



Trends in Canada's Urban Forests

Prepared by:

Dr. Adrina C. Bardekjian, Program Manager, Urban Forestry, Tree Canada

Dr. Andy Kenney, R.P.F., Sr. Lecturer Emeritus, Faculty of Forestry, University of Toronto

Michael Rosen, R.P.F., President, Tree Canada



Contents

Executive Summary	3
Background and objectives	4
Approach	6
Results	8
Discussion and Conclusions	30
References	32
About the Authors	33
Acknowledgements	34



Executive Summary

This report is a result of two studies: the *State of Canada's Municipal Forests* survey conducted by Tree Canada in early 2014 with 42 Canadian municipalities, and the *National Municipal Needs Assessment* conducted in early 2015 with 26 Canadian municipalities. Amongst other observations, urban forest managers see the following trends:

- The number of street and park trees and the amount of urban woodland is increasing while the amount of “natural cover” is decreasing;
- Only 20% of municipalities have a management plan for urban forests;
- 25% of all municipalities have no inventory of their trees with 64% having no assessment of their canopy cover
- The amount of knowledge in urban forest issues by the public/institutional owners (hospitals, schools) is not strong with few neighbourhood groups (e.g. BIA's, community associations) active in urban forests, in contrast to the U.S.;
- In spite of the former, trees and woodlands are seen as very important by most municipal residents – with this trend growing;
- Developing better urban soil conditions is seen as the most important applied research need;
- “Exploring community perspectives” is seen as the most important social research need;
- “Other levels of government” (regional, provincial and federal) was given the highest level of importance of all municipal partnerships;
- The top pressures facing urban forests include urban development, lack of funding and a lack of planning.

1. Background and Objectives

With 82% of Canadians living in urban areas, urban forests are important to the environment of municipalities and to the health of their citizens. This report captures the results of two studies: the first is *The State of Canada's Municipal Forests* survey (SCMF) conducted in early 2014; the second is the *National Municipal Needs Assessment* (NMNA) conducted in early 2015 (Bardekjian & Rosen, 2015). The data from the SCMF was analyzed in autumn of 2014. The Canadian Forest Service (CFS) supported the analysis of this data and the writing of the NMNA.

The overall objective of this report is to:

- Provide detailed and specific information on the level of urban forestry and arboricultural activities carried out in Canadian municipalities (with populations of 10,000 and greater) for the 2013 planning year,
- Improve our understanding of knowledge gaps and associated science and research activities and,
- Understand the needs of municipalities to further develop the benefits of the urban forest. These needs include finding tactical and technological solutions to specific technical challenges, as well as more strategic ways to plan for and manage our urban forests.

As the front line management of urban forests rests with municipalities (and to some extent) property owners, it is these entities that are closest to and understand best their capacity and their needs at present and into the future. Thus, the objective is to clearly delineate, on a national basis, municipal activities and needs with respect to:

- Budgets as a factor in the capacity to engage in quality urban forest management;
- The distribution and number of trees under management including those in parks and roadsides;
- Understanding the importance of and reliance on canopy cover as a measure of urban forest activity and trends;
- Awareness of the choice of tree species and their distribution in terms of native or non-native trees in origin and abundance;
- Constructing the delineation of ownership between public and private land (residential vs. industrial/institutional) and how this will impact the future urban forest;
- Understanding the role of partnerships (with academia, governmental organizations, the private sector, etc.) as a factor in managing the urban forest including ways to engage citizens in urban forests, research needs, both in applied sciences (such as new pesticides, forest management techniques, genomic tools, or climate change adaptation strategies) and the social sciences (such as values, community perceptions).

Aside from three previous surveys that have been conducted covering the periods 1993-1996 (prepared as internal reports to *Tree Plan Canada*); 1996-1998 (Kenney & Idziak, 2000); and 2010 (internal report to *Tree Canada* by Hiba Ali), little is known about the level of urban forestry practices in Canada. While some municipalities may have this information within and for their own jurisdiction, a national database with consistent data characteristics and collection does not exist.

Information from these two reports is needed by the urban forest sector to:

- a) Allow municipalities to determine their progress with respect to other municipalities;
- b) Provide “benchmark” data to track progress from year-to-year in urban forestry planning and management issues at the municipal, provincial, regional and national levels;
- c) Identify important gaps in our efforts to move towards strategic urban forestry planning and management at the municipal, provincial, regional and national levels;
- d) Provide consistent information for policy makers at all levels of government; and
- e) Provide fundamental data to guide and support the development of the Canadian Urban Forestry Strategy * (CUFS) (Working Group 1: Task 4) and thereby raise the profile of urban forestry in Canada.

The intent is that this will lead to the advancement of more, long-term and sustainable urban forestry programmes across the country which will not only benefit municipalities and their residents, but the urban forest economy as a whole.

* <http://www.cufn.ca/#!canadian-urban-forest-strategy/c1gbp>

Approach

The State of Canada's Municipal Forests survey (SCMF) was directed to Canadian municipalities with a population greater than 10,000. The *National Municipal Needs Assessment* report (NMNA) was circulated to a contact list of municipalities with varying levels of population (small, medium, large) in each province and territory.

Half the chosen cities in the NMNA were selected from submissions made to the SCMF survey in the months prior (May-December 2014). From the existing submissions to the SCMF survey, a contact list of 34 municipalities was developed and augmented with additional municipalities and contacts. Much of the information and data collected in the SCMF survey informed the data collection (content and process) for the NMNA study. The final response we received for the NMNA was from a total of 26 municipalities. The final response we received for the SCMF survey was from a total of 42 municipalities. Acquiring responses proved to be the greatest challenge in the SCMF project. Of the 366 municipalities who were asked to submit data, we received 42 responses. Every effort was made to capture data across all provinces.

Questionnaires were completed in English and French using Adobe FormsCentral – an online survey tool and circulated. The main difference between the two studies is that the SCMF survey results offer a comprehensive look at applied data (e.g. budgets, tree species, etc.), whereas the *National Municipal Needs Assessment* captures specific data with respect to qualitative research needs and public values.

Municipalities were then contacted directly to obtain the information via phone and email. Respondents were instructed to provide fact-based responses to questions as accurately as possible using their budget for the 2013 fiscal year and results from their urban forest management plan (if applicable).

The SCMF survey questions were developed to collect both quantitative and qualitative data. For both studies, questions addressed issues of the degree of planning and management, staffing including the level of training, budgets and public opinions. Questions only pertained to activities and conditions during the 2013-planning year. In both cases, participants were asked to only respond about the trees that were solely under their jurisdiction.

This list of contact information for urban forest managers and practitioners was compiled from various sources. Sources included: lists from the previous SCMF survey conducted in 2010; participant lists from past Canadian Urban Forest Conferences, the membership of the Canadian Urban Forest Network and other known contacts from Tree Canada.

Preliminary results were reported: by all three authors at the 11th Canadian Urban Forest Conference in Victoria, BC, on October 2, 2014; by Dr. Bardekjian and Mr. Rosen to the Canadian Forest Service on March 27, 2015; and by Dr. Bardekjian at the Environmental Studies Association of Canada Congress in Ottawa on June 2, 2015.

Results

The results of this report are **categorized into three sections:**

1. Status of the urban forest resource
2. Management of the urban forest
 - (i) Establishing and sustaining the resource (planting, pruning, removals)
 - (ii) Inventory: Measuring the resource
 - (iii) Planning, Policy and budgets
3. Cooperation, engagement and research needs

The charts on the following pages will allow comparisons with other respondents across the country by population size. In some cases, extreme results were not included to make the results clearer. Charts are presented as follows: mixed with per capita scatter charts and expert opinions of the survey participants.

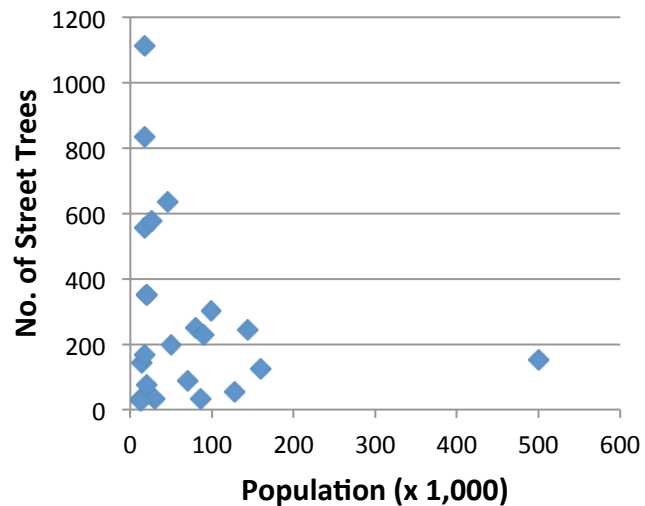
Respondents were all urban forestry practitioners who directly manage the urban forest resource, and who responded to the SCMF survey and the NMNA study.

1. Status of the Urban Forest Resource

Number of Street Trees per 1000 people

Managers were asked to report the number of street trees in their municipality. To standardize these data to account for the differences among the size of the municipalities, the number of street trees is expressed in terms of trees per 1,000 residents.

There were 42 respondents to this question. Four large municipalities (>500,000) reported but their values are not shown because they tended to change the scale of the figure to the point that it is difficult to view the distribution among the majority of smaller communities.

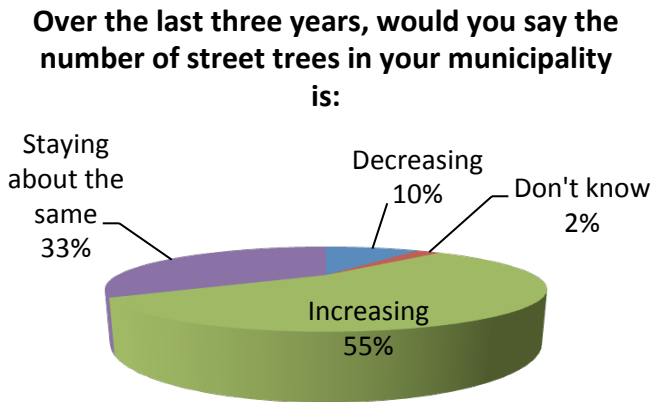


The maximum number of trees per 1,000 residents was 1,800 (including those municipalities > 500,000) and **the median was 149 trees per 1,000 residents** (50% of municipalities had higher than 149 and 50% had lower values.). These values include all 42 respondents.

In the earlier, 2010 study, the median value was 210 trees per 1,000 residents. It should be noted that the respondents from this study were not identical to those in the current study, which may account for the lower value.

