A Comparative Case Study of Urban Forest Planning in Oakville and Kingston, Ontario

by

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Finally, I would like to thank Nick and all of my amazing friends at SURP for a fun and unforgettable two years.
Executive Summary

Canada is experiencing a trend of increasing urbanization and development pressures. The associated competition for land in urban areas presents challenges to the management and maintenance of green spaces. A number of municipalities across the country are responding to these challenges by developing long-range plans to expand and better manage their urban forests. This report explores how urban forest planning is being carried out within municipalities in the province of Ontario, Canada through a comparative case study of the Town of Oakville’s 2008 Urban Forest Strategic Management Plan and the City Kingston’s 2011 Urban Forest Management Plan.

This report addresses two research questions:

1. What strengths, weaknesses, and best practices can be identified from recent Ontario urban forest management plans and planning processes?
2. What can other Canadian municipalities learn from Oakville and Kingston’s experiences in developing urban forest management plans?

A literature review of international best practices and principles of urban forest planning revealed a set of 12 key urban forest plan components. These key plan components were organized into four general categories as follows:

A) Context and Goal-setting Process
   1. Definition of “urban forest”
   2. Scope of the plan
   3. Plan goals/targets

B) Incorporation of Ecological Principles
   4. Tree inventory
   5. Identification of plantable space
   6. Identification of threats and disaster management

C) Stakeholder Involvement
   7. Inclusion of public input
   8. Collaborative efforts
   9. Public education and ongoing participation

D) Implementation Strategies
   10. Adaptive management techniques
   11. Group responsible for implementation
   12. Regulatory instruments
The two Ontario urban forest plans were then analyzed against the key plan components, with telephone interviews with key informants involved in the planning processes supplementing the document analysis.

Overall, both of the Ontario plans use techniques that are consistent with academic literature and international best practices in urban forest planning. The majority of the 12 plan components were apparent within each of the plans in some form. Kingston had a more in-depth public consultation process and its establishment of a Tree Advisory Board as the predominant group responsible for implementation made the goals and objectives of the plan seem more feasible. Oakville’s plan had a strong base of scientific and technological knowledge, highly organized techniques to facilitate adaptive management, and significant detail regarding regulatory tools for urban forest management.

From the document analysis and results of interviews with key informants, a set of six recommendations was derived for other municipalities in Ontario and across Canada in developing successful urban forest plans:

1. Keep the scope of the plan manageable and realistic
2. Develop a set of clear, detailed and manageable goals and objectives
3. Incorporate advanced scientific and technological knowledge
4. Encourage public involvement and facilitate public input
5. Develop a meaningful message for Council and the public
6. Support provincial urban forest planning initiatives

With concerns for the effects of climate change and increased development pressures in Canadian cities, the creation of urban forest management plans is becoming more popular. As urban forest planning becomes a more standard practice in Canada, municipalities can look to these lessons from Oakville and Kingston to work towards successful urban forest management.
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Chapter 1: Introduction

1.1 Research Objectives

Canada is experiencing a trend of increasing urbanization and development pressures. The associated competition for land in urban areas presents challenges to the management and maintenance of green spaces. A number of municipalities across the country are responding to these challenges by developing long-range plans to expand and better manage their urban forests.

While urban forest planning is a relatively well-established practice in several European countries and American municipalities, it has only recently begun to gain popularity in Canada. As a result, literature on Canadian urban forest planning is currently limited. This report addresses these knowledge gaps through an exploration of how urban forest planning is being carried out within municipalities in the province of Ontario, Canada. This is done through a comparative case study of Oakville and Kingston’s recently implemented urban forest management plans, along with the processes behind these plans.

This report addresses two research questions:

1. What strengths, weaknesses, and best practices can be identified from recent Ontario urban forest management plans and planning processes?

2. What can other Canadian municipalities learn from Oakville and Kingston’s experiences in developing urban forest management plans?

1.2 Background

The above research questions are part of a broader discourse on urban ecosystems and sustainability. Urban development pressures typically have such negative implications as encroachment of built-up areas onto farmland, woodlands and natural habitat, loss of biodiversity, an increased proportion of impervious surfaces, and a separation of humans and nature (Carreiro et al. 2008). In Canada, urban sprawl often results from a desire for rural landscapes as an alternative to an urban lifestyle. Sustainable alternatives are needed to resist these development patterns (Van Wassenaer et al. 2000).
Carreiro and colleagues (2008) suggest that a movement towards “eco-cities”, or an integration of human urban activities with natural ecosystems, could be a viable alternative to environmentally destructive urban sprawl. An important component of the development of eco-cities is the urban forest. An urban forest encompasses the system of treed parks, private gardens and street trees within a city, and provides numerous ecosystem services and significant benefits to inhabitants of urban regions (Bolund and Hunhammar 1999).

1.2.1 Urban Forest Benefits

Among the environmental, economic and social benefits of effective urban forest management is the ability to maintain rural-like landscapes and recreational amenities within densely populated areas, reducing the likelihood of outward sprawl. Reductions in distance to parks and increases in tree cover have also been associated with higher property values, leading to a greater tax base. Urban forests can be utilized to create linkages between existing fragmented ecosystems and improve wildlife habitat in cities, as well as regulating climate, filtering noise, improving air quality, and reducing the need for man-made stormwater management erosion control structures (Van Wassenaer et al. 2000).

Numerous studies have been carried out with the aim of quantifying these benefits of urban trees. Carver and associates (2004) used a software called CITYgreen to predict energy savings due to shade trees based on values of canopy cover and home energy use of two residential neighbourhoods in Carbondale, Illinois. It was found that on average, shade trees contributed to energy savings of 162 to 296 kWh per home due to reductions in the need for air conditioning. Similarly, a study carried out in Hangzhou, China found a significant correlation between urban vegetative cover and reductions in land surface temperature, indicating that urban trees effectively combat the urban heat island effect that typically results from a lack of permeable surfaces (Huang et al. 2009).

These quantifications have further led to detailed cost-benefit analyses of urban trees, often indicating that financial gains associated with such benefits as reduced energy costs and increased property values outweigh the costs of planting and maintenance
programs. McPherson, an often-cited researcher in the field of urban forestry, and colleagues (2005) calculated an annual return of $1.37 to $3.09 per dollar invested in urban tree management, based on information from five U.S. municipalities. These benefits were strengthened where a diversity of species, age and size was present. In the Toronto, Canada park Allan Gardens, Millward and Sabir (2011) utilized the Street Tree Resource Assessment Tool for Urban Forest Managers (STRATUM) to assess financial benefits associated with energy savings, carbon sequestration, air filtration, stormwater runoff control, and aesthetic appeal. The 309 trees and 43 species present in the park in 2008 were found to provide a total annual benefit of 26,326 U.S. dollars over the calendar year, the majority of which was related to environmental services. The benefit-to-cost ratio was calculated at 3.4 to 1, comparable to that of some of the urban forests studied by McPherson’s research group in 2005. Possible long-term gains that can be derived from well-managed and sustained urban forests should not be overlooked in land use planning practice.

1.2.2 Urban Forest Planning in Canada

Urban forest planning is defined by the American Planning Association as “a planned and programmatic approach to the development and maintenance of the urban forest, including all elements of green infrastructure within the community, in an effort to optimize the resulting benefits in social, environmental, public health, economic, and aesthetic terms, especially when resulting from a community visioning and goal-setting process” (Schwab 2009). It is relatively well-established in many European countries and in the United States, but this practice had not been widely carried out within Canadian municipalities until recent years.

Urban forest planning has recently become more popular in Canada, with the creation of the Canadian Urban Forest Network and the development of urban forest management plans by a number of municipalities. The City of Toronto employs roughly 25 staff with involvements in management of tree cover and protection of the urban forest from development pressure. Although these programs are still more common among cities and regions in the United States, Canada is becoming increasingly prepared to meet the challenges of urban expansion, invasive species and disease (Rosen et al. 2006).
It is been indicated through surveys that Canadian residents consider urban forests to be important components of their communities and are generally concerned about their conservation and management (Kenney 2003). Increasing energy costs may result in a return to the need for urban forests for temperature regulation. With the majority of the Canadian population residing within urban areas and a trend toward further urbanization, it is crucial that strategic planning and management programs are put into effect.

### 1.2.3 Case Studies

In Ontario, the Town of Oakville and the City of Kingston are two municipalities that have recently developed urban forest management plans. Oakville’s *Urban Forest Strategic Management Plan* was put into effect in 2008, while Kingston’s *Urban Forest Management Plan* was released in 2011. The location of these two municipalities within the province of Ontario is shown below in Figure 1.

![Figure 1. Location of the Town of Oakville and the City of Kingston, Ontario. (Google Maps)](image)

These two municipalities have been selected for this comparative case study of Ontario urban forest planning due to their location within the province, their recently developed urban forest plans, and their similarities in population. They allow for a comparison of
recent urban forest planning initiatives in two mid-sized Ontario municipalities. The two cities differ in population density and growth rate, which will facilitate an exploration of urban forest planning practices in face of varying degrees of development pressure and competition for land. Table 1 summarizes geographic information of the two cities based on 2011 data from Statistics Canada; a detailed overview of the case selection process is provided within Section 2.2 of this report.

