Resident Support and Awareness for Urban Forestry Policy and Municipal Actions after the December 2013 Ice Storm

Tenley Conway, Adrian Lue and Vivian Yip
Department of Geography, University of Toronto Mississauga

Executive Summary

Urban trees perform a number of ecosystem services and provide social and financial benefits, including storm water management, air quality improvement, temperature regulation, habitat for wildlife, recreation opportunities and increased property values (Hostetler et al. 2013; Zhang et al. 2007). One the other hand, the December 2013 Ice Storm highlighted risks associated with urban trees. Damage to and by trees was extensive, with residents bearing many of the costs: loss of utilities, clean-up of debris and damage to property. Thus, the first objective of this study was to explore the impact of the ice storm on residents and their support for future tree management.

The second study objective was examining residents' knowledge of tree protection by-laws. Conway and Urbani (2007) found that municipalities in the Greater Toronto Area (GTA) are not actively enforcing tree protection by-laws on private property, which raises concerns about their effectiveness in managing the urban forest. Thus, it is worth investigating residents' levels of awareness and support for these tree protection by-laws to understand if municipalities have effectively communicated the existence and purpose of such by-laws.

To address the study objectives, surveys were mailed to residents in five study neighbourhoods in the Greater Toronto Area. The response rate was 56%. Most residents noted that the ice storm causes loss of small branches on their property. Approximately half of all respondents reported one or more larger branches falling, but very few residents reported downed trees.

Residents were supportive of statements relating to increased street tree care by their city, burying utilities, and the city providing subsidies to remove trees. Most respondents disagreed with the statement that the city should plant fewer street trees, and were neutral about the city planting smaller or native trees and providing subsidies for residents to prune trees on their property. Responses indicated that most residents did not have any plans to plant or remove a tree in the near future, but were likely to prune current trees. However the ice storm did not change any future tree care actions.

Awareness of the tree removal by-law varied between neighbourhoods. When asked about their opinion the tree removal by-law and permit costs, respondents generally fell into two categories: that the by-law requirements or permit cost was appropriate, or that the city should not regulate tree removal on private property.

1. Introduction

Urban forests and green spaces provide many valuable services to urban areas, such as local mitigation of climate change and improvements in air quality, and are therefore important components of urban ecosystems. Urban forest management is a relatively new public program and many citizens are not aware of its importance or its need for budgetary support (Zhang et al. 2007). However public attitudes have a large impact on participation and fund allocations for tree programs (Zhang et al. 2007). Therefore it is important to examine public attitudes regarding urban trees and municipal management. By collecting information about residents' opinions, we can create more effective and specific plans targeted at different residents. For example, Lorenzo et al. (2000) found that residents in Louisiana who had positive perceptions of trees (and their associated benefits) were more willing to pay for tree maintenance and protection, and that male and female respondents were willing to pay different amounts for year to year tree maintenance.

In addition to planting trees, it is also important to maintain tree health to prevent damage from lack of maintenance, pollution and natural disturbance events (such as disease and extreme weather events) (Hostetler et al. 2013). The ice storm that occurred in December 2013 in Southern Ontario is an example of a natural disturbance event. A thick layer of ice from the storm accumulated on tree limbs and caused them to snap and fall onto other structures and utility lines (Armenakis and Nirupama 2014; Hauer et al. 2011). The weather event resulted in major damage to the canopy cover, as well as a power outage for over a million customers in southern Ontario lasting for more than three days (Armenakis and Nirupama 2014). Damages for the city of Toronto were estimated at $106 million (Armenakis and Nirupama 2014).

While the benefits of urban trees have become widely known to the point where almost all residents are aware of their positive effects (Zhang et al. 2007), there has been relatively less research on the perception of risks associated with urban trees and residential support for municipal actions regarding damage mitigation. Determining which demographic groups are more likely to support municipal actions or dislike the risks associated with tree ownership will help inform future urban forest management programs and policies.

Due to complex patterns of land use in the urban environment, the urban forest is located on both public land and private property (Dunster 1994). In fact, McPherson (1998) found that 90% of tree coverage in Sacramento County (California) occurs on private property, suggesting that the conditions that occur on private property can have a significant role on urban forest form and function. In addition to urging homeowners to plant trees on their property, municipalities have adopted tree removal restrictions (Conway and Bang, 2014). One of the ways that municipalities restrict removal of privately owned trees is through the adoption of policies that require a permit application to remove trees.