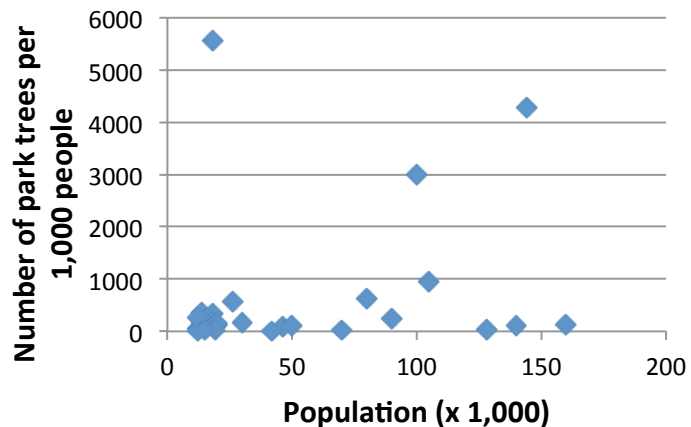
Managers were asked to indicate, in their opinion, how the street tree population in their community has changed over the previous three years. The results from the 42 respondents are summarized in the pie chart shown below.

A small majority of respondents (55%) were of the opinion that their street tree population had increased in number, with an additional one third of respondents indicating that street tree numbers had held their own.



Number of Park Trees per 1,000 residents

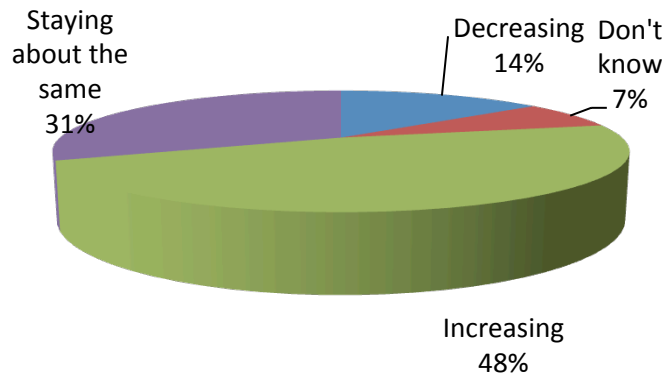
Similar to street trees, managers were asked to report the number of park trees in their municipality. Forty-two responses were received. The figure at the right shows the distribution, again the largest municipalities are not shown to simplify the view.



The median was 106 park trees per 1,000 residents with a maximum of 5,556 trees. The figure clearly shows a very wide range in street trees per 1,000 residents. This may be due partly to the definition of a “park tree”. Some municipalities may consider semi-natural areas as parks while others are reporting more highly managed areas with a lower tree density.

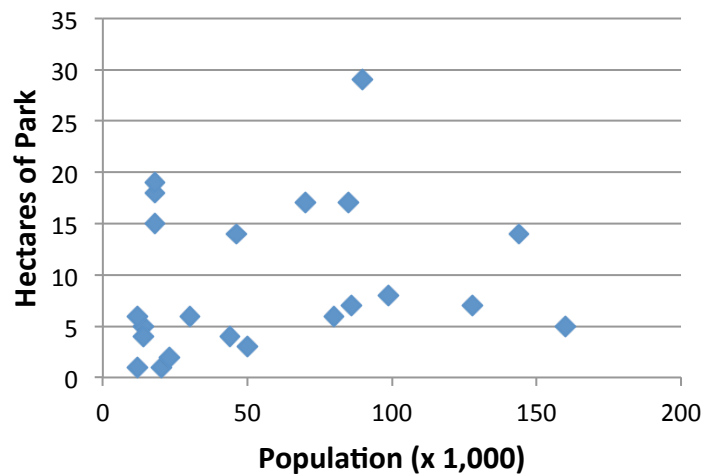
Almost half of the respondents were of the opinion that the number of park trees increased over the previously three years. Almost another third felt that the number of park trees was staying about the same.

Over the last three years, would you say the number of park trees in your municipality is:

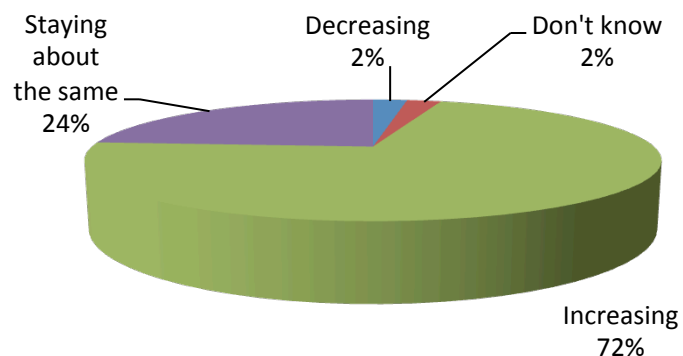


Managers were also asked to report the number of hectares of park in their municipality. The results are shown, per 1,000 residents, in the figure to the right. As before, the largest four municipalities are removed for clarity. In this case, 35 municipalities reported with a median of seven hectares of park per 1,000 residents. The maximum was 167 ha. In the United States Cochran *et al* (2008) reported the following values for park area per 1,000 residents:

Median = 5.06
 Minimum = 0.32
 Maximum = 1188.6



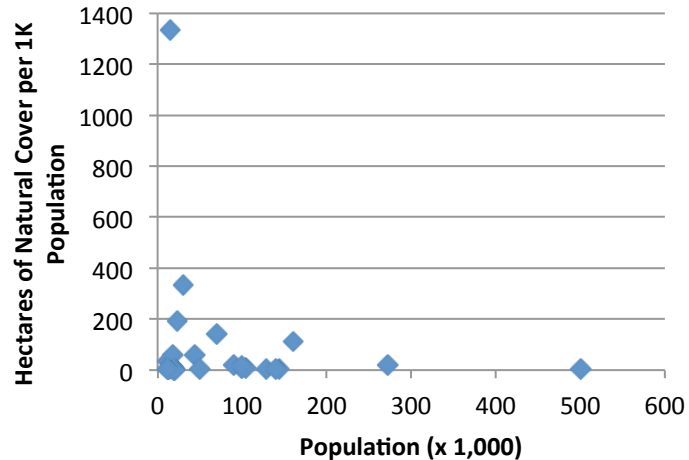
Over the last three years, would you say the area of parkland in your municipality is:



The expert opinion of the respondents, with respect to the area of park land is shown in the figure to the right

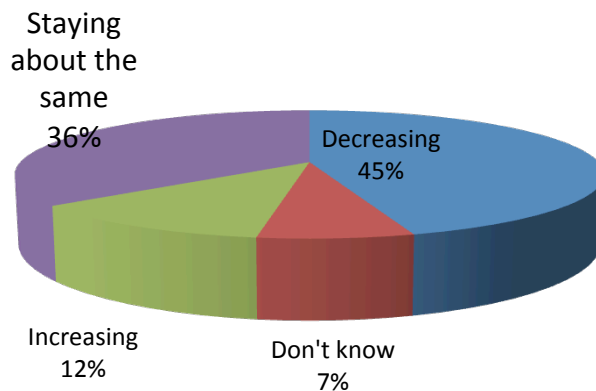
Area of Natural Cover per 1,000 residents

Natural areas were considered independently of “parks”. The distribution (excluding the four largest municipalities) is shown to the right. Forty-two responses were received with a maximum of 1,333 ha per 1,000 residents and a **median of only 8 ha per 1,000 residents.**



A strong majority of the forty-two managers who responded felt that the area of park land and the number of park trees has either held their own or increased over the last three years. The story for natural areas is less encouraging. Almost half of the managers were of the opinion that the area of natural cover in their jurisdiction had decreased over the previous three years. Only 12% indicated that the area of natural cover was increasing.

Over the last three years, would you say the area of natural cover in your municipality is:

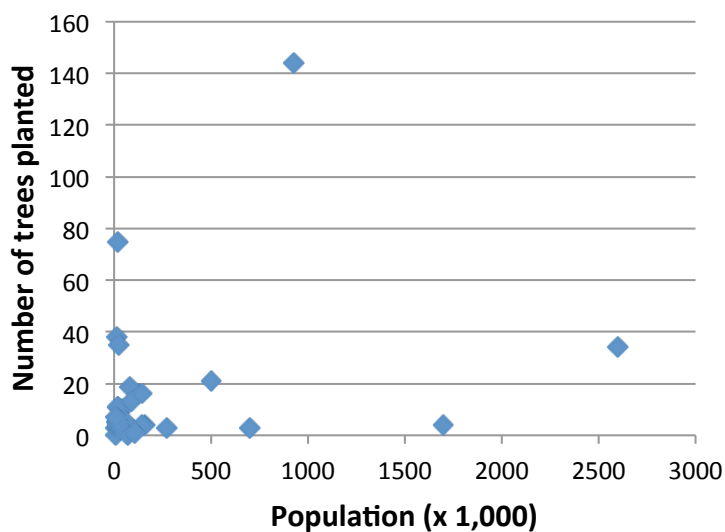


2. Management of the Urban Forest

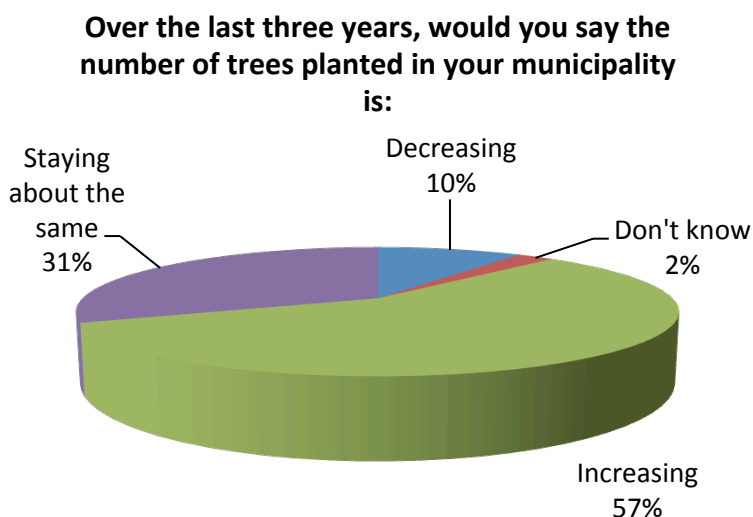
Establishing and Sustaining the Resource

Planting

Thirty-nine municipalities reported the number of trees that they planted in 2013. The distribution by the size of the municipality is shown in the figure to the right. The four largest municipalities are omitted for clarity. The maximum number of trees planted per 1,000 residents was 144 and **the median was 5 trees/thousand people.**

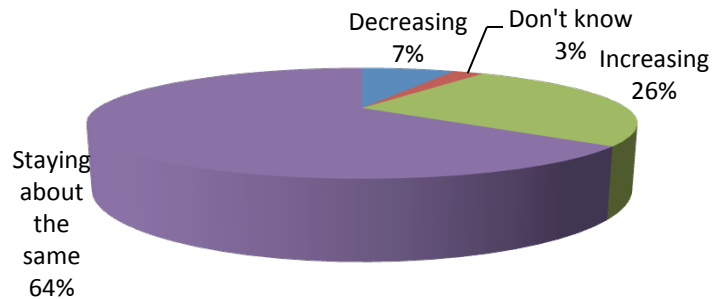


The trend in tree planting in the 42 reporting municipalities over the previous three years is shown in the figure to the right. Only 10% (4) of the municipalities showed a decline in tree planting efforts on municipal property while less than one third reported planting programs that were staying the same. More than one half reporting municipalities indicated a trend towards more planting.

