

Level of Support for Tree and Garden-Related Policies in the City of Mississauga

Elizabeth Bang

996708941

Thesis Supervisor: Professor Tenley Conway

Course Instructor: Professor Nathan Basiliko

GGR417Y5

March 30th, 2012

Introduction

Urban forests provide environmental, financial, and social benefits. These benefits include, but are not limited to air pollution mitigation, increased property values, and spaces available for social and cultural exchange (Perkins et al. 2004). These benefits have made it increasingly important for urban forests to be protected and maintained even as urbanization rates increase (Tyrväinen et al. 2005). They have contributed to a pattern where urban forest management has become stronger, tree planting programs have increased, and community based stewardship is increasingly present in urban areas. Despite these efforts, the distribution of urban forests still varies according to factors such as presence of municipal tree policies and socioeconomic status of neighbourhoods. Exploring the impacts of these factors can improve urban forest management practices, and produce tree and other vegetation-related policies that better address the values of residents within a municipality.

The purpose of this research is to address the lack of knowledge of the different levels of residential support for tree and edible garden-related policies. In addition, it will explore who does and does not support tree and edible garden-related policies based on household demographics and landscaping conditions. Addressing this information gap is important because these policies and the residents' perception of them have the ability to shape the management and preservation of urban forests. Thus, the objectives of this study are to: a) investigate the level of support for different tree and garden-related policies and b) determine who is more or less supportive of these policies.

Background Literature

The History of Urban Forest Management and its Significance

Urban forest management was a concept introduced in the 1960's by Jorgenson at the University of Toronto (Tyrväinen et al. 2005). It emphasized the management of trees in areas used by the urban population and introduced the environmental and social benefits associated with urban forest management (Tyrväinen et al. 2005). Urban forest management has been extensively developed, supported by research addressing urbanization and its effects on the natural environment. Researching the effects of urbanization and how it relates to urban forest conditions can protect and create green spaces, further develop tree and garden-related policies, and educate stakeholders on their physical surroundings.

Urban forests are cited as a protectant against the stressors of a highly built environment. The environmental, financial, and social benefits compensate for what is lost within the urbanization process and ultimately help preserve the integrity of the natural environment. The environmental benefits of urban forests include the regulation of temperatures, management of storm water runoff, and the mitigation of air pollution. Urban forests also reduce noise pollution, increase biodiversity by providing habitats for wildlife and endangered species, and act as carbon sinks (Perkins et al. 2004). In terms of its financial benefits, property values are known to increase, and homeowners can save money by strategically planting trees to reduce the use of heating and air conditioning.

From a social and psychological point of view, urban forests can increase the overall well-being of individuals (McConnachie and Shackleton, 2010). The presence of urban forests has been known to increase social cohesion, reduce crime rates, and aid in integrating older adults into the community (Landry and Chakraborty, 2009). It has also been known to reduce stress, increase overall quality of life, and increase emotional health (Perkins et al. 2004). On a neighbourhood level, trees increase a neighbourhood's attractiveness and can create an emotional

attachment between the residents and the neighbourhood (Perkins et al. 2004). Urban forests perpetuate a safe and positive environment and are able to appeal to the interests of individuals from a variety of demographics.

Factors Affecting Urban Forest Management

The distribution of the urban forests varies in conjunction with housing characteristics, socioeconomic factors, and characteristics of neighbourhoods and municipalities. Investigating why these factors have such an effect on urban forests can help us improve urban forest management practices and have a better understanding of urban forestry patterns. Level of home ownership can have noticeable effects on the urban forest pattern and is a predictor of its maintenance (Perkins et al. 2004). Renters and their absentee landlords often do not invest in maintaining their property because they often do not have the control to make physical changes to their yards, are highly mobile, and are likely to relocate in a short time period (Conway and Urbani, 2007). This high mobility means that they are unable to experience the longer term benefits associated with property maintenance and are also unable to gain future market returns (Perkins et al. 2004). This in turn produces a lack of trees in areas with a high proportion of renters. Home owners, on the other hand, are more likely to invest in maintaining trees on their property, probably because they are able to capture the longer term benefits, like the increased property values associated with having trees. As a result, reforestation efforts are typically most supported by homeowners. This has led to a gap in knowledge of tree related policies and programs between homeowners and renters (Perkins et al. 2004).

Socioeconomic factors have a strong influence on urban forests and can create constraints on the ability of the individual to contribute to urban forest management. Neighbourhoods with high education and income levels are believed to be more aware of the environmental benefits of

urban forests and have greater access to information related to policies and tree care (Landry and Chakraborty, 2009). The result is an inequitable distribution of urban forests and by extension, the inequitable distribution of environmental, social, and financial benefits. This can create a culture within the municipality or neighbourhood where urban forest management is less emphasized because of community members being uneducated on the various benefits that urban forests can provide. On the other hand, residents with greater access to information and financial ability give them a greater capacity to manipulate urban forest patterns and increase the diversity of plant species being planted. The well-documented impacts of socioeconomic status on tree patterns is referred to as the inequity hypothesis. The hypothesis states that low tree canopy cover occurs in neighbourhoods that contain a high proportion of racial and ethnic minorities and/or socioeconomically disadvantaged individuals (Landry and Chakraborty, 2009).

Characteristics of neighbourhoods and municipalities are also related to urban forest management. The age of the neighbourhood is often an indicator of tree canopy cover. Older neighbourhoods consist of more mature trees and a large canopy cover, however neighbourhoods older than 50-60 years start to see decreasing tree canopy cover as a result of natural tree mortality, unless additional planting occurs. Younger neighbourhoods typically contain low tree canopy cover due to the lack of mature trees and are often limited to plantings done by developers. Population density can have an effect on the presence or absence of municipal policies, community activism, and stewardship programs. Conway and Urbani (2007) found that highly urbanized and dense municipalities had more tree planting, removal, and monitoring policies than their less dense counterparts.