<table>
<thead>
<tr>
<th></th>
<th>Town of Oakville</th>
<th>City of Kingston</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area (ha)</td>
<td>13,888</td>
<td>45,117</td>
</tr>
<tr>
<td>Population (2011)</td>
<td>182,520</td>
<td>123,363</td>
</tr>
<tr>
<td>Population Growth (2006-2011)</td>
<td>10.2%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Population Density (people/ha)</td>
<td>13.14</td>
<td>2.73</td>
</tr>
<tr>
<td>Year of Urban Forest Plan Adoption</td>
<td>2008</td>
<td>2011</td>
</tr>
</tbody>
</table>

*Table 1. Geographic information for the Town of Oakville and the City of Kingston, Ontario. (Source: Statistics Canada)*

1.3 Report Outline

This report is organized into four chapters:

*Chapter 1* provides background and context for the report with the use of a literature review. It defines urban forest planning and the state of this practice in Canada, describes the various benefits of the urban forest, and introduces the two case studies.

*Chapter 2* outlines the research methods used, again using a literature review to explore international best practices in urban forest planning and develop an evaluation tool. It also describes the limitations and scope of the research.

*Chapter 3* includes a detailed analysis of the two Ontario urban forest plans through use of the evaluation tool outlined in Chapter 2.

*Chapter 4* concludes the report and provides a set of recommendations for other Canadian municipalities in developing urban forest plans.
Chapter 2: Methodology

2.1 General Approach
This report used a comparative case study approach as a qualitative method to explore the contents of and processes behind urban forest management plans that have been recently developed in Ontario municipalities. Multiple-case studies typically allow the researcher to arrive at more robust and powerful conclusions than single-case studies. It is beneficial to use replication as a technique, with each case analyzed using the same process in order to identify patterns (Yin 2009). This method was used to identify similarities, differences, best practices, and trends in Ontario urban forest planning processes. The research primarily involved an analysis of municipal documents, with supporting information acquired through interviews undertaken with municipal planners involved in the creation of each plan.

2.2 Case Selection
A scan of Ontario municipalities that have recently implemented urban forest management plans was completed in order to identify appropriate cases for this study. This scan was completed through use of the Ontario Urban Forest Council’s webpage, last updated in 2012 at the time of writing. Table 2 provides a summary of each municipality in Ontario that has adopted or is in the process of developing an urban forest plan, along with its population, the status of the plan, and the lead agency assisting the municipality with the plan’s creation.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population (2011)</th>
<th>Lead Agency</th>
<th>Plan Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakville</td>
<td>182,520</td>
<td>Urban Forest Innovations</td>
<td>Complete (2008)</td>
</tr>
<tr>
<td>Kingston</td>
<td>123,363</td>
<td>SENES Consultants</td>
<td>Complete (2011)</td>
</tr>
<tr>
<td>Guelph</td>
<td>121,688</td>
<td>Urban Forest Innovations; Beacon Environmental</td>
<td>In progress; draft plan complete (2012)</td>
</tr>
<tr>
<td>Ajax</td>
<td>109,600</td>
<td>Urban Forest Innovations; Beacon Environmental</td>
<td>Complete (2010)</td>
</tr>
<tr>
<td>Pickering</td>
<td>88,721</td>
<td>unknown</td>
<td>In progress</td>
</tr>
<tr>
<td>Burlington</td>
<td>175,779</td>
<td>Urban Forest Innovations; Beacon Environmental</td>
<td>Complete (2010)</td>
</tr>
</tbody>
</table>

Table 2. Summary of municipalities in Ontario that have adopted or are in the process of developing urban forest management plans (Statistics Canada; Ontario Urban Forest Council).
Two of these Ontario urban forest plans were chosen as case studies for this report:

2. The City of Kingston’s *Urban Forest Management Plan* (SENES Consultants Ltd. 2011)

Though each of these cases represents a mid-sized city in Ontario, they were selected based on their variation in location and regional context, time of plan completion, and consulting groups that were involved in plan development. This case selection method allowed for a more complete picture of urban forest planning in Ontario. While Oakville’s plan has been in effect for several years, Kingston’s completed plan was approved by Council in late 2011. Each municipality is additionally faced with the challenge of responding to unique threats and opportunities associated with its environmental and economic context. This resulted in the identification of a range of urban forest planning and management techniques that are being implemented in Ontario.

### 2.3 Data Collection Methods

The structure of this report was influenced by Miller’s 2011 Master’s Report. Miller’s research used a multiple-case study approach to assess the implementation of a new policy initiative in three North American cities. These initiatives were analyzed against a set of key policy components that were identified through a literature review. Similarly, this report uses academic literature to identify a set of key plan components by which to evaluate Oakville and Kingston’s urban forest plans.

Research was triangulated through use of a literature review, municipal document analysis, and semi-structured interviews. The literature review was conducted to serve two main purposes:

1. It provided context through introducing the concept of urban forestry and green infrastructure, describing the various benefits of urban trees, outlining a brief history of urban forest planning practices worldwide, and introducing the current state of Canadian urban forest planning (see Chapter 1: Introduction); and,
2. As in Miller’s report (2011), it was additionally used to identify key strategies in urban forest planning and key components that are often included within urban forest plan documents. These key plan components, displayed in Table 3 below, were then used as a basis for analyzing and comparing the two Ontario initiatives. Rationale behind each of the 12 selected plan components based on the literature review is provided in Section 2.4.

<table>
<thead>
<tr>
<th>Category</th>
<th>Key Plan Component</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Context and Goal-setting Process</td>
<td>1. Definition of “urban forest”</td>
<td>Town of Oakville</td>
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<tr>
<td></td>
<td>2. Scope of the plan</td>
<td>City of Kingston</td>
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<td></td>
<td>3. Plan goals/targets</td>
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<tr>
<td>B) Incorporation of Ecological Principles</td>
<td>4. Tree inventory</td>
<td></td>
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<td></td>
<td>5. Identification of plantable space</td>
<td></td>
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<td></td>
<td>6. Identification of threats and disaster management</td>
<td></td>
</tr>
<tr>
<td>C) Stakeholder Involvement and Collaboration</td>
<td>7. Inclusion of public input</td>
<td></td>
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<td></td>
<td>8. Collaborative efforts</td>
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<td></td>
<td>9. Public education and ongoing participation</td>
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<tr>
<td>D) Implementation Strategies</td>
<td>10. Adaptive management techniques</td>
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<td></td>
<td>11. Group responsible for implementation</td>
<td></td>
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<td></td>
<td>12. Regulatory instruments:</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.** Evaluation matrix for urban forest plan analysis.

Next, the two municipal plan documents were analyzed against the 12 key plan components. This allowed the researcher to identify whether and how each municipality incorporated the 12 components into their urban forest planning processes; methods of analysis are explained further within Section 2.4 below. Where necessary, additional information was gathered from municipal websites, relevant by-laws, and other supporting documents. An evaluation matrix (Table 3) was developed to illustrate
comparisons between the strategies undertaken by each municipality. These findings are presented in the Analysis (Chapter 3), which also describes each of the plan processes in further detail.

Finally, semi-structured interviews of municipal staff involved in the process of creating Oakville and Kingston’s urban forest plans were conducted to address any unclear elements or gaps in information left by the document analysis. These interviews also helped to gain perspectives on the strengths and weaknesses of the individual plans, challenges and constraints that were encountered, and the need for urban forest planning initiatives across the province. Specific interview questions and rationale are presented in Section 2.5.

This triangulation of data is a necessary tactic in strengthening the case study method. It provides a number of advantages: Yin (2009) argues that using multiple sources of evidence often reveals “converging lines of inquiry”, or patterns in the information gathered. This minimizes the impact of subjective judgements and bias, and thereby improving construct validity (Yin 2009). The use of academic literature, municipal documents and personal interviews helps to clarify patterns and identify best practices in urban forest planning.

2.4 Key Plan Components: Rationale

A review of academic literature revealed a set of strategies in urban forest planning that are widely believed to contribute to the effectiveness of such initiatives. Key sources that were reviewed include the American Planning Association’s report Planning the Urban Forest: Ecology, Economy, and Community Development (2009), as well as several articles by Andy Kenney of the University of Toronto, who was involved in the creation of Oakville’s urban forest plan (Kenney 2003; Kenney et al. 2011; Van Wassenaer et al. 2000). Much of Kenney’s research focuses on urban forest planning in the Canadian context; for the purpose of this report, it effectively complemented American and European academic literature on urban forest planning.
The following key plan components represent steps to be taken in the urban forest planning process and were used as a comparative tool to analyze the two case study municipalities. As many of these key plan components have been identified within academic literature as international best practices in urban forest planning, they were also used to identify how similar strategies are presently being used in the Canadian context.

A total of 12 key plan components were used, which were organized by the researcher into four general categories:

A) Context and Goal-setting Process;
B) Incorporation of Ecological Principles;
C) Stakeholder Involvement; and,
D) Implementation Strategies

Below, the rationale behind the use of each plan component is described with references to supporting literature. Subsections labeled “Analysis” describe how Oakville and Kingston’s urban forest plans will be assessed against each component.

### 2.4.1 Category A: Context and Goal-setting Process

#### 1. Defining the urban forest

Urban forest strategies often begin with a clear definition of the urban forest in order to focus the plan. This identification of the urban forest can range from the inclusion solely of trees in the community to entire ecosystems. It is largely believed by experts that it is advantageous to consider a holistic view of the urban forest community-wide. This involves the consideration of both trees and their associated ecosystems, in order to develop a true understanding of the urban forest’s value and develop effective management programs (Schwab 2009).

