	10				x							
156	9/17/2010	1:00	Belair Edison	Laraville	21214			3000	Overland	0	Balt Co.		x		x	x		x		x	
157	9/17/2010	1:00	Belair Edison	Hamilton	21214		x			20			x		x	x			x		
158	9/17/2010	1:00	Belair Edison	Hamilton	21214		x	6000	Selton	9	Marriotsville		x		x	x					
159	9/17/2010	1:00	Belair Edison	Cedonia	21206	x		9800	Hamilton	5	Westside		x		x	x					
160	9/17/2010	1:00	Belair Edison	Belair Edison	21203	x		2800	Chesterfield	10		St. Thomas	x		x	x			x		
161	9/17/2010	1:00	Belair Edison	Hamilton	21239		x	3500	Rosecamp	7			x		x	x			x	x	
162	9/17/2010	2:00	Hamden	Medfield	21211		x	1300	42nd	30	Hamilton		x		x	x	x				
163	9/17/2010	2:00	Hamden	Bolton Hill	21201	x		1000	Park	38			x		x	x		x	x		
164	9/17/2010	2:00	Hamden	Hamden	21211	x		3600	Keswick	0		Pennsylvan	x		x	x					
165	9/17/2010	2:00	Hamden	Bolton Hill	21217		x	1700	Linden	38			x		x			x			
166	9/17/2010	2:00	Hamden	Roland Park	21210		x	200	Hawthorne	8			x		x	x			x		
167	9/17/2010	2:00	Hamden	Parkville	21234		x			4	Herford		x		x	x			x		
168	9/17/2010	2:00	Hamden	Roland Park	21210	x		1500	Hamil	5			x		x	x			x		
169	9/17/2010	2:00	Hamden	Charles Village	21218		x		E. 26th	22			x		x					x	
170	9/17/2010	2:00	Hamden	Roland Park	21210		x	600	Stoneyspring	4			x		x						
171	9/17/2010	2:00	Hamden	Hamden	21211	x		1000	Falls	1	Woodberry		x		x						
172	9/17/2010	2:00	Hamden	Owings Mills	21117		x		Foxmore	18	Mt. Washington		x		x	x	x				
173	9/17/2010	2:00	Hamden	Medfield	21211		x		Weldon	11			x		x						
174	9/17/2010	2:00	Hamden	Charles Village	21218	x			Guilford	0	Fells Point		x		x		x		x		
175	9/17/2010	2:00	Hamden	Roland Park	21210		x	5000	Roland	5	Elkridge		x		x			x	x		
176	9/17/2010	2:00	Hamden	Hamden	21216		x	2700	Queen Anee	50			x		x	x		x	x		
177	9/17/2010	2:00	Hamden	Forrest Park	21207		x	4500	Springdale	20			x		x		x				
178	9/17/2010	2:00	Hamden	Stevenson	21208		x		Woodvalley	7			x		x	x					
179	9/17/2010	2:00	Hamden	Waverly	21218		x	3100	Ellerslie	2	Reisterstown		x		x				x		
180	9/23/2010	3:00	Canton	Ednor Gardens	21218		x	3700	Elkader	5			x		x				x		

Survey #	Other	Harm to cars	Costs	Messy	Harm to pipes	Large	Small	Mix	Water	Protect	Plant	Save money	Increase value	Reduce pollution	Keep cooler	Yes	No	Where?
91								x	x	x	x	x	x	x	x		x	
92								x	x	x	x	x	x	x	x	x		Hamden neighborhood council
93								x	x	x	x	x	x	x	x		x	
94								x	x	x	x	x	o	x	x		x	
95								x	x	x	x	x	x	x	x		x	
96								x	x	x	x	x	x	x	x		x	
97						x			x	x	x	x	x	x	x	x		
98						x			x	x	x	x	x	x	x	x		
99							x		x	x	na	o	o	o	x		x	
100								x	x	x	x	x	x	x	x	x		Aquarium promotes it
101								x	x	x	x	x	x	x	x		x	
102						x			o	o	o	x	x	o	x		x	
103								x	x	x	x	x	x	x	x		x	
104							x		x	x	x	x	x	x	x	x		city paper
105						x			o	x	x	o	o	x	x		x	
106								x	x	x	x	o	o	o	o	x		from a friend
107								x	o	o	o	o	x	o	x		x	
108				x			x		x	x	o	o	x	o	x		x	
109								x	x	o	x	x	o	x	x		x	
110								x	x	x	x	x	x	o	x		x	
111								x	x	x	x	x	x	x	x		x	
112								x	x	x	x	x	x	x	x	x		
113				x			x		x	x	x	x	x	x	x		x	
114							x		x	x	x	o	x	o	x		x	
115						x			x	x	x	o	x	x	x		x	
116							x		x	x	x	x	o	o	x		x	
117		x				x			o	x	x	o	x	x	x		x	
118								x	x	x	x	x	x	x	x		x	
119						x			o	x	x	x	x	x	x		x	
120								x	x	x	o	x	x	o	x	x		signs
121								x	x	x	x	x	x	x	x		x	
122								x	x	x	x	x	o	x	x	x		