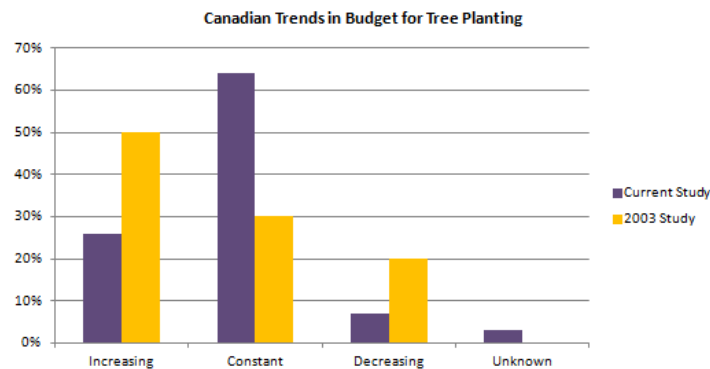


The figure to the right shows the trends in expert opinions about tree planting budgets over three years illustrating a sustained planting budget in a strong majority with about ¼ of the 42 municipalities actually seeing a trend of increased planting budgets.

Over the last three years, would you say the budget for tree planting in your municipality is:

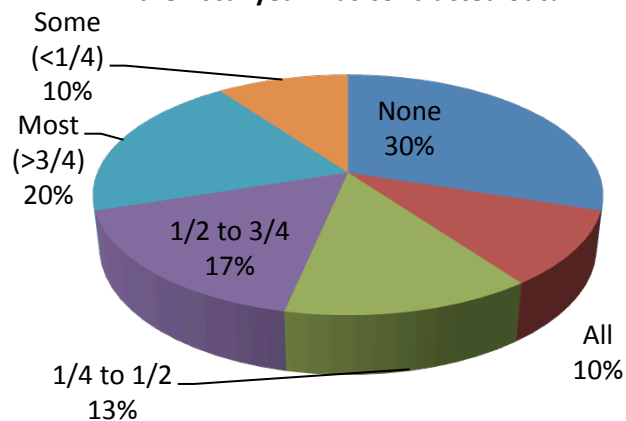


The figure below compares these trends with those of the previous internal report. The previous study indicates greater change over the three year period with stronger trends in both increasing and decreasing planting budgets when compared to the current study. It should be noted that these comparisons are not necessarily showing changes over the periods by municipality since the response rates were different between the two studies. The comparisons therefore are between the general trends across all responding municipalities.



Thirty managers reported on the proportion of their tree planting budget that was contracted out. The figure at the right illustrates considerable variation. With 3 of the 30 respondents indicating that all of their planting was contracted out and 9 (30%) doing all of their planting "in-house".

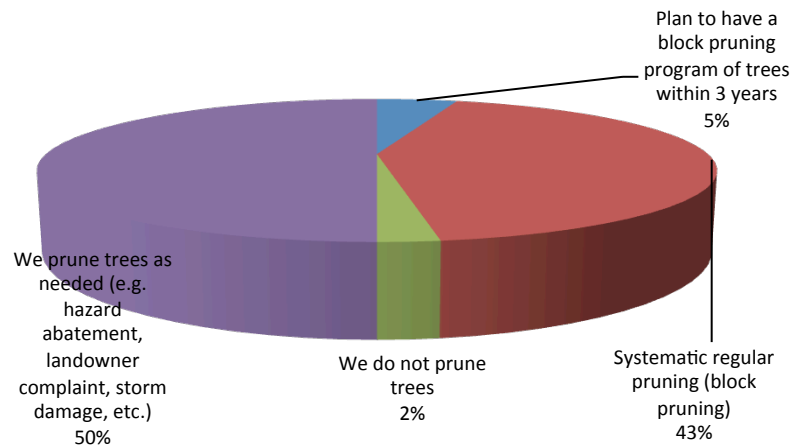
What proportion of the budget of tree planting in the fiscal year was contracted out?



Pruning

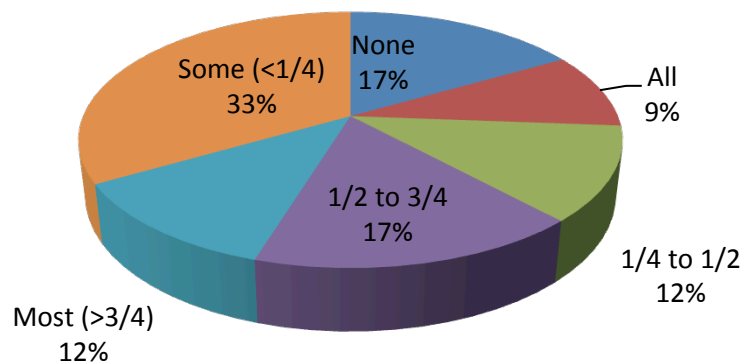
One half of the 42 respondents reported that they pruned municipal trees as needed while slightly fewer communities currently prune based on a systematic or “block” pruning program.

How does your municipality deal with tree pruning?



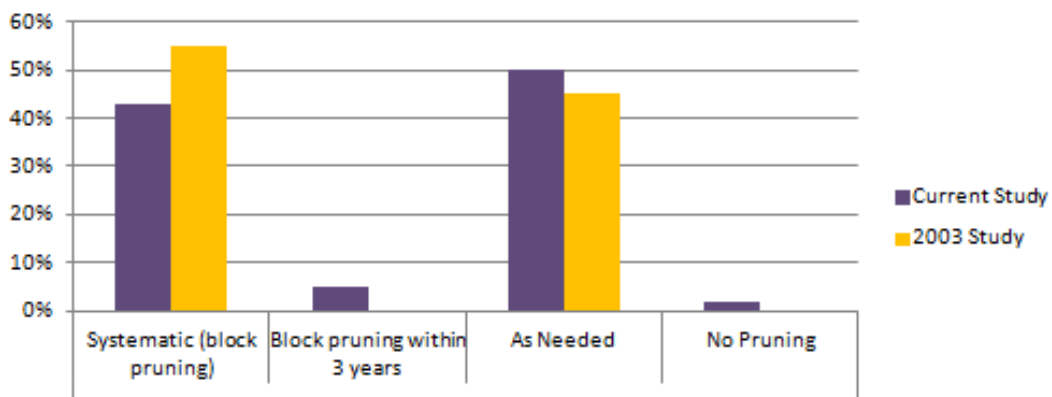
As can be seen to the right, considerable variation exists among the 42 respondents with respect to the rate of contracting out of tree maintenance. Seventeen percent did all tree maintenance “in-house” while 9% contracted all maintenance work.

What proportion of your tree maintenance budget in the fiscal year was contracted out?



The figure below compares these trends with those of the previous internal report and illustrates that the trends have not changed dramatically between the reports. The comparisons are between the general trends across all responding municipalities.

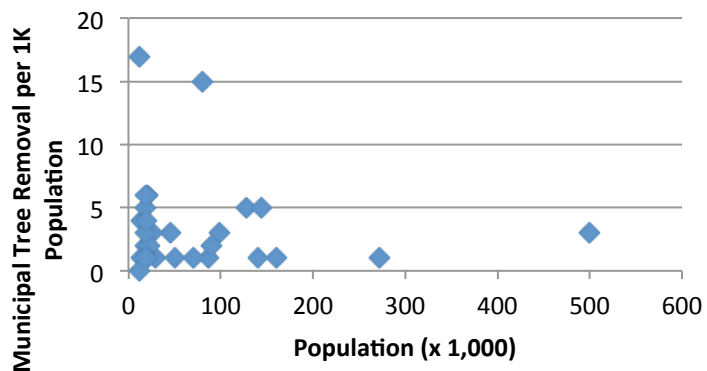
Canadian Trends in Tree Pruning Policy



Tree removal

The distribution of annual tree removal per 1,000 residents is shown to the right with the four largest municipalities not shown for clarity. Thirty-seven managers responded. The maximum removal per 1,000 residents was 17 and **the median was 3/1,000 residents.**

Municipal Tree Removal per 1K Population

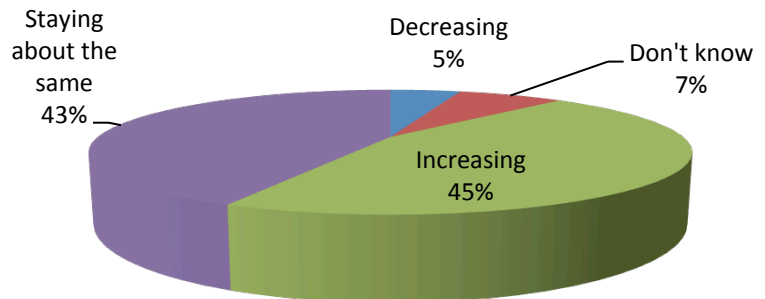


Forty-five percent of the 42 respondents were of the opinion that tree removal rates from municipal property increased over the three year period while a similar proportion felt that removal rates stayed about the same.

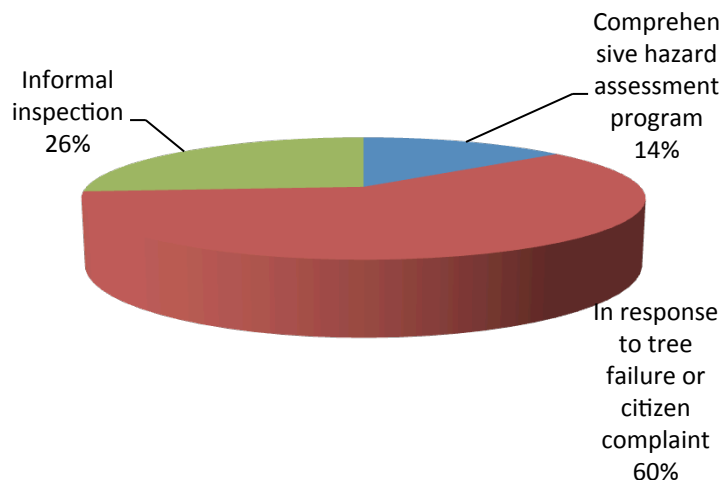
Thirty-eight of the 42 responding managers (91%) indicated that staff in their department made the decisions about tree removals.