*Analysis:* This report compares and assesses definitions of “urban forest” within Oakville and Kingston’s plans, highlighting whether they include a holistic view that considers ecosystems associated with city trees.
2. **Scope of the plan**

Effective urban forest strategies should take into account the city’s complete forest network, including trees and associated ecosystems located on both private and municipally owned lands. Typically, the majority of urban trees within a municipality are located on private land (Kenney 2003). This may present challenges in maximizing the benefits of the urban forest while recognizing and respecting private property rights.

This issue has recently been addressed by Ontario’s Ministry of Natural Resources in the establishment of the Natural Spaces program. Volunteer stewardship councils across the province guide various initiatives to promote public education and environmental stewardship. The program also offers private consultations with property owners regarding the protection of on-site natural heritage features, and a property tax incentive program for effective management of forested land on private property (Ontario Ministry of Natural Resources 2006).

**Analysis:** This report highlights whether private trees were involved in the planning process along with municipally owned trees, the lifespan of each plan, as well as whether the plan applies solely to selected areas of the city or the entire community.

3. **Setting ambitious and attainable goals**

The American Planning Association’s report *Planning the Urban Forest: Ecology, Economy, and Community Development* (2009) includes the results of a two-day symposium held in 2006 that brought together a number of American experts to develop a set of principles to guide urban forest planning practices. In addressing the goal-setting process, participants recognized a trend in municipalities setting specific canopy cover targets. For example, Baltimore, Maryland was found to have a canopy cover of 20 percent of total municipal area in 2006. After a study by the Maryland Department of Natural Resources indicated that an increase to 46.3 percent canopy cover would be sufficient to achieve and maintain the health of local water bodies, the city set a goal of reaching this target within three decades. Symposium participants highlighted that while these far-reaching goals can be highly effective, it is important that they are achievable within a reasonable time frame (Schwab 2009).
Kenney and associates (2011) offer a critique on the reliance on canopy cover targets in North American urban forest planning practices. These targets, which consider measurements of the total proportion of a city’s land that appears forested from a bird’s eye view, are useful in providing a simple method of measuring change and progress. However, the researchers write that “a much more effective measure of the success of urban forest stewardship rests with moving steadily and aggressively toward a more comprehensive set of performance indicators” (p. 108). Urban forest plans should address such factors as species diversity, age and size class distribution, available planting spaces, current and future land uses, climate, and soil condition (Kenney et al. 2011).

**Analysis:** This report assesses the goal-setting process that was used in the development of Oakville and Kingston’s urban forest plans. This includes an exploration of how goals or targets were justified to be attainable within the established timeframe and whether a detailed set of performance indicators was addressed in the plan. This information was gathered from within the plan documents themselves, and from personal interviews where necessary.

### 2.4.2 Category B: Incorporation of Ecological Principles

4. **Conducting an inventory of existing trees and associated ecosystems**

As a first step in developing an urban forest management plan, it is necessary to conduct an inventory of the existing urban forest as baseline data. Recent advancements in geographic information systems (GIS) and the development of related software for urban forest planning purposes have allowed municipalities to keep track of both public and private trees, calculate the environmental and economic benefits provided by the canopy cover, and manage community needs and municipal budgeting (Schwab 2009). Successful plans begin with gathering holistic information on the many attributes of the urban forest including species, age, and condition of existing trees, as well as wildlife habitat (Van Wassenaer et al. 2000). This involves collaboration with a variety of professionals. Foresters can be consulted for information about species distribution and adaptation, soil conditions, and stressors; while GIS experts can analyze
how the urban forest has changed through history to provide better indicators of its future potential (Schwab 2009).

**Analysis:** This report investigates how inventories of existing trees are being conducted in Oakville and Kingston, including how GIS or other software programs are used. It was noted whether existing species and age distributions are recorded, as well as assessments of forest health, soil conditions, associated wildlife habitat, and historical changes in urban forest structure.

5. **Identification of plantable space**

In addition to carrying out a detailed inventory of city trees, it is advantageous for plans to publish a comprehensive map of the entire network of existing and proposed forest throughout the municipality (Jones 2008). This visual representation is helpful in communicating the plan’s goals and coordinating plan implementation strategies (McDonald et al. 2005).

The suitability of proposed planting sites is critical. Expertise is needed in finding suitable species that will thrive in a given environment, as well as making effort to restore linkage gaps where possible (McDonald et al. 2005). In the United Kingdom, successful urban forest strategies recognize the importance of natural colonization and pioneer species; they base plantings on tree species that naturally grow in a particular environment (Jones 2008). Bradshaw, Hunt and Walmsley (1995) highlight the need for resourcefulness in finding available land for tree growth in and around urban areas. This could include efforts to convert any land that has development restrictions, such as brownfield sites, or land at the urban fringe that has less potential for development into woodlands.

**Analysis:** This report investigates whether each of the two municipalities has published a map of existing and proposed forested lands, clearly indicating opportunities for urban forest expansion. This research also looked for efforts made by the municipalities to target such areas as brownfield sites, whose development potential is low, for potential new plantings.
6. **Identification of threats and disaster management**

Miller (1997) highlights the importance of being proactive rather than reactive in urban forest planning, as often these initiatives place a large focus on crisis management. Ontario’s forests face a range of unique threats, which are discussed in detail within Section 3.2.2. It is beneficial in urban forest planning to identify any potential threats to local forests. Disaster prevention and mitigation strategies should be developed accordingly. For example, utilizing a diversity of species provides resilience to disease and pests (Jones 2008). A diversity of age and size classes can also maximize the potential long-term benefits of the urban forest (Kenney et al. 2011).

**Analysis:** This report explores how each plan identifies common and potential threats to local forests. Additionally, disaster prevention and mitigation strategies to ensure long-term tree health were evaluated.

2.4.3 **Category C: Stakeholder Involvement and Collaboration**

7. **Inclusion of public input into visioning process and final plan**

Kenney (2003) used discussions held among 175 participants of a Canadian urban forestry conference held in Markham, Ontario in 2002 to identify critical issues and actions in the field of urban forestry in Canada. Community involvement was one of the key techniques that were believed to be critical in urban forest planning, as forests are of benefit to all municipal residents. Participants in this conference agreed that municipalities should be required to develop a process to involve community groups in planning and management of the urban forest (Kenney 2003).

Principles of effective public consultation processes in planning can include ensuring that discussion among stakeholders is facilitated, promoting fairness through allowing all stakeholders to participate equally, and allowing for flexibility and compromise in the planning process by responding to public concerns (Webler et al. 2001). When public participants in an urban forest planning process in Helsinki, Finland were surveyed, it became apparent that participation in the visioning and goal-setting process was particularly valued. It is also useful to use a combination of public engagement methods, such as open houses, breakout sessions, and online commenting systems, in order to
ensure that a diverse group of stakeholders is given the opportunity to participate (Sipila and Tyrvainen 2005).

**Analysis:** This report explores how the two Ontario municipalities involved the community in the urban forest visioning process prior to plan development, as well as the public's influence on the final plan and implementation strategies. This analysis involved an investigation of the number of public meetings that were held, when these meetings were held with respect to the plan development timeline, whether reception of public comments was facilitated through online systems or telephone throughout the planning process, and how the final plan was adapted to respond to public concerns. Public comments were reviewed where available for this analysis, along with information gathered from semi-structured interviews of municipal staff involved in the urban forest planning process.

8. **Collaboration among groups**

Kenney's conference participants additionally expressed concerns that the level of interaction between the many professions and trades involved in urban forest planning in Canada is inadequate. Municipal departments, private landowners and business owners can have conflicting goals (Kenney et al. 2011). Strategies to promote constructive communication between all groups involved are needed (Kenney 2003), along with collaboration and partnership working between various sectors of society and organizations working towards the common goal of a well-developed and sustainable urban forest (Jones 2008).

McDonald and colleagues (2005) note the importance of a diverse group responsible for urban forest plan development: “Bringing together a diversity of perspectives, backgrounds and expertise will provide a strong basis for developing the goals that will lead planning efforts”. Such an organization can ensure that the various needs of the community are met (McDonald et al. 2005).

**Analysis:** This report includes an analysis of the range of municipal departments, organizations, professionals and stakeholders involved in the urban forest planning
process. It was also noted whether a communication strategy was utilized to facilitate efficient interaction among these groups. This information was obtained both from municipal documents and personal interviews.

9. **Public education efforts and ongoing citizen participation strategies**

In order for urban forest initiatives to succeed over the long term, there is a need for a community that is both informed and motivated (Kenney 2003). Members of the public should be made aware of the environmental and social benefits of city trees (Kenney *et al.* 2011). Public education efforts can be combined with strategies to involve the community in events and activities such as surveying and mapping neighbourhoods, tree planting, and maintenance initiatives. This often helps the public to become more comfortable with any landscape changes that take place, as well as encourage long-term public support of urban forest expansion (Jones 2008).

*Analysis:* This report explores planned ongoing efforts to involve the public in urban forest management initiatives in the cases of Oakville and Kingston. Interviews with municipal key informants clarified how members of the community continue to be involved in urban forest planning and management processes. This could include educational programs, regular public events, and stewardship programs.