Municipal policies aid in guiding discussion around urban forest management, regulating the growth of urban forests, and protecting and preserving existing urban forests. It is ideal for

tree by-laws, which protect trees and regulate urban forest management, to be in place because of their ability to facilitate increase tree canopy cover and height. Sung (2012) was able to demonstrate this using LiDAR remote sensing data to measure the value of tree protection policies. It was used to evaluate tree canopy cover between two villages in Austin, Texas: Lakeway and The Hills. The Lakeway village adopted a tree removal permit program in 2002 while The Hills village did not. LiDAR remote sensing was then used to compare land parcels in Lakeway village and The Hills village after 2002. It was found that the parcels from Lakeway village that adopted the tree removal permit and tree protection policies had the highest average tree height (Sung, 2012). In this case, it was revealed that municipal policies have the ability to increase protection of urban forests.

Urban forest policies are known to have a positive impact on the distribution of urban forests, however a knowledge gap exists in the literature concerning the level of support for these policies. This study will investigate the different levels of support for typical tree policies in the City of Mississauga. It will also explore how the support level varies in relationship to household characteristics.

Methods

Study Areas

The four neighbourhoods included in this study are located in Mississauga, Ontario, Canada. Each one is defined by two dissemination areas, representing between 200 and 500 households per neighbourhood. The neighbourhoods were selected to include two representing the 80 percentile of household income and two representing the 20% of household income. Within each income pair, one neighbourhood was dominated by houses built prior to 1970, while

the other was dominated by newer houses that were built after 1970. In Table 1, demographic characteristics of the four neighbourhoods from the 2006 Census and this research are shown. The first two neighbourhoods, Lakeview and Mineola, are considered to be older neighbourhoods (before 1970). The last two neighbourhoods, Rathwood and Meadowvale, are considered to be newer neighbourhoods (after 1970). Lakeview and Rathwood represent the lower income neighbourhoods, while Mineola and Meadowvale represent the higher income neighbourhoods.

Neighbourhood	Census (2006)			Research Survey (2011)		
	Household Income (\$)	Bachelors Degree (%)	Top 3 Ethnicities	Household Income (\$)	Bachelors Degree (%)	Top 3 Ethnicities
Lakeview	66,447	13	European, British, Other	60,000-89,000	14	European, British, Canadian
Mineola	138,103	28	British, European, Other	90,000-119,000	30	European, British, East & Southeast Asian
Rathwood	63,520	16	European, British, Other	30,000-59,000	16	European, British, East & Southeast Asian
Meadowvale	152,765	40	European, East & Southeast Asian, British	90,000-119,000	40	European, East & Southeast Asian, South Asian

Table 1. Demographic characteristics of the four neighbourhoods from the 2006 Census data from Statistics Canada and this study. Demographic characteristics in this study are similar to that of the 2006 Census.

The following are four neighbourhood descriptions and they each highlight key historical, demographic, and yard features.

Lakeview Neighbourhood

The neighborhood Lakeview is located south of the Queen Elizabeth Way, in between Cawthra Rd and Dixie Rd. Lakeview is an older neighbourhood consisting of mainly low income households. The average household income of this neighbourhood is \$66,447 and the average household value is \$350,364, which is one of the lowest average household values compared to the other four neighbourhoods. Forty-four percent of the total population was 30 to 59 years old, while 23% was 60 to 85 years old and over. Out of all of the households in this area, 94% are owned by the residents. A report written by The Social Planning Council of Peel (2006) reported that Lakeview was one of the three slowest growing neighborhoods in the Peel region. This shows that the neighbourhood mainly consists of residents who have chosen to settle in the area. In terms of education, 15% of the neighbourhood had some sort of university level education. Furthermore, of residents between 25 to 64 years of age, 30% possessed a University level education and of that 30%, 20% obtained a Bachelor's degree. In the 65 years and over age group, apprenticeship certificates and diplomas dominated.

When the neighbourhood was explored, it was evident that there was an industrial influence along Lakeshore Road east and significant commercial development (City of Mississauga, 2011). In the residential area, houses were older and ranged in size. Census data shows that 88% of these houses were built before 1970 and that the majority of houses are single detached. The sizes of the front yards also ranged, but for the most part were of a medium size compared to the other four neighbourhoods. An abundant amount of trees and shrubs were observed within the area. The trees were mature and varied between deciduous to coniferous types. An interesting characteristic to note is that the majority of households chose to plant trees

and shrubs rather than flower beds. It was rare to see both groups existing in one yard; it was either one or the other.

Meadowvale Neighbourhood

Meadowvale is a neighborhood in the northwestern part of Mississauga bordered by highway 401, Mississauga Road, Ninth Line and Britannia Road. The average income level of its residents is \$153,000 with 33% of the population, 15 years or older, having some form of university level education. The largest age group is between 30-49 years, which represents 43% of the population in this neighborhood followed by the second largest age group of 0-9 years at 21%, indicating that most of the population in this area is made up of young families. The employment rate of Meadowvale is 77%, which is attributed to education level of the population and the presence of significant employment opportunities discussed below. Meadowvale is a newer community in comparison to the others neighborhoods in the municipality as 97% of the homes were constructed after 1970, and the majority of these houses are semi-detached (56%). The neighborhood consists of residential properties with average property values of \$433,000.

The Meadowvale community was initially a village which was first settled by Irish immigrants from New York City, USA on early 1800s. The village became famous for wood, wool and saw mills. Settlers and mill owners constructed brick houses and some of which are recognized today for their architectural significance (Hicks, 2004; Meadowvale Village, 2009). The Credit River runs through the eastern part of Meadowvale and mature coniferous and deciduous forests make up the central part of the community. The Credit Valley Conservation protects the ecological and historical well-being of local natural spaces. The Ontario Heritage Act has designated Meadowvale as Ontario's first Heritage and Conservation district for its

ecological, architectural and historical significance (Meadowvale Village, 2009). This community is also home to one of the largest business parks in the municipality, consisting of head offices of various corporations and banks such as Royal Bank of Canada, Daimler Chrysler, Wal-Mart Canada and Microsoft. Given the above economical, ecological, and social characteristics, Meadowvale is considered a wealthier community. These variables as well as the younger age of the neighborhood were also considered when surveys were analyzed.

