

Willing Partners? Residential Support for Municipal Urban Forestry Policies

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Abstract

Cities across North America are adopting ambitious goals to increase their urban forest. As existing trees and new planting opportunities are often located on private property, residents' support and participation is needed in order to meet these goals. However, little research has examined support for municipal urban forestry efforts, including policies specifically targeting residential areas. The objectives of this research are to (1) examine residents' attitudes towards trees; (2) assess levels of support for urban forest policies targeting residential areas; and (3) determine if there are specific household characteristics associated with different levels of policy support. The objectives were addressed through a statistical analysis of a survey and a qualitative examination of follow-up interviews with residents in four neighborhoods located in Mississauga (Ontario, Canada). The neighborhoods vary in their socioeconomic characteristics, age of development, and urban forest conditions. Our results indicate that nearly all residents appreciate trees where they live, but lower levels of support exist for municipal policies encouraging planting and restricting removal of trees. Several household characteristics are significantly related to level of policy support, with shorter residencies, children present in the household, higher property-level tree density and those who recently planted a tree more supportive of the policies. Older residents were significantly less likely to support the policies, and often spoke about required maintenance being a deterrent to having more trees. Interviews also highlighted residents' concerns about living among tall trees. The results suggest that many residents would be willing partners in urban forestry efforts. However, to increase support and participation rates, different types of trees should be part of any information or planting program to meet the varying needs of households.

Keywords: Urban Trees; Residents; Municipal Policy; Attitudes

Introduction

The well documented environmental, financial, physiological, and social benefits provided by urban trees have increased calls to protect and grow the urban forest. Thus, we see a growing number of municipalities engaged in urban forestry activity, often identifying ambitious canopy cover targets or tree planting goals (Braverman, 2008; Princetly et al., in press). As the majority of urban trees are located on residential property (McPherson, 1998), successful efforts to grow the urban forest will need to involve residents through a combination of programs encouraging planting and care and/or regulations limiting removal of trees.

An underlying assumption made by many practitioners and researchers is that residents' desire trees (Braverman, 2008), and that a sparse urban forest indicates a lack of resources (time, money, political power) needed to produce high canopy cover and/or a lack of knowledge regarding the benefits of trees (Heynen, 2006). However, not all urban residents want trees in their yard or neighborhood (Fraser and Kenney, 2000; Schroeder et al., 2006; Kirkpatrick, 2012). Additionally, little is known about the level of support for municipal urban forestry policy targeting residential areas, even though residents' active support is often required for the policy to be successful. Thus, a better understanding of residents' preferences for neighborhood and property-level trees, as well as their support for municipal urban forestry policy, is needed to develop successful urban forestry programs.

The objectives of this research are to (1) examine residents' attitudes towards trees in their neighborhood and on their property; (2) assess levels of support for municipal urban forestry policies directly targeting residential areas; and (3) determine if there are common characteristics among residents who support such policies, as compared to those who do not. The study area is four neighborhoods within the City of Mississauga (Ontario, Canada)

representing a range of socioeconomic characteristics, building ages, and tree cover conditions. The range of neighborhoods allows for exploration of satisfaction levels with current urban forest conditions and support for municipal policies by residents living in different environments.

Residents, Trees and Effective Municipal Policy

Over the last decade numerous municipalities across North America have invested in planting trees to reach specific targets, with New York City and Los Angeles' Million Trees programs representing two prominent initiatives. These and many other municipalities' urban forestry programs rely on resident participation. As the majority of urban trees (McPherson, 1998) and many future planting locations tend to fall on private property (Troy et al., 2007), residents are not only needed to help plant trees on public land but also to plant and maintain trees on their own properties if ambitious planting or canopy cover targets will be reached.

Several studies examining residents' attitudes towards the urban forest found most people are overwhelmingly positive about trees (Sommer et al., 1990; Lohr et al., 2004; Zhang and Zheng, 2011), suggesting they will be supportive partners in urban forestry efforts. For example, in a telephone survey of residents in US metropolitan areas, all participants indicated positive attitudes towards urban trees. Slightly higher support was seen among middle-age women, those with university-level education, people from high income households, respondents who identified as white, and those who grew up in a rural area (Lohr et al., 2004).

However, while many people love the idea of urban trees, they are not always in love with the reality of them (Braverman, 2008). Schroeder et al. (2006) discuss a number of studies in the UK documenting an 'I love trees *but...*' phenomena. A study in Pennsylvania identified a

significantly worse attitude towards street trees by residents who had one in front of their house, as oppose to those without (Gorman, 2004). A few studies have also suggested that different ethnic and socioeconomic groups have divergent ideas about desired canopy level and species type in their yards and neighborhoods (Fraser and Kenney, 2000; Grove et al., 2006).