**2.4.4 Category D: Implementation Strategies**

10. **Adaptive management techniques**

Urban forest management plans often present long-range goals and initiatives. It is important to routinely monitor progress in meeting goals or targets through the use of a set of performance indicators, and to identify when it is necessary to make adaptations to the original strategies (Kenney *et al.* 2011). Tree inventories and community-wide ecological information should be continuously updated. New knowledge may also be acquired over the period of time that an urban forest plan is in effect; this should be constantly incorporated into initiatives (Schwab 2009). This emphasis on adaptive management allows for the benefit of sustainability and cost-effectiveness (Miller 1997).
Analysis: This report investigates plans to regularly monitor progress and update strategies within the two Canadian examples in this study. The plans should identify how any new knowledge regarding the urban forest and effective management strategies will be obtained and incorporated.

11. **Identification of groups responsible for implementation**

Kenney and associates (2011) highlight the need for a “multidisciplinary management team entrenched within a dedicated municipal forestry unit” that combines “the tree care skills of arborists with the planning, modeling and ecological background of professional foresters and ecologists to develop and implement successful strategic management plans” (p. 111). This team would oversee and organize the meeting of each goal outlined in the plan.

Analysis: This report investigates the groups responsible for implementation strategies as identified in Oakville and Kingston’s urban forest plans, in order to analyze the feasibility of carrying through with each initiative. Municipalities should ensure that these groups possess all necessary expertise in urban forest management.

12. **Regulatory instruments**

In Canada, municipalities are empowered by provincial governments to enact legislation governing the management of trees on both public and private land. Such legislation can manage the protection of heritage trees, the replacement of damaged trees, cutting permits, and protection from construction and hydro utility activities (Canadian Urban Forest Network 2006).

Analysis: This report identifies regulatory instruments such as tree by-laws that are being proposed or amended in each of the two Ontario municipalities. Comparisons between the regulation of municipally owned and privately owned trees were made. Where this information was not clearly indicated within plan documents, personal interviews were used to identify relevant municipal legislation.
2.5 Interview Questions

Semi-structured interviews were conducted by telephone with two municipal staff responsible for urban forestry efforts in the Town of Oakville and City of Kingston. This style of interview allowed participants to give detailed responses to each question and address any additional points of interest that they found relevant. The interview questions were formulated to facilitate a discussion of the public involvement process, strengths and weaknesses of each city’s urban forest plan, major constraints and challenges that were faced, and recommendations for other municipalities.

The first part of each interview aimed to provide clarification pertaining to several of the key plan components where information was missing from the urban forest plans. Answers to these questions were analyzed in the same manner as the document analysis, as outlined within Section 2.4 above. They are presented throughout Chapter 3: Analysis, within key plan components 5) Identification of plantable space; 7) Inclusion of public input into visioning process and final plan; 8) Collaboration among groups; and, 12) Regulatory instruments. These questions were as follows:

1. How are potential planting sites being identified and prioritized? Will priority be given to sites with low development potential such as brownfield sites and urban fringe areas?
2. How was the public involved in the visioning and goal-setting process?
3. How was public input incorporated into the final plan? How did public consultation efforts affect the outcome?
4. How did various city departments, organizations and stakeholders collaborate in the process of developing the plan? To what extent was effort made to ensure that all groups were working effectively toward a common goal?
5. What regulatory tools are being used to meet the goals set out in the plan? Are any new by-laws or other regulatory tools being put into effect as a result of this plan?

The second part of each interview focused on opinion-based questions pertaining to the strengths and weaknesses of each urban forest plan, the challenges of urban forest
planning, and recommendations for other Ontario or Canadian municipalities in undertaking similar initiatives. Answers to these questions were used to further highlight specific components of each plan, as well as help the researcher in developing the set of recommendations for Canadian municipalities presented in Chapter 4: Recommendations and Conclusions. These questions were as follows:

6. What are the strengths of your city’s urban forest plan? Why do you think it will be successful in achieving the goals that it sets out?
7. What challenges were faced in the creation of the plan?
8. What could have been done differently? Did constraints such as budget and time limits inhibit the plan’s potential impact?
9. Do you believe that detailed urban forest strategies should be implemented in all Canadian municipalities? Why or why not?
10. What recommendations would you make to other Canadian municipalities in the process of developing an urban forest plan?

Interviews were conducted after the initial analysis of municipal documents. Interviewees were additionally asked to review the researcher’s analysis of their municipality’s plan in order to determine whether any key information is missing or misrepresented. This verification of the analysis further strengthened the research.

2.6 Limitations
Several limitations exist in this research as a result of time constraints. The researcher selected 12 key plan components as an analysis tool, while a number of additional urban forest planning strategies have been identified in academic literature. Though consideration of regional ecosystems is critical in urban forest planning, the scope of this report is limited to planning practices at a local or municipal scale. Furthermore, both case studies represent an investigation of urban forest planning efforts within a mid-sized municipality; a different set of strategies with a more complex process may be more effective in larger cities. Analyses and recommendations also solely represent urban forest planning practices in Ontario and may not apply to that of other Canadian
provinces. Time constraints additionally limited the researcher to conducting no more than two interviews.

Several forms of bias may exist within the processes of data collection for this research. The researcher holds a bias in support of urban forest planning initiatives. Available information within plan documents and that obtained from interviews also may have been limited and lack a fully accurate representation of urban forest planning strategies. Urban forest planning is a relatively new practice in Canada. The case study of Oakville investigates a plan that has been in effect for four years, while Kingston’s *Urban Forest Management Plan* was in its final stages of completion at the time of writing. As a result, this report explores the planning processes behind these documents but does not investigate planning outcomes.
Chapter 3: Analysis

This chapter presents an analysis of the urban forest plans developed by the Town of Oakville and the City of Kingston. First, a summary of the analysis of the two plans against each of the 12 key plan components is presented using the same evaluation matrix that was introduced as Table 3 within Chapter 2: Methodology. A detailed analysis is then presented in Section 3.2, including the document analysis and interview results, again organized by the 12 key plan components. Finally, a brief discussion of the results concludes the chapter.

3.1 Summary of Results: Evaluation Matrix

Table 4, presented on the following pages, summarizes the analysis of the two urban forest plans against the 12 key plan components that were introduced within Chapter 2. This evaluation matrix was previously presented as Table 3, and clearly displays comparisons between the two plans in a simplified format. Detailed analyses are presented within Section 3.2.
## Urban Forest Planning in Ontario

### Julia Cziraky 2012

### Category: Key Plan Component  | Municipality

<table>
<thead>
<tr>
<th>Town of Oakville</th>
<th>City of Kingston</th>
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<tbody>
<tr>
<td><strong>1. Definition of “urban forest”</strong></td>
<td><strong>Includes “individual trees to open space, forest and roadside plantings; it is found in parks, around schools, churches, hospitals, ravines, streets, and all other privately-owned property”</strong>&lt;br&gt;<strong>Plan recognizes associated ecosystems and habitats</strong></td>
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<tr>
<td><strong>2. Scope of the plan</strong></td>
<td><strong>20-year lifespan</strong>&lt;br&gt;<strong>Applies to public and private lands</strong>&lt;br&gt;<strong>Applies only to lands south of Dundas Street</strong></td>
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<td><strong>3. Plan goals/targets</strong></td>
<td><strong>Provides set of recommendations with assigned priority numbers from 1 (highest) to 3 (lowest), estimated cost, and suggested timeframe</strong>&lt;br&gt;<strong>Provides set of criteria and performance indicators to measure progress</strong>&lt;br&gt;<strong>Use of computer modeling to determine potential for urban forest expansion</strong></td>
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<td><strong>4. Tree inventory</strong></td>
<td><strong>Data on public trees and overall canopy cover gathered in 2006</strong>&lt;br&gt;<strong>Tree inventory including public and private tree information to be incorporated within the Town’s GIS system, along with imagery showing canopy cover</strong>&lt;br&gt;<strong>Inventory will include species, age, size, health, management history, and habitat information</strong>&lt;br&gt;<strong>Inventory will be continuously updated in GIS database</strong></td>
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<td><strong>5. Identification of plantable space</strong></td>
<td><strong>Proposed Tree Establishment Plan and Prime Site strategy will identify priority planting sites and develop detailed planting plans</strong></td>
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<td><strong>6. Identification of threats and disaster management</strong></td>
<td><strong>Threats: climate change and extreme weather, invasive pests, development pressures</strong>&lt;br&gt;<strong>Management: species and age diversity, engineered soils and porous pavements, risk and hazard monitoring</strong></td>
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<td>Town of Oakville</td>
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<td>C) Stakeholder Involvement and Collaboration</td>
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<td>D) Implementation Strategies</td>
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Table 4. Completed evaluation matrix summarizing the urban forest plan analysis. A detailed analysis of each of the 12 key plan components is presented within Section 3.2.
3.2 Detailed Key Plan Component Analyses

The following represents a detailed analysis of the Town Oakville’s Urban Forest Strategic Management Plan and Kingston’s Urban Forest Management Plan against the twelve key plan components outlined within Chapter 2: Methodology. The analysis of each key plan component follows a consistent format: first Oakville’s plan is analyzed, then Kingston’s plan is analyzed, followed by a comparison of the two plans.