The purpose of this study was to gain an understanding of residents' experiences and perceptions of urban trees in the aftermath of the December 2013 ice storm by studying

residential support for municipal actions and by-laws. The following section describes the methods and the main findings of our study.

2. Methods

The study focused on five high canopy residential neighbourhoods around the Greater Toronto Area- specifically within Brampton, Mississauga, North York, Etobicoke and Scarborough (**Figure 1**).
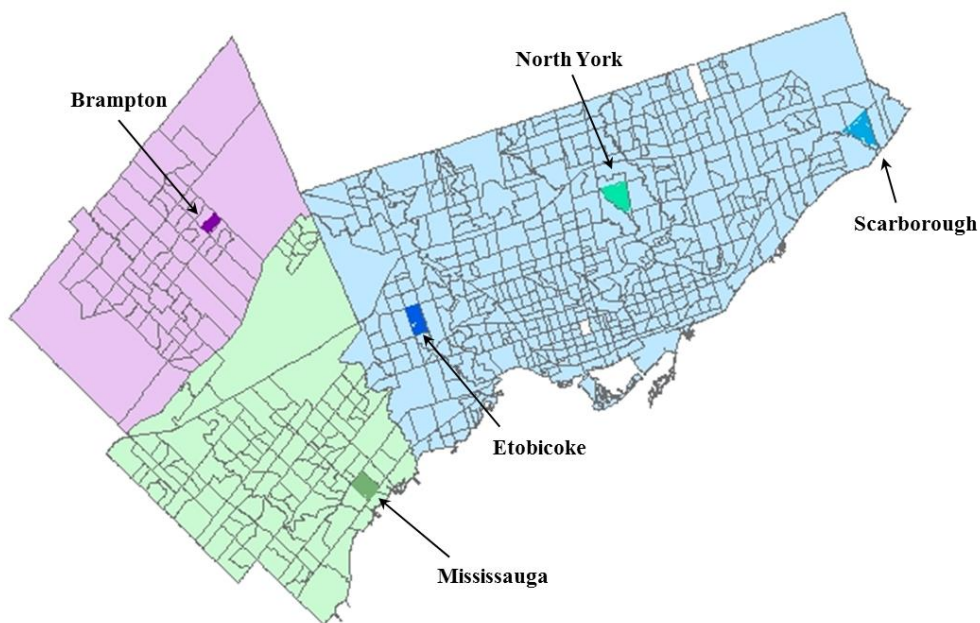

Figure 1: Study areas within the GTA. The specific neighbourhoods that received surveys are highlighted within their respective municipalities.

Areas with high tree canopies were chosen because they were most likely to experience the effects of tree damage from the ice storm (**Table 1**), but also most likely to experience benefits associated with urban trees.

Table 1: Canopy cover and survey response rate for each neighbourhood.

Neighbourhood	Canopy Cover	Number of Responses	Response Rate
Brampton	17%	188	49%
Mississauga	44%	208	54%
Etobicoke	44%	245	63%
North York	50%	197	51%
Scarborough	49%	237	60%
Overall	**41%**	**1075**	**56%**

Surveys were sent to 400 randomly selected households in each neighbourhood, defined as one census tract. First, a letter of invitation was sent out to all respondents detailing the

research project in June 2014. Approximately a week later, written surveys were sent. The survey asked questions about attitudes towards urban trees, damage inflicted by the ice storm, support for possible municipal management actions, and demographic information. A reminder letter and second survey were sent in July 2014, if necessary. The mailings took place approximately six months after the ice storm. All surveys were given a unique ID to help track responses. Completed surveys were entered into a dataset, and then checked to eliminate error. Simple summaries of survey responses were then calculated.

3. Results

The overall survey response rate was 56% (**Table 1**). Brampton had the lowest response rate at 49%, and Etobicoke had the highest response rate at 64%.