Braverman (2008) further argues that many people overemphasize their support for urban trees based on cultivated stigmas associated with negative attitudes towards trees. Thus, at least some residents will likely not be reliable partners in urban forestry activities.

While municipal planting initiatives clearly hold the potential to increase the number of trees present (Pincetly et al., in press), recent research has begun to examine who actually participates and benefits from municipal urban forest activities aimed at residents (Straka et al., 2005; Fleming et al., 2006; Wall et al., 2006). Fleming et al. (2006) found those most likely to participate in general urban forestry activities were middle age (30 to 49), with higher education and income-levels. In terms of municipal planting programs focused on residential property, Perkins et al. (2004) determined that participants in Milwaukee's adopt-a-tree program were most likely to be homeowners, who are disproportionately high income and white.

In addition to municipal urban forestry program participation rates, residents' characteristics are also related to the actual distribution of the urban forest, with neighborhoods occupied by higher percentages of owner-occupied homes, residents with university degrees, and higher incomes typically associated with more canopy cover (Landry and Chakraborty, 2009). Kirkpatrick et al. (2012) found that income and education were also positively related to tree planting behaviour outside municipal planting projects. The findings that those with higher income-levels are most likely to participate in programs that provide trees at a reduced cost to residents, but are also already more likely to live in neighborhoods with higher canopy cover and

be more likely to plant trees on their own, raises questions about the ability of such programs to engage the wide variety of residents needed to significantly grow the urban forest. In other words, are municipal planting programs only attracting residents who would be planting and caring for trees regardless of municipal action?

Beyond encouraging residents to plant trees, municipalities are increasingly restricting residents' removal of trees on their property. While many tree removal regulations are relatively new, initial evidence suggests they are an effective ways to increase and protect canopy cover. For example, in the Tampa area, Landry and Pu's (2010) examination of neighboring municipalities with and without a tree removal ordinance found that the adoption of the policy had some positive impact on canopy cover extent. In Austin (Texas) Sung (2012) found higher average tree height, based on LiDAR data, in a neighborhood with a tree removal permit program— where residents need to apply for a permit in order to remove trees on their property— than a comparative neighborhood without such a program. While most private tree removal policies have a legislative basis and monetary penalties, most municipalities do not actively monitor for violators (Conway and Urbani, 2007). Thus, tree removal policies, like many planting programs, require resident buy-in in order to succeed. While there is a growing number of municipalities in North America with policies enabling and restricting residents' tree-related activities, a better understanding of residents' level of support for such policies is needed to assess who will be good partners, and identify ways to broaden participation to ensure success.

Methods

Study Area

The four study neighborhoods are in Mississauga (Ontario, Canada), a city of 713,443 people (Statistics Canada, 2011). Mississauga is located within the Greater Toronto Area, on the shores of Lake Ontario (Figure 1). It contains a mix of residential neighborhoods (ranging from large apartment towers to fully detached homes), shopping complexes, employment centers, industrial areas, and historic town centers.

Administered by the Parks and Forestry division, the City of Mississauga has urban forestry policies and programs in place to plant and maintain street trees in residential neighborhoods and provides general information to residents through its website and brochures. The Toronto and Region Conservation Authority has recently produced an urban forest strategic plan for the Region of Peel, the upper-tier municipality within which Mississauga is located. Although the responsibility for managing the urban forest primarily lies with the lower-tier municipalities (i.e. Mississauga), the document outlines goals and objectives related to growing the urban forest. A central theme of the plan is the necessity of residents' support and participation (TRCA 2012).

In term of specific policies and programs, Mississauga does not have detailed information available for residents regarding tree planting or care, nor does it offer trees at a reduced cost (or partner with an organization that does). At the time of the data collection (Summer 2011), Mississauga had a tree removal by-law that required property owners to apply for a permit if more than five trees (with DBH's greater than 15 cm) were going to be removed from a given property within a one year period; a replacement tree also needed to be planted for each tree

removed if the permit was granted. In 2011, a more stringent by-law had been proposed and was being discussed through a series of public meetings. The proposed additions require a permit to remove any tree over 30 cm DBH, even if only one tree in total is removed, and for every healthy tree over 30 cm removed two trees must be planted as replacements. The proposed changes will likely be voted on by city council in the Fall of 2012.