123								x	x	x	x	x	x	x	x	x		
124			x					x	x	x	x	o	o	x	x		x	
125								x	x	x	x							
126								x	x	x	x	x	x	x	x	x		
127								x	o	x	x							
128								x	x	x	x	x	x	x	x		x	
129								x	x	x	o	x	x	x	x	x		newspaper
130								x	x	x	x	o	x	x	x	x		
131								x	x	x	x	x	x	x	x		x	
132								x	x	x	x	x	x	x	x	x		news
133								x	x	x	x	x	x	x	x	x		
134								x	x	x	x							
135								x	x	x								
136								x	x	x		x	o	o	x		x	
137						x			x	x	x	x	x	x	x		x	
138				x				x	x		x							
139						x			x	x	o	x	o	x	x		x	
140				x		x			o	x	o	x	o	x	x	x		Community paper
141			x	x	x		x					x	x	x	x		x	
142								x	x	x	x	o	x	o	x		x	
143							x		x	x	x	x	x	x	x		x	
144				x				x	x	x	x	x	x	o	x		x	
145								x	x	x	x	x	x	x	x		x	
146							x		x	x	x	x	x	x	x		x	
147								x	x	x	x	x	x	x	x		x	
148						x			x	x	x						x	
149								x	x	x	x	o	x	o	x	x		
150								x	o	x	x	x	x	x	x		x	
151								x	x	x	x	x	x	o	x		x	
152								x	x	x	x	x	x	x	x		x	
153								x	x	x	x	x	x	x	x		x	
154								x	x	x	x	x		x	x		x	
155	x, allergies			x								o	x	o	x		x	
156						x			x	x	x	o	o	o	x		x	
157								x	o	x	x	x	o	x	x		x	
158								x	x	x	x	x	x	x	x		x	
159								x	x	x	x	o	o	x	x		x	
160								x	x	x	x	x	x	x	x		x	
161								x	x	x	x	o	o	o	x		x	
162								x	x	x	x	x	x	x	x	x		
163								x	x	x	x	o	x	x	x		x	
164								x	x	x	x	o	o	o	x		x	
165						x			x	x	x	x	x	x	x		x	
166								x	x	x	x	x	x	x	x	x		Banner
167				x				x	x			x	x	o	x		x	
168								x	x	x	x	x	x	x	x	x		Signs
169				x		x			x	x	x	x		x	x		x	
170							x		o	x	x	x	x	x	x	x		Friend is volunteer
171								x	x	x	x	x	x	x	x	x		
172				x				x			x	x	x	o	x		x	
173							x		x	x	o				x		x	
174						x			x	x	x	x	x	x	x			
175						x			x	x	x	x	o	x	x		x	
176						x			x	x	na	x	x	x	x		x	
177				x			x		x	x	o	o	x	o	x		x	
178								x	x	x	x	x	x	x	x		x	
179								x	x	x	x	o	x	o	x		x	
180								x	x	x	x	x	o	x	x		x	

Survey #	Date	Time	Location	Neighborhood	Zip Code	Rent	Own	Block	Street	Years	In State	Out State	Like trees	Don't Like	Live in neighborhood w/ tress	Aestetic	Health	Environment	Physical Comfort	Emotional Comfort	Money
181	9/23/2010	3:00	Canton	Relay	21227	x		5100	Roland	2			x		x			x	x	x	
182	9/23/2010	3:00	Canton	Little Italy	21202	x							x		x				x		
183	9/23/2010	3:00	Canton	Canton	21224	x			Clinton	3			x		x	x					
184	9/23/2010	3:00	Canton	Canton	21224		x	3200	Foster	11			x		x	x					
185	9/23/2010	3:00	Canton	Highland	21224		x		Lakewood	54			x		x		x		x		x
186	9/23/2010	3:00	Canton	Canton	21224	x		2800	Boston	3			x		x						
187	9/26/2010	12:00	Belair Edison	Arcadia	21214		x	3200	Burkshire	20		DC	x		x				x	x	
188	9/26/2010	12:00	Belair Edison	Hamilton	21212		x	5800	Crossroad	12			x		x			x	x		
189	9/26/2010	12:00	Belair Edison	Arcadia	21214		x	3200	Tyndale	30			x		x	x			x		
190	9/26/2010	12:00	Belair Edison	Harris Point	21206		x	4000	Parkside	20			x		x	x			x	x	
191	9/26/2010	12:00	Belair Edison	Laraville	21214		x	3300	Rosehemp	15	Chales Village		x		x	x	x				
192	9/26/2010	12:00	Belair Edison	Ahmilton	21214		x	4300	Arabia	14			x		x				x		
193	9/26/2010	12:00	Belair Edison	Hamden	21204		x	500	Catulpa	10			x		o						
194	9/26/2010	12:00	Belair Edison	Hamden	21214	x		2900	Overland	1			x		x	x			x		
195	9/26/2010	12:00	Belair Edison	Laraville	21214		x	4600	Morello	3			x		x	x		x			x