3.2.1 Category A: Context and Goal-setting Process

1. Defining the Urban Forest

Oakville’s Urban Forest Strategic Management Plan identifies the Town’s urban forest as all trees located within the municipality, including “individual trees to open space, forest and roadside plantings; it is found in parks, around schools, churches, hospitals, ravines, streets, and all other privately-owned property” (p. 1). The plan then goes on to detail the various benefits that the urban forest provides to the community: improving air and water quality, reducing building energy use, contributing to human mental and physical health, and providing habitat and food sources to a range of wildlife.

While Oakville’s definition of the urban forest initially appears to exclude ecosystems associated with urban trees, this recognition of local woodlands as potential wildlife habitat indicates a more holistic view of the urban forest. The urban forest is additionally referred to as “green infrastructure” within the plan, indicating that it encompasses more than city trees. Oakville’s plan also makes a specific recommendation that the Town amends its Official Plan “to designate its municipally owned urban forest as ‘green infrastructure’” (p.1). As discussed in Section 2.4.1 of this report, this holistic view of the urban forest as an important resource that is inclusive of a variety of habitats sets the stage for effective planning and management.

Kingston’s Urban Forest Management Plan similarly acknowledges the urban forest as comprising “City-owned trees along streets, in parks and in natural areas as well as trees on private property and on other public and institutional lands such as those of the Cataraqui Conservation Authority, Parks Canada and Queen’s University” (p. 4). The plan also lists and describes the benefits of the urban forest, recognizing its value as
habitat and food source for urban wildlife and migratory birds. Kingston’s urban forest vision statement recognizes a healthy urban forest as “a fully functioning green infrastructure” (p. 20), indicating a holistic perspective.

Kingston and Oakville both have similar approaches to defining the urban forest; while each plan recognizes the significance of whole ecosystems and habitats associated with urban trees, the plans do not include a distinct comprehensive definition of the urban forest indicating inclusion of these ecosystems. As discussed within Chapter 2, it is advantageous in urban forest planning to consider both trees and their associated ecosystems. A clear, holistic definition of the urban forest that reflects its wide range of environmental benefits may contribute to more effective urban forest management techniques.

2. **Scope of the plan**

Oakville’s plan has a 20-year lifespan from 2008 to 2027, and applies to both publicly and privately owned trees within the municipality. In addition to managing trees located on municipally owned lands, the plan includes a private land stewardship program and addresses private tree management and protection policies. These private tree management initiatives will be explored further within this chapter.

The *Urban Forest Strategic Management Plan* only addresses Oakville’s lands south of Dundas Street. A second plan, the *North Oakville Urban Forest Strategic Management Plan*, was proposed in late 2011 and is currently undergoing public consultation processes. It builds on the findings from the first urban forest plan (Natural Resource Solutions Inc. and Dillon Consulting 2011). As it remains in the process of completion, this second plan is beyond the scope of this report and will not be reviewed in detail.

Kingston’s plan is slightly longer-term in scope, setting goals and objectives to be achieved over a 25-year time frame. Although the plan recognizes the importance of managing privately owned woodlands, it directly addresses only trees on public lands. It also applies only to urban land; much of Kingston’s rural areas are not considered within the plan. This urban boundary is shown in Figure 2 below.
Several initiatives within Kingston’s plan indirectly contribute to private tree protection and management, and the City acknowledges residents’ concerns for better management of trees on private lands. The City aims to direct more attention to private tree management in the future, particularly following the plan’s first five-year review in 2016. However, as the majority of trees are located on private lands, the strength of Kingston’s current urban forest management initiatives may be compromised by the focus on public lands.

Both plans attempt to maintain a manageable scope by applying only to specific areas of the municipality. They differ in their consideration of public and private trees, with Oakville’s plan applying to all trees regardless of ownership and Kingston’s plan applying solely to trees on public property. However, each plan clearly recognizes the need to manage the city’s whole urban forest, and indicates goals to develop further urban forest planning initiatives to address different land areas.
3. Setting ambitious and attainable goals

Oakville clearly organizes and justifies its goals and objectives for the urban forest within the plan. Throughout the body of Oakville’s plan, a series of recommendations are presented and justified with background information about the current state of the Town’s urban forest and research on effective urban forest planning and management. A table summarizing these recommendations is provided at the beginning of the plan, and includes an assigned priority number from 1 (highest) to 3 (lowest), estimated cost, and suggested time for implementation to take place.

The plan additionally includes a set of criteria and performance indicators for the measurement of progress in urban forest management. This set was adapted from a report by Clark et al. (1997) for use by the Town of Oakville. Within each criterion, an assessment of the state of Oakville’s forest prior to plan implementation is provided under low, moderate, good, or optimal performance indicators. Key objectives within each criterion are also outlined. These criteria are organized into three categories: vegetation resource, community framework, and management approach (pp. 5-8). For example, under the criterion Canopy Cover, Oakville’s current state is identified as “good” at 50 to 75 percent of the Town’s potential canopy cover. “Optimal” canopy cover is identified as achieving 75 to 100 percent of the potential, and the key objective for Oakville’s canopy cover is to reach a “climate-appropriate degree of tree cover, community-wide” (p. 5).

Oakville’s canopy cover targets are made more realistic through emphasizing measurements of canopy cover as a percentage of the Town’s total potential. This method considers variations in urban forest carrying capacity across neighbourhoods, as densely developed areas will not allow for as much new tree growth as low-density neighbourhoods with a high proportion of green space. The Town has also carried out studies using the Urban Forest Effects (UFORE) computer model to determine potential urban forest expansion opportunities and to quantify the environmental benefits of varying degrees of canopy cover in Oakville.
Oakville’s plan provides in-depth rationale for each of its objectives, and critiques overly simplistic approaches to urban forest planning. A discussion of the advantages and disadvantages of setting the canopy cover targets mentioned above is included within the plan; the importance of monitoring a range of factors such as species diversity, tree health, and age or size class distribution is acknowledged. The plan promotes the use of leaf area density as a more effective method of measuring the state of the urban forest. However, during a personal interview it was indicated that Oakville’s overarching goal of achieving 40% canopy cover was fundamental in capturing attention and support from council and members of the public. This was due to the 40% target being simple and easy to visualize (Personal Telephone Interview, April 2, 2012).

In addition to these canopy cover goals, Oakville’s plan incorporates a range of objectives with a similar level of detail in terms of providing rationale and outlining implementation strategies, feasibility analyses, and projected budgeting and time frame. It is clear that each objective has been carefully developed to encourage effective implementation. This method will likely increase the probability that objectives will be attained over the life of Oakville’s urban forest plan.

Kingston’s urban forest plan outlines its general strategy within Section 3.0: Kingston’s Urban Forest in 2035. The plan aims to identify an overarching vision, provide direction with a set of goals, outline specific outcomes to be achieved, and detail management actions that will be used to achieve the outcomes set out. A detailed table is provided within the plan outlining each goal along with its associated outcomes, activities, and resources.

For example, the first goal outlined within the table states that Kingston will “maintain, restore and enhance a sustainable urban forest” (p. 22). Outcomes include achieving an urban forest that is resilient to stress, is diverse, includes species that are suitable for each unique environment within the City, is healthy, is prepared for any possible threats, and is managed proactively. Under “activities”, five detailed implementation strategies or management actions are listed. These include updating the City’s existing tree maintenance plan, developing a city-wide tree planting strategy, refining the existing tree inventory, documenting and updating tree planting and care guidelines, and
implementing an Emergency Response Plan. For each of these actions, an estimated budget is provided and groups responsible for implementation are identified.

Both plans include clearly organized and highly detailed goals and implementation actions. Goals are realistic and measurable. Oakville’s plan goes into more detail in terms of specific performance indicators, which may further encourage implementation. Oakville had already begun to carry out detailed studies such as the UFORE study prior to the plan’s release, which may have allowed for more justified and realistic goals and targets. Kingston may have to adapt its plan after such studies make clear more realistic approaches and attainable goals over the plan’s 25-year timeframe.

3.2.2 Category B: Incorporation of Ecological Principles

4. Conducting an inventory of existing trees and associated ecosystems

Several of Oakville’s criteria and performance indicators address the need for a detailed inventory of existing trees. At the time of the plan’s release, the Town had gathered data on publicly owned trees and overall canopy cover. This information is provided within the Town’s 2006 document Oakville’s Urban Forest: Our Solution to Our Pollution. A map showing existing canopy cover within each community in 2006 is also included in the plan and is shown below in Figure 3. Oakville aims to complete the tree inventory with both public and private tree information, along with aerial photographs or satellite imagery showing canopy cover, included within the Town’s GIS files.
One of Oakville’s plan’s recommendations is to complete “a tree inventory for all street trees within the first 2 years of the first management plan with a focus on collecting information on trees in the oldest and youngest age classes in the first year” (p. 36). This inventory is to include details of the urban forest’s structure such as species composition, mix of native and non-native species, age structure, size, location, tree health status, management history, and habitat. These details are recognized as useful or necessary for effective urban forest management and in achieving Oakville’s specific goals.