In this study, four neighborhoods in Mississauga were included to capture a diversity of forest, built, and socioeconomic conditions. Each neighborhood is defined by two Statistics Canada census dissemination areas, representing between 250 and 600 households per neighborhood. Potential neighborhoods were identified as those where at least 80% of households live in on-the-ground homes (i.e. fully-detached, semi-detached, and townhomes), making it likely that they have a yard where trees could be located. From this initial sample, two neighborhoods were selected that primarily contained houses built in the 1940s through 1960s, while two others were identified as dominated by houses build in the last 30 years (Table 1). Within each age pair, one neighborhood represents approximately the 80th percentile and one represents approximately the 20th percentile of average household income for neighborhoods dominated by single family homes in the region.

The first neighborhood is Mineola, classified as an older, higher-income neighborhood. It contains a large number of mature trees and has properties approximately double the size of the other neighborhoods in the study. Lakeview is the other older neighborhood, consisting of relatively low income households. It also has a number of older trees, with overall density similar to Mineola. Meadowvale is the new, higher-income neighborhood, with many young families present. The neighborhood actually consists of two areas, separated by conservation land and an older settlement location in the center. The majority of houses in the two main

sections of the neighborhood have small trees, mostly limited to the front of the house and property edges. The last neighborhood, Rathwood, has newer homes and households with relatively low income. It differs from the other neighborhoods in three ways: Rathwood has the greatest number of townhomes; many of the homes are part of a condo association, with 'street trees' the responsibility of the association, not the city; and it is the only neighborhood where less than 50% of the residents are home-owners.

Residents Survey

The primary data used in this study were derived from a mail-based survey of all 1,394 households living in on-the-ground homes in the four study neighborhoods, conducted during the summer of 2011. A multi-contact approach was used to increase participation rates (Dillman, 2007), with up to four contacts occurring. Each survey was given a code to keep track of the responses and match completed surveys to specific properties.

Survey questions asked residents about their attitudes towards residential trees, support for common municipal urban forestry policies, details about the number and location of trees on their property, and some basic household demographic information. Attitude and level of support were assessed using a 5-point Likert scale. Attitudes towards tree presence focused on level of support for trees in residents' ideal neighborhood and property, as well as potential desire for more trees in their actual neighborhood. Respondents were also asked to indicate their level of agreement with statements that highlighted potential benefits (i.e. trees attract wildlife I like to see in my yard) and costs (i.e. I do not like trees in my yard because their roots cause problems) associated with trees.

Residents were next asked to identify their level of agreement with four hypothetical municipal policies. The first policy focused on having the municipality plant additional street trees in the resident's neighborhood (policy 1). The second two policies addressed ways the municipality could help property-owners plant more trees: by providing information about planting and care (policy 2) and by providing trees at a reduced cost to residents (policy 3). The final policy was a simplified version of the proposed tree removal by-law (policy 4); it differed from the final proposal by not exempting single, smaller trees being removed (i.e. those 15 to 30 cm DBH) nor specifying a 2:1 replacement for larger trees removed.

Demographic questions focused on respondents' education level and ethnic origins, length of residency in current house, homeownership status, household income, and age of household members. These characteristics were chosen because previous research suggests they are related to neighborhood tree presence, willingness to participate in urban forestry programs, and/or level of activity related to general landscaping. The percent of residents who own their homes, average household income and percent of university graduates at the neighborhood-level are often correlated with percent canopy cover (Landry and Chakraborty, 2009), while income and education are both positively related to participation in urban forestry programs and the amount of inputs (water, fertilizer) used on residential yards (Zhou et al., 2009). Previous research has suggested that length of residency in one's home and working age people are the most active in general landscaping activities (Loram et al., 2011). We wanted to see if presence of children or seniors in the household altered attitudes towards trees, while others have found differences in tree cover varies by ethnic composition of neighborhoods (Henyen et al., 2006).

Survey respondents were also asked to identify the number of trees planted in their yard during the last year, as well as the current number of trees in the yard and the city owned

‘boulevard’ located in front of most houses. Based on responses to the number of trees present, tree density was calculated for each respondent’s property. In addition to the survey data, percent tree canopy cover at the property-level was identified using classified Ikonos imagery (Shakeel, 2012). Available planting space was also calculated, subtracting building footprints (houses, garages and other structures) from property boundaries to determine the area of each property that was not covered by a building. These latter two variables differ from the property-level tree density variable, as tree density includes streets trees located in front of the house, while canopy cover and available planting space exclude the city owned ‘boulevard’ located between the private property boundary and street.

Analysis

Simple summaries of survey responses were calculated to determine level of agreement with the statements related to tree presence, benefits and costs, and municipal policies. Based on initial examination of these summaries, it was evident that responses to the statements regarding wanting more trees in one’s neighborhood and the four municipal policies were most varied. Thus, statistical analyses were conducted to explore household characteristics associated with those more or less likely to indicate agreement with these statements.