196	9/26/2010	12:00	Belair Edison	Roland Park	21210	x		500	N.W. Parkway	2	Overly		x		x		x				
197	9/26/2010	12:00	Belair Edison		21206		x	3700	Chessmate	8	Owings Mills		x		x		x	x			
198	9/26/2010	12:00	Belair Edison	Hamilton	21214			3100	Hamilton	12	Bel Air		x		x		x			x	
199	9/26/2010	12:00	Belair Edison	Laraville	21214		x	4500	Hartford	2			x		x						
200	9/26/2010	12:00	Belair Edison	Berea	21213		x	1300	Kenhill	24	Freedon valley		x		x	x	x		x		
201	9/26/2010	12:00	Belair Edison	Mayfield	21213			2200	Lake	16	Highlandtown		x		x						
202	9/26/2010	12:00	Belair Edison	Laraville	21214	x		2100	Hermosa	1		Kentucky	x		x			x			
203	9/26/2010	12:00	Belair Edison	Hamilton Hills	21214		x	5000	Birchwood	23	Rogers Forge		x		x	x	x	x	x		
204	9/26/2010	12:00	Belair Edison	Moravia	21214		x	3000	Moravia	3		Louisianna	x		x	x	x		x		
205	9/26/2010	12:00	Belair Edison	Hamilton	21214		x	5000	Carter	5	Owings Mills		x		x				x		
206	9/26/2010	12:00	Belair Edison	Overlea	21206			6100	Alta	10			x		x						
207	9/26/2010	12:00	Belair Edison	Ednor Gardens	21218		x	400	37th St.	3	Canton		x		x				x		
208	9/26/2010	12:00	Belair Edison	Mayfield	21213		x	2200	Pelham	24			x		x	x					x
209	9/26/2010	12:00	Belair Edison	Northwood	21218		x	1000	Southview	20	Columbia		x		x	x			x		
210	9/26/2010	12:00	Belair Edison	Parkville	21234		x	2000	Bauerwood	6	Canton		x		x				x	x	
211	9/26/2010	12:00	Belair Edison	Towson	21204	x		900	Locusvale	1		N.Carolina	x		x	x				x	
212	9/26/2010	12:00	Belair Edison	New York	11232	x				7			x		x						
213	9/26/2010	12:00	Belair Edison																		
214	9/26/2010	12:00	Belair Edison	Hamilton	21214		x	3000	Frankford	20	Parkville		x		x						
215	9/26/2010	12:00	Belair Edison	Parkville	21234			2900	Hallsbow	8			x		x						
216	9/26/2010	12:00	Belair Edison	Hamilton	21215		x	2900	White	7	A.A County		x		x		x		x		

Survey #	Other	Harm to cars	Costs	Messy	Harm to pipes	Large	Small	Mix	Water	Protect	Plant	Save money	Increase value	Reduce pollution	Keep cooler	Yes	No	Where?
181						x			x	x	x	x	x	x	x		x	
182							x		x	x	x	o	o	x	x		x	
183							x		x	x	na	x	x	x	x		x	
184								x	x	x	x	o	x	x	x		x	
185								x	x	x	x	x	o	x	x	x		
186								x	x	x	x	x	x	x	x		x	
187	x, to much shade							x	x	x	na	x	x	x	x	x		Herring park
188						x			x	x	x	o	x	x	x		x	
189				x				x	x	x	x	x	x	x	x		x	
190	x, twist anke on walnuts							x	x	x	x	x	x	x	x	x		Signs, bus ads
191				x				x	x	x	x	x	x	x	x		x	
192				x				x	x	x	x	x	x	x	x		x	
193												o	o	x	x		x	
194								x	x	x	x	x	o	o	x		x	
195				x				x	x	x	x	x	x	x	x	x		Homeowners Assoc.
196	x, allergies					x			x	x	x	x	x	x	x		x	
197						x			x	x	x	o	x	x	o		x	
198								x	x	x	x	x	x	x	x		x	
199				x		x			x	x	x	x	x	o	x	x		Farmers Market
200				x				x	x	x	x	x	x	o	x		x	
201						x			x	x	x	o	x	x	x		x	
202								x	x	x	x	x	x	o	x		x	
203								x	x	x	na	x	x	x	x	x		
204				x			x	x	x	o	x	x	x	x	x	x		
205						x		x	x	x	x	x	x	o	x		x	
206								x	x	x	o	o	x	x	x		x	
207				x		x			x	x	x	o	x	o	x	x		
208	x, plant native trees							x	x	x	x	x		x	x	x		
209				x		x			x	x	x	x	x	x	x		x	
210				x				x	x	x	x	x	x	x	x		x	
211				x		x	x	x	x	x	x	x	x	x	x		x	
212								x	o	o	o	x	x	x	x		x	
213																		
214	x, allergies							x	x	x	o	o	x	x	x		x	
215								x	x	o	x	o	x	x	x		x	
216				x				x				x	x	x	x		x	