A strong majority (60%) of the 42 respondents stated that tree risk assessment was based on a response to tree failure or citizen complaints. Informal inspections accounted for 26% of municipalities. Interestingly, the 6 municipalities (14%) that reported having a comprehensive risk assessment program were an even mix of smaller (<20,000 residents) and larger municipalities.

Over the last three years, would you say the number of municipal trees removed in your jurisdiction is:



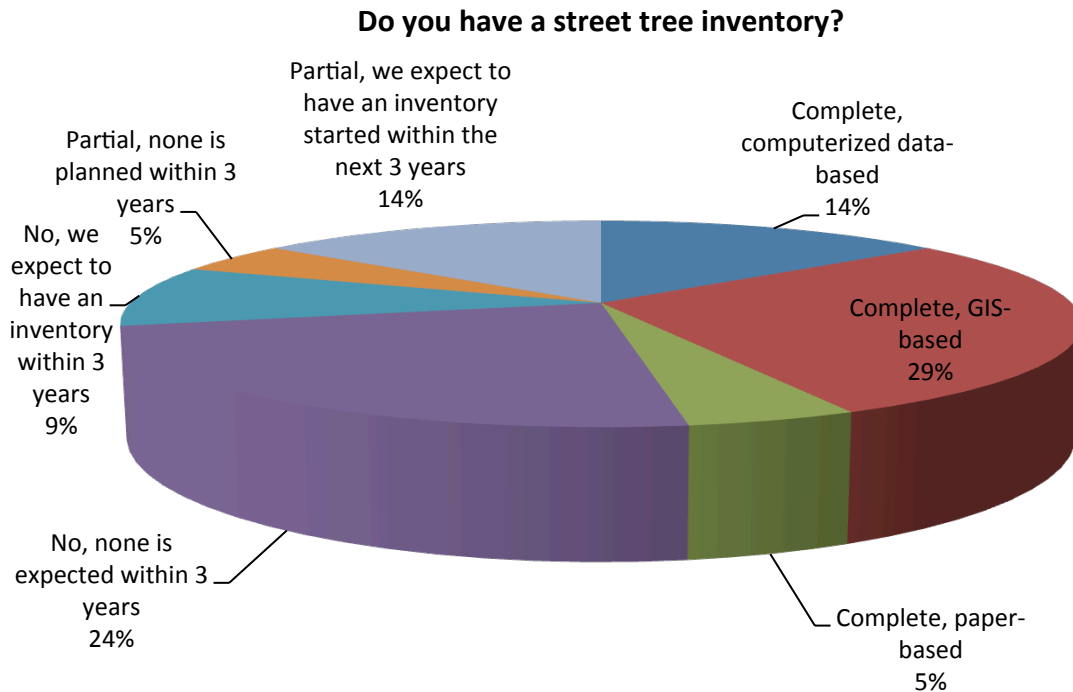
How are hazard trees dealt with in your municipality?



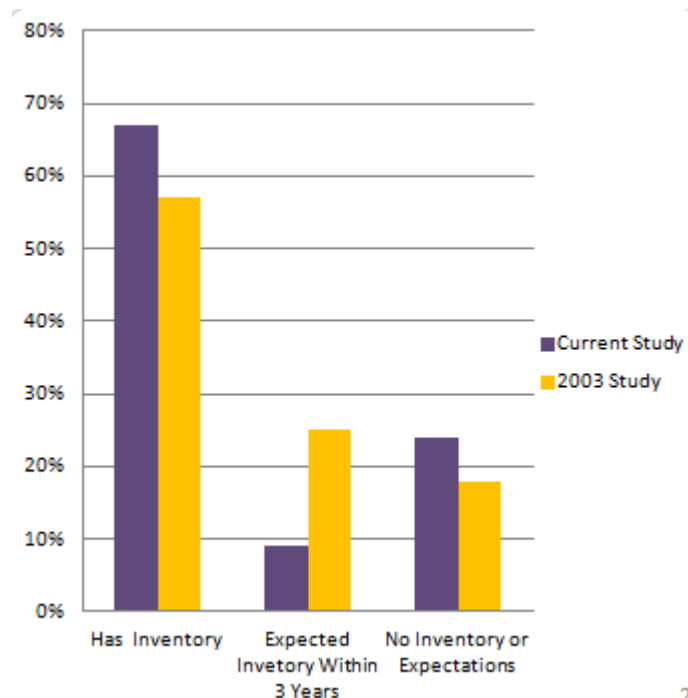
Inventory: Measuring the resource

Street tree inventories

The figure below illustrates the proportion of 42 respondents reporting the status of their street tree inventory.

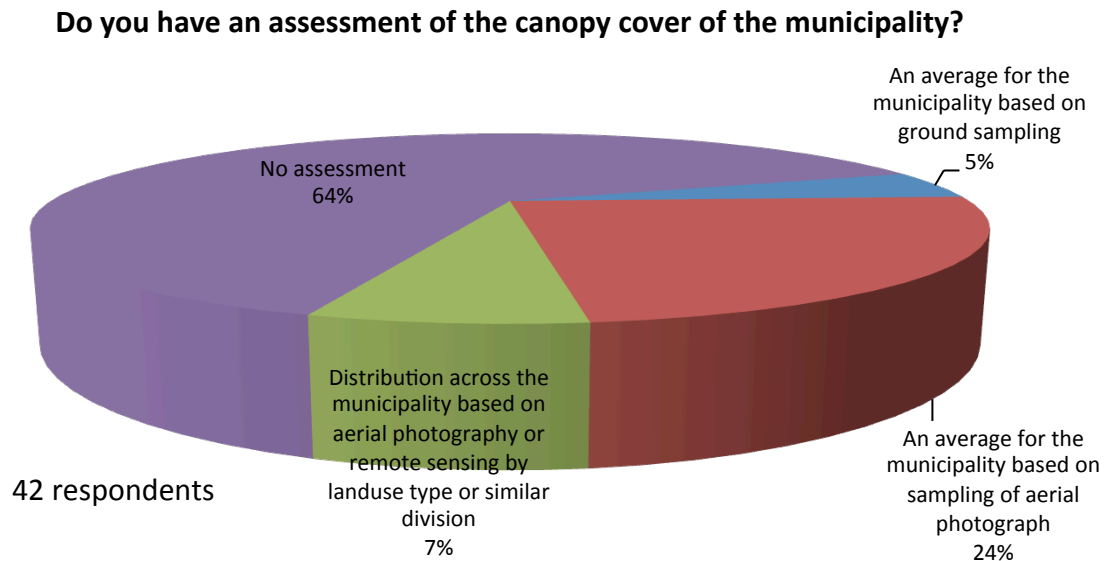


A comparison of the results from the current study and the previous internal study are shown at the right. As before, these are general trends and not municipality by municipality. This figure suggests that there has been a slight shift from the *expectation* of an inventory to having an inventory. However, there also seems to be a slight increase in the proportion of municipalities that reported no inventory among the municipalities that responded to the current survey.



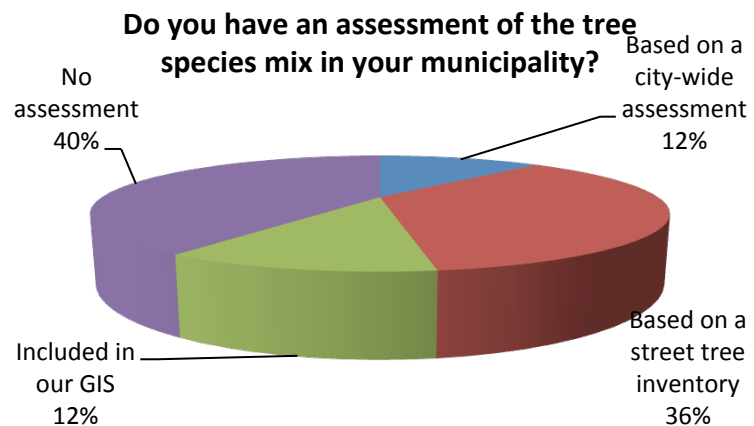
Canopy cover assessment

Canopy cover is often used as a simple measure of the extent of the urban forest in a municipality or part of one. Managers were asked to report if they had an assessment of canopy cover. The figure below indicates that almost 2/3 of the 42 respondents do not have an assessment. One quarter of the municipalities had an average for the entire community based on aerial photos. Three municipalities reported the optimal level in which canopy cover assessment is applied across the municipality by landuse type or similar division.



Tree species mix assessment

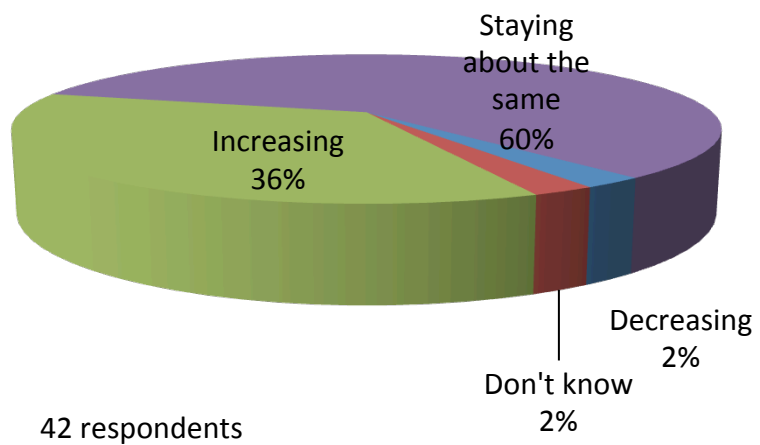
The diversity of tree species is critically important for the sustainability and ability of the urban forest to provide ecological, social and economic benefits. The figure to the right illustrates the degree to which the 42 municipalities understand this aspect of their resource. It is interesting to note that 76% of respondents have no assessment or one based on street trees only.



Trends in overall budget

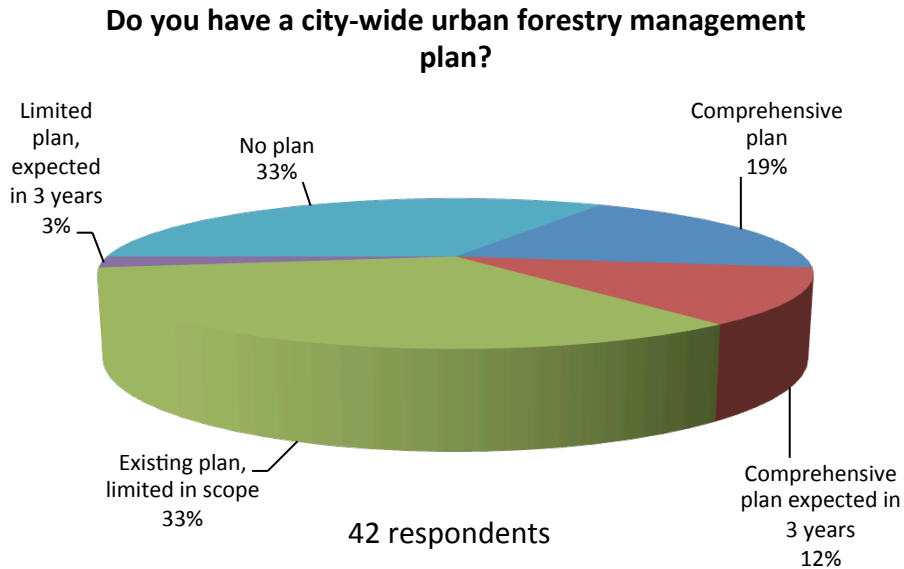
It is encouraging to see that 96% of respondents indicated that their overall urban forestry budgets have “held their own” or increased over the past three years.