First, cross-tabulations were calculated to compare differences in level of agreement with the five statements (four policies plus desire for more trees) and categorical variables reflecting property and household-level characteristics (Table 2). The five point scale used to gauge level of agreement was collapsed into three categories (agree, neutral and disagree) for this and all subsequent analyses. Residency length, income-level and educational attainment were initially

collected as multi-category variables. However, after initial analysis they were reduced to binary variables based on natural breakpoints in their relationship to level of agreement with the examined statements. Cramer's V test statistic was used to calculate level of significance in all cross-tabulations because this statistic is appropriate when comparing relations where one or more variable has more than two categories.

Second, a non-parametric ANOVA was used to compare level of support with differences in the three continuous variables: tree density, canopy cover, and available planting space. The Kruskal-Wallis test statistic was used because it is appropriate when samples are varied in size and there are more than two groups included in the comparison.

Resident Interviews

Residents who participated in the survey were asked to volunteer for a follow-up interview. These interviews occurred in the residents' yard, taking approximately one hour to complete. A semi-structured interview approach was used, with questions focused on general tree care activities, the reasons and process for selecting recently planted and/or removed trees, the likelihood of future modification of trees on the property, conflicts involving trees, and interactions with the city regarding trees. Through these discussions the city's actions and specific by-laws were often mentioned. In total, 43 interviews were conducted. Each interview was then transcribed and coded.

Results and Discussion

Residents' Attitudes towards Trees and Policy

The overall response rate to the survey was 42%, with the survey participants generally reflective of the broader population in each neighborhood (Table 3). The number of respondents who agreed or strongly agreed to statements related to wanting trees where they live was nearly always above 80%, with only small variations between neighborhoods (Table 4). These results are in line with previous findings (Zhang and Zheng, 2011). The exception was for the statement 'I would like my neighborhood to have more trees,' which had an overall agreement level of 52%.

In terms of benefits and costs, the number of respondents who indicated agreement with statements highlighting potential benefits of trees was generally above 80%, and the level of agreement for the statements highlighting cost was below 15% (Table 5). The exception here was in response to the statement 'trees attract wildlife I like to see in my yard', where respondents in all but Lakeview indicated agreement less than 80% of the time. Across the four neighborhoods, statements focused on non-specific aspects of attractiveness and environmental benefit had the highest levels of agreement, while root problems was the potential cost with the greatest agreement.

For the four policy statements, the level of agreement indicated by respondents was much lower than for general attitudes towards trees (Table 6). The highest number of respondents supported policy statements 2 and 3, which focused on the municipality providing information or low cost planting material to residents as a way to encourage planting on private property. The lowest level of support was for policy 4, which restricts tree removal on private property.

It was somewhat surprising that on average 53% of survey respondents indicated

agreement with each municipal policy even though three of those policies were simply supporting municipal or voluntary planting. This may be because many residents feel that there are already sufficient trees in their neighborhood. The interviews also indicated that a number of residents felt tree planting and care should be the responsibility of the homeowner, not the municipality. In response to the question of whether the municipality should plant more street trees, one Lakeview resident said: 'I think this is enough ... yeah because anybody that wants to have trees I mean, you know they put in their own.' Another resident noted concerns about costs for the city: 'I'd like to live in a neighborhood where the city plants trees in the boulevard or on the side of the road. On the other hand it's just going to become an ongoing expense to maintain them. So, I'd prefer to see the homeowners take the responsibility of planting.' Finally, others specifically stated that they did not believe additional information would be useful: 'for our own stuff I don't think it [municipally-provided information] would really make any different to us... But I guess we come from a background where we've been growing stuff for years,' said one resident of Mineola.

Support for the policy restricting residents' ability to remove trees was lowest, suggesting that residents want to govern tree presence on their own property. These results were confirmed in the interviews, with several interviewees specifically stating that they didn't want to lose control over the trees on their property: 'If someone told me, "No, you have to plant this on your property" I don't think I would appreciate it,' said one Rathwood homeowner. Interviewees also often indicated a desire to be able to remove trees— and many already had— because of concerns over safety or a dislike of the specific tree species or location on the property: 'but [I] generally like trees. Mean don't get me wrong, I like these trees, these maples. But I just wish they weren't on my property... I wish it was a tree that didn't destroy the grass,' said one Meadowvale

resident. Finally, a few residents did not like the costs associated with obtaining a permit to remove trees. One woman in Lakeview stated: ‘It's just a little tax grab, where's it go? What's the use for it, you know?’