Mineola Neighbourhood

Mineola is located south of Queen Elizabeth Way in between Cawthra Road and Mississauga Road. The neighborhood is classified as an old, high-income neighborhood, which has a large number of mature trees located in it. Mineola consists of primarily upper middle class, with an average house value of \$581,000. The average household income is approximately \$138,000 and this high average household income could be a reflection of the dual incomes of its residents. The high level of income is further supported by the high level of employment, with the majority of those over the age of 15 in the Mineola being employed. At the time of the 2006 census, 67% of the population in Mineola was employed. The high employment rates could also relate to the high level of post-secondary education, with an average of 54% of the residents having completed a certificate diploma or degree (age group of 25 to 64 years old). This suggests that there may be a relationship between the amount of trees on one's property and higher levels of education, coupled with employment.

Most of the homes in this area were built prior to 1970, suggesting that it could be more common for older, more mature trees to be present in this area. This shows a potential correlation between an older neighborhood and established trees. This was verified when visiting

this neighborhood and multiple large trees were observed. The amount of tree cover in this area could relate to its residents cultural perceptions, available time, or financial situation. House ownership is often associated with higher levels of canopy cover, and this is true within Mineola, with 89% of the residents owning their houses and a large amount of tree cover in this area. After exploring this neighborhood it would suggest that this was the case.

Rathwood Neighbourhood

The Rathwood neighborhood is located about 5 km north-east of Square One Mall and the Mississauga City Centre. The specific area being researched lies between the major streets of Cawthra Road, Central Parkway, Burnhamthorpe Road, and the 403 Highway. The two dissemination areas in Rathwood combined have the lowest average income level of all the neighborhoods being researched in this study. This community can therefore be described as being primarily low income and consist of newer housing in comparison to the other neighbourhoods being studied. It can be determined from the 2006 Census data that the two dissemination areas within Rathwood are mostly populated by adults between the ages of 30 and 59 years old, indicated by over 80% of the neighbourhood's population falling into this demographic. Since the majority of the homes (90%) were built post-1971 and the majority of the population is only between 30 and 59 years of age, it is suspected that the current residents and homeowners were not the original occupants in the area upon development. Hence, few of the current residents, if any, had control over the original use of the land and what was planted. In addition, over 70% of the population are in the labour force and of those, 92% of them are employed. Only about 14% of the total population have a university education, demonstrating that this community consists mostly of 'working class' people.

Based on the data provided and field observation, many of the houses in this neighborhood are a part of small townhouse row communities. Of the four neighborhoods analyzed in this study, Rathwood has the greatest number of row-houses and the smallest number of single-detached homes. In most cases, the front lawns of these homes are relatively small and shared with neighbour(s). It appears that most of these residents do not have much influence over the presence of trees on their property. This is also based on the fact that most lawns have trees of same species. The residents in these homes are mostly renters and only 2.26% of the population in Rathwood are owners of their home. These row-house properties mostly have one tree on each lawn and are considerably tall (approximately 30 feet). The front lawn areas of these homes are dominated by one tree, which does not allow for much else to be planted or grown.

Most of these row-house complexes were found on Meadows Boulevard whereas on Wilcox Road there were a greater number of single-detached homes. Upon observation it was noticed that these properties had bigger yards and many of them had a greater variety and number of trees. These trees varied in size from approximately 5 – 30 feet and in species, varying from large coniferous trees to small trees in the garden. The single-detached homes appear to be older; this was determined based on the style of home, the size of the trees lining the street, and the fact that some of these larger trees had their canopies removed.

Mail-Based Surveys, Interviews, and Statistical Software

The primary data used in this research study was a mail-based survey. The group of intended participants came from the four neighborhoods in Mississauga; Lakeview, Meadowvale, Mineola, and Rathwood. A mailing address list was acquired for each neighborhood to determine which residents would receive the survey. These particular

neighborhoods were chosen because they represent areas that are different in their overall age and their property values, which are key factors in determining the level of vegetation and condition and age of trees. The four neighborhoods include two older and two newer neighborhoods, as well as two high and two low incomes neighbourhoods. A total of 1399 households were contacted, 253 from Mineola, 584 from Meadowvale, 256 from Lakeview, and 306 from Rathwood. The survey was limited to only single family households. To achieve a random response, any adult in the household over 18 years old was eligible to complete it.

Before the survey was mailed out, a recruitment letter was sent to all households informing them of the coming survey and providing residents with the option to complete the survey online. Shortly after, the complete survey package was sent to all residents. The package was addressed directly to the homeowner and contained a copy of the survey, a return envelope, and a cover letter informing participants about the nature of the study, the requirements, ethical considerations, and contact information. Each survey was given a code that correlated with the code assigned to each house on the mailing list in order to keep track of the responses, and to protect the participants' identity.

Questions in the survey asked residents about their attitudes towards neighborhood and private trees, details about trees on their property, and some basic household demographic information (Appendix I). The questions that specifically applied to this study were questions 26 to 39. Question 26 consisted of a subset of questions that required participants to indicate on a Likert scale, ranging from "strongly agree" to "strongly disagree," of how they felt regarding the municipality's role in neighborhood tree care. The six subset questions asked the residents to rate their feelings towards policies increasing the number of street trees within their neighbourhood,

having the municipality provide more information about planting and care, and being provided a community garden space. Questions 27-39 asked standard household and demographic questions involving age, ethnicity, household income, and education level. At the end of the survey participants were asked to provide their contact information if they were interested in participating in a follow up interview or receiving a copy of the study results. As residents expressed willingness to participate, follow-up interviews on their properties were conducted to gain first-hand knowledge of the vegetation present in each of the neighborhoods.

A 46% response rate was achieved from the mail-based surveys. The data from the returned surveys was compiled using an excel spreadsheet. This data was organized according to the date it was entered and differentiated by the code that each survey was assigned. The spreadsheet headings feature each question and the answers were entered using a coding system that abbreviated the responses allowing for more efficient entry and organization. Once all the data was entered into the system, it was summarized using summary calculations like mean and proportions. Charts and tables were created to display the information gathered from each neighborhood, which were then analyzed to make comparisons and identify trends.