Over the last three years, would you say the overall budget for urban forestry in your municipality is:



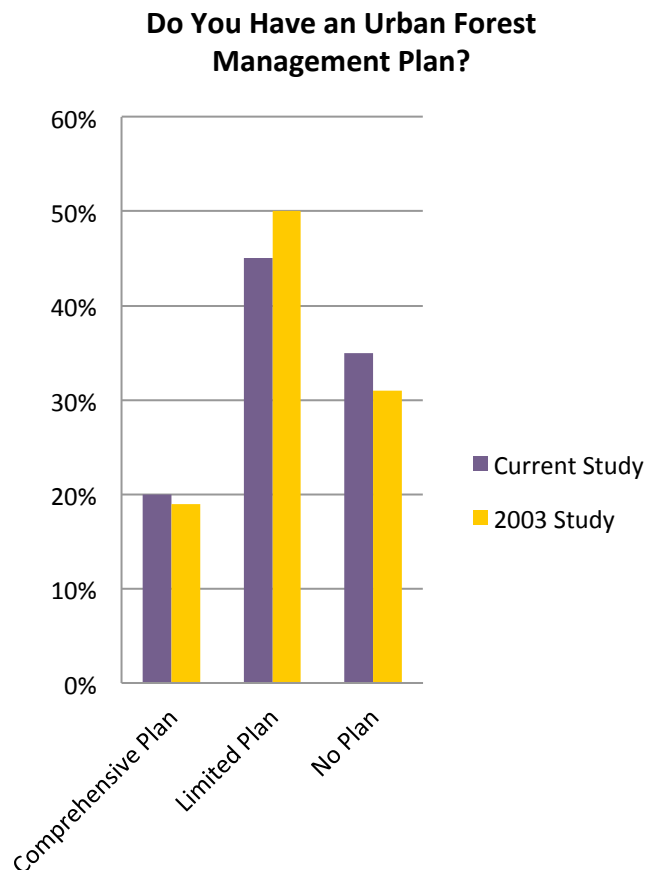
Planning and policy: Management plans and bylaws

Management plan



Urban forests are complex ecosystems superimposed on the complicated context of the built landscape and human society. Comprehensive management plans will guide decision making to ensure the forests can sustain the supply of ecological, social and economic benefits. One third of the forty-two respondents indicated that they have no management plan. Another third had limited plans and another third had comprehensive plans in place or expected to have such plans within the next three year.

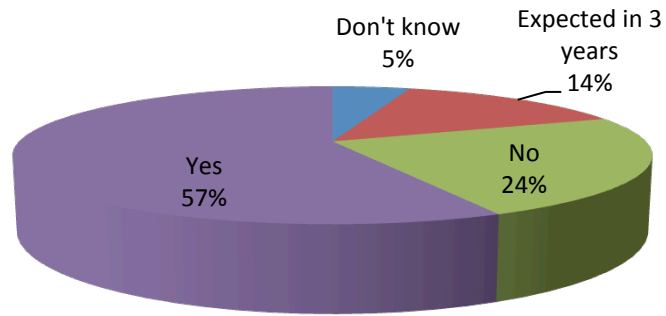
The trend shown in the earlier survey is similar to that for this study. As before, it should be noted that the latter does not refer to city by city comparisons.



Municipal tree protection by-law

More than one half of the 42 respondents reported that they have by-laws in place to protect trees on municipal property. One quarter of the respondents didn't have a municipal tree by-law and no plans to have one in place over the next three years.

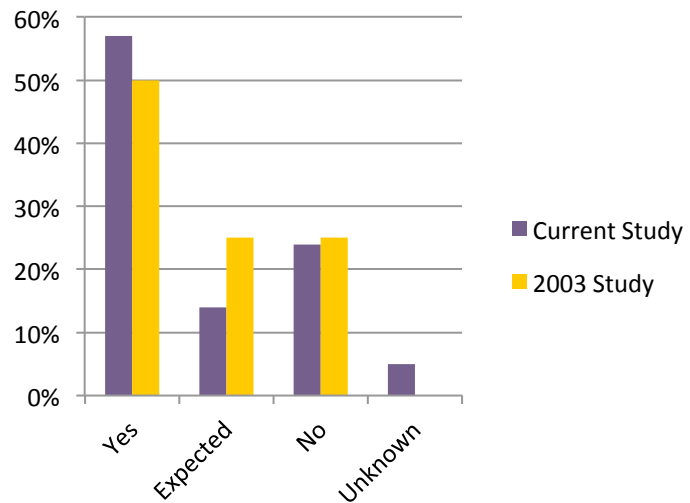
Does your municipality have a by-law to protect municipal trees?



42 respondents

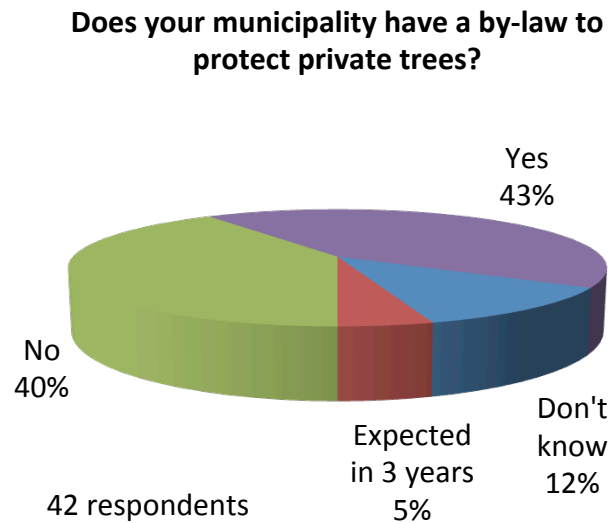
The figure to the right shows that the trend in developing municipal tree bylaws between the 2003 and current studies.

Canadian Trends in Municipal Tree Bylaws

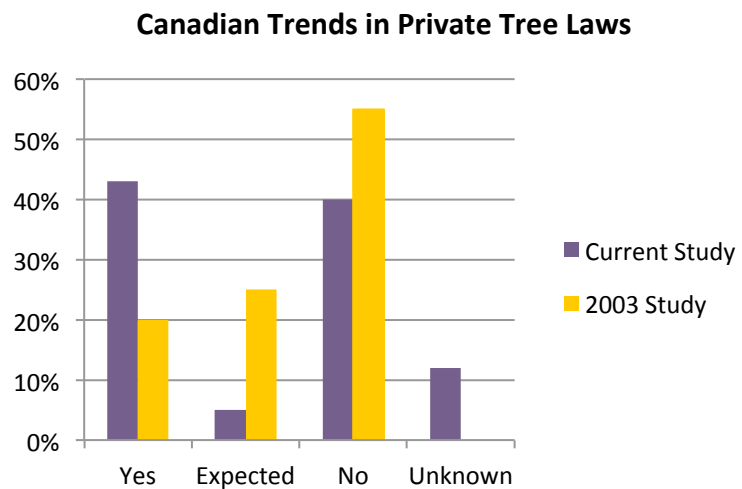


Private tree protection by-law

By-laws to protect trees on private property are less common than public tree by-laws. However, it is interesting to note that fully 43% of respondents indicated that they already have private tree by-laws in effect with another 5% expecting one in the next three years.



The figure to the right shows that there appears to be a trend towards more private tree bylaws when the current study is compared to the 2003 survey. Keep in mind that this is not a municipality by municipality comparison but rather the general trend of the respondents from the two surveys.

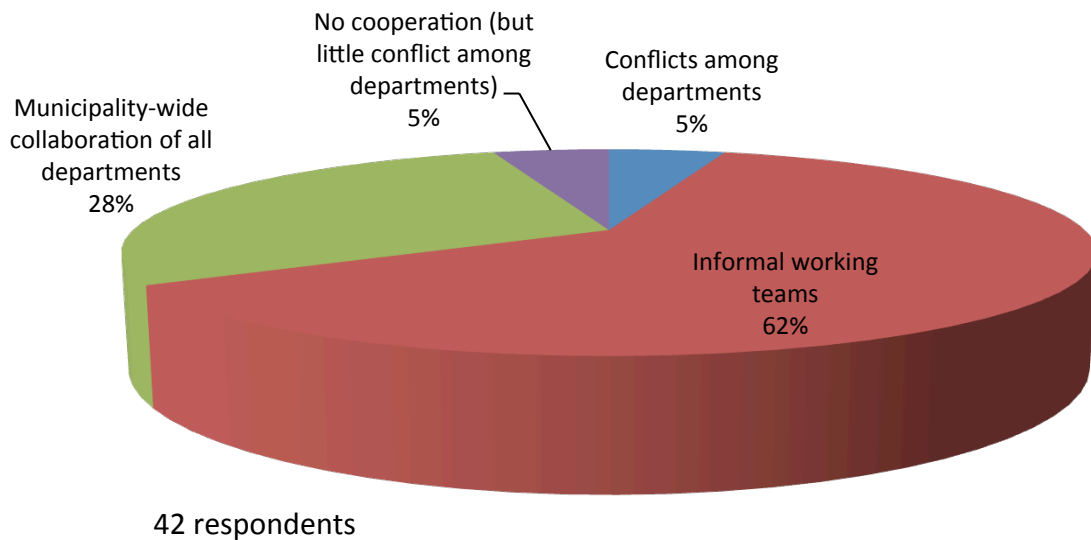


3. Cooperation and Engagement

This section represents respondents' options regarding cooperation between agencies and departments, involvement of landowners.