Differences in Support among Households

The cross-tabulation analysis identified highly significant differences in agreement levels between neighborhoods for the statement ‘I would like my current neighborhood to have more trees’ (Table 7). Not surprisingly, residents in the newer neighborhoods, which have sparser canopy cover, were more likely to agree that their neighborhood should have more trees; while tree densities are actually higher in the newer neighborhoods, the canopy cover is lower due to the size of trees (Table 1). Differences were also highly significant across neighborhoods for the three policies supporting tree planting (policies 1, 2, and 3) and significant for the policy limiting removal (policy 4), but the patterns causing these differences vary by policy (Table 7). The two newer neighborhoods (Meadowvale and Rathwood) have higher levels of support for more municipal planting (Policy 1), while the higher income neighborhoods (Mineola and Meadowvale) have higher levels of support for policy 2. Meadowvale also has the highest level of support for policy 3, and Rathwood respondents indicated the highest level of agreement with policy 4.

As expected, the desire for more mature trees was a very common theme in the interviews with Meadowvale residents: ‘And I would love to have more shade. I just think bigger trees make the neighborhoods look a lot nicer.’ Another Meadowvale resident said: ‘[I want] more trees, more mature trees. Cause we've been here - this neighborhood is about 11 years old. The trees, they're not even close to being mature. They still look very young.’

On the other hand, the finding that most residents in the older neighborhoods of Lakeview and Mineola did not desire more neighborhood trees was also supported by the interviews: ‘We have no room for more trees as far as I’m concerned’ said one Lakeview resident. While not apparent in the survey, a related theme among interviewees from the older neighborhoods was a concern about the size of existing trees. This was often expressed as the risk of living among very tall trees: ‘They’re so big. They’re kinda scary in a storm sometimes. You know, because you see this one here and it wavers back forth. And the people in this house next door have had a lot of limbs from the great big trees outside their house come down in their driveway and on top of their cars. So, that’s not good,’ stated one Mineola resident. Another interviewee said: ‘Because these are huge trees they will grow and um, that is a problem.’ During a discussion of trees to remove, one resident stated: ‘I am a little concerned at the height of it. And uh... aside from getting all the leaves into the eaves, I am worried about a bad storm coming and maybe the tree falling on the house.’

In addition to significant neighborhood differences, the desire for more trees in respondents’ neighborhoods varied based on length of residency, presence of children and/or seniors in the household and the recent planting of a tree (Table 7). Eight of the categorical variables were also significantly related to at least one policy (Table 7). Respondents who completed university, have lived fewer years in their current house, and were part of households with higher incomes, children under 18, and had planted a tree in the last year were generally more likely to support the three planting policies (policy 1, 2, and 3). Households with at least one member over 65 were significantly less likely to support the same policies. For policy 4 (tree removal by-law), respondents living less than 15 years in their house and renters were

significantly more supportive, while income and age composition were not related to level of agreement. None of the ethnic variables were significantly related to any of the statements.

As we anticipated, age of household members is significantly related to desire for more neighborhood trees and the three planting policies. The difference in landscaping goals and policy support between households with children and seniors is likely due to the different stages of the household. Higher agreement for households with children may be signalling their desire for shade in outdoor play spaces and/or thoughts about how their landscape could change and grow with their family. As one Meadowvale resident stated: ‘They [the city] could have done a better job [planting and encouraging residents to plant]. You know, everyone would've had trees ... There would have been shade when kids play on the driveway and play chalk. It would have been nicer.’

Alternatively, seniors may not be as interested in long-term investments, like trees. Several older interviewees expressed active efforts to create lower maintenance landscapes, including reducing the need to rake leaves, as the reason not to have more trees: ‘As I get older I kind of get shrubs and plants and everything that are as maintenance free as possible. And it's not being lazy, it's just you know, as you get older you just don't have the same energy to work on stuff,’ said an older Lakeview resident.

Similar to other studies examining actual tree presence and planting participation, income is positively related to level of agreement with the residential planting policies, suggesting that households with higher income— who are more likely to already have the resources (money, knowledge, etc.) to consider planting more trees— would utilize municipal support if provided.

While the survey indicates lower income households are less supportive of the municipal policy, the cost of planting was identified as a barrier in several interviews in the lower income

neighborhoods. Specifically, some interviewees indicated a desire to plant more trees but said that money was stopping them, or at least impacting their choice of what to plant. One Lakeview residents said: ‘Economy plays a big part. Because it if it on sale or if there's– you know, I got my Maple at a church sale for 10 dollars.’ In response to a question, asking what it would take to plant the trees the interviewee indicated he wanted, one Rathwood homeowner simply said: ‘Yeah, money.’ Alternatively, lack of money was also often a reason people had not removed trees: ‘I'd have to hire a tree removal service which would involve a lot of money. So the finances are stopping it from being done,’ said one Lakeview resident.