Question 26, regarding the municipality's role in tree management was divided into its six respective sub-questions to be further analyzed. These questions were analyzed according to respondents' level of agreement, household demographics, the average number of front and back yard trees, the range of front and back yard trees, and the presence of a city tree and edible garden. The intention of this analysis was to identify neighbourhood differences. Initially, means and proportions were calculated for all data and by neighbourhood. These neighbourhood summaries began to illuminate which neighbourhoods' respondents were the most supportive or unsupportive of the respective policy question.

IBM SPSS Statistics 20 (SPSS) was used to investigate relations between policy responses and other variables through a series of cross tabulations. Policy responses were reduced to three levels of agreement: disagree, neutral, and agree. Three analyses were done and the first compared level of policy agreements for each policy question by neighbourhoods. The second analysis compared level of policy support against each other, within each neighbourhood. The final analysis looked at level of policy support versus various demographic characteristics such as age, education, income, and ethnicity.

Phi Cramer's V Value (CVC) test statistic was used to calculate the significance values of each policy question. This statistic is appropriate when comparing relations among two categorical variables, where one or more variables have more than two categories. Values with less than 0.05 were noted and classified as being significant. Values with less than 0.01 were classified as being highly significant.

Results

Analysis #1: Comparing levels of policy agreement by neighbourhood.

The first analysis using cross tabulations involved comparing the policy questions and their respective level of policy agreements against the four neighbourhoods in the City of Mississauga. This analysis was combined with conducting a neighbourhood summary and using basic statistical calculations. Table 2 outlines the six policies in the survey, their associated significance levels, and the proportion of those who agreed with the policies within the four neighbourhoods.

Policy	Significance	Proportion of respondents who agreed
1	*	46%
2	* *	62%
3	* *	65%
4		42%
5		61%
6	*	58%

Table 2. Significance of policy questions 1 to 6 between the four neighbourhoods in the City of Mississauga. Phi Cramer’s V Coefficient (CVC) values that have a p-value less than 0.05 are significant and indicated by an asterisk (*). P-values that are less than 0.01 are highly significant and indicated by two asterisks (* *). High level of support for a policy question was identified by more than 50% of the respondents agreeing to the policy statement.

Neighbourhood summaries were able to identify four policies that had a high level of support among respondents. These policies were questions 2, 3, 5, and 6 and they asked about the municipality encouraging residents to plant more trees by providing information about planting and care, providing trees at a reduced cost, encouraging edible gardening by providing information about planting and care, and providing garden space, respectively. Cross tabulation tables identified four different policies to vary significantly by neighbourhood, with two being highly significant (Table 1). Overall, policy questions 2 and 3 were found to be highly significant and they mainly focused on the municipality providing information about planting and care and providing trees at a reduced cost.

Analysis #2: Comparing levels of policy agreement against each other within each neighbourhood.

In each neighbourhood, levels of policy agreements within the six policy questions were compared against each other. Policy comparisons in every neighbourhood except for Lakeview produced highly significant p-values. Table 3 outlines the policy comparisons in Lakeview and the comparisons that were found to be significant.

Policy Comparison	Significance
Policy 1 and Policy 2	* *
Policy 1 and Policy 3	* *
Policy 1 and Policy 4	* *
Policy 1 and Policy 5	*
Policy 1 and Policy 6	* *
Policy 2 and Policy 3	* *
Policy 2 and Policy 4	*
Policy 2 and Policy 5	* *
Policy 2 and Policy 6	* *
Policy 3 and Policy 4	* *
Policy 3 and Policy 5	* *
Policy 3 and Policy 6	* *
Policy 4 and Policy 5	* *
Policy 5 and Policy 6	* *

Table 3. Analysis 2 of Lakeview where policies were compared against each other using cross tabulations. CVC test statistics that have a p-value of less than or equal to 0.05 are significant and indicated by an asterisk (*). P-values that are less than or equal to 0.01 are highly significant and indicated by two asterisks (* *).

Lakeview was the only neighbourhood that did not show high significance for all of its policy comparisons. Table 3 shows Lakeview's policy comparisons that were found to be significant in the variations of level of agreement. The policy comparisons between 2 and 4, and 3 and 4 showed a varying level of support for the municipality not allowing individuals to cut down trees on their own property. This often resulted in their agreement with the policy question that policy question 4 was compared with (i.e. policy questions 2 and 3). Policy comparisons 4 and 6 were the only comparisons not found to have significance in the variations in level of agreement.

Analysis #3: Comparing levels of policy agreement against demographic characteristics, within each neighbourhood.

In each neighbourhood the levels of policy agreement and demographic characteristics were compared against each other using significance with. The demographic characteristics and its abbreviated forms that were used were:

- The number of adults that were 65 years old and over in the household (Over 65).
- The number of children that were less than 18 years old in the household (Under 18).
- If the respondent was of British Isles ethnic origin (British Isles).
- If the respondent was of European ethnic origin (European).
- The annual household income (Income)
- The highest education level attained (Education)
- The presence of tree(s) in the front yard (Front Yard Trees)
- The presence of tree(s) in the back yard (Back Yard Trees)
- The presence of an edible garden (Edible Garden)

- The presence of a city tree (City Tree).

Tables 4 to 9 represent policy questions 1 to 6, respectively. They outline the demographic characteristics that showed significance within each neighbourhood and its associated p-value. Table 10 summarizes the significant demographics between all the policy questions and within each neighbourhood.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Over 65	0.030 (*)	0.466	0.796	0.349
Income	0.006 (* *)	0.020 (*)	0.113	0.281
Edible Garden	0.001 (* *)	0.000 (* *)	0.000 (* *)	0.205
City Tree	0.308	0.908	0.011 (* *)	0.993
Back Yard	0.309	0.001 (* *)	0.464	0.433

Table 4. Policy question 1 compared against demographic characteristics within each neighbourhood. List of significant demographic characteristics for policy question 1 (my municipality should increase the number of street trees in my neighbourhood). Bolded numbers indicate significance. P-values that are less than or equal to 0.05 are significant and indicated by an asterisk (*). P-values that are less than or equal to 0.01 are highly significant and indicated by two asterisks (* *).