Once Oakville’s tree inventory is complete, the plan outlines a monitoring program that will allow any changes to be recorded into the GIS database. Several tools are to be utilized to analyze various aspects of the urban forest. The UFORE system will record the structure of the urban forest and quantify the environmental value that it provides to communities, while the Street Tree Resource Analysis Tool for Urban forest Managers (STRATUM) uses the tree inventory to quantify the value of energy conservation, air quality improvement, carbon reduction, storm water management, and increases in property values that the urban forest provides. These systems have been used successfully internationally and will provide a means of effective continuous urban forest management and communication of the benefits of urban trees.
Kingston has not completed a tree inventory since 1999, although this inventory included information on tree species, size, and health, and has been useful in informing the City's newly released urban forest plan. The City plans to update this inventory and include the information within its GIS system, like Oakville. This information will also be organized by Kingston's neighbourhood areas and will be made available to the public. It is recognized that while updating the inventory and entering it into the system may take time, it will allow for great efficiency in the future.

Oakville's plan appears to place a greater emphasis on creating a detailed tree inventory than Kingston's plan, although Kingston recognizes the importance of recording species distribution, size distribution, and tree health information. Kingston's plan does not mention the use of any specialized urban forest management software like UFORE or STRATUM. It also does not specify a strict period of time over which the tree inventory will be conducted. A more detailed strategy for carrying out the inventory could be detailed within the plan to ensure that action will be taken in a timely manner.

5. **Identification of plantable space**

Oakville's plan recognizes that built-up land, referred to as *grey infrastructure*, strongly influences the availability of tree habitat. Grey infrastructure also impacts tree health, shortening the age and size to which trees can grow. Oakville plans to produce maps clearly displaying available growing space along with the variability in forest structure across the Town and how it is influenced by factors such as grey infrastructure. These maps will identify where resources should be allocated and allow for efficient monitoring of changes in forest structure.

Oakville also emphasizes planting trees that are suitable for their environment. Large-stature trees can thrive only where enough growing space is provided; densely built-up areas may be better suited to smaller tree species. Special attention must also be given to trees in more urban areas to ensure health and longevity despite the threats of grey infrastructure. Oakville's tree inventory efforts prior to plan implementation show that proportions of canopy cover and plantable space vary greatly among land use types (Figure 4).
Oakville’s plan recommends a specific *Tree Establishment Plan* that will involve an assessment of the Town’s plantable lands after the tree inventory is complete. From this assessment, detailed tree planting plans will be developed. A *Prime Site* strategy will identify sites where planting priority is given due to their immediate potential for expanding the Town’s urban forest. These plans will emphasize leaf area density rather than solely canopy cover, as leaf area is the greatest overall determinant of the degree of benefits derived from urban trees.

Specific canopy cover targets for parking lots are also recommended in Oakville’s plan. Tree growth within parking lots is particularly challenging due to the high proportion of impermeable surface, but providing shade with trees in these areas allows for great environmental and human benefits. As discussed in Section 2.4.2, this resourcefulness in the identification of desirable plantable space strengthens Oakville’s plan, ensuring that opportunities to improve canopy cover and to maximize the benefits of urban trees are taken advantage of. However, as Bradshaw, Hunt and Walmsley (1995) highlighted, it is useful to focus a proportion of planting efforts on a variety of land types that have low development potential: brownfield sites and land at the urban fringe are examples of such areas. Efforts to utilize these opportunities are not apparent within Oakville’s plan, although this may change with the development of the *Prime Site* strategy.

In regards to identifying plantable space, Kingston’s plan outlines an implementation action to “develop an overall tree planting strategy” (p. 22). The City emphasizes
planting “the right tree in the right place”; like Oakville, Kingston aims to determine suitable species for each environment and its unique environmental conditions. Soil characteristics will be considered, and a diverse distribution of species, size and age will be used to promote tree health. Young trees will be planted in areas currently dominated by large, mature trees to ensure that the regeneration process begins before older trees need to be removed. Kingston will also implement a program wherein unwanted trees on private property will be relocated to public spaces where they are well suited. Other proposed initiatives include partnering with local schools to help update the tree inventory, concentrating planting within one to two public sites each year, taking advantage of high quality natural soils, and improving soil conditions where possible to facilitate tree growth.

These initiatives within Kingston’s plan indicate that effort will be made to determine suitable planting locations and ensure that new plantings are suited to their environment. Both Kingston and Oakville emphasize “the right tree in the right place”. Like Oakville’s plan, Kingston does not appear to recognize opportunities to plant on lands with low development potential such as brownfields and urban fringe areas. Specific initiatives geared towards these areas would likely allow each municipality to reach its canopy cover or leaf area density goals within a shorter timeframe.

6. Identification of threats and disaster management

Under Oakville’s criteria and performance indicators, the criteria “hazard tree management” is listed. At the time of the plan’s release, there was no existing tree risk assessment and remediation program, and threats to the urban forest were dealt with in a reactive, request-based manner. The plan outlines a key objective for hazard management of ensuring that all publicly owned trees are safe; the tree inventory should include risk and hazard potential ratings, and any foreseen hazards should be eliminated. The plan acknowledges the presence of various threats to Oakville’s urban forest: climate change and extreme weather, invasive pests such as the Emerald Ash Borer and Asian Long Horned Beetle that have been known to contribute to lost woodlands in the region, and in-fill development within established residential neighbourhoods.
Oakville’s plan calls for promoting forest diversity to mitigate risks. As nearly one third of the Town’s urban forest is comprised of maple trees, the introduction of an invasive pest associated with these species would be devastating. A diverse age distribution is also critical to avoid large proportions of the urban forest maturing and declining during the same time period. Background research was carried out on desirable species and age distributions for risk management, and Oakville will strive to meet these distributions to ensure the long-term health and sustainability of the Town’s urban forest.

Oakville’s plan recognizes conflicts between grey infrastructure and green infrastructure, and promotes ways of minimizing these conflicts. For example, engineered soils and porous pavements can improve the environment of developed areas for urban tree growth. A trial of structural soils, which can support pavements while providing a health environment for tree growth, was carried out in a densely developed area in Oakville. An expansion of this trial has been recommended within Oakville’s urban forest plan.

Kingston’s plan also recognizes the urban forest expansion will continuously become more challenging with population growth and associated grey infrastructure development. In addition to the inhospitable urban environment, Kingston’s plan recognizes the threats of limited city resources, along with a currently high proportion of mature trees that may decline during the same time period. Although the plan mentions that Kingston’s 1999 tree inventory was completed in response to severe damage caused by the ice storm that struck the region in 1998, the possibility of a reoccurrence of this event is not acknowledged as a possible urban forest threat within the plan.

Kingston’s plan aims to achieve an urban forest with diverse age, size, and species structure, effectively managed risks, known health status, and proactive management. A preliminary *Emergency Response Plan* is provided within an appendix, and is geared toward responding to threatening storms and infestations. A *Risk Management Program* will also be developed, and will involve evaluating tree health and monitoring for invasive pests.

Both municipalities recognize the various unique threats to their urban forests and prioritize the development of programs to prepare for and mitigate these risks. Oakville’s
plan appears to detail risk management in more depth than Kingston’s plan; it is more specific and indicates that efforts have already been made to work towards successful risk management. This analysis also appears to reflect the differences in growth rates and population density among the two cities. Geographic information (Table 1) indicates that the Town of Oakville is experiencing stronger development pressures than the City of Kingston, and as a result, Oakville’s plan places greater emphasis on the threats of competition for land between grey and green infrastructure.

3.2.3 Category C: Stakeholder Involvement and Collaboration

7. Inclusion of public input into visioning process and final plan

Goals and objectives for Oakville’s urban forest were established through a focus group meeting held in 2006. This meeting was directed by professional facilitators and attracted roughly 40 members of the public and interest groups (Personal Telephone Interview, April 2, 2012). It resulted in a cohesive vision for the urban forest: “Oakville’s urban forest, an equal part of the community’s infrastructure, contributes positively to the health of all residents. Oakville is a proud leader in urban forest stewardship” (p. 3).

Oakville’s focus group meeting allowed for an opportunity for members of the public to have their questions answered and provide input into the development of the urban forest plan. An online system allowed for additional questions and comments after the meeting was held. In an interview held by the researcher, it was indicated that while the public had opportunities to provide input throughout the process of producing the plan, public comments had minimal influence on the contents of the final plan. This was likely due to the hiring of a highly skilled and experienced consulting team that produced a detailed, well-organized, and scientifically sound urban forest plan (Personal Telephone Interview, April 2, 2012).

In the creation of Kingston’s plan, existing urban forest plans were researched and it was found that an in-depth public consultation process would be crucial for the creation of a successful plan (Personal Telephone Interview, April 2, 2012). Kingston held a public open house in June of 2010 to introduce the urban forest plan and obtain public input on
components of the plan and specific goals to achieve. This open house attracted nearly 40 attendees, and was additionally supplemented by a paper and online survey.

A draft of the plan was posted on the City of Kingston’s website in June of 2011 prior to a second public meeting. Again, 40 local residents attended this open house session where the plan was presented, followed by a question period. Residents were then invited to provide feedback on the plan through an online survey or through email. Feedback was received from over 100 members of the public. A summary of the public comments that were received throughout Kingston’s public consultation process is provided within an appendix of the final plan.