A comparison of the data collected in the 2011 census and the survey responses showed differences in almost all demographic variables (**Table 2**), including a lower average household income and a higher percentage of single detached houses, semi-detached houses and percentage of individuals with a university degree or higher. In particular, the percentage of individuals with a university degree or higher increased quite significantly. However, this last variable likely reflects differences in the way this information was collected.

Table 2: Comparison of household-level socioeconomic factors from the 2011 Canadian Census and the survey responses from 2014.

	2011 Census Data				2014 Survey Responses			
	Average Household Income (CAD)	**Single Detached Houses**	**Semi Detached Houses**	**University Degree or Higher**	**Average Household Income (CAD)**	**Single Detached Houses**	**Semi Detached Houses**	**University Degree or Higher**
Brampton	83 593	47%	29%	40%	60 000 – 89 000	58%	34%	39%
Mississauga	151 247	81%	0%	51%	90 000 – 119 000	99%	0%	55%
Etobicoke	250 323	93%	0%	57%	150 000 – 179 000	100%	0%	72%
North York	245 058	82%	0%	61%	120 000 – 149 000	98%	1%	83%
Scarborough	133 874	84%	0%	55%	90 000 – 119 000	97%	0%	51%

Almost all respondents reported damage to the small branches (<10 feet in length) from trees on or near their property (**Table 3**). Just under half of the respondents reported that 1 to 5 large branches fell on their property, and around a third of the respondents reported no damage to large branches. Finally, most respondents did not report any felled trees from the ice storm.

3.1 Residents' Support for Municipal Actions

In general, shade provision and oxygen provision were by far the most commonly identified urban tree benefits by respondents (**Table 4**). These responses were chosen more often in Brampton than in any other neighbourhood. Other popular answers included providing food and shelter for animals (Brampton) and tree attractiveness in the four other neighbourhoods.

Table 3: Percentage of responses for tree damage on respondents' property during the December 2013 ice storm.

	Did any small branches fall on your property?	How many larger branches fell down on your property?				How many trees fell down on your property?		
	Yes	None	1 to 5	5 to 10	More than 10	None	1 to 2	3 to 4
Brampton	86	21	49	14	16	86	14	1
Mississauga	89	39	41	14	6	90	10	0
Etobicoke	94	33	45	11	10	91	9	0
North York	87	37	44	11	7	89	9	2
Scarborough	85	33	43	14	11	90	10	0

More respondents from Mississauga chose lowering heating or cooling costs and soil stabilization as a benefit than any other neighbourhood. In Etobicoke, respondents were less likely to think that trees' providing food and shelter for animals was a benefit, as compared to the other neighbourhoods. Respondents from North York were more likely to choose shade as a benefit than any other neighbourhood and less likely to choose providing food and shelter for animals. Finally, respondents from Scarborough were less likely to choose combating global warming and creating a calming effect as benefits.

Table 4: Percentage of response rates for most important urban tree benefits.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Provide shade in yard or garden	75	65	66	62	66
Provide food and shelter for animals	45	30	16	24	29
Lower heating or cooling costs	32	34	19	16	23
Trees look attractive	32	41	42	44	41
Combat global warming effects	21	14	15	20	12
Stabilize the soil	31	38	24	30	28
Provide oxygen	69	54	60	60	61
Create a calming effect	24	28	21	19	16
Increase property value	20	27	24	13	12
Reduce noise or sight lines	28	31	26	22	22
Other	1	0	0	0	0
There are no benefits	3	2	4	3	2

Tree roots causing damage to drains or foundations was the most common risk identified across all municipalities. Other common risks included problems with utility wires and high costs for pruning/removal (**Table 5**). Although root damage to hard landscape surfaces was one of the most common responses amongst most neighbourhoods, Etobicoke had the lowest selection rate (20%) for this risk. Mississauga respondents indicated a higher level of concern about tree pruning and removal costs, although about a third of residents indicated this as a top three concerns in other neighbourhoods.

With some small variations, respondents in all neighbourhoods agreed that better pruning of street trees are needed, that the city should plant trees that are more structurally sound, that the

city should provide subsidies for residents to remove damaged trees and that utilities should be buried (**Table 6a, b**). Most respondents disagreed that the city should plant fewer street trees, and were generally neutral regarding the statements: the city should plant smaller trees, the city should plant native trees, and that subsidies should be available for residents to prune their trees.