Overall, the demographic characteristics that were found to be significant within policy question 1 were over 65, income, the presence of an edible garden, the presence of city tree(s), and the presence of a tree(s) in the back yard. Rathwood was the only neighbourhood that did not have significant demographic characteristics related to the levels of policy agreement in policy question 1. Respondents who agreed with increasing the number of street trees were less likely to

be over 65, showing a negative correlation between the policy question and demographic characteristic.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Over 65	0.016 (* *)	0.667	0.455	0.412
Income	0.001 (* *)	0.022 (*)	0.152	0.334
Edible Garden	0.003 (* *)	0.000 (* *)	0.000 (* *)	0.003 (*)
City Tree	0.302	0.074	0.002 (*)	0.261
Education	0.010 (* *)	0.609	0.931	0.455
British Isles	0.265	0.036 (*)	0.713	0.603

Table 5. Policy question 2 compared against demographic characteristics within each neighbourhood. List of significant demographic characteristics for policy question 2 (my municipality should encourage residents to plant more trees on their own properties, by providing information about planting and care).

In Lakeview, over 65, income, the presence of an edible garden, and education were significant demographic characteristics for determining the level of agreement with policy question 2. The significant demographics in Meadowvale were income, the presence of an edible garden, and British Isles ethnicity. In Mineola, the significant demographics were the presence of an edible garden and the presence of city trees. Mineola respondents who agreed with this policy also possessed an edible garden, city tree, or both. The only significant demographic characteristic in Rathwood was found to be the presence of an edible garden, which was a significant demographic characteristic within all four neighbourhoods regarding policy question 2.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Over 65	0.003 (* *)	0.486	0.215	0.327
Income	0.279	0.004 (* *)	0.819	0.823
Edible Garden	0.051	0.000 (* *)	0.000 (* *)	0.039 (*)
City Tree	0.113	0.775	0.021 (*)	0.811
Backyard	0.229	0.026 (*)	0.391	0.009 (* *)

Table 6. Policy question 3 compared against demographic characteristics within each neighbourhood. List of significant demographic characteristics for policy question 3 (my municipality should encourage residents to plant more trees on their own properties, by providing trees at a reduced cost).

The only significant demographic characteristic in Lakeview was over 65. In Meadowvale, the significant demographic characteristics were income, presence of an edible garden, and the presence of trees in the back yard. In Mineola, they were the presence of an edible garden and a city tree. Mineola was the only neighbourhood that had the presence of a city tree as a significant demographic characteristic. Finally, in Rathwood the significant demographic characteristics were the presence of an edible garden and the presence of trees in the back yard.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Over 65	0.011 (* *)	0.543	0.649	0.070
Edible Garden	0.378	0.000 (* *)	0.000 (* *)	0.002 (* *)

Table 7. Policy question 4 compared against demographics within each neighbourhood. List of significant demographics for policy question 4 (my municipality should protect trees by not allowing people to cut down trees on their own properties).

In all neighbourhoods except for Lakeview, the significant demographic characteristic was the presence of an edible garden. Lakeview's significant demographic was over 65, with the same inverse relationship where agreement with the policy question was likely by respondents that did not have an adult that was over 65 in the household. Between Meadowvale, Mineola, and Rathwood, only Rathwood showed an inverse relationship between the presence of an edible garden and the level of agreement of the policy question. Respondents were more likely to not participate in edible gardening and agree to the statement that the municipality should protect trees by preventing people from cutting down trees on their own properties.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Income	0.439	0.001 (* *)	0.166	0.444
Edible Garden	0.017 (*)	0.000 (* *)	0.000 (* *)	0.001 (* *)
City Tree	0.766	0.155	0.000 (* *)	0.227

Table 8. Policy question 5 compared against demographics within each neighbourhood. List of significant demographics for policy question 5 (my municipality should encourage people to grow fruits and vegetables at their house, by providing information about planting and care).

The significant demographic that was similar for all four neighbourhoods was the presence of an edible garden. The level of support for the municipality providing information on planting and care for fruits and vegetables was mainly dependent on the presence of an edible

garden. Thus, respondents were more likely to support being provided with planting information for fruits and vegetables if they had an edible garden. In Meadowvale, another significant demographic was income, while in Mineola, the other significant demographic was the presence of a city tree.

Demographic characteristics which demonstrated significance	Lakeview	Meadowvale	Mineola	Rathwood
Income	0.009 (* *)	0.001 (* *)	0.338	0.574
Edible Garden	0.000 (* *)	0.000 (* *)	0.000 (* *)	0.049
City Tree	0.658	0.155	0.001 (* *)	0.595

Table 9. Policy question 6 compared against demographics within each neighbourhood. List of significant demographics for policy question 6 (my municipality should provide community garden space for all interested residents to grow fruits and vegetables).

Income, the presence of an edible garden, and the presence of a city tree were found to be significant demographic characteristics in policy question 6. In Meadowvale, another significant demographic was income, while in Mineola, another significant demographic was the presence of a city tree. The high level of support for this policy question was dependent on the presence of an edible garden. Rathwood had no demographic characteristics that were significant to explain why the neighbourhood had the highest proportion of respondents who supported the municipality providing a community garden space (71%).

Demographic Characteristics	Lakeview	Meadowvale	Mineola	Rathwood
Under 18				

Over 65	****			
British Isles		*		
European				
Income	***	*****		
Education	*		*	
Front Yard				
Back Yard		***		*
Edible Garden	****	*****	*****	****
City Tree			****	

Table 10. Summary of the common significant demographic characteristics (by shaded grids) within each neighbourhood. Number of asterisks indicate the number of policy questions the demographic characteristic was found to vary significantly in the level of agreement.

Table 10 shows the presence of an edible garden to be a common significant demographic characteristic between all four neighbourhoods. The demographic characteristic, over 65, was only significant in Lakeview. British Isles was only significant in Meadowvale, while in Mineola the presence of a city tree was only significant.

Discussion

Neighbourhood Summaries: Yard Composition and Levels of Agreement

Neighbourhood summaries were first conducted and found that policy questions 2, 3, 5, and 6 were highly agreed upon by most respondents. Policy questions 2 and 5 were both concerned with the municipality providing more information, whether it was tree, fruit, and vegetable related. Approximately 62% of the respondents agreed with policy question 2, which involved the municipality providing information for only planting and care. Houses with the highest average number of front and back yard trees also typically agreed with the policy question 2. On the other hand, 61% of respondents agreed with policy question 5 and when

analyzing the composition of respondents who agreed with policy question 5, it was mainly composed of respondents who participated in edible gardening. Between those who agreed both these policy questions, it appeared that they were more likely to support policies that reflected their yard composition.