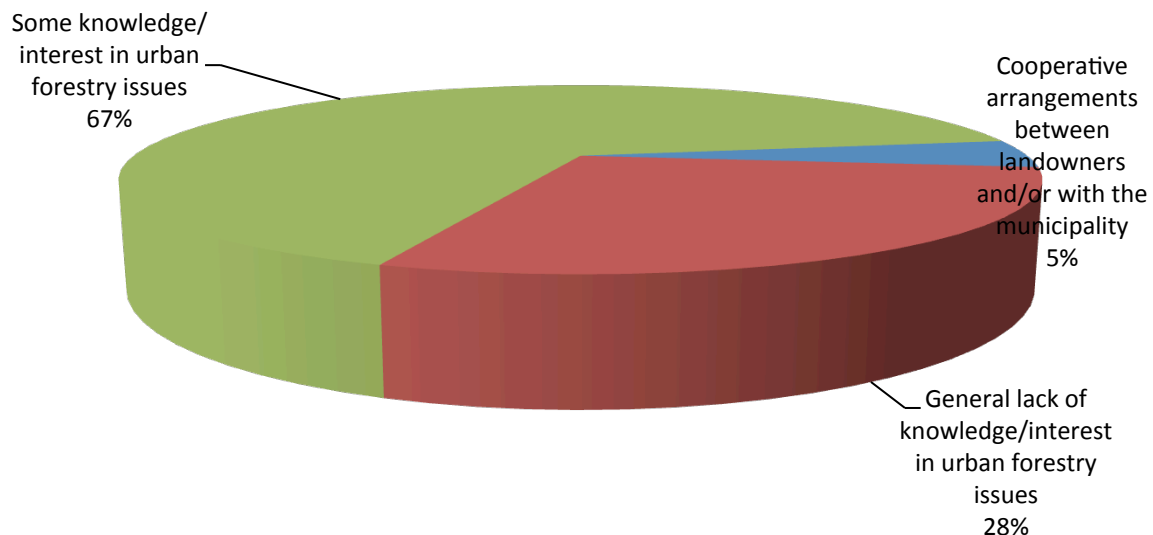
Public agency cooperation

How do you describe public agency cooperation for urban forestry in your municipality?



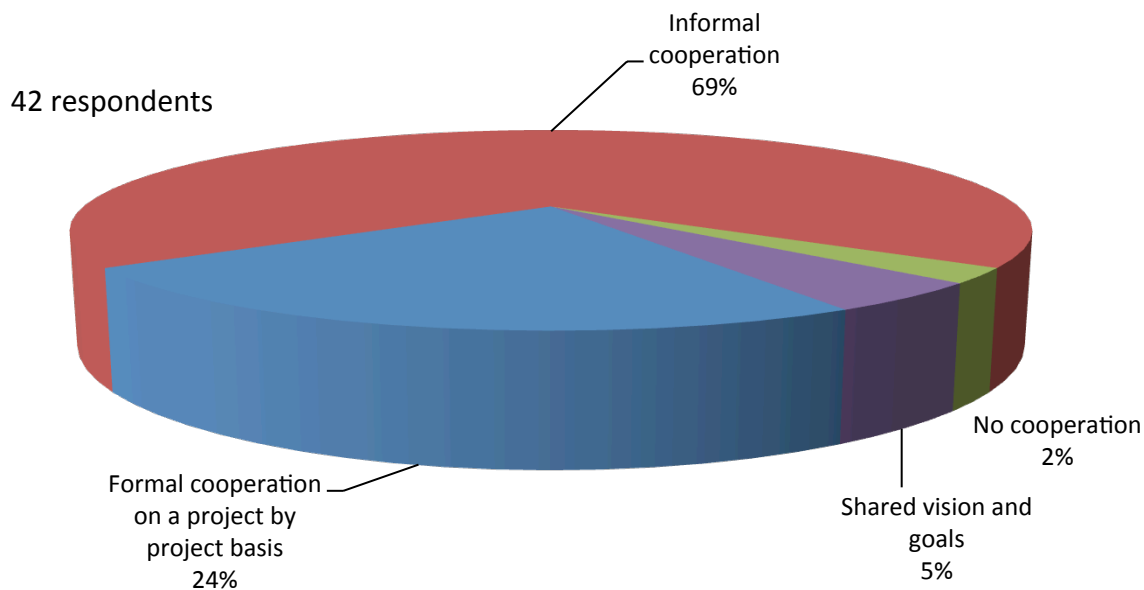
Private and institutional landowners

How would you describe the involvement of private and institutional landowners in urban forestry?



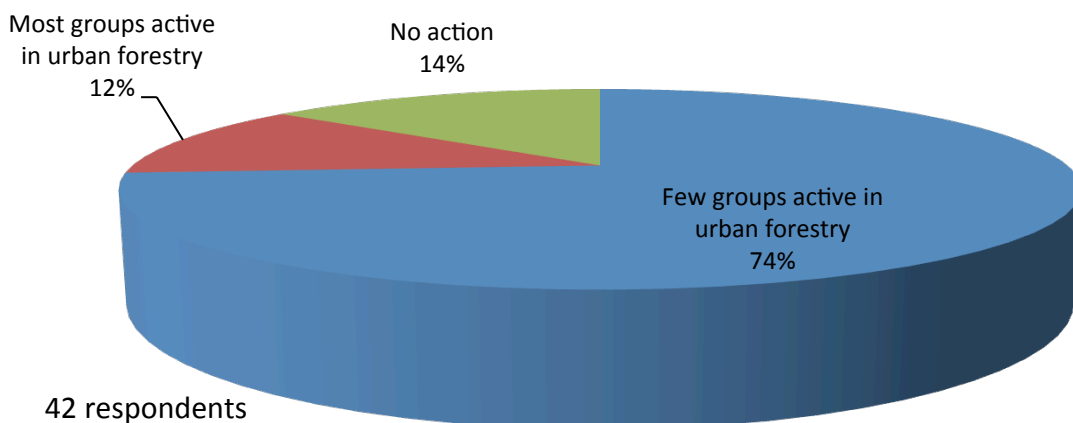
Green industry cooperation

How would you describe the cooperation between your municipality and arboricultural/landscaping industries?



Neighbourhood group activities

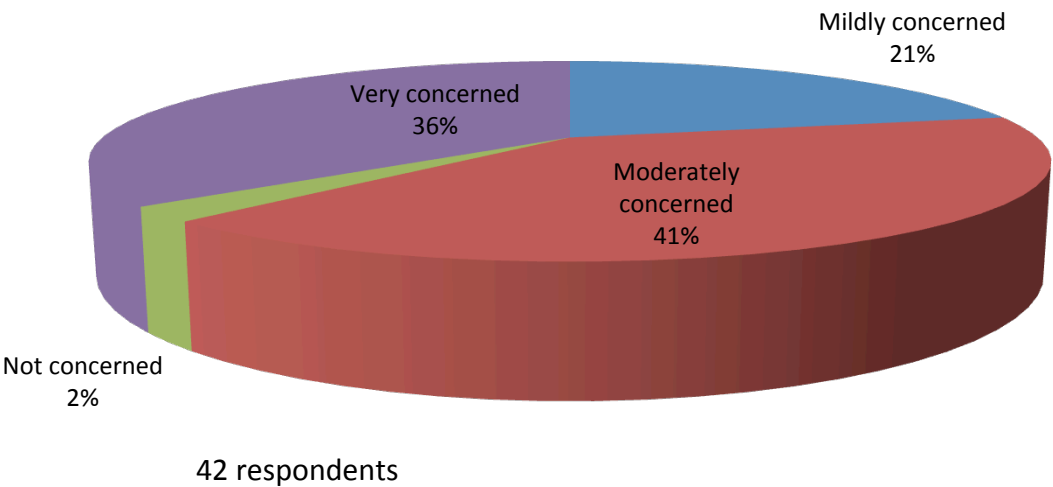
How would you describe neighbourhood groups' action relating to urban forestry?



A neighbourhood group could be a BIA, a neighbourhood committee, action committees, public agency, etc.

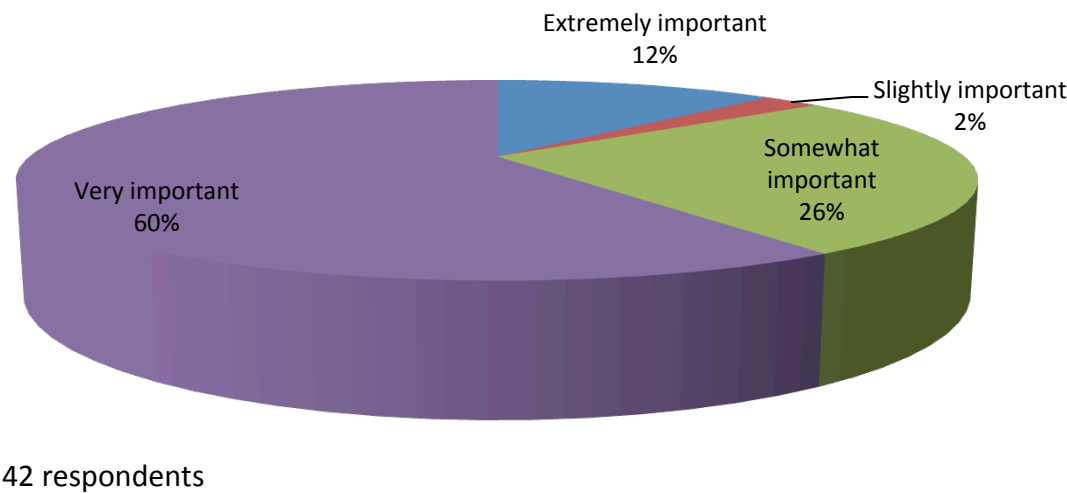
Public concern about the condition of trees

If asked about their concern for the condition of trees in their community, people in this municipality would say they are:



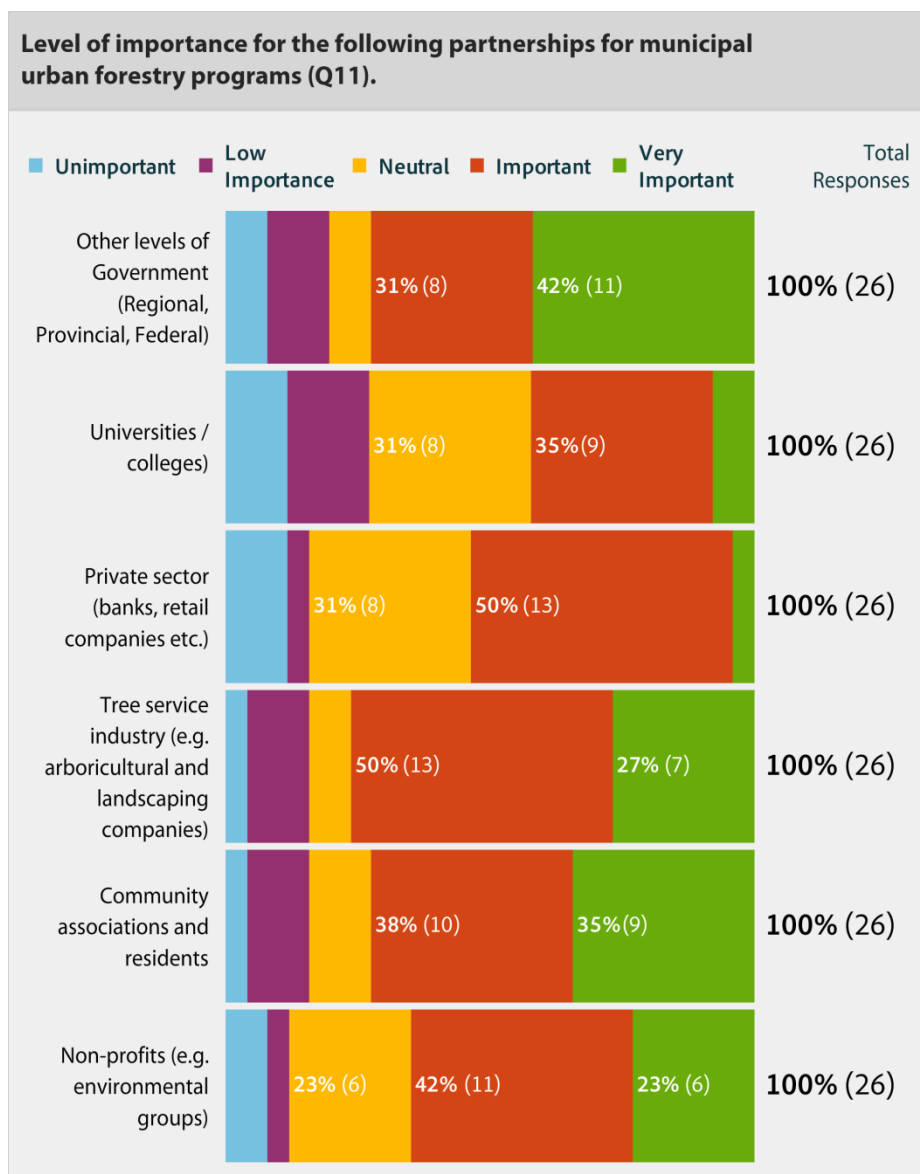
Significance of trees in the community

Generally, people in this municipality would consider trees and woodlands in and around their community to be:



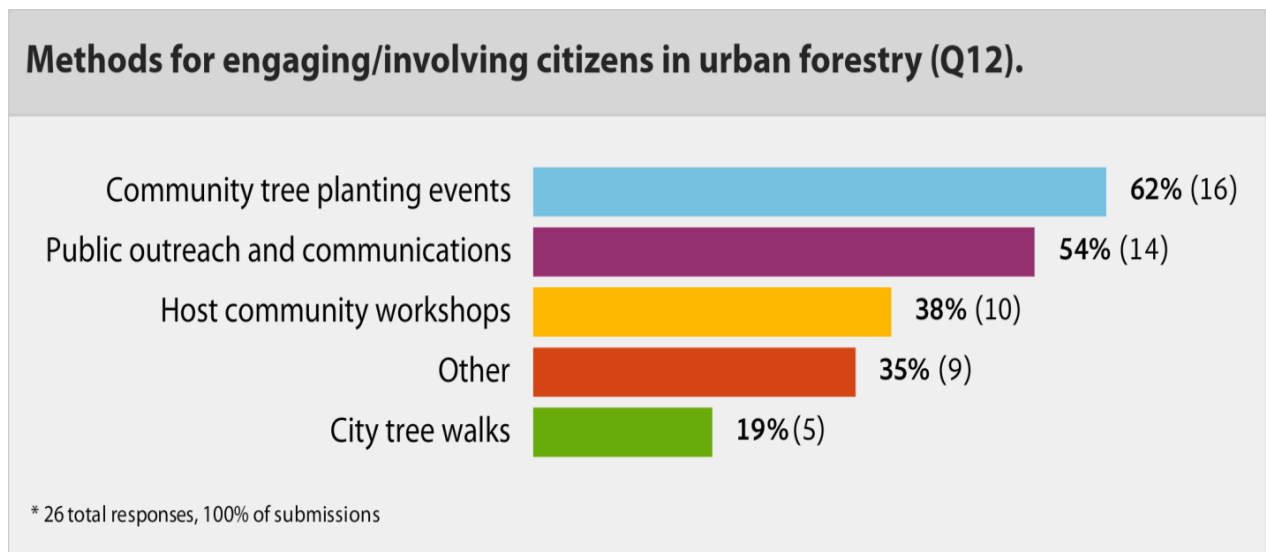
Level of importance placed on external partnerships

With respect to partnerships with academia, governmental organizations and departments and the private sector, municipalities were asked to identify and rank whether these were important to their urban forestry programs. This figure shows the level of importance placed on specific partnerships for urban forest programs. Results show that the most prioritized partnerships are with other levels of government, community associations and the tree service industry. The identification of partnerships for urban forestry programs is important because it sheds insights for future work, research and practice.



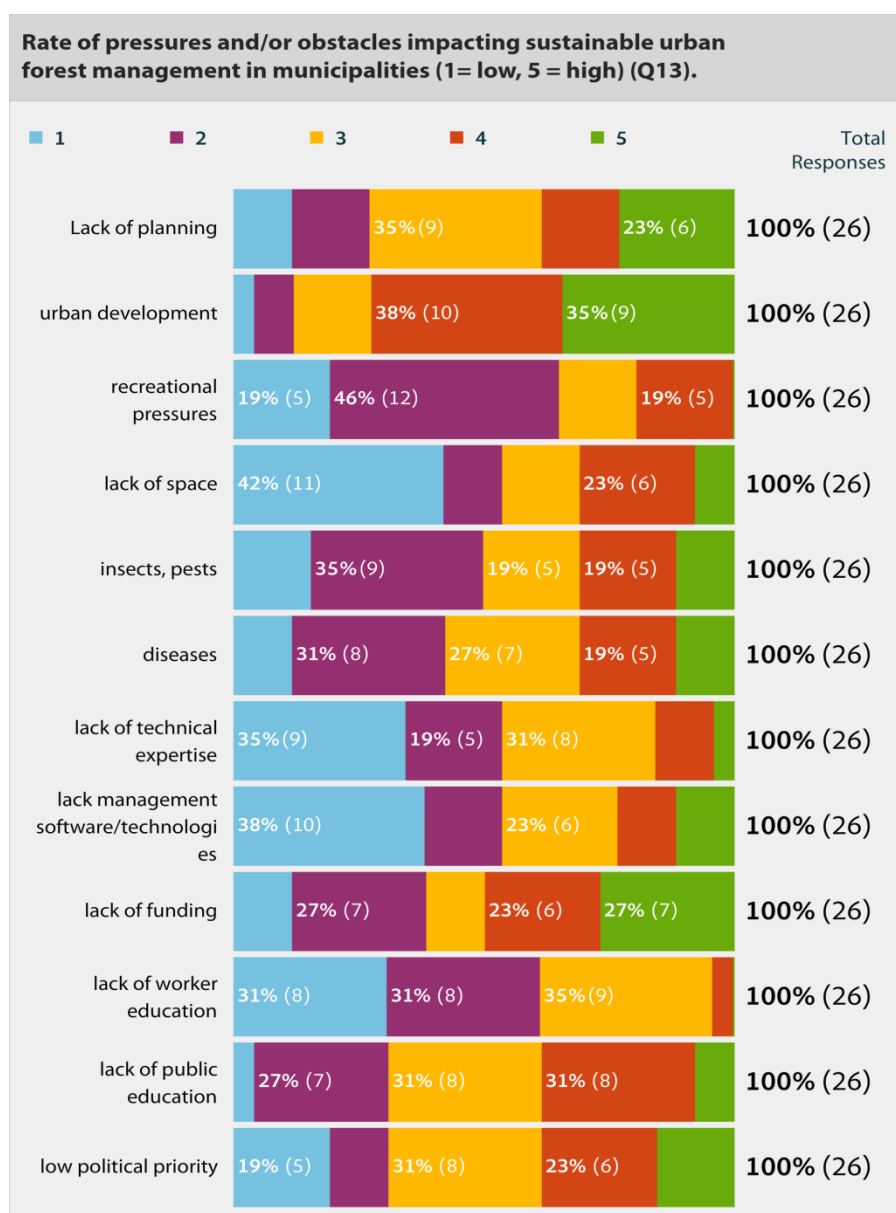
Methods for engaging citizens in urban forestry

With respect to methods for engaging citizens in urban forestry, 62% of respondents reported that they hosted community tree planting events. 35% reported that they perform other activities; the two examples given included a cost-share program and the formation of a civic enhancement committee. This figure shows this breakdown.