This idea that residents who are already planting and caring for trees are more likely to agree with municipal planting programs is clearly supported by the highly significant positive relationship between recently planting a tree, desiring more trees, and support for all planting policies. The continuous tree condition variables provide further evidence that residents who want more trees already have higher densities and canopy cover (Table 8). Those with higher tree densities on their property were also more likely to indicate agreement, and in some cases neutral support, for all four policies, while percent canopy cover was significantly related to only one of the policies (providing information to residents; Table 8). The positive significant relationship with tree density and lack of consistent relationship with canopy cover may signal that residents who have many trees, regardless of size, are those most likely to be interested in supporting and growing the urban forest. Residents who desire an abundant urban forest can quickly plant more trees; it is much harder to quickly increase the canopy extent, minimizing differences in canopy cover between those who do and do not support urban forestry efforts.

The amount of physical space does have a relationship to desiring more neighborhoods trees, but is only related to one policy (more municipal planting). Although in both cases,

residents with less planting space were both more and less likely to support the statement, while those with larger available planting spaces were more neutral. This may be because residents of larger properties were already more likely to have planted the trees they desire in their yard. A lack of planting space was often the primary reason residents stated for not wanting more trees: ‘But the problem is I don't, we don't have a big yard. So I don't exactly want to plant something that will be humungous.’ A second interviewee said: ‘Plus I don't have a whole lot of lawn to work with. I didn't want to put, like, a tree right in the middle, or anything.’ Alternatively, those with small yards may see municipal street tree planting as a way to increase neighborhood trees to levels that cannot be achieved by private planting on small yards.

Conclusions

This study examined residents’ attitudes towards trees and municipal urban forestry policies across four neighborhoods that vary in their socioeconomic characteristics, age of development, and tree conditions. Overwhelmingly, respondents indicated a desire to have trees in and around their property, but positive attitudes towards trees did not necessarily translate into support for more trees in ones’ neighborhood or municipal policy. These results are in line with previous findings that people love urban trees in general, but often have more complicated feelings towards actual trees on their property and in their neighborhood (Schroeder et al. 2006).

Participants who lived in the older areas with relatively low tree densities but a high proportion of large trees (Minoela and Lakeview) were less likely to desire more neighborhood trees or support municipal planting policy targeting residents, while residents in the newer neighborhoods that are dominated by smaller trees were more supportive. Thus, in this study

residents in areas with lower canopy cover do not appear to be less interested in urban forestry efforts than those living in higher canopy neighborhoods, in fact the opposite seems to be the case. On the other hand, the participants who were already planting trees and have higher tree densities on their property are significantly more supportive of the policies, suggesting that there is a risk that adoption of policies would not necessarily attract new participants.

The results do, however, point to some strategies that could be used to broaden participation. Households with seniors were less likely to support municipal policies, highlighting concerns about ongoing maintenance, while households with children were more likely to support the policies, often framing their support as a desire for more shade. These results indicate the need to have a variety of tree species and information available to meet the different needs and expectations of residents, including trees that require little ongoing maintenance (i.e. conifers that minimize leaf clean up). The results also suggest that the municipality should target new residents for planting programs. Longer-term residents' generally have greater satisfaction with current conditions, likely reflecting a familiarity with those conditions (Nausser et al., 2009), so may be more resistant to planting trees.

The low support for more trees and urban forestry policy in the older neighborhoods was at least partially a result of concerns about existing mature trees. The specific issue of tall trees is worth exploring further, as many urban forestry programs focus on maximizing or increasing canopy cover through large shade trees. While an emphasis on large trees makes sense within the context of managing an urban forest to, in part, maximize ecological services, it may not be aligned with the ways residents manage their yard; some residents may be more supportive of higher densities of trees if they are smaller in stature. For instance, Mineola has the highest canopy cover but relatively low tree densities due to the size of most trees, indicating that canopy

cover could significantly decline when the large trees die as few trees exist to replace them. A strategy of promoting small to moderate trees in Mineola could be a way to overcome resistance to having more large trees, while ensuring replacement does occur.