Policy question 3 asked respondents their level of agreement with the municipality encouraging residents to plant more trees in their properties, by providing trees at a reduced cost. This policy question received the highest proportion of respondents who agreed (65%) out of all the policy questions. Those who agreed had one of the highest average number of front yard trees and back yard trees. Policy question 6 asked respondents their level of agreement with the municipality providing a community garden space. Approximately 58% of respondents agreed with the statement and they were likely to possess an edible garden. Those who disagreed with it had the highest number of back yard trees, front yard trees, and city trees. Those who agreed with policy questions 3 and 6 showed a similar pattern with those who agreed with policy questions 2 and 5. There was a relationship between yard composition and the level of agreement within each policy question; respondents were answering based on their yard composition.

Analysis #1: Policy Questions Identified to Vary Significantly in Levels of Agreement

The first of three analyses using cross tabulations focused on comparing levels of agreements among the six policy questions and within each neighbourhood. It found policy questions 1, 2, 3, and 6 to be significant with policy questions 2 and 3 to be highly significant (Table 1). However, in the neighbourhood summaries only policy questions 2, 3, 5, and 6 were identified to have a high proportion of agreement. Although policy question 1 was not identified to be important through the neighbourhood summaries, it should be noted that cross tabulations

did find it to be significant. This can also indicate that respondents generally want to increase the number of street trees in their neighbourhood. Overall, respondents' level of support varied significantly in the policy questions concerning: providing more information on tree planting and care, trees at a reduced cost, and a community garden space.

Analysis 1 combined with the data collected from the neighbourhood summaries showed that there was a divide between those who participate in edible gardening and tree planting. In essence, those who favour a certain aspect of their yard want their municipality policies to respond accordingly. This can have a great effect on urban forest management and plant biodiversity. It can be inferred that if there is a high proportion of residents who support edible gardening in a particular region, then the protection of city and privately owned trees may be less emphasized in these areas. In contrast, those with a higher proportion of residents who support city and privately owned trees may contribute less to plant biodiversity within the municipality.

Analysis #3: Significant Variation of Levels of Policy Agreement in Policy Questions, Within Neighbourhoods.

The third analysis compared the levels of policy agreement against demographic characteristics, within each neighbourhood. Policy question 1 was in regards to increasing the number of trees and Rathwood was the only neighbourhood where significant demographic characteristics were not found. This may be explained by the neighbourhood's townhouse row complexes, which do not have the space to support more trees. The selected demographic characteristics to be analyzed in cross tabulations tables may be irrelevant seeing as there is no yard space within the neighbourhood to support policy question 1 anyways.

Policy question 2 asked respondents their level of agreement with the municipality encouraging residents to plant more trees on their own properties, by providing information about planting and care. In Lakeview, income was found to be a significant demographic characteristic in determining the level of agreement to policy question 2. Lakeview is one of the two lower income neighbourhoods in this study and it is suspected that they may not be able to frequently purchase trees and vegetation or pay for landscaping, consulting, and gardening services. Thus, the high proportion of respondents from Lakeview would benefit more with the municipality providing information about planting and care. This would also be a better way for Lakeview respondents to participate in urban forest management.

It was believed that since Lakeview was one of the two lower income neighbourhoods, that this pattern in supporting the municipality providing information would be observed in Rathwood. Rathwood was the second lower income neighbourhood, however neighbourhood summaries showed that there was minimal support. This may be because it does not matter whether or not the municipality provides educational approaches, like informative pamphlets, on planting and care. The neighbourhood's yard maintenance and plantings are managed by a private townhouse corporation board. Rathwood respondents have no real control over their yard composition and thus, could be indifferent to whether or not the municipality could aid them.

A second pattern was identified in Mineola and this involved a negative correlation between the presence of a city tree and a high level of support for the municipality providing planting and care information. When analyzing the neighbourhood, there were a significantly lower proportion of city trees compared to trees on private property within the neighbourhood. A majority of those interviewed in Mineola frequently expressed their desire to manage their own trees, lawn, and vegetation, and mentioned the use of landscaping and consulting services. It is

assumed Mineola respondents agree with wanting more planting and care information because they own a large amount of trees on private property. They would rather focus efforts on maintaining the trees on their own property than maintaining city trees, and would prefer to have an active role in the management of their yards.

The third policy question asked respondents of their level of agreement with the municipality providing trees at a reduced cost in order to encourage residents to plant more trees on their property. Approximately 65% of the respondents were in favour of this statement in the neighbourhood summaries. When cross tabulations were conducted, it was found that income was one of the demographic characteristics in determining the level of agreement with policy question 3 in Meadowvale. Those in favour of the policy statement were found to have a high income that ranged from \$90,000 to \$119,000. Despite the fact that the neighbourhood is seen as a high income neighbourhood, respondents in Meadowvale would still be interested if trees were provided at a reduced cost. In Mineola, the absence of a city tree determined the level of agreement with providing trees at a reduced cost. It is believed that if the overall composition of the neighbourhood has a low proportion of city trees, there needs to be a way to offset the costs associated with respondents investing in privately owned trees. Purchasing trees at reduced costs can help Mineola respondents preserve their independence in managing their own yards. It is evident that there is a general appeal among respondents to be able to purchase trees at a reduced cost, regardless of their socioeconomic status.

Policy question 4 asked respondents about their level of agreement with the municipality protecting trees by not allowing people to cut down trees on their own properties. Out of all the respondents, 42% agreed, 29% disagreed, and 26% neither agreed nor disagreed. These varying levels of agreement reflected the mixed feelings expressed by respondents during the interviews.

Among those who supported the limits placed on cutting, the main concerns were maintaining the overall aesthetics of the neighbourhood and a consistent property value within the neighbourhood. Those who agreed with the limits were expected to be from older neighbourhoods, where it is known to have a larger tree canopy cover and proportion of mature trees compared to a newer neighbourhood. Different results were found in Lakeview and Mineola, which were older neighbourhoods. Lakeview had the highest proportion of respondents who disagreed with this policy question and the majority of those interviewed in Mineola expressed desire for the ability to cut down trees on their own property. Not only did this reflect the independent nature of Mineola in yard management, but it showed that older neighbourhoods disagreed with limits being placed on cutting trees down on private property.