Kingston additionally established a Tree Advisory Board that reviewed these public comments. This Board is “comprised of community experts to advise on plan components and to work in partnership with the City on the Plan’s implementation” (p. 14). Board membership is voluntary, and at the time of the plan’s release included 14 members of City departments and stakeholder organizations such as the Public Works department, Queen’s University, and the Cataraqui Region Conservation Authority; as well as professionals in landscape architecture, arboriculture, and horticulture. The Tree Advisory Board will continue to work with the public throughout the plan’s 25-year lifespan, meeting three to four times annually (Personal Telephone Interview, April 2, 2012).

Kingston’s plan appears to place greater emphasis on public consultation than Oakville’s plan, providing ongoing opportunity for public involvement. Although Oakville’s plan is more detailed overall and addresses a wide range of issues, it could benefit from improved, continuous efforts to involve the public.

8. **Collaboration among groups**

Urban forest planning is greatly impacted by interdepartmental issues (Personal Telephone Interview, April 2, 2012). Several components of Oakville’s urban forest plan indicate efforts to enhance communication and collaboration among departments and groups involved in urban forest planning and management processes. The category
“Community Framework” under then plan’s criteria and performance indicators details several objectives pertaining to collaboration (p. 6). The plan recognizes conflicting goals between departments prior to plan implementation, with a key objective of achieving interdepartmental cooperation with common goals. The formation of formal interdepartmental working teams is recommended.

Oakville’s performance indicators also stress the importance of involving and educating large private and institutional land holders, achieving green industry cooperation through involving nurseries and tree care companies in urban forest planning efforts, encouraging communication and collaboration between individual neighbourhoods, and interacting with neighbouring communities and regional groups. Each criteria addressing collaboration outlines specific objectives to be achieved. It is clear that Oakville prioritizes efficient communication as a means of successfully working toward the Town’s goals for the urban forest.

Kingston’s plan does not directly address the issue of conflicting departmental goals in detail. However, the plan does outline an implementation action that involves developing an “internal communications plan” (p. 24). This plan will make responsibilities for City staff clear, and will require regular reporting on plan implementation progress.

While Kingston’s plan does not appear to emphasize interdepartmental cooperation, a personal interview revealed that various City departments such as Planning and Development, Recreation and Leisure, and Engineering reviewed the proposals put forward in the creation of the urban forest plan. These departments provided feedback based on their particular expertise, and their input was included within the final plan (Personal Telephone Interview, April 2, 2012).

This analysis of the two urban forest plans, coupled with personal interviews, revealed that both Oakville and Kingston placed great emphasis on collaboration and communication within their plans. However, the challenges of overcoming municipal government silos are not easily overcome and have slowed the implementation of Oakville’s plan (Personal Telephone Interview, April 2, 2012). While encouraging
collaboration is critical in the development of a successful urban forest plan, it may not be achieved despite these efforts.

9. **Public education efforts and ongoing citizen participation strategies**

Oakville’s urban forest plan emphasizes the importance of public involvement throughout its implementation. It includes a proposed *Public Education and Private Land Stewardship Program* (p. 77). The goals of this program involve improving the awareness and knowledge that local residents have of the urban forest, encouraging increased public interest in its protection and enhancement, and involving residents in urban forest care and maintenance practices.

Currently, Oakville holds an annual “Arbor Week” event in the spring where residents, particularly young students, are involved in school and park plantings and taught to care for trees. The plan recognizes that schools are a highly effective target for disseminating information regarding the urban forest and encouraging public interest. Public education and involvement efforts will be strengthened with Oakville’s establishment of a *Citizen Urban Forest Advisory Committee*, which will facilitate communication between municipal staff and members of the community and provide ongoing opportunity for public input.

As regulating forest management on private lands is difficult, Oakville’s plan aims for widespread behavioural change and environmental stewardship. Successful public education and citizen participation programs must consider “individual interests and situations” (p. 78). In addition to increasing awareness of the urban forest, Oakville will work to effectively identify and address any barriers to behavioural change. A community-based social marketing tool is recommended for implementation.

Kingston’s plan outlines several goals and implementation actions to foster public awareness and involvement. The City aims to communicate the various benefits of the urban forest, and quantifications of the value of urban trees, to members of the community. One of the plan’s goals is to “increase community awareness of the benefits of trees and engagement in a shared responsibility for management of Kingston’s urban
forest” (p. 26). This will involve distributing informational pamphlets, organizing community groups to encourage widespread participation in urban forest stewardship events and initiatives, developing an interactive website where residents can calculate the dollar value of the benefits of various tree species, and holding contests and races to fundraise for the urban forest.

Although Kingston’s plan does not directly address privately owned trees, it aims to “encourage planting and care of private trees or trees on public property not owned by the city” (p. 27). This will be done through engaging local residents, community groups and businesses in urban forest management. The plan recommends holding competitions for local businesses to green their properties, with entry fees being donated to public urban forest management. A city tree give-away will provide residents with trees to plant and care for on their private property. The City will also partner with various agencies and institutions, such as the Conservation Authority and the Society for Conservation Biology, to maintain and enhance the urban forest on public and institutional lands in accordance with the plan.

Oakville and Kingston’s urban forest plans both appear to emphasize ongoing public participation and education through a range of programs. These programs will likely be helpful in maintaining public support for municipal urban forest management practices, as well as encouraging environmental stewardship and effective management of privately owned trees.

3.2.4 Category D: Implementation Strategies

10. Adaptive management techniques

Oakville’s plan has a detailed strategy in place to continuously adapt the plan to address the incorporation of new knowledge and the performance of individual programs and initiatives. Although the plan will retain its general principles, modifications to its goals and targets may become necessary over its lifespan. The 20-year plan will be supported by a series of four Management Plans of five-year duration, as well as Annual Operation Plans. See Figure 5 below for a visual representation of Oakville’s adaptive management strategy.
Oakville’s plan allows for adaptive management through the development of five-year Management Plans and Annual Operating Plans (Urban Forest Innovations Inc. et al. 2008).

Each five-year Management Plan will be developed as necessary and will take into account the plan’s progress and any new knowledge that will facilitate achieving the plan’s goals. These plans will address broad objectives over the five-year period, informing the Annual Operating Plans (AOPs). The purpose of the AOPs is to direct specific day-to-day operations, as well as detail budgeting for urban forest management.

Kingston’s plan does not directly address adaptive management techniques, although it recognizes that several other Canadian urban forest plans such as that of Calgary, Oakville and Peterborough use these techniques to “monitor, evaluate, and respond to urban forest threats” (p. 16). Within Section 5: Conclusions, the plan outlines a preliminary progress report that will be considered for annual reporting on the performance of the plan’s implementation actions. These progress reports will describe the plan priorities and the areas that were focused on over the year, detail the progress made toward each of the tasks or implementation actions under the seven goals of the
plan, present annual projects and resource or budget requirements over the following three years, and identify possible emerging challenges and trends in urban forest planning.

Of the two municipalities, Oakville’s plan has a more structured approach to adaptive management and provides a detailed justification for this approach. Kingston’s plan also allows for adaptation, but could benefit from detailed scheduling of plan review and updating processes. These adaptive management techniques allow the municipalities to more effectively respond to urban forest threats and continuously improve their urban forest management practices.

11. Identification of groups responsible for implementation

Prior to plan implementation, the Town of Oakville’s Forestry Section had 14 full-time staff members including certified arborists and professional foresters. This team is responsible for the safety of urban trees, plant health care, tree protection, emergency response, line clearing, regional road maintenance, and woodlands stewardship. The plan outlines an objective to further improve the structure of the urban forest management team by employing and training appropriate staff to carry out all of the plan’s proposed initiatives. For example, the plan recommends that Oakville hire an urban forestry and GIS specialist who will be responsible for the tree inventory software and database. Oakville’s plan recognizes the need for a “multi-disciplinary team within the urban forest unit” (p. 7).

In Kingston, the Department of Public Works is currently responsible for City-owned tree management. In the process of developing the urban forest plan, the City brought together a team of community experts to form a distinct Tree Advisory Board. This team is responsible for advising on specific components of the plan and working with the City towards implementing the plan’s initiatives.

Additionally, for each implementation action that Kingston’s plan outlines, it identifies the groups responsible for implementation. Many of the initiatives will be carried out by the Tree Advisory Board and City Planning Staff, although several initiatives identify
community groups whose expertise is required. This method of identifying groups responsible for implementation is highly organized and clear.

Kingston’s establishment of the Tree Advisory Board may significantly contribute to ensuring that implementation actions are carried through. While Oakville’s plan recognizes the need for a skilled multidisciplinary team and delegates certain initiatives to key groups, many recommended initiatives do not identify a responsible team. Oakville’s plan could benefit from better organization of groups responsible for implementation.

12. **Regulatory instruments**

Oakville had two tree by-laws in place prior to plan implementation, both pertaining to tree cutting on municipal property. The Parks By-law, number 1988-73, prohibits the destruction of park plants. By-law number 1981-31 requires that any planting, trimming or removal of trees along highways is regulated by the Town’s designates Supervisor of Urban Forestry.

Oakville’s plan looks to other municipalities who have enacted private tree by-laws, and recommends that such controls be implemented within the Town. While the plan does not directly recommend a particular approach to private tree regulation, it provides detailed information on similar initiatives to aid the Town in introducing new tree by-laws.