Similar to previous studies of planting programs (Perkins et al., 2004), lower-income residents were less supportive of policies supporting planting by residents. This was somewhat surprising as several interviewees in our lower income neighborhoods indicated that costs played a role in planting decisions. It may be that a higher income is needed for households to even begin considering more trees and/or the costs of planting is only one barrier to lower income households planting trees. Another possibility is that respondents may have assumed investment in urban forestry policies would mean fewer resources for other municipal activities, and lower income residents may put more of a priority on alternative municipal services.

Rathwood respondents' moderate support for the planting policies and relatively high support for a tree removal policy may signal an additional challenge faced by municipalities relying on resident initiated participation in low income neighborhoods: lower income neighborhoods often have a higher percentage of renters who typically lack the authority to plant (or remove) trees where they live. Many renters in Rathwood likely do not have the authority to plant more trees, but still appreciated trees and do not want to see their landlord remove them. Approaches targeting landlords would help overcome this barrier, broaden participation, and increase canopy cover in neighborhoods typically containing a relatively sparse urban forest.

There are two limitations of the study that should be noted. First, the older neighborhoods tend to have more mature trees, more households with seniors, and fewer households with children. As a result, it is unclear the extent to which the households age-

structure relationship is a reflection of different households' desires or their reaction to living with differences tree conditions. Additional research should work to disentangle these factors. Second, tree density is based on self-reported tree counts in residents' yards. There is some evidence from the interviews that residents used varying definitions of what a tree is, with trees that are part of 'living fences' along property edges not always counted. It may be that residents experiencing different tree characteristics in their neighborhood or holding divergent attitudes towards trees counted trees in different ways, with the strong tree density- policy support relationship partially influenced by varied approaches to defining trees. Future research could examine different definitions of trees held by residents to better understand if there is a relationship between attitudes towards trees, urban forestry support more generally, and understandings of what a tree is.

Overall, we found positive attitudes towards trees but lower support for increasing trees in residents' neighborhoods and municipal policy focused on residential areas. The survey responses and interviews indicate residents in our lower canopy neighborhoods are equally or more supportive of urban forestry policy targeting residential areas. Those already planting and having more trees on their property are also more supportive. The household age-structure, length of residency, and in some cases, income and education, were also significantly related to level of support. A broader range of residents may become active partners in urban forestry initiatives if a variety of tree species are included under policies promoting planting to meet the different needs of residents. The low level of support for a tree removal policy, indicates the municipalities need to inform residents of such by-laws and the penalties for violating, if only to help ensure compliance. Future work should focus on better understanding lower income

households' relatively low support for planting programs, and identify approaches to overcome barriers to participation.

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Table 1

Basic characteristics of the four neighborhoods in the study.

Neighborhood	Households Surveyed (response rate)	Average Property-level Canopy Cover ^a	Average Property-level Tree Density (/1000 m ²) ^a	Census Data (2006)			
				Houses Built pre-1970 (%)	Household Income (CAD)	University Degree ^b (%)	Home Ownership (%)
Mineola	252 (50%)	39%	15	80	138,103	28	92
Lakeview	255 (50%)	26%	13	87	66,447	13	95
Meadowvale	582 (37%)	21%	19	5	152,765	40	90
Rathwood	305 (38%)	24%	28	11	63,520	16	44

a. Canopy cover and tree density values only include properties that had responses to the survey. Tree density values are based on available planting space (total property size minus building footprints).

b. University degree includes only those whose highest education-level is completion of university (i.e. those with Masters and Doctoral degrees are excluded).

Table 2

Household and property-level characteristics included in the analysis.

Variable	Description	Percent Yes or Median Value
Neighborhood	Categorical: Mineola, Lakeview, Meadowvale, Rathwood	See Table 1
Ownership	Categorical: yes/no	87%
Residency length	Categorical: Number of years in current house, 14 or fewer/ 15 or more	10-14 yrs
Income	Categorical: 89,000 and below, 90,000 and above, in CAD	60,000-89,000
Education: University	Categorical: completed university, yes/no	39%
Under 18 present	Categorical: at least one household member under 18, yes/no	45%
Over 65 present	Categorical: at least one household member 65 or older, yes/no	26%
British	Categorical: yes/no	27%
European	Categorical: yes/no	39%
South Asian	Categorical: yes/no	7%
East and Southeast Asian	Categorical: yes/no	11%
Planted tree in last year	Categorical: yes/no	28%
Tree density	Continuous: number of trees on property, per 1,000 m ²	19
Tree canopy cover	Continuous: percent of property under tree canopy	27%
Available planting space	Continuous: property size minus building footprints (m ²)	478

Table 3

A comparison between the census data and characteristics of the survey participants.