Policy question 5 asked respondents about their level of agreement with the municipality encouraging people to grow fruits and vegetables at their house, by providing information about planting and care. Between all four neighbourhoods, respondents were likely to agree to this policy question if they possessed an edible garden. This is expected, as those who are avid participators in edible gardening would be attracted to the municipality providing more information on fruits and vegetables. In Lakeview, income was identified to have an impact on the level of agreement to this statement too. Lakeview is a lower income neighbourhood and there is a financial burden associated with employing gardening services, as well as researching on and testing out specific techniques. If the municipality is able to provide information about planting and care for fruits and vegetables, it can alleviate this financial burden and reduce researching and testing time of gardening techniques.

Policy question 6 asked respondents their level of agreement with the municipality providing a community garden space for interested growers. It was found that the presence of an

edible garden was significant in determining the level of agreement in Lakeview, Meadowvale, and Mineola. This could be because those who have an edible garden are well known in the subject of gardening and would likely be interested in participating in a community garden, as opposed to those who are not already familiar with edible gardening. The third analysis identified no significant demographic characteristics within Rathwood, even though it had the highest proportion of respondents (71%) who agreed to want a community garden space. This could be because none of the demographic characteristics picked for analysis in this study were applicable enough to the neighbourhood's situation.

It is recommended that yard space be a parameter to be analyzed for the future. This is because during the interviews, the yard spaces of Rathwood were visibly smaller than those of the other neighbourhoods. These small yard spaces would potentially prevent edible gardening practices in the neighbourhood, but it could lead to the creation of a community garden space because of the overwhelming support for edible gardening within the neighbourhood.

Conclusion

Overall, respondents were more likely to support a policy question that reflected their yard composition. If front yard, back yard, and city trees were present, there was a high level of support for tree-related policies. If an edible garden was present, there was a high level of support for edible gardening-related policies. This would affect the overall distribution of urban forests, as well as have impacts on plant biodiversity and edible gardening practices.

Lakeview was a low income neighbourhood and it was found that income was a significant factor in the variations in level of agreement with policy question 2. There was a high level of support for the municipality providing planting and care information, which was

suspected to be because of its ability to aid in alleviating the financial burden associated with urban forest management. This pattern was not observed in Rathwood, another low income neighbourhood. It was suspected that because the private townhouse corporation board's yard management policies were strict, it did not matter whether or not the municipality would be able to provide more information. Regardless of aid from the municipality, the respondents of Rathwood would be unable to act upon it because of the restrictions provided by the private townhouse corporation board.

Older neighbourhoods have a larger canopy cover and contain a high proportion of mature trees. It was believed that their protection would be of high priority; however, this was not the case. Lakeview and Mineola, which were the two older neighbourhoods in this study, were found to disagree with limits being placed on cutting trees on private property. Thus, older households in the City of Mississauga are believed to not support policies that limit increasingly independent management of the urban forest.

Finally, yard space is recommended to be added to the list of indicators to be analyzed in all four neighbourhoods. This would be especially important in identifying certain significant variations in levels of policy agreement observed in Rathwood.

Works Cited

- City of Mississauga. (2011). Inspiration Lakeview. Retrieved on July 25th, 2011 from <http://www.mississauga.ca/portal/residents/inspirationlakeview>.
- Conway, T.M. and Urbani, L. (2007). Variations in municipal urban forestry policies: a case study for Toronto, Canada. *Urban Forestry and Urban Greening*, 6(3), 181-192.
- Hicks, K. A. (2004). Meadowvale Mills to Millennium. 1st ed. Mississauga Library System.
- Landry, S.M. and Chakraborty, J. (2009). Street trees and equity: evaluating the spatial distribution of an urban amenity. *Environment and Planning*, 41, 2651-2670.
- McConnachie, M.M. and Shackleton, C.M. (2010). Public green space inequality in small towns in South Africa. *Habitat International*, 34, 244-248.
- Meadowvale Village. (2009). A Heritage Tour; Meadowvale Village. Received on May 23rd, 2011 from <http://www.heritagemississauga.com/assets/Meadowvale%20Village%20Heritage%20Tour%20Brochure%20-%20Final%202011.pdf>.
- Perkins, H.A., N. Heynen, and J. Wilson. (2004). Inequitable access to urban reforestation: The impact of urban political economy on housing tenure and urban forests. *Cities*, 21(4), 291-299.
- The Social Planning Council of Peel. (2006). Socio-Economic Status of Peel Neighbourhoods. *InfoShare*, 12:1-12.
- Tyrväinen, L., S. Pauleit, K. Seeland, and S. De Vries. (2005). *Urban forests and trees in*

Europe: A reference book. New York: Springer-Verlag.

Appendix I: Residential Tree Survey

PLEASE START SURVEY HERE

1. Please indicate how strongly you agree or disagree with the following statements about neighbourhood trees.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Ideally, I would like to live in a neighbourhood with large trees.					
Ideally, I would like live in a neighbourhood with a tree in front of most houses.					
Neighbourhoods with trees are more attractive than those without trees.					
Trees provide environmental benefits that I want in my neighbourhood.					
Trees create a physical hazard (i.e. falling branches) I do not like in my neighbourhood.					
Trees make a neighbourhood look less tidy.					
Trees make a neighbourhood less safe (i.e. block views, create hiding places).					
I do not want trees in my neighbourhood because they contribute to my allergies.					
I would like my current neighbourhood to have more trees.					

2. Please indicate how strongly you agree or disagree with the following statements about trees at your home.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Ideally, I would like to see at least one tree when I look out my window.					
Having at least one tree at my home is important to me.					
Trees require more work than they are worth.					
I like the cooling benefits trees provide by shading my house in the summer.					
Trees attract wildlife I like to see in my yard.					
I do not like trees in my yard because their roots cause problems (i.e. interfere with pipes, crack sidewalks)					
My ideal front yard would have at least one tree (including publicly-owned street trees).					
I prefer that the majority of my front yard have sun exposure (i.e. not shaded by trees).					
Trees conflict with the activities I enjoy doing in my front yard .					
My ideal back yard would have at least one tree.					
I prefer that the majority of my back yard have sun exposure (i.e. not shaded by trees).					
Trees conflict with the activities I enjoy doing in my back yard .					