Since the implementation of Oakville’s plan, the Town’s Official Plan has adopted its canopy cover target of 40%. Two new tree by-laws have also been established: the Private Tree Protection By-law, number 2008-156, regulates the destruction of trees on private property, protecting endangered species and mature trees in particular; the Town Tree Protection By-law, number 2009-025, regulates the maintenance of municipally owned trees and enacts fines for the destruction of trees on public lands. Additionally, the Town’s new Tree Protection Policy, EN-TRE-001, targets tree protection during construction processes.
Kingston’s existing Tree By-law, number 2007-170, requires permits for the destructions of trees of certain endangered or at-risk species, greater than 15 centimetres in diameter, located on municipal property or within protected areas. This by-law does not apply to private residential trees in the City, and the Urban Forest Management Plan does not address regulatory tools pertaining to private trees.

Although Kingston does not currently have a private tree protection by-law in place, the plan acknowledges that many public comments from the City’s consultation process expressed concerns for management of private trees. The City is interested in developing policies and plans pertaining to trees on private property, although this will likely occur later in the urban forest plan’s execution (Personal Telephone Interview, April 2, 2012).

Of the two municipalities, Oakville has placed a greater emphasis on enacting regulatory tools to protect both public and private trees. However, its urban forest plan has been in place for a longer period of time than Kingston’s plan, and Kingston may enact policies protecting the urban forest in the near future.

3.3 Overall Impressions

This analysis of Oakville and Kingston’s urban forest plans against the 12 key plan components indicates that both of the Canadian plans use techniques that are consistent with academic literature and international best practices in urban forest planning. The majority of the 12 plan components were apparent within each of the plans in some form. Overall, Oakville’s plan was more detailed; several studies and computer modeling techniques had been undertaken prior to the release of the final plan, enriching its contents. Kingston’s plan had a narrower scope and less technological detail. This could have been due to differences in budget and time constraints between the two plans, or the stronger development pressures that are apparent in the Town of Oakville.

The two plans exhibited different strengths pertaining to the 12 key plan components. Kingston had a more in-depth public consultation process and its establishment of a Tree Advisory Board as the predominant group responsible for implementation made the
goals and objectives of the plan seem more feasible. Oakville’s plan had a strong base of scientific and technological knowledge, highly organized techniques to facilitate adaptive management, and significant detail regarding regulatory tools for urban forest management.

These documents represent two of the few urban forest management plans that have been implemented within Canada. Oakville and Kingston could potentially lead the way for future urban forest planning efforts in municipalities across Ontario and other Canadian provinces. A series of recommendations for other Canadian municipalities in developing urban forest plans, based on lessons from Oakville and Kingston, is presented within Chapter 4.
Chapter 4: Recommendations and Conclusions

This report’s analysis of municipal documents and personal interviews of key informants involved in Oakville and Kingston’s urban forest planning processes revealed lessons for other Canadian municipalities undertaking similar initiatives. This chapter presents the challenges that were faced in the development of the two urban forest plans, as well as a set of recommendations for other municipalities.

4.1 The Challenges of Urban Forest Planning

As a relatively new field in Canada, a number of challenges are faced in the creation and successful implementation of urban forest plans. Several challenges of urban forest planning were revealed in interviews with key informants involved in this report’s two Ontario case studies.

Municipal departments can be highly disconnected, and urban forest planning is highly effected by this issue. In the implementation of Oakville’s plan, it has been a major challenge to attract and maintain the interest of various departments and groups. The challenge of achieving effective collaboration and communication has slowed the implementation of Oakville’s urban forest plan (Personal Telephone Interview, April 2, 2012).

Disconnects between municipalities and the province of Ontario also present challenges. Provincial and federal governments do not play a significant role in urban forest planning and management practices; municipalities are the highest level of government responsible. In Oakville’s urban forest planning process, the lack of a senior level of government to help guide the process and provide a third party opinion was felt. As a result of this lack of provincial and federal support, it was difficult to acquire adequate funding to implement components of the plan, such as the tree inventory; urban forest planning and management is also largely funded by the municipality alone, where resources can be limited (Personal Telephone Interview, April 2, 2012). Provincial urban forest planning guidelines and financial support could significantly improve the success of municipal urban forest planning efforts.
With limited resources, another challenge in urban forest planning is ensuring that the scope of the project is manageable. Budget and time constraints impacted both Oakville and Kingston’s urban forest planning processes. In Kingston, the public expressed concerns for the management of trees on private lands and in rural areas; while the City recognizes the need to consider the whole urban forest, at the time of the plan’s creation, resources were not available to target these areas. Focusing on public lands within the urban boundary ensured that the goals and objectives of the plan were manageable within a reasonable timeframe, which is a critical tactic in maintaining public support for urban forest planning (Personal Telephone Interview, April 2, 2012).

An awareness of these challenges of urban forest planning may help other Canadian municipalities to effectively overcome obstacles and develop successful urban forest plans. As urban forest planning becomes more common in Canada, recognition of the field may alleviate some of these challenges.

4.2 Recommendations for other Municipalities
The following set of six recommendations was derived from the analysis of Oakville and Kingston’s urban forest plans, as well as personal interviews of key informants. It represents lessons for other municipalities in Ontario and other Canadian provinces in developing successful urban forest plans.

1. **Keep the scope of the plan manageable and realistic**
Kingston’s budget and time constraints limited the plan’s scope to public trees within the urban boundary. Although concerns for the inclusion of private and rural lands have been apparent, this narrower scope helped the City to convince the public that the plan’s goals were achievable. With limited support from senior levels of government, many Canadian municipalities developing urban forest plans may face similar constraints. An effective strategy is to work with the available resources, and widen the scope of the project as it gains more support and funding.
2. **Develop a set of clear, detailed and manageable goals and objectives**
Both Kingston and Oakville's urban forest plans ensure that goals, implementation actions, and the required resources were detailed. This results in having a specific plan for implementation, as well as a document to refer to during efforts to acquire resources. It additionally helps to educate the public about municipal urban forest planning initiatives that are taking place. Oakville's list of criteria and performance indicators further provided a specific technical benchmarking tool, making the plan's goals more manageable.

3. **Incorporate advanced scientific and technological knowledge**
A key strength of Oakville's plan was an emphasis on creating a technically sound plan with a strong scientific base. The plan considered factors such as potential canopy cover, based on soil conditions and the proportion of built-up land within individual areas of the Town. This allowed for more accurate goals and targets for urban forest expansion. The use of modern computer applications such as UFORE and STRATUM allowed for detailed modeling of ideal canopy cover and leaf area targets, as well as projections of the value of urban forest benefits. These strategies also further encourage public interest and participation.

4. **Encourage public involvement and facilitate public input**
A major strength of Kingston’s urban forest plan was the prioritization of public consultation processes. The ongoing input from the Tree Advisory Board, which will continuously work with the public and meet three to four times annually throughout the plan, further ensures that public comments are heard. Events, school programs, and other efforts to improve public awareness and knowledge of the urban forest can be highly effective. These ongoing public involvement processes ensure that concerns are not overlooked, while maintaining public interest and encouraging widespread environmental stewardship. While Kingston’s plan does not directly address privately owned trees, its efforts to involve the public have the potential to significantly contribute to the management of private trees in addition to trees on public land.
5. Develop a meaningful message for Council and the public

Leaf area density is promoted as the most effective method of measuring the health of the urban forest within Oakville’s plan; however, of the plan’s detailed series of goals and objectives, the target of achieving 40% canopy cover across the Town received the most attention. This target was well-understood and easily visualized by municipal staff and members of the public, and has greatly contributed to efforts to gain support for the plan’s initiatives. Promoting a simple and meaningful message that summarizes an urban forest plan’s objectives can be helpful in achieving public support and acquiring resources to support urban forest planning and management initiatives.

6. Support provincial urban forest planning initiatives

As previously discussed, a major challenge in Canadian urban forest planning is the current lack of provincial guidelines and support from senior levels of government. Municipalities should express support for the development of cohesive provincial or federal goals for urban forests. Senior government leadership would make municipal urban forest planning processes more manageable in terms of the time needed to develop effective proposals and the available financial resources.

4.3 Conclusions

It is evident that effective urban forest planning emphasizes continuous public involvement. While regulatory tools can be used to effectively reduce injury and destruction of the urban forest, measures taken to educate and gain the support of the public are an effective long-term strategy. These strategies are additionally helpful in acquiring the resources necessary to successfully implement an urban forest plan.

Urban forest planning requires collaboration between a number of municipal departments and stakeholder groups; the role of planners can be varied and complex. Neither Oakville nor Kingston’s urban forest planning processes were headed by municipal planning departments. Although planning departments were significantly involved, Oakville’s Forestry Section and Kingston’s Public Works department held primary responsibility. However, as planners often play a critical role in collaboration
and communication, they likely possess the necessary skills to successfully lead urban forest planning efforts.

With concerns for the effects of climate change and increased development pressures in Canadian cities, the creation of urban forest management plans is becoming more popular. These practices promote a balance between grey infrastructure and green infrastructure, providing a range of environmental and cultural benefits. Both key informants interviewed for this report expressed their beliefs in urban forest management plans as an effective tool in planning for environmental sustainability that should be carried out across Canada, wherever the resources are available. As urban forest planning becomes a more standard practice in Canada, municipalities can look to these lessons from Oakville and Kingston to work towards successful urban forest management.
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