Table 5: Percentage of response rates for most important urban tree risks.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Root damage to drains or foundation	78	64	67	71	80
Root damage to hard landscape surfaces causing uneven or broken surfaces	46	25	20	30	34
Harm from falling branches to people and property	64	70	61	56	60
Problems with utility wires	46	49	64	49	54
Create unsafe areas for criminal activity	13	10	4	2	1
High costs for pruning/removal	33	50	32	36	40
Tree leaves/flowers create a mess on ground	28	24	18	14	13
Attract unwanted animals/insects	19	11	9	7	8
Creates shade in yard or garden	14	13	2	3	4
Other	8	10	6	10	3
There are no risks	3	2	2	2	1

Respondents from Brampton were more likely to 'agree' and 'strongly agree' that subsidies should be available to remove dead/damaged/diseased trees (**Table 6a, b**). Mississauga had a lower response rate for agreement to better pruning and tree care; more respondents chose 'neither agree nor disagree' for this option than other municipalities. As well, a greater proportion of respondents 'strongly disagreed' that fewer street trees should be planted in Mississauga than other municipalities. Respondents in Etobicoke were more likely to 'strongly agree' that utilities should be buried than respondents from other municipalities. Although the responses were still split, respondents in Scarborough were more likely than other municipalities to 'agree' and 'strongly agree' that subsidies should be available for residents to prune trees, however Mississauga had the highest rate of listing pruning costs as a top concern.

3.2 Tree Management Activities

Across all study neighbourhoods, most respondents stated that they did not plan to plant, or remove a tree in the near future but do plan to prune existing trees (**Table 7**). Residents in Brampton and North York were the most likely to state that they had no plans to plant or remove a tree within the next three years, while residents in Mississauga had the highest proportion of responses that stated that they were likely to plant and remove a tree in the near future. Residents in Etobicoke were the most likely to state that they had plans to prune their trees (81%).

For most respondents, less than 15% of respondents reported alterations to their tree planting or removal plans. Just over 20% indicated pruning plans had changed due to the ice storm.

Table 6a: Respondents' level of support for municipal tree planting.

	Better pruning and care of street trees by the city is needed	The city should plant fewer street trees	The city should plant trees that are more structurally sound	The city should plant smaller trees	The city should plant native trees
Brampton					
Strongly Disagree	5	42	5	11	2
Disagree	9	41	7	31	6
Neutral	9	11	28	39	34
Agree	39	4	39	14	40
Strongly Agree	38	1	21	5	18
Mississauga					
Strongly Disagree	2	51	4	13	4
Disagree	9	35	8	35	4
Neutral	20	9	29	36	29
Agree	45	2	49	12	50
Strongly Agree	23	2	11	3	14
Etobicoke					
Strongly Disagree	5	42	2	7	1
Disagree	3	36	4	27	4
Neutral	12	15	29	47	49
Agree	40	4	51	15	35
Strongly Agree	41	3	14	3	12
North York					
Strongly Disagree	1	42	2	8	2
Disagree	5	36	8	32	7
Neutral	9	16	29	41	39
Agree	42	3	46	15	40
Strongly Agree	44	3	15	5	12
Scarborough					
Strongly Disagree	1	42	3	9	2
Disagree	4	34	7	35	4
Neutral	17	14	26	32	33
Agree	36	7	41	16	40
Strongly Agree	42	3	23	8	21

3.3 Awareness and Opinions of Tree Removal By-laws

Respondents were generally aware of the tree removal by-law in their respective municipality (**Table 8**), with Brampton having the lowest level of awareness (44%) and Etobicoke and Scarborough having the highest level of awareness (71% and 70%).

Table 6b: Respondents' level of support for other municipal actions.