The following questions ask about your **front yard**. The front yard is defined as the area between your house and the street in front of your house, and may include public street trees.

3. Please indicate if any of the following are located in your front yard? Check all that apply.

- There is no front yard → **Skip to Question 12**
- Grass
- Flower beds or other ornamental plants
- Shrubs
- Vegetable or fruit plants (not including fruit trees)

4. How many trees have been removed from your front yard in the last year (including dead or dying ones)?

5. How many trees are currently in your front yard?

_____ **If 0 → Skip to Question 12**

6. How many of these trees were planted in the last year?

7. How many of these trees were planted since you moved into your house?

8. Please check all the ways you acquired the trees planted in your front yard?

- No tree has been planted since I/we have lived here
- The municipality planted or provided the tree(s)
- A non-government organization planted or provided the tree(s)
- The tree(s) was bought at a nursery or plant store
- The tree(s) was bought at a store that was not a nursery or plant store
- The tree(s) was a gift
- Other: _____

9. Are any of the trees in your front yard located on city property (i.e. the responsibility of the city)?

- No
- Yes
- Do not know

10. If known, please list the type(s) (species) of tree(s) found in your front yard?

11. Would you like to have more trees in your front yard?

- No
- Yes
- Do not know

The following questions ask about your **back and side yards**. The back yard is defined as the area between the back of your house and the back property line. Please also include trees on your property located **along the sides of your house**.

12. Please indicate if any of the following are located in your back and side yards? Check all that apply.

- There is no back or side yards → **Skip to Question 20**
- Grass
- Flower beds or other ornamental plants
- Shrubs
- Vegetable or fruit plants (not including fruit trees)

13. How many trees have been removed from your back and side yards in the last year (including dead or dying ones)?

14. How many trees are currently in your back and side yards?

_____ **If 0 → Skip to Question 20**

15. How many of these trees were planted in the last year?

16. How many of these trees were planted since you moved into your house?

17. Please check all the ways you acquired the trees planted in your back and side yards?

- No tree has been planted since I/we have lived here
- The municipality planted or provided the tree(s)
- A non-government organization planted or provided the tree(s)
- The tree(s) was bought at a nursery or plant store
- The tree(s) was bought at a store that was not a nursery or plant store
- The tree(s) was a gift
- Other: _____

18. If known, please list the type(s) (species) of tree(s) found in your back and side yard?

19. Would you like to have more trees in your back or side yards?

- No
- Yes
- Do not know

The following questions ask about **other types of plants you are growing**.

20. Is anyone in your household growing (or will grow) any fruit or vegetable plants this year?

- No → **Skip to Question 26**
- Yes

21. Please list the types of fruits or vegetables being grown (or will be grown this year) (i.e tomatoes, plums, etc):

22. Please check all locations where the fruit or vegetable plants are (or will be) growing this year:

- In containers outside my house
- Planted directly in the ground at my house
- Planted at a community garden
- Other: _____

23. How many years have you (or someone in your household) grown fruit and/or vegetables? _____

24. How has the area devoted to fruit and vegetable plants changed in the last five years (or since you started growing them at your current house, if you have lived there less than five years).

- Increased
- Stayed the same
- Decreased

25. Ideally, would you like to grow more fruit or vegetable plants at your house?

- No
- Yes
- Do not know

26. Please indicate how strongly you agree or disagree with the following statements about your municipality.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
My municipality should increase the number of street trees in my neighbourhood.					
My municipality should encourage residents to plant more trees on their own properties, by providing information about planting and care.					
My municipality should encourage residents to plant more trees on their own properties, by providing trees at a reduced cost.					
My municipality should protect trees by not allowing people to cut down trees on their properties.					
My municipality should encourage people to grow fruits and vegetables in their yards, by providing information about planting and care.					
My municipality should provide community garden space for all interested residents to grow fruits and vegetables.					

Please answer the following questions about **you and your household**.

27. What is your age? _____

28. What is your gender? _____

29. What is the highest education level you have attained?

- No certificate, diploma or degree
- High school certificate or equivalent
- Apprenticeship, College, CEGEP or other non-university certificate or diploma
- University Bachelors degree
- Masters or Doctorate degree

30. Please indicate your ethnic origin(s). Check all that apply.

- British Isles
- European
- South Asian
- East & Southeast Asian
- Caribbean
- Other: _____

31. How long have you lived at your current house?

- 1 year or less
- 2 to 4 years
- 5 to 9 years
- 10 to 14 years
- 15 to 19 years
- 20 or more years

32. Where did you live prior to moving to your current house?

Please give the city/town and province. Provide the country if it is not Canada.

33. Do you or someone in your household own your house?

- No
- Yes

34. Please indicate your type of house.

- Detached
- Semi-detached
- Townhouse
- Other: _____

35. Please indicate who is responsible for maintaining your yard.

- You or someone else in your household
- Landlord
- Condo or homeowners association
- Other: _____

36. What is your annual household income, in dollars?

- 0 to 29,000
- 30,000 to 59,000
- 60,000 to 89,000
- 90,000 to 119,000
- 120,000 to 149,000
- 150,000 to 179,000
- Over 180,000

37. How many adults 65 and over are in your household?

- 0
- 1
- 2
- 3
- 4 or more

38. How many adults 18 to 64 are in your household?

- 0
- 1
- 2
- 3
- 4 or more

39. How many children (< 18 years) are in your household?

- 0
- 1
- 2
- 3
- 4 or more

Thank you for completing the survey. Please return the survey in the pre-stamped envelope.

If you are **willing to participate in a follow-up interview** (to be conducted in your yard), please provide your name and the best way to contact you. The interview will take 30 to 60 minutes, focusing on questions about the landscaping choices you have made or acquired when you moved to your home.

If you would like a summary of the study sent to you at the end of the project, please provide your mailing address.