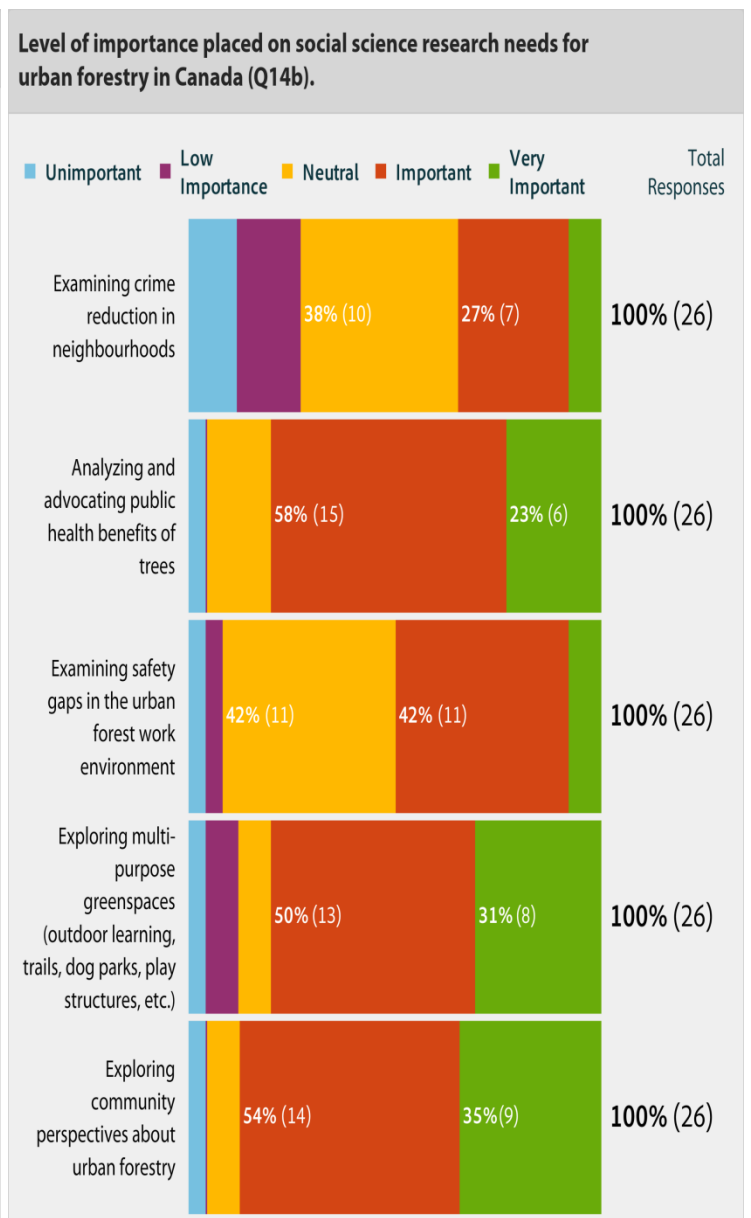
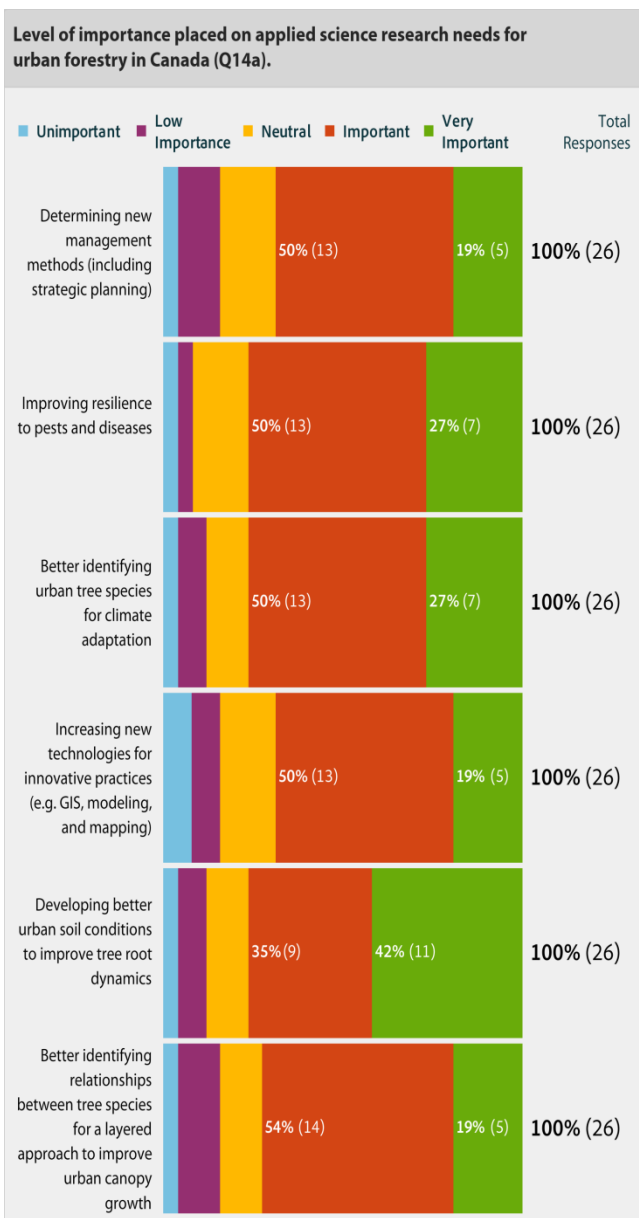
Pressures and obstacles facing urban forests

With respect to identified pressures facing urban forests, the top 3 obstacles that were identified by respondents were urban development (35%), lack of funding (27%), and lack of planning (23%). See below for a comprehensive breakdown. Urban forests are often overlooked and, as a result, may not be adequately protected or managed. The wealth of benefits that the urban forest provides may be lost in the development and expansion of small communities, or as a result of in-fill development in established neighbourhoods in larger centres. As with any resource, the urban forest requires care and attention to ensure its viability and sustainability. More attention needs to be given to planning for the future health and enhancement of this resource.



Research needs (applied and social)

With respect to research needs, data was collected for both applied sciences (such as management methods, resilience and species diversity) and social sciences (such as health benefits, crime reduction and safety gaps). The top three identified applied science research needs are: developing better urban soil conditions, improving resilience to pests and diseases, and better identifying urban tree species for climate adaptation. The top three identified social science research needs are: exploring community perspectives, exploring multi-purpose greenspaces, and analyzing and advocating for public health benefits of trees. Figure 14a and 14b below depict the detailed breakdown. For property owners, NGOs, municipalities, senior levels of gov't, and academia to provide an effective response to these identified research needs, better communication is needed with respect to sharing knowledge and vision for future collaboration. Better collaboration between research institutions, municipalities and communities has implications on planning and the opportunities that could be provided such as stronger awareness around social research for better community stewardship. International organizations can also be helpful in providing insights into lessons learned from their own experiences and networks (e.g. International Society of Arboriculture, International Union of Forest Research Organizations). The risk of not addressing identified research needs is that a disconnect will remain between research and practice. The positive impact of specifically addressing research needs is that practitioners will greatly benefit from new insights and methods.



Discussion

- While making contact with most municipalities continues to be a challenge, we are progressing in this area. We continue to add to the database and this analysis will be updated as we approach a 50% response rate.
- Results from the *National Municipal Needs Assessment* study which yielded 26 responses are engaged with the qualitative aspects of the urban forest, including: partnerships (with academia, governmental organizations, the private sector, etc.); practices to involve citizens in urban forestry; identified pressures; and research needs, both applied sciences (such as new pesticides, forest management techniques, genomic tools, or climate change adaptation strategies) and social science (such as values, community perceptions).
- The results from both the SCMF survey and the NMNA study data revealed that there is still much work to do in urban forestry across Canada with respect to planning, bylaw development and enforcement and general awareness among non-residential owners (who may own up to 80% of the urban forest).
- The goal is to conduct this survey every five years. As communities express the need for compiled and comparative information (such as the data found this report), our hope is that the response rate for such inventories of data collection increases.

Conclusions

- Urban forest managers in Canada see the number of street trees, park trees and amount of urban woodland as increasing; but see the area of “natural cover” decreasing;
- Increasing trends show promise that Canadian urban forests moving in the right direction;
- Further analysis using canopy cover assessment tools (e.g. iTree, other aerial methods) may provide better comparative data;
- Trends in urban Forestry in Canada remain similar to those stated in the 2003 report.

- Only 20% of the municipalities have a comprehensive management plan for their urban forests;
- Only ½ the municipalities have a bylaw protecting municipal trees (although this number is increasing);
- The number of municipalities who have a tree bylaw on private land equals those that do not, although the trend to have a bylaw is increasing – this is in spite of the fact that some provinces do not have legislation enabling municipalities to pass tree bylaws on private land;
- In spite of the fact that municipalities say that the amount of trees they are planting is increasing, they also state that their budgets are staying the same;
- Cooperation among municipalities and other agencies is mainly informal;
- The amount of knowledge in urban forest issues by public/institutional owners is not strong;
- Few neighbourhood groups (e.g. BIA, neighbourhood committee, action committees, public agency) are active in urban forests; where by comparison, in the United States 91% of municipalities report working on public engagement with urban forest policies, and 53% say that public awareness of these issues is increasing (Cochran et al, 2008).
- Trees and woodlands are seen as very important by most municipal residents – this trend is growing in Canada
- Developing better urban soil conditions to improve root dynamics was seen as a very important applied research need
- Other levels of government (Regional, provincial, federal) was given the highest level of importance by municipalities of all partnerships (community associations/residents was a close second)
- Community treeplanting events were the most popular way of engaging/involving citizens in urban forestry
- The top pressures and obstacles facing urban forests are urban development, lack of funding and lack of planning

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About the Authors

Dr. Adrina Bardekjian is currently the national Urban Forestry Program Manager with Tree Canada and a Totten Fellow of the USDA Forest Service. For ten years, Adrina has worked as a consultant and researcher with a number of organizations on a diversity of projects and initiatives. She has authored and contributed many publications on diverse topics, and is one of the editors of a recent book called, *Urban Forests, Trees and Greenspace: A Political Ecology Perspective*. Adrina is the recipient of several awards including the International Society of Arboriculture's Ontario Chapter *Honourary Membership Award* (2014) in recognition for her efforts to advance the ideas of arboriculture and urban forestry within Ontario, and the Canadian Dermatology Association's *Public Education Award* (2014), (group award), for "*Partners in Action*," a documentary showcasing the development of the City of Toronto's Shade Policy. She remains an active Board member on the Toronto Cancer Prevention Coalition and the Ontario Urban Forest Council. During National Tree Day (2014) in Montreal, Quebec, with Tree Canada, Adrina set the Guinness World Record for the Longest Tree Hug. Adrina has a Bachelor of Arts in Creative Writing and Anthropology from Concordia University, a Master of Forest Conservation from the University of Toronto and a doctoral degree from the Faculty of Environmental Studies at York University. Her academic research interests focus on urban forests and political ecology, transdisciplinary and *social arboriculture*.

Dr. Andy Kenney, R.P.F., is a Sr. Lecturer Emeritus in urban forestry and agroforestry from the Faculty of Forestry, University of Toronto. Andy is the past coordinator of the Faculty's Master of Forest Conservation program. His professional activities are primarily focused on forestry issues in the inhabited landscape, and urban and peri-urban forests. One major area of interest for Andy has been the relationship between urban design and urban forest structure. He is particularly interested in strategic planning in urban forestry and the involvement of stakeholder groups in the management of this important natural resource. Andy has served on a number of Boards including Tree Canada, the Ontario Urban Forest Council, and LEAF. He is also the recipient of a number of awards including the first *Jorgensen-Morsink Award* from the Ontario Professional Foresters Association (OPFA). Andy received his Bachelor of Science in Forestry from Lakehead University in 1976, a Masters of Science from the University of Guelph in 1986, and his Doctorate from University of Toronto in 1991. His knowledge, caring, energy and enthusiasm make him a favourite among students and an effective advocate for Urban Forestry.

Mr. Michael Rosen, R.P.F., is the President of Tree Canada. Michael has 30 years of experience in the urban forestry and forestry sectors including 13 years with Tree Canada, eight of them as President. He has authored and blogged on many topics including *Towards a Federal Presence in Urban Forestry* at the request of members of the Standing Committee of the Environment and Sustainable Development in 2012, invasive species, forest history and other topics. He is the recipient of the John H. Sellers and Jorgensen-Morsink Awards from the Ontario Professional Foresters Association and has successfully advocated for an undergraduate course in urban forestry at the University of British Columbia and for a National Tree Day for Canada. Previously he was a Stewardship Coordinator and Forester for the Ontario Ministry of Natural Resources where he received the Amethyst Award for his work during the 1998 ice storm. Michael has a B.Sc.F. from the University of Toronto, a Bachelor of Arts in History from Trent University, and a diploma from the University of Toronto and Lakehead University in the Ontario Advanced Forestry Program. Michael is a Registered Professional Forester in Ontario and a member of the International Society of Arboriculture.

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