	Utilities should be buried	Subsidies should be available to residents to remove diseased/dead/damaged trees	Subsidies should be available to residents to prune trees on their property
Brampton			
Strongly Disagree	0	4	7
Disagree	3	8	25
Neutral	17	11	20
Agree	31	35	22
Strongly Agree	49	42	26
Mississauga			
Strongly Disagree	4	9	12
Disagree	2	14	21
Neutral	19	14	21
Agree	42	38	28
Strongly Agree	32	25	17
Etobicoke			
Strongly Disagree	2	5	10
Disagree	2	15	23
Neutral	10	12	18
Agree	28	38	26
Strongly Agree	57	30	23
North York			
Strongly Disagree	3	7	11
Disagree	2	13	26
Neutral	9	14	19
Agree	38	36	21
Strongly Agree	48	30	22
Scarborough			
Strongly Disagree	2	5	11
Disagree	1	9	16
Neutral	10	9	19
Agree	34	34	27
Strongly Agree	53	43	27

Table 7: Percentages of respondents for future tree actions (including planting, removal and pruning).

		Brampton	Mississauga	Etobicoke	North York	Scarborough
Do you plan to plant a tree in the next 3 years?	Yes	18	27	24	16	18
	No	57	39	50	60	53
	Maybe	25	33	26	24	28
Do you plan to remove a tree in the next 3 years?	Yes	12	26	21	11	20
	No	66	47	51	65	61
	Maybe	21	27	28	24	20
Do you plan to prune your trees in the next 3 years?	Yes	68	78	81	78	65
	No	22	8	7	8	15
	Maybe	9	14	13	14	19

Table 8: Percentage of tree removal by-law awareness.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Respondents that knew about the tree removal by-law	44	62	71	56	70

Respondents generally thought that the size and replacement requirements for the tree removal permit application was appropriate as defined, or that the city should not regulate tree removal (**Tables 9, 10**). Respondents in Brampton and Mississauga were more likely to agree that the by-law should be stricter. Respondents in Toronto (Etobicoke, North York, Scarborough) were more likely to agree that the by-law should be relaxed. However, **Table 11** shows that there is some support for relaxing the permit application cost in all neighbourhoods.

Table 9: Percentage of resident opinions about the size requirement for the tree removal permit application.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Number and size is defined as appropriate	31	37	36	32	21
By-law should be stricter, size should be lower	20	32	5	7	8
By-law should be relaxed, small number of trees should be exempt	6	5	18	18	21
Tree removal on private property should not be regulated by the city	43	27	37	38	50

Table 10: Percentage of resident opinions about replacement tree requirements for removal permits.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Potential replacement tree requirement is defined as appropriate if a permit is granted	39	49	48	40	38
By-law should be stricter	10	14	5	4	5
By-law should be relaxed, no replacement trees required	9	8	12	14	14
Tree removal on private property should not be regulated by the city	43	29	32	38	43

Table 11: Percentage of resident opinions about tree removal permit application costs.

	Brampton	Mississauga	Etobicoke	North York	Scarborough
Current application fee is defined as appropriate	28	34	33	33	26
By-law should be stricter, with a higher application cost	11	19	9	4	6
By-law should be relaxed, with a lower application cost	17	20	17	21	22
Tree removal on private property should not be regulated by the city	44	27	39	38	46

5. Conclusions

The results of our survey showed that the majority of our respondents in five study neighbourhoods around the GTA identified common benefits and risks that urban trees can provide. Shade provision and oxygen provision were benefits that were most commonly identified across all neighbourhoods. Commonly identified risks included root damage to drains or foundations and problems with utility wires. In terms of support for municipal actions for damage reduction, respondents generally agreed with the statements: better pruning of street

trees are needed, the city should plant trees that are more structurally sound, the city should provide subsidies to remove damaged trees and utilities should be buried. Conversely, respondents disagreed with the statement: the city should plant fewer street trees and neither agreed nor disagreed with the statements: the city should plant more native trees and the city should provide subsidies for pruning trees.

While most respondents experienced tree damage during the ice storm, the majority did not have plans to plant or remove trees in the near future, and the December 2013 ice storm did not change their plans. However a higher proportion of respondents planned to prune trees within the next few years, and more respondents noted that the ice storm changed their pruning plans (compared with changes in planting and removal plans).

Awareness of the tree removal by-law was moderately high across all municipalities (with the exception of Brampton). When asked about size requirements, replacement trees and permit application costs, respondents were split between supporting the current requirement and supporting the idea that the city should not regulate tree removal on private property.

6. Acknowledgements

7. References

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