Neighborhood	Census Data (2006)			Residents Survey (2011)		
	Household Income (CAD)	University Degree ^a (%)	Home Ownership (%)	Household Income (CAD)	University Degree ^a (%)	Home Ownership (%)
Mineola	138,103	28	92	90,000-119,000	30	92
Lakeview	66,447	13	95	60,000-89,000	14	95
Meadowvale	152,765	40	90	90,000-119,000	40	94
Rathwood	63,520	16	44	30,000-59,000	16	59

a. University degree includes on those whose highest education-level is completion of university (i.e. those with Masters and Doctoral degrees are excluded).

Table 4

Percentage of respondents who indicated agreement with statements related to presence of trees.

	Mineola	Lakeview	Meadowvale	Rathwood
Ideally, I would like to live in a neighborhood with large trees.	96	85	89	83
Ideally, I would like live in a neighborhood with a tree in front of most houses.	89	82	91	85
Ideally, I would like to see at least one tree when I look out my window.	96	94	97	96
Having at least one tree at on my property is important to me	93	92	92	89
My ideal front yard would have at least one tree (including publicly owned street trees)	87	87	92	83
My ideal back yard would have at least one tree	93	88	86	79
I would like my current neighborhood to have more trees	39	40	66	55

Table 5

Percent of respondents who indicated agreement with statements about possible benefits and costs of trees.

	Mineola	Lakeview	Meadowvale	Rathwood
Neighborhoods with trees are more attractive than those without trees.	94	98	97	93
Trees provide environmental benefits that I want in my neighborhood.	98	98	98	95
I like the cooling benefits trees provide by shading my house in the summer.	86	92	83	87
Trees attract wildlife I like to see in my yard.	72	84	62	63
I do not want trees in my neighborhood because they create a physical hazard (i.e. falling branches).	9	9	8	11
Trees make a neighborhood look less tidy.	7	3	7	5
I do not want trees in my neighborhood because they make the neighborhood less safe (i.e. block views, create hiding places).	9	7	8	8
I do not want trees in my neighborhood because they contribute to my allergies.	3	1	2	4
Trees require more work than they are worth.	7	3	4	10
I do not like trees in my yard because their roots cause problems (i.e. interfere with pipes, crack sidewalks)	14	4	12	15

Table 6

The percent of respondents who indicated agreement with the policy statements.

Policy	Mineola	Lakeview	Meadowvale	Rathwood
1: More municipal planting	33	36	58	47
2: Information for residents	65	46	73	57
3: Low cost trees for residents	63	50	75	61
4: Tree removal by-law	43	33	43	51

Table 7

Cross tabulation results for level of support with statements. Only those variables significant with at least one policy included. Cells values included if p-value < 0.05, bolded if p-value < 0.01.

Variable	Would like neighborhood to have more trees	Policy 1: More municipal planting	Policy 2: Information for residents	Policy 3: Low cost trees for residents	Policy 4: Tree removal by-law
Neighborhood	Meadowvale, Rathwood = higher agreement	Meadowvale, Rathwood = higher agreement	Meadowvale, Mineola = higher agreement	Meadowvale = higher agreement	Rathwood = higher agreement
Length	Shorter = higher agreement	Shorter = higher agreement	Shorter = higher agreement	Shorter = higher agreement	Shorter = higher agreement
Ownership					No = higher agreement
Income			High = higher agreement	High = higher agreement	
Education: University		Yes = higher agreement	Yes = higher agreement		
Under 18 present	Yes = higher agreement	Yes = higher agreement	Yes = higher agreement	Yes = higher agreement	
Over 65 present	No = higher agreement	No = higher agreement	No = higher agreement	No = higher agreement	
Planted tree in last year	Yes = higher agreement	Yes = higher agreement	Yes = higher agreement	Yes = higher agreement	

Table 8

ANOVA results for level of support with statements. Cells values included if p-value < 0.05, bolded if p-value < 0.01.

Statement	Response	Tree Density	Canopy Cover	Planting Space
Would like neighborhood to have more trees	Agree	20.9	26.5	449.9
	Neutral	16.9	28.3	572.0
	Disagree	16.1	22.3	388.6
Policy 1: More municipal planting	Agree	20.3		426.7
	Neutral	17.2		577.7
	Disagree	17.9		438.9
Policy 2: Information for residents	Agree	19.7	27.6	
	Neutral	19.0	26.4	
	Disagree	12.0	20.2	
Policy 3: Low cost trees for residents	Agree	19.7		
	Neutral	17.5		
	Disagree	16.2		
Policy 4: Tree removal by-law	Agree	19.7		
	Neutral	19.9		
	Disagree	16.8		

Figures

Figure 1 Four study neighborhoods Mississauga, Ontario, Canada.