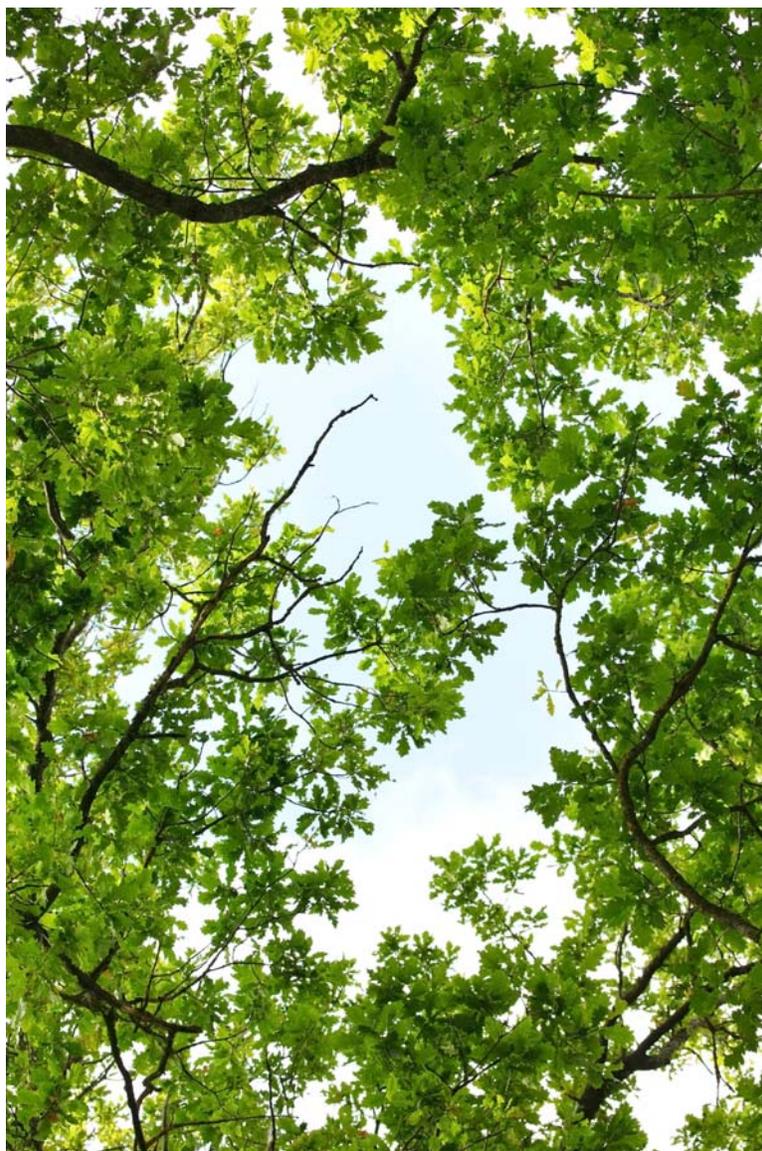




Urban Forestry Management Plan



RECREATION AND COMMUNITY SERVICES DEPARTMENT
FEBRUARY 2011

IT IS WELL THAT YOU SHOULD CELEBRATE YOUR ARBOUR DAY
THOUGHTFULLY, FOR WITHIN YOUR LIFE TIME THE NATION'S NEED OF
TREES WILL BECOME SERIOUS. WE OF AN OLDER GENERATION CAN
GET ALONG WITH WHAT WE HAVE, THOUGH WITH GROWING HARDSHIP;
BUT IN YOUR FULL MANHOOD AND WOMANHOOD YOU WILL WANT
WHAT NATURE ONCE SO BOUNTIFULLY SUPPLIED AND MAN
THOUGHLESSLY DESTROYED; AND BECAUSE OF THAT WANT YOU WILL
REPROACH US, NOT FOR WHAT WE HAVE USED, BUT FOR WHAT WE
HAVE WASTED.

THEODORE ROOSEVELT
1907 ARBOUR DAY MESSAGE

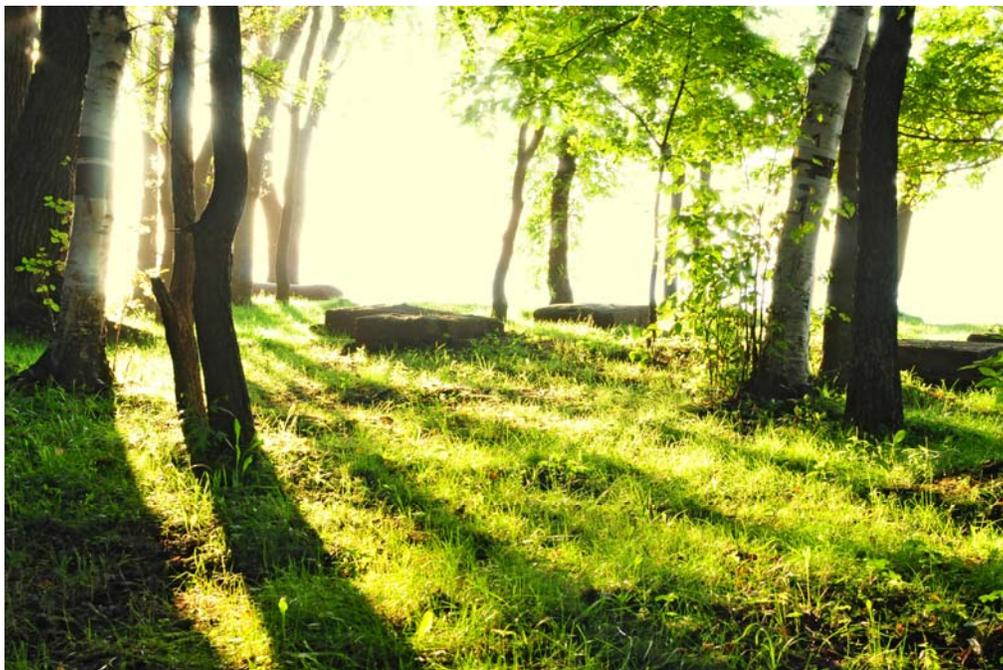


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Executive Summary

The Urban Forest Management Plan, prepared by the Recreation and Services Department, quantifies the structure, function and value of the urban forest in St. Catharines and provides a list of action items that will act as the building blocks for the development and sustainability of our urban forest canopy cover.

The purpose of having an urban forest management plan is to ensure that our community will enjoy the benefits of trees. The goal of the plan is to state what is needed to manage the urban forest and to provide the roadmap to reach those goals. In order to realize this potential, it is essential for the community to plan, design and maintain the urban forest as green infrastructure. An overview of the current forestry strategies and budgets indicates that the City cannot reach the proposed canopy target. At the current rate of tree plantings versus tree removals the net gain per year is negligible in comparison to the numbers required to significantly increase the tree canopy cover. To sustain the urban forest the City must commit to a more robust tree planting strategy. To reach the proposed goals the City must manage the Urban Forest as a continuous resource regardless of ownership boundaries. A program for the planting of large-stature trees in parks and open spaces must be implemented and the conservation of trees on private property must be encouraged and promoted through an educational component or private property tree bylaw.

Over the summer of 2010 staff held two public information meetings and created an on-line survey for the purpose of generating response on the state of the urban forest in St. Catharines and the draft management plan. The information gathered from those meetings has been incorporated into this document.

Definitions

Cal. Abbreviation for caliper. The diameter of a tree trunk (indicated in inches or centimeters)

Canopy Cover The area occupied by the crowns of trees when viewed from above. Forest canopy cover, also known as canopy coverage or crown cover, is defined as the proportion of the forest floor covered by the vertical projection of the tree crowns (Jennings et al. 1999).

Carbon Sink: an environmental reservoir that absorbs and stores more carbon than it releases, thereby offsetting greenhouse gas emissions. Forests and oceans are examples of carbon sinks.

'Complete Streets': a comprehensive tree planting program that will include initiatives to populate all municipal boulevards as a necessary requirement for a healthy, vibrant, robust urban forest

D.B.H. Tree diameter at breast height. Tree d.b.h. is outside bark diameter at breast height. Breast height is defined as 4.5 feet (1.37m) above the forest floor on the uphill side of the tree. For the purposes of determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Dutch Elm Disease: a fungal disease of elm trees which is spread by the elm bark beetle. Although believed to be originally native to Asia, the disease has been accidentally introduced to Europe and North America, where it has devastated populations of elms which had not had the opportunity to evolve resistance to the disease.

Green infrastructure: is an interconnected system of natural areas and other open spaces that are protected and managed for the ecological benefits they provide to people and the environment.

Grey infrastructure: the man-made substructure that supports societal functions such as communications, movement, and commerce. Gray infrastructure consists of engineered and built systems that support community functions, for example: roads; sewer and water facilities; gas pipelines and electrical transmission lines; and communication towers.

Invasive species: any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Large-Stature Tree: a tree greater than 12m tall and wide with trunk diameters (dbh) commonly over 76 cm at maturity - 40 years after planting

Paradigm Shift: Major shift in a certain thought pattern - a radical change in personal beliefs, complex systems or organizations, replacing the former way of thinking with a radically different way of thinking or organizing.

Small-Stature Tree: a tree less than 7.6 m tall and wide with trunk diameters (dbh) less than 51 cm at maturity - 40 years after planting

Urban Forest Canopy Cover: the proportion of area occupied by tree canopies when viewed from above

Urban Forest: the sum of all woody and associated vegetation in and around dense human settlements

Urban Forest Management Plan: Standardizes the policies and practices related to trees on a City wide basis, is supported by all City departments, local stakeholders and the community, and has the human and capital resources required to carry out priority initiatives.

Street Trees: Individual trees growing in rows within or directly adjacent to a street or public right-of-way between the curb and property line along the side of streets or in medians of all streets, avenues within the City.

Native Species: trees and plants that have adapted to the local climate and soil conditions. This means that they do not need as many resources such as watering or fertilizers to grow properly. These species have evolved with native animal and insects and provide habitat and a food source.

Urban Heat Island (UHI): the rise in temperature of any man-made area, resulting in a well-defined, distinct "warm island" among the "cool sea" represented by the lower temperature of the area's nearby natural landscape. Urbanization negatively impacts the environment mainly by the production of pollution, the modification of the physical and chemical properties of the atmosphere, and the covering of the soil surface. Considered to be a cumulative effect of all these impacts is the UHI.

We must protect the forests for our children, grandchildren and children yet to be born. We must protect the forests for those who can't speak for themselves such as the birds, animals, fish and trees.

Chief Edward Moodym Qwatsinas, Muxalk Nation

Introduction

Trees are an integral part of both our community and the ecological systems in which our community exists. They represent one of the major assets to the City, similar in size and scale to the buildings and grey infrastructure. They provide significant economic, social and ecological benefits. They are as necessary as water, roads, and energy to sustaining a healthy community.

The collection of trees in and around our community makes up what is called the urban forest. We are rapidly losing this resource and must rethink the way we plan and build our community in order to stop and eventually reverse this trend. In the urban forest, a single tree may be as important as a patch of forest remnant. We must preserve existing trees, plant new ones and maintain them to sustain the urban forest system.

Despite the best efforts of public and private entities, Canada's urban forests have been damaged and continue to be threatened by human and natural forces, such as sprawling development, lack of care or maintenance, and insects and disease. In many places ecosystem integrity is at risk. When trees and urban forests are damaged, ecological services such as air and water quality are degraded and nearby communities suffer, sometimes showing signs of economic and social decline. In order to work toward a vision of sustainable ecosystems and communities, the City of St. Catharines believes it is necessary to focus on actions to restore and maintain trees and urban forests as critical components and indicators of healthy ecosystems. Canadians from all walks of life, cultural and ethnic backgrounds, and political persuasions care deeply about trees and forests. The City of St. Catharines believes that actions to restore and maintain forest ecosystems represent a common objective among diverse interests and will find broad support in our community.

Tree advocacy groups, researchers, provincial policy makers, and many municipalities have evaluated available research and concluded that a healthy and sustainable tree canopy is essential for a livable community. Currently the Cities of Toronto, Oakville, and Markham all are actively engaged in supporting a tree canopy policy that aims to significantly increase their tree canopy on both private and public lands. The City of St. Catharines does not have an urban forestry strategy.

The City of St. Catharines needs to commit adequate resources, both human and financial, to properly manage, sustain and expand its tree resources.

This document provides a comprehensive strategy for managing the urban forest in St. Catharines. The City of St. Catharines Urban Forest Management Plan provides recommendations that are a result of the following main concerns:

Trees outstrip most people in the extent and depth of their work for the public good.

Sarah Ebenreck,
American Forests



1. *Insufficient funding* to maintain and grow the urban canopy.
2. *Threats of pest or disease infestations* that would decimate portions of the existing urban forest.
3. *Lack of species diversity* which results in monoculture and increased susceptibility to threats.
4. *An aging urban forest without a comprehensive strategy in place to increase canopy cover or complete our streets.*
5. *A majority of the trees within the urban boundary are located on private property but there are no policies for the conservation of these trees.*



A Call To Action

The City of St. Catharines has experienced rapid residential and commercial growth in the past 40 years. One effect of this rapid growth is the loss of tree cover within our closed urban boundary. This sprawling development has turned our once open green spaces, many of them filled with trees, into a lattice work of paved roadways connecting residential neighbourhoods and commercial developments within the older urban centre of our city. The net effect has been a marked decrease in canopy cover. Development initiatives and municipal programs for tree planting have been unable to keep stride with our aging urban forest and the result is a tree canopy cover that is far below acceptable standards.

There are approximately 50,000 municipal addresses in the City of St. Catharines, yet only 37,000 of those properties have a tree on the municipal boulevard that fronts the property. Currently the canopy cover of our urban forest stands at approximately 15-17 percent, while the recommended target is 30 percent. In St. Catharines, the current tree planting initiatives (1000 to 1200 trees per year) barely cover the number of trees removed from municipal properties (900 to 1000). Many of our park sites require new trees or the replacement of trees that are dying or have been removed, but the strain of too many needs and not enough dollars has left them wanting. More than 65% of all of the trees in our city are located on private property but there are no by-laws to protect them or programs to plant more trees on these sites.

Each year, and usually in a planned and phased approach, the City undertakes work to maintain, replace or add new grey infrastructure. At any one time, the value of this work, both completed and budgeted is known. Through monitoring and evaluation, the value of existing underground services and some above ground work (roads and sidewalks) is also known. These works are known as the grey infrastructure, and because the value of such works is known, it has a tangible worth and value.



Of all man's works of art,
a cathedral is greatest. A
vast and majestic tree is
greater than that.

Henry Ward Beecher



For decades, this systematic approach has not been used for the greenery or green spaces in many cities. Larger cities such as the City of Toronto and Town of Oakville have started to change this. Through detailed inventories, the trees in these cities are given a monetary value. Long range, detailed plans for care and maintenance are being implemented, and significant changes to budgeting processes are undertaken. When a monetary value is assigned to the 'green infrastructure', any loss of trees can also be given a value. Without this knowledge, the value of the loss of trees that are found on our streets, within development sites or in established neighbourhoods cannot be determined. The green infrastructure within our city has not been afforded the same status as the grey infrastructure and there is a vital need to re-examine the role that trees play in the city's framework.

Trees shade and cool houses and environments, increase property values, prevent water runoff and soil erosion, improve water quality, reduce energy use, clean the air, and enhance wildlife habitats. Trees even help reduce stress and help us recover from illness more quickly. A city filled with trees is sustainable. These benefits underscore the importance of creating and sustaining urban forests, maintaining undeveloped treed land and planting trees for future generations. The urban forest is both a collection of individual trees in a traditional landscape setting, and forest remnants in parks and open space. It is the tree in a person's backyard, the street trees on municipal boulevards and the trees that grow along a stream. Collectively, these trees create a functional canopy that provides us with these economic, ecological, and social benefits. Without trees, our greenspaces and streets are not complete.

We need to create a green strategy that will complete our streets and neighbourhoods. This strategy will create a healthy balance between the green and the grey infrastructure in our city. Of equal importance, this strategy will create a healthy and sustainable balance for our community.



This report quantifies the function of the urban forest in St. Catharines and its value to people living and working in our city. It also identifies the role of trees on both public lands and private property and addresses the need for enhanced public education and stewardship. It identifies the paradigm shift in engineering and development that is required in order to realize this potential: link the green infrastructure - trees - with the grey infrastructure so that both function optimally. Finally, it delivers the building blocks for a diverse and sustainable urban tree canopy.

I think that I shall never
see
A billboard lovely as a
tree.Perhaps, unless the
billboards fall,
I'll never see a tree at all.

Ogden Nash, *Song of the
Open Road*, 1933



The Model Urban Forest

The model urban forest is based on the need to re-examine current development attitudes. It attempts to place trees at the same level of importance as other critical infrastructure elements like roads and utility lines. To do this, a collective vision is required that includes the views and values of the public as well as those of engineers and politicians. The following table highlights the existing urban development model compared to the proposed urban forest model.

<u>Existing Development Model</u>	<u>Urban Forest Model</u>
Trees have low priority Trees as ornament Individual trees Small and ornamental trees Lawn and paving Tree maintenance Aesthetics-based design	Trees have equal priority Trees as infrastructure Forest Large Canopy Trees Vegetative ground cover Forest Management Soil/Ecological based design

Urban forests and forests in developing areas face a number of challenges that rural or wilderness forests do not face. A rural or wilderness forest area is often under single or limited numbers of owners and can be managed through relatively simple single-purpose policies. In these areas of managed forest, the natural forces of forest succession have a significant effect on the future health of the forest. In contrast, the urban forest is overlaid with a complex set of ownerships, values, and goals with differing maintenance levels and attitudes towards tree planting and preservation. Urban forest growing conditions vary greatly from natural forest processes and are often in conflict with human needs and management attitudes. They therefore require a specialized set of implementation and management practices in order to achieve success.

I willingly confess to so great a partiality for trees as tempts me to respect a man in exact proportion to his respect for them.

James Russell Lowell



The Urban Forestry Management Plan



The Urban Forestry Management Plan

Introduction

Urban forestry is the planning, management and research of urban forests. As cities continue to grow, increasing numbers of people will choose to live, work and play in urban forests making the field of urban forestry critical for healthy and sustainable living.

The urban forestry management plan should lay out policies to protect and manage the municipal forest in a way that increases the investment. It should also move the process of tree planting and tree maintenance away from 'reactive' urban forest management toward a more 'pro-active' approach.

The successful management plan must be based on the economic, social and ecological benefits associated with a healthy urban forest. The plan must recognize the characteristics of the healthy urban forest and put in place the building blocks to ensure this continuous resource. This would include planting initiatives on both public lands and private property to ensure meeting target goals for canopy cover. The success of the program to meet these goals is dependant on the assessment of the tree resource, a management strategy to meet the canopy cover target and the funding to compliment the strategy objective.

The Management Strategy

A tree-planting program alone is not a comprehensive urban forest management strategy because it does not deal with canopy cover targets, it does not address the issue of trees on private property and it does not deal with the education and stewardship that that are necessary to enhance green ideologies. This document identifies the principles and tools necessary to build the urban forest in St. Catharines and how they will serve as the framework for a successful management strategy for a healthy, sustainable urban forest.

Without the benefit of a complete inventory of all of the trees in St. Catharines it is estimated that the number of trees within the urban boundary is 300,000. Public lands – parks, municipal boulevards, ravines, watercourses, etc. – make up nearly one-third of the total or 100,000 trees, while trees on private properties account for the balance, or approximately 200,000 trees. The canopy cover created by all of these trees is 15 – 17 percent.

The management of urban trees in most municipalities involves only trees located on municipally owned property. This typically includes "street trees" — trees within the road allowance on residential front lawns, boulevards, municipal parks, ravines and other municipally owned properties. However to reach the target goals for canopy cover the resource must be managed in a way that includes all trees within



300,000

Number of trees in the urban boundary

200,000

Number of trees on private property

100,000

Number of trees in parks, on boulevards or in natural areas

15-17%

Existing canopy cover in St. Catharines

30%

Canopy cover goal



the urban boundary. The primary objectives must be to increase the number of trees planted each year and ultimately to reach the target goal of additional trees planted. Although the canopy cover will not reach 30% until these trees have matured, the framework will be in place by 2030. To achieve this, the following strategies are recommended.

A. The Management Plan

Trees on streets and on other publicly owned properties provide a multitude of aesthetic and environmental benefits to citizens, businesses and visitors alike. Unlike other public infrastructure components, properly planted and maintained trees increase in value over time. The urban forest management plan, based on recent tree inventory data and analysis is an essential tool for protecting this valuable resource. The urban forest management plan is an action plan and it gives the city detailed information, recommendations, and resources needed to effectively and proactively manage public trees.

The purpose of having an urban forest management plan is to ensure that a community will enjoy the benefits of trees through proper arboricultural techniques and management practices. The goal of the plan is to state what is needed to manage the urban forest and to describe activities and services required to execute these responsibilities. If a management plan is based on analysis from an accurate tree inventory and developed with input from city staff, arboricultural experts, and the citizens, then the community will realize many benefits.

To realize these benefits the management plan must address two major issues:

1. 'Complete Our Streets'. Continue to maintain the core objectives that have served as the foundation of our tree planting initiatives – beautify and fill our public boulevards with trees.
2. Increase Our Canopy Cover. Initiate tree planting programs on public lands and private properties to meet our target goals.

A.1 Complete Our Streets

The public trees growing in any community are valuable municipal resources. They provide tangible and intangible benefits for diverse services such as pollution control, energy reduction, storm water management, increased property values, wildlife habitat, education, and aesthetics. The most visible of these public trees are those that are found on our municipal boulevards. Street trees are an integral part of a community's infrastructure, and as such, warrant thoughtful planning and budgeted management. In St. Catharines there are approximately 50,000 municipal addresses of which approximately 47,000 can support a boulevard tree. The 2005 inventory indicates that only 37,000 of these locations currently have a tree planted on the municipal space that fronts the property. To 'complete our streets' the plan must



God has cared for these trees, saved them from drought, disease, avalanches, and a thousand tempests and floods. But he cannot save them from fools.

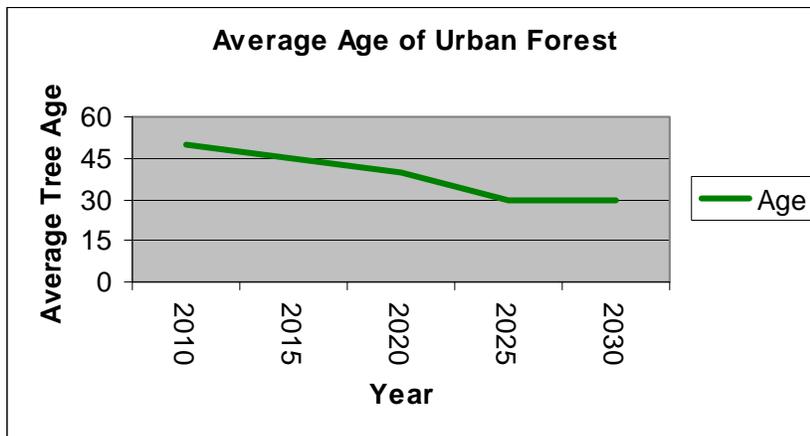
John Muir

An overwhelming 97% of respondents to the St. Catharines UFMP survey reacted positively that "complete streets" with trees on all municipal boulevards are essential to creating aesthetically pleasing and welcoming neighbourhoods

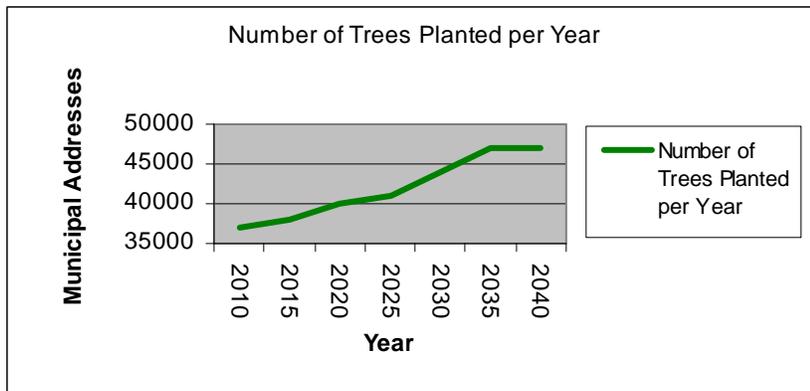
consider the existing age of our urban forest, the number of trees removed annually and the funding required to suit the solution.

Currently the municipality removes approximately 600 - 800 boulevard trees per year, or as many as are planted through the municipal tree planting program. The annual net gain for trees planted is negligible. The current average age of the urban forest is 40-45 years, or nearly 15 years higher than the accepted average age for trees in urban areas. The reforestation or continued beautification of our streets is contingent upon resolving these two issues – increase the net number of trees planted and reduce the age of the urban forest.

The following chart indicates that by increasing the number of boulevard trees planted per year to 1000 the average age of the urban forest in St. Catharines will fall to an acceptable 27-30 years by the year 2030.



It should also be noted that the number of removals will decrease as the average age of the forest decreases. The accompanying charts indicate that by planting the same number of trees annually (1000) each available municipal address will have a boulevard tree by the same date (2030).



Suburbia is where the developer bulldozes out the trees, then names the streets after them.

Bill Vaughn



Year	Removals	Planted	Net Trees Planted
2010-2015	4000 (800/yr)	5000 (1000/yr)	1000
2015-2020	3000 (600/yr)	5000 (1000/yr)	2000
2020-2025	2000 (400/yr)	5000 (1000/yr)	3000
2025-2030	2000 (400/yr)	5000 (1000/yr)	3000
20 Year Total	11000	20000	9000

It will be recommended that the annual tree planting budget include the funds necessary to plant approximately 700 trees. The compliment of trees planted on boulevards (300) will be assumed through the replacement of removed trees and infilling vacant boulevards on road construction programs and included in the budget for these projects. All trees planted on boulevards will continue to be 50mm specimens with the installation of smaller varieties under overhead utilities.

A.2 Increase Our Canopy Cover

A recent survey of attitudes of urban residents towards urban forests tells us that the vast majority (84 percent) thinks the presence of trees in their local community is very important. This includes trees on private property and those on public property such as streets and parks. Almost no one thinks trees are unimportant, and most believe strongly that trees play a very important role in urban areas, while having a major impact on their own personal health and well being. As well, most urban residents (84 percent) view the woodlots and forests found generally throughout southern Ontario as important.

Unlike the trees that are planted on our streets, it is the trees that are found in our parks, along trails, ravines, watercourses and greenbelts and on private lands that are a critically important part of the urban forest landscape. It is on these lands that we find the tracts of large stature trees that provide exponentially more benefits than smaller trees

St. Catharines' urban forest cover has recently been calculated at 15-17 percent. This includes canopy in residential areas and on private property. The total urban area is approximately 7,000 ha. with the current canopy covering nearly 1200 ha. The accepted minimum



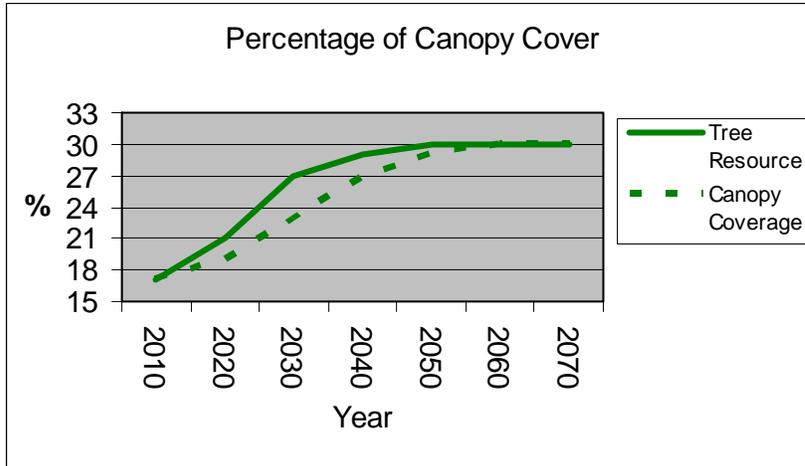
No town can fail of beauty, though its walks were gutters and its houses hovels, if venerable trees make magnificent colonnades along its streets.

Henry Ward Beecher



percentage for canopy cover is 30 percent or for our municipality approximately 2100 ha. To reach the 30% target goal the management plan must include an additional 910 ha. or approximately 40,000 large stature trees.

The accompanying chart indicates that the 40,000 tree goal can be reached by 2030 by planting 2,000 trees annually in addition to boulevard trees. These trees must be large stature trees that will draw the greatest benefit for the urban area.



Someone's sitting in the shade today because someone planted a tree a long time ago.

Warren Buffett

Smaller caliper specimens are recommended for these locations so that a greater number of trees can be planted. To achieve the target goal it will be necessary to combine the resources of the municipal tree planting program (1300 trees) and garner assistance for the remaining plantings through community groups such as the Green Committee, and The Friends of Malcolmson Park(300 trees) and the public (400 trees). The City should increase its partnerships with interested community associations, environmental groups, or other interested partners to undertake tree planting activities. To achieve the canopy cover target the City will develop and distribute materials on tree maintenance, invasive species detection and management, and other materials to help promote trees as green infrastructure in the city and hold events to raise public awareness of the importance of trees, such as neighbourhood tree tours and honour roll competitions.

Action Item #1: The City of St. Catharines will implement the Urban Forestry Management Plan.

B. Increase the funding for trees planted on Municipal property.

The municipal tree planting program is facilitated through the Recreation and Community Services Department.

The program has an annual budget of \$140,000 that provides for the planting of approximately 500 to 600 trees. Currently trees are planted in three main areas which are:

- street or boulevard plantings - plantings as requested by property owners.
- project related plantings - areas related to road, sewer, water main or other subdivision improvements.
- park plantings – city parks, natural areas, watercourses.

Within the current policy trees that have been removed are only replaced at the property owners request, however infilling is initiated on road work projects.

Tree planting initiatives are organized on an annual basis by combining public requests for trees on municipal boulevards, staff input for park and roadside planting and the reinstatement or installation of new trees in areas where road construction, water main replacements or sidewalk installations have occurred.

The City currently plants 50 mm WB specimens on all municipal boulevards. This size of tree ensures superior growth development, significantly reduces vandalism and provides more visual impact for each new tree planted

To increase canopy cover, the master plan requires a focus on areas of the municipality deficient in forest cover such as city parks, watercourses and natural areas. The opportunity exists for the planting of large canopied native species in these areas that will significantly increase the urban canopy cover. As part of any new urban forestry plan the municipality should dedicate a minimum of 30 per cent of the resource to these areas.

To facilitate these needs the City of St. Catharines must increase the number of trees planted annually. It is recommended that the tree planting (RCS) budget should be increased to \$300,000. The City should also make allowance for the replacement of trees or the planting of new trees on TES Road Improvement sites (300 trees - \$90,000). The budget increase will accommodate the plan's two main objectives, 'Complete Our Streets' – the planting of 1000 trees annually on all municipal boulevards – and 'Increase Our Canopy Cover' – the planting of 2000 trees annually in parks, watercourses, etc.; in order to attain the target goal of 30 percent canopy cover by the year 2030.

The sustainability of the urban forest is dependant upon planning and budgeting in the same manner as sidewalks, buildings and other grey

A society grows great
when old men plant
trees
whose shade they
know they shall never
sit in.

Greek Proverb



Over 85% of the St. Catharines UFMP survey respondents support an increase in the tree planting budget to meet the goals of the Urban Forestry Management Plan



infrastructure. The City must recognize that new tree planting and tree replacement costs should be a significant future budget consideration and that there will be a need to encourage/facilitate additional planting. The “green infrastructure of the city” is as valuable as the “grey infrastructure”. To sustain and renew its urban forest, the City of St. Catharines must place the same importance on funding for trees as it does for any component of the grey infrastructure. To succeed, community and political-wide support is required, as are management methods which are environmentally sound, cost-effective, and conscious of human needs.

Proposed Tree Planting Budget

	RCS	TES
Boulevard Trees (700)	\$200,000	
Road Improvement (300)		\$90,000
New Trees (1300)	\$100,000	
Total	<u>\$300,000</u>	<u>\$90,000</u>

Proposed Trees Planted

	Complete Our Streets	Increase Canopy Cover
RCS	700	1300
TES	300	
Parks, Projects, Etc		300
Private		400
Total	<u>1000</u>	<u>2000</u>

Action Item #2: The City of St. Catharines will provide the necessary funding to meet the goals of the Urban Forest Management Plan.

C. Include tree planting at the onset of all road construction design and as part of the total budget.

The sustainability of the urban forest is dependant upon planning and budgeting in the same manner as sidewalks, buildings and other grey infrastructure. The City should recognize that tree replacement costs should be a significant future budget consideration and that there will be a need to encourage/facilitate additional planting. To sustain and renew its urban forest, the City needs to place the same importance on budget funding for trees as it does for any component of the ‘grey infrastructure’. To succeed, community and political-wide support is required, as are management methods which are environmentally sound, cost-effective, and conscious of human needs.

To meet these needs it is recommended that the budgets for all road



It is not so much for its beauty that the forest makes a claim upon men’s hearts, as for that subtle something, that quality of air that emanation from old trees, that so wonderfully changes and renews a weary spirit.

Robert Louis Stevenson



construction projects include funding for the replacement of all removed trees as well as the planting of new trees on all vacant municipal boulevards within the construction boundary. A necessary requirement for a healthy, vibrant, robust urban forest is planning for 'complete streets'. The planting of all trees on these sites will be coordinated through RCS at the beginning of the design process. Providing adequate growing space for trees needs to be viewed as a key item in the programmatic development of the site. The addition of trees to road works projects should be done at the onset of the project, prior to any other design work being started. Designers need to include adequate space and conditions in boulevards in addition to allowing adequate space for curbs, sidewalks, bike lanes and driving lanes.

It is estimated that the net gain for trees planted annually through this initiative could approach 300 trees.

Action Item #3: The City of St. Catharines will include the funds for new or replacement trees in the budgets for road construction projects.

D. Conduct an inventory of all the trees in St. Catharines

The success of the urban forest management plan is dependant on the collection and management of the data information. It is important to ensure that the data collected is valid and reliable, since this information provides the basis planning and evolution. The continued success of the urban forest management plan is dependant on the management of this information. The collection of tree data allows for significant decisions on tree-related issues and the authority and ability to effectively manage the urban forest resource through comprehensive urban forestry programmes which are the integral components in managing the urban forest.

Complete inventories provide a direct means for assessing the relationship between trees, planting locations and maintenance expenditures. The types of information included in the inventory should reflect the goals of the overall management strategy and provide the information necessary to make significant decisions on tree related issues.

Some Canadian municipalities such as the Town of Oakville, are applying these assessments and tools to aid in the planning and management of their urban forest . In 2004, the City of St. Catharines conducted an inventory of trees on all of the municipal boulevards and has used this information to assess and manage the current tree planting program.

“Research has shown that where you have longer wider root zones there is a better survivability of trees as opposed to putting them in restrictive wells”

Peter Fritz, ASLA, AICP

Over 85% of respondents believe an increase in the cost of road construction to include trees and plantable spaces would be beneficial



To satisfy the proposed strategy the existing inventory will require updating.

Action Item #4: The City of St. Catharines will update the inventory of trees on municipal lands and undertake a study of trees on private property.

E. Create a by-law for the preservation of trees on private property

All of the trees located within the urban boundary of the City of St. Catharines make up the Urban Forest. Over sixty-five percent or two-thirds of these trees are located on private property.

From a municipal perspective the planning and maintenance of our urban forest includes species selection, site selection, pruning schedules, planting and removals and tree inventories. All of this is done in an effort to maintain and enhance our urban forests — yet a majority of the trees that make up the urban forest are on private property and in people’s backyards! These trees are not maintained by the municipality but are looked after by the landowner. Hence, any decisions about the removal of these trees are left up to the property owner.

Any consideration of tree conservation must be mindful of the authority provided to Ontario municipalities through the Municipal Act to regulate tree cutting. Since the law came into effect in 2001, many municipalities across the province have enacted forest conservation by-laws. St. Catharines is now one of the few major centers in Ontario that does not have any regulations for tree cutting on private lands.

The provisions of the Municipal Act provide a great deal of flexibility to municipalities to determine what trees to protect and how. Some municipalities require a permit to remove any tree over a certain size, measured as the diameter of the tree trunk, with the size limit varying among municipalities. Other municipalities are more focused, requiring a permit only to remove “distinctive trees”, with the definition of distinctive tree also varying among municipalities. The by-law can be tailored to apply to:

- size of trees
- trees in a given area or neighbourhood of the city
- trees on a minimum property size
- trees defined as “distinctive” due to their age, size, species or history

A municipality may decide what trees it wishes to protect and enact a by-law to protect those trees. As a general approach, the by-laws

There is an urgent need for more trees and forests in Ontario, and in Southern Ontario in particular. If this comes as a surprise to you, think of the urban sprawl where forests are in serious jeopardy, and remember older neighbourhoods where trees that were planted decades ago will die soon, leaving a void in the urban forest. As well, tree planting in rural areas of southern Ontario has declined significantly in recent years. Up until the early 1990s, 20 million trees were planted per year in southern Ontario. As of 2006, only about 2 million were being planted annually.

Trees Ontario



provide exemptions for trees that are removed because they are dead or diseased or are cut in compliance with an approved plan for tree removal (i.e., a Tree Preservation and Protection Plan).

The preservation of singular, distinctive trees within the built city could also be promoted through a tree conservation by-law. The first step would be to develop a St. Catharines specific definition of distinctive trees. Elements to consider include:

- the rarity of a tree species in St. Catharines
- the age of a tree
- tree size
- trees with specific cultural, social, or historic value

Such a by-law could apply to trees throughout the urban area, including individual residential properties or it could be enacted to apply only to non-residential lands. A by-law could also be enacted only in selected neighbourhoods. If residential properties are included, concerns will likely be raised about increased regulation on private property and impositions on property rights. These concerns need to be balanced against the need for tree conservation in the urban area of St. Catharines.

Trees are a valuable asset to homeowners and the community as a whole. They add natural beauty to urban surroundings and play a key role in our social, economic and environmental surroundings. Large stature trees of specific variety must be preserved for the benefit of the community as a whole. The preservation of specific distinctive trees should also be included in any conservation bylaw for the diverse and historic value that they offer to the urban forest. As part of its ongoing plan to be an environmentally responsible community, it is recommended that City Council create a By-law with respect to regulating the injury and removal of trees on private property.

Action Item #5: The City of St. Catharines will develop a private property tree bylaw to govern the removal of specific trees on private property.

F. Create public education and stewardship programs

A recent survey by Trees Canada of attitudes of urban residents towards urban forests tells us that the vast majority (84 percent) thinks the presence of trees in their local community is very important. This includes trees on private property and those on public property such as streets and parks. Almost no one thinks trees are unimportant, and most believe strongly that trees play a very important role in urban areas, while having a major impact on their own personal health and well being. As well, most urban residents (84 percent) view the

I am sure that if you plant the trees back again, it will do nothing but good.

Michael Fish

Over 67% of respondents to the City of St. Catharines survey Agree or Strongly Agree that a private property tree bylaw is essential to protect and manage the urban forest



woodlots and forests found generally throughout southern Ontario as important.

It is recommended that the City of St. Catharines develop an educational component that will include the distribution of materials on tree maintenance, invasive species detection and other materials to help promote trees as green infrastructure in the city. This comprehensive program is a key component in the success of the growth of the urban canopy as the majority of trees in the municipality are found on private property. Educating the broadest range of citizens, including businesses will ensure that the importance, care and replacement of trees is understood and appreciated.

To increase community awareness of the benefits of trees the City must encourage the community's involvement, and create a shared sense of responsibility for the stewardship of the urban forest. These goals can be reached by addressing the following through education and stewardship programs:

- work with community stakeholders to identify educational needs and provide suitable resources about the urban forest for City Council and staff, construction companies, homeowners, developers, woodlot owners, the business community, children and youth to become more knowledgeable about the urban forest
- provide public access to up-to-date information through a City Forestry web page that includes:
 - benefits of trees;
 - tree by-laws (protection, preservation, permits, penalties);
 - planting requests and species availability for public rights-of-way;
 - species selection, planting, aftercare and long term maintenance on private property;
 - dealing with invasive species;
 - pruning and removal requests, process and response time;
 - tree ownership;
 - City and community programs;
 - links to other organizations;
 - incentives and support;
 - conserving private natural areas
- work with community stakeholders to provide a variety of incentives and support services to encourage stewardship of the urban forest including:
 - neighbourhood fundraising, tree planting and maintenance programs;
 - sponsorship of urban forest initiatives by the commercial sector;
 - public tree care workshops;
 - public participation in neighbourhood tree inventories;
 - incentives for tree planting and stewardship in schoolyards and public parks;

Acts of creation are ordinarily reserved for gods and poets. To plant a pine, one need only own a shovel.

Aldo Leopold

Eighty four percent of urban residents think the presence of trees in their local community is very important.



- recognition of volunteer efforts.

- sustain strategic alliances with stakeholder organizations to maximize collective impact of communications, community engagement, and resource protection and enhancement initiatives. Stakeholders include government agencies, utility providers, schools, large landowners, businesses, corporations and neighbourhood associations.

A public with an understanding of the value of trees in the city may result in a healthier and stronger urban forest. Increased stewardship, outreach, and the promotion of tree programs will help to further educate the residents of St. Catharines on the values and benefits of the urban forest. The City should look to increase its partnerships with interested community associations, environmental groups, or other interested partners to undertake activities such as:

Events to raise public awareness of the importance of trees, such as neighbourhood tree tours and honour roll competitions. Such events encourage people to nominate trees in their area for various reasons and those trees can be recognized in community newspapers and on subsequent tree tours.

Development and distribution of 'Homeowner Environmental Awareness Packages' to residents of new subdivisions, to describe the community's forest and outline the homeowner's role as a steward of that forest.

Action Item #6: The City of St. Catharines will create a community education and stewardship programmes to assist with protecting and preserving the urban forest and promote tree conservation.

G. Create an Urban Forest Advisory Committee

The creation of an advisory committee that will identify, through the UFMP, will compliment municipal staff efforts.

The Urban Forest Advisory Committee (UFAC) will serve in an advisory capacity on matters of environmental stewardship, specifically concerning the care and planting of trees and the urban forest by advocating sound arboricultural and urban forest management practices.

The Committee will provide proactive leadership for development of public policy and serve to educate citizens of St. Catharines, regarding the numerous environmental, recreational, social and aesthetic benefits of a thriving urban forest.

The committee will be authorized to study, plan, advise, report and



Over 80% of respondents to the municipal survey reacted positively to the city creating public education programs to increase awareness and understanding of tree conversation

make recommendations on plans, programs or city by-laws, which the Council or RCS staff determines necessary or advisable for the care, conservation, planting, pruning, removal or disposition of trees city wide.”

Action Item #7: The City of St. Catharines will create an Urban Forestry Advisory Committee to advise and make recommendations for the care and preservation of the urban forest in St. Catharines.



H. Review planning and development guidelines

The importance of trees has been lost in the economic structure that determines the shape of the world we live in. While most development regulations give cursory notice to the preservation and planting of trees, very few preserve or plant enough trees to make a difference in the larger view of sustaining the life supporting systems that we depend upon. That life support system requires that enough trees be planted to create a forest, even in highly urbanized areas. This philosophy is supported in the City of St. Catharines Official plan.

While individual trees are very important, the sum of the effects of a continuous tree canopy provides the real benefit and is what we must strive to achieve. Trees growing in small parks and urban parkettes, along streets, and in the yards and gardens of neighborhoods provide a mosaic of green landscapes within a community. The Planning process can provide substantial long range planning practices that protect, enhance and expand our overall urban forest. Consistently stated throughout the plan is the guiding principle of sustainability. “Sustainable development is development that recognizes the interdependence of the economic, environmental, social, and cultural needs of the community. It promotes actions that expand economic opportunity, improve environmental quality, increase social well-being, and expands cultural awareness. Sustainable development also involves:

- Long-term impacts and consequences – sustainable development requires long-term horizons rather than short-term reactive responses to problems
- Participation – sustainable development depends on decision – making that is inclusive, participatory and transparent
- Equity – sustainable development promotes equity between generations and among different groups in society
- Proactive prevention – sustainable development is anticipatory and attempts to prevent problems as the first course of action.

All of these statements pertaining to sustainability apply to the principles required to promote and sustain the urban forest. While many of the actions proposed result in immediate results, others are intended to be applied in a phased approach, the results of which may not be realized for many years. The nature of trees is such that immediate satisfaction cannot be guaranteed. It would take dozens of

Increased stewardship, outreach, and the promotion of tree programs will help to further educate the residents of St. Catharines on the values and benefits of the urban forest.



years to replace the canopy of a thirty or forty year old tree.

Integrative planning is necessary to achieve consistency and ensure that the overall canopy vision is achieved. The City needs participation from a number of municipal departments and many varied public groups. The results will benefit all. Long range planning, that anticipates threats and can predict with reasonable accuracy potential weaknesses in the aging canopy is critical if the forest is to be sustainable.

The development practices of the recent past, such as separated land uses, larger lots, bigger setbacks, wider roads, and engineered drainage systems, take away space and resources from trees by requiring more site grading and paved surfaces. These are the same development factors that contribute to urban sprawl. As we begin to recognize the cost of sprawl economically, socially, and environmentally, development regulations must change. In the process of this re-evaluation, we must introduce requirements for preserving and planting healthy trees. Trees, and the soil to support them, must become as much a part of the infrastructure requirements of sound community building as water, roads, and energy. We must build our new communities to be 'tree ready' as noted above.

Changing the way land is developed and redeveloped affects individual land parcels at the time of development, but does not address larger stewardship issues. Successful long-term stewardship of the urban forest canopy must include good principles of tree protection and planting to the way space is allocated and trees are planted and protected on all land parcels in the community. In addition, community tree maintenance and management policies must be established. The model urban forest must address the ownership of trees on public lands and the responsibility for the maintenance and planning of our urban forest. The model must also examine the conservation of trees on private property and the urban forest as a continuous resource regardless of ownership boundaries.

See Appendix

Action Item #8: The City of St. Catharines will review and make the necessary changes in the planning and development guidelines to provide for the care and development of the urban forest.

I. Adopt an aggressive tree replacement policy

When indications of decline become apparent, a young replacement tree will be planted as soon as possible, unless there are compelling reasons (e.g. lack of space) not to do so, or to postpone the replacement.

Taking into account the standards for optimum distances between large

93% of respondents to the municipal survey Strongly Agreed or agreed that a primary function of municipal government should be the protection of green infrastructure



While individual trees are very important, the sum of the effects of a continuous tree canopy provides the real benefit and is what we must strive to achieve.



trees, any tree removed will be replaced by a tree of the same, or similar, species and characteristics.

The replacement tree will be planted as close as possible to the location of the tree to be removed, or in a more advantageous location.

The City will decide the *species* of tree to be planted, in conformity with the Urban Forest Policy.

Action Item #9: The City of St. Catharines will adopt an aggressive tree replacement policy for the replacement of all removed trees where possible.

J. Investigate alternative sites for tree planting

Maintaining the forest cover in urban centers is becoming an increasing challenge, especially for trees situated near roads, in parking lots and on boulevards. Some U.S. cities like Chicago have created very detailed rules about the sizes of tree to be planted in new developments; the required soil volumes, guard rails and protections; the amount of tree cover relative to paved surface; and the spacing of trees for property frontages.

There is also the need to investigate alternative planting locations that will aid in increasing our canopy cover. Some of these alternatives include:

- Planting trees in watercourses and ravines that will support large stature trees. These plantings will also provide buffers to protect streams and increase infiltration of storm water
- Create forested areas in parks, along trails and pathways
- encourage roof top gardens, trees in planters
- Plant trees in schoolyards, community centers, right of ways, naturalized areas, etc.

See Appendix

Action Item #10: The City of St. Catharines will access all available opportunities to plant trees.

K. Plant large stature trees where possible

Larger trees provide exponentially more benefits than smaller ones. Most of the benefits we derive from the urban forest can be directly or indirectly related to the total leaf area of the urban forest. It is the leaves that take in carbon dioxide and eventually through photosynthesis, lock up carbon in the wood. Similarly, leaves absorb gaseous pollutants and trap dust particles. Since big trees have a much

He who plants a tree,
plants a hope.

Lucy Larcom



greater leaf area than small trees (and also store much more carbon), it is important to retain these big trees as long as possible. Therefore, protecting and caring for existing large trees while also establishing species that have the potential to become large is important.

Action Item #11: The City of St. Catharines will strive to plant large stature trees to maximize opportunities to increase canopy cover.

L. Prepare a threat evaluation response

An Urban Tree Canopy Program sets urban forestry planning objectives and qualifies natural and man made disturbances in order to identify and implement appropriate response initiatives to protect and enhance the health and longevity of the urban forest.

The most current risk to the City's urban forest is the possibility of a migration of the Emerald Ash Borer (EAB), a destructive alien insect pest that has recently caused significant widespread degradation to areas within Essex and Chatham-Kent Counties. The Urban Tree Canopy program aims to identify all potentially destructive pests and threats and establish present long-term management strategies to detect and mitigate any infestations.



It is estimated that the Emerald Ash Borer threatens to kill all of the Ash trees in St. Catharines. The existing municipal database indicates that there are approximately 3000 Ash trees on municipal boulevards, while staff has estimated that approximately another 15,000 exist in municipal parks, road allowances, water courses, etc. The estimated cost to the City to remove and replace

these trees is \$9 million. This estimate does not include the loss of ash trees on private properties that could easily reach \$ 20 million. While this is a serious loss to the City and further loss to urban canopy, the foresight by City staff to stop planting Ash trees 10 years ago has helped soften the economic loss to the municipality. Further, measures to reduce mono-culture in plantings will also strengthen the resistance of the urban canopy to other pest and disease threats. In the City of Oakville the EAB threatens to kill all of the 176,000 ash trees with an estimated economic loss of \$ 86.1 million.

There are also other factors that pose continued threats to the health and vitality of the urban canopy including: disease, development, changes in the environment, increasing annual temperatures and reduced annual rainfall or extended periods of drought.

The primary objective of the Urban Forest Management Program is to optimize the health and longevity of the City's Urban Forest to ensure that maximum benefits are derived from this essential component of

The tree which moves
some to tears of joy is
in the eyes of others
only a green thing
which stands in there
way.

William Blake



our city's infrastructure. Direct program services include tree "disease and pest" monitoring, detection, assessment, and the provision of remediation recommendations and advice from staff. In addition, the program will include community education and outreach functions aimed at increasing residents' awareness of tree health issues and stewardship "best practices.

Action Item #12: The City of St. Catharines will prepare a threat evaluation response for the purpose of protecting our urban forest.

M. Plant trees for diversity and suitability

The importance of biodiversity to healthy ecosystems is not limited to natural areas. A more diverse urban forest will provide a greater variety of habitats for wildlife and a more interesting environment for humans. Even more importantly, genetic diversity will help protect the urban forest from catastrophic losses due to insects, disease, drought, and climate change. For example, the impact of Dutch Elm Disease on urban forest ecosystems with a disproportionately large number of trees in one genus is well known. Throughout North America, many saw their streetscapes devastated by the fungus. Since most of these trees are produced vegetatively (by grafting), the genetic diversity within species is very low. It has been suggested that an urban street tree population should be made up of no more than 30 percent of one genus, 20 percent of one family, and 10 percent of one species.

As with a diversity of species, there should also be a diversity of ages in the urban tree population. Many parts of our cities are facing declining tree populations, as the trees age and die off, without a new generation of trees coming up to replace them. In a more naturalized forest, this happens through natural regeneration. In the urban forest, trees need to be planted and cared for throughout its lifespan to ensure that it is healthy and reaches maturity.

Tree planting on the public right-of-way is a long term initiative. What is done today can have a serious impact on street tree maintenance activities for years to come. It is therefore imperative that tree planting be done with care and planning. Planning is critical to ensure that the final product is sustainable and aesthetically pleasing. Trees of similar shape but different species, if carefully selected, will provide the desired effect of tree arch over the street. The mix of species is essential to reduce the chances of insect epidemics, to guard against the spread of disease as trees are trimmed in efficient block treatments, to prevent widespread neighbourhood complaints and to eliminate extensive tree removal programs when single species plantings die (i.e. Dutch Elm Disease on American Elm, Verticillium Wilt on Norway Maples).

- Use native species where appropriate.
- Select trees that grow to a size appropriate to the available space.



It is estimated that the Emerald Ash Borer threatens to kill all of the Ash trees in St. Catharines.



- Select trees appropriate to the soil and drainage in the planting area.
- Select trees for drought tolerance to reduce irrigation needs.
- Plant quality nursery stock.

Action Item #13: The City of St. Catharines will strive to promote biodiversity by increasing the number of species used for all tree planting.

N. Manage the Urban Forest as a Continuous Resource Regardless of Ownership Boundaries

The following conditions will apply to the management of the urban forest as a continuous resource:

- Understand issues of tree ownership.
- Know who has maintenance responsibility.
- Monitor trees for regular maintenance requirements.
- Respond to outside threats to the urban forest.
- Manage activity in the community that may damage trees.
- Establish adequate urban forest budgets.
- Establish tree conservation bylaws that protect trees on both public and private properties

The maintenance and management of trees in the urban forest is the responsibility of a complex network of private and public landowners. Most maintenance is the responsibility of the tree owner, but often tree ownership is not always clear. Trees that straddle property lines have two "owners," while trees in the public domain may be planted by one government department and maintained by another. The level of care and maintenance response may vary dramatically from one maintenance provider to another.

Sometimes problems or threats to trees such as a rapid insect invasion may transcend property lines and require an area-wide response. Other threats to trees may result in laws requiring owners to remove trees, as in the case of Dutch Elm disease, or not to remove trees, as in the case of tree removal bylaws that protect trees from the whims of landowners. Finally, utility providers usually have the right to prune trees to maintain utility easements.

A reasonable management program must include critical tasks that maintain the future quality and value of this important resource regardless of ownership boundaries.

Action Item #14: The City of St. Catharines will manage the urban forest as a continuous resource regardless of property boundaries.



A more diverse urban forest will provide a greater variety of habitats for wildlife and a more interesting environment for humans. Even more importantly, genetic diversity will help protect the urban forest from catastrophic losses due to insects, disease, drought, and climate change.

O. Commit RCS to deliver a State of the Urban Forest report by updating Council annually.

Maintaining the existing forest cover in urban centres and creating new canopy cover is becoming an increasing challenge. To meet these challenges many municipalities have created very detailed rules about tree planting in new developments, in existing greenspace and on municipal boulevards. Without adequate action plans or budgets at the local level the urban forest will age and die. For these reasons greater resources and attention need to be paid to the development and sustainability of the urban forest.

In St. Catharines the UFMP has been created to act as a guide or roadmap for the care of our urban forest. To reach the goals outlined in the plan staff will provide an annual report to City Council on the state of the urban forest.

Action Item #15: The Recreation and Community Services will report to City Council annually on the state of the urban forest.



The best friend on earth of man is the tree: when we use the tree respectfully and economically we have one of the greatest resources of the earth.

Frank Lloyd Wright

Measuring Success

The goal of the urban forest management plan is to achieve long term sustainability. A sustainable system is one which survives or persists or in the context of the urban forest, a system that will have continuity over time in a way that provides maximum benefits from the functioning of that forest. A sustainable urban forest is founded upon community cooperation, quality care, continued funding and personal involvement. It is created and maintained through shared vision and cooperation with an ever-present focus on maximizing benefits. Taken together, they acknowledge the need for shared vision and responsibility, for direct intervention with the resource and for programs of care that are on-going and responsive. The implementation of the model for urban forest sustainability will further redirect the traditional orientation of urban forest management away from municipal trees to the mix of public and private trees. Achieving sustainability for our urban forest involves meeting each of these criteria.

a) Canopy Cover: The increase in canopy cover in 5 year increments should meet the target goals of 30% coverage.

b) Urban Forest Budget: The urban forest needs full time care and management. A healthy urban forest will have a budget that will allow for maintenance, improvement and expansion of the urban forest. The municipality, to ensure the sustainability of the urban forest, will provide the necessary funding to increase the canopy coverage.

c) Tree Planting Program: The vegetation resource is the engine that drives urban forests. The tree planting program provides for the composition, extent, distribution and health of our urban forest and as such defines the limit of benefits provided and costs accrued. As dynamic organisms, urban forests (and the trees that form them) change over time as they grow, mature and die. Therefore, sustainable urban forests must possess a mix of species, sizes and ages that allows for continuity of benefits while trees are planted and removed.

d) Age Distribution: A mix of young and mature trees is essential if canopy cover is to remain relatively constant over time. To insure sustainability, an on-going planting program should go hand in hand with the removal of senescent trees. Some level of tree inventory will make monitoring for this indicator easier. Small privately owned properties pose the biggest challenge for inclusion in a broad monitoring program.

e) Species Mix: Species diversity is an important element in the long-term health of urban forests. Experience with species-specific pests has shown the folly of depending upon one species. Unusual weather patterns and pests may take a heavy toll in trees in a city. It is often recommended that no more than 10% of a city's tree population consist of one species.

The cultivation of trees is the cultivation of the good, the beautiful and the ennobling in man.

J. Sterling Morton



Other holidays repose on the past. Arbour Day proposes the future.

J. Sterling Morton



f) Public Education and Stewardship: A sustainable urban forest is one in which the all parts of the community share a vision for their forest and act to realize that vision through specific goals and objectives. It is based in neighborhoods, public spaces and private lands. At one level, this requires that a community agree on the benefits of trees and act to maximize them. On another level, this cooperation requires that private landowners acknowledge the key role of their trees to community health.

g) Development and Planning Guidelines: Policies that are set out at the beginning of the design and planning process need to include the directives of the Urban Forest Management Plan. The guiding document is The Garden City Plan (Official Plan). It lays out, in general policies, the direction the City should move in regards to its urban forest, tree planning and planting.

h) Urban Forestry Management Plan: Sustainable development, according to the Garden City Plan "*requires long-term horizons rather than short-term consequences*". The importance of this type of planning cannot be understated. Foresight regarding the future of the urban forest is necessary in order to prevent damage of a monumental impact. A phased approach to the overall management will create a solid inventory of healthy species with a long life span that will not be as prone to disease, threat of pests or weakness due to excessive age.

To achieve the target goals the City will develop and implement a management plan for trees on public and private property. A city-wide management plan will add to the urban forest's sustainability by addressing important issues and creating a shared vision for the future of the community's urban forest. Elements may include: species and planting guidelines; performance goals and standards for tree care; requirements for new development (tree preservation and planning); and specifications for managing natural and open space areas



	Key Objective	Key Performance Indicators			
		LOW	MODERATE	GOOD	OPTIMAL
Canopy Cover	Achieve appropriate degree of tree cover, community wide	No assessment	Visual assessment i.e. photographic	Sampling of tree cover using aerial photographs	Information on urban forests included in city-wide GIS
		Current status 15-17%	increased tree count 5 year period 17-20% 10 year period 20-23%	15 year period 23-25%	20 year period 25-27% trees in place to achieve 30%
Tree Planting Budget	Develop and maintain adequate funding to implement a city-wide management plan	Funding by crisis management – no growth to existing tree population	Funding to optimize existing tree population and key programs i.e. complete our streets	Adequate funding to provide for net increase in tree population	Adequate funding to reach target goals i.e. 30% canopy cover and sustain maximum potential benefits
Tree Planting Program	Develop and implement a management plan for tree planting that will attain the target goals i.e. Complete Our Streets	Trees removed negate the number of trees planted	Existing Plan that lays the foundation for attainable goals	City-wide plan, accepted and implemented	City-wide plan, attaining target goals
Age Distribution	Provide for uneven age distribution	No assessment	Street tree inventory and city-wide assessment of age distribution	Implementation of plan to reach target goals	Attaining target goals of 25-30 years average age.
Species Mix	Provide for species diversity	No assessment	Street tree inventory and city-wide assessment of species mix	Implementation of plan to reach target goals.	Species diversity city-wide
Public Education and Stewardship	The public understands and participates in urban forest management	No action	Isolated and/or limited number of active groups; education materials available to public	Interaction of community groups and City of St. Catharines	Shared vision and goals to develop the urban forest management plan
Development and Planning Guidelines	The urban forest is key element in all urban design and planning	Trees planting and tree issues are not considered	New development regulations for tree planting	Consistent, proactive planning for a sustainable green infrastructure	Integrative planning and development to meet the canopy vision
Urban Forestry Management Plan	Develop and implement a management plan for trees on public and private property	No plan	Existing plan limited in scope and implementation	Management plan accepted and implemented	City-wide plan accepted and implemented

Action Items Overview

Action Item #1	The City of St. Catharines will implement the Urban Forestry Management Plan.
Action Item #2	The City of St. Catharines will provide the necessary funding to meet the goals of the Urban Forest Management Plan.
Action Item #3	The City of St. Catharines will include the funds for new or replacement trees in the budgets for road construction projects.
Action Item #4	The City of St. Catharines will update the inventory of trees on municipal lands and undertake a study of trees on private property.
Action Item #5	The City of St. Catharines will develop a private property tree bylaw to govern the removal of specific trees on private property.
Action Item #6	The City of St. Catharines will create a community stewardship and education programmes to assist with protecting and preserving the urban forest.
Action Item #7	The City of St. Catharines will create an Urban Forestry Advisory Committee to advise and make recommendations for the care and preservation of the urban forest in St. Catharines.
Action Item #8	The City of St. Catharines will review and make the necessary changes in the planning and development guidelines to provide for the care and development of the urban forest.
Action Item #9	The City of St. Catharines will adopt an aggressive tree replacement policy for the replacement of all removed trees where possible.
Action Item #10	The City of St. Catharines will access all available opportunities to plant trees.
Action Item #11	The City of St. Catharines will strive to plant large stature trees to maximize opportunities to increase canopy cover.
Action Item #12	The City of St. Catharines will prepare a threat evaluation response for the purpose of protecting our urban forest.
Action Item #13	The City of St. Catharines will strive to promote biodiversity by increasing the number of species used for all tree planting.
Action Item #14	The City of St. Catharines will manage the urban forest as a continuous resource regardless of property boundaries.
Action Item #15	The Recreation and Community Services will report to City Council annually on the state of the urban forest.

Action Plan for Implementation of the Urban Forestry Management Plan 2011 - 2013

Date	Action Item	Description
2011		
February	1	Approve Urban Forestry Management Plan
April	2	Increase budget to support Urban Forestry Management Plan (\$300,000)
May	7	Create Urban Forestry Advisory Committee
August	6	Develop public education program and adopt stewardship program
September	12	Prepared threat evaluation response
December	15	Report to Council on State of the Urban Forest
2012		
May to September	4	Prepare Inventory of trees on Municipal Properties
September	5	Report for Council regarding Private Property Tree By-law
October	8	Review planning and development guidelines
December	15	Report to Council on State of the Urban Forest
2013		
January	3	Include funds for tree planting in all road construction budgets
December	15	Report to Council on State of the Urban Forest

Benefits of the Urban Forest



Benefits of the Urban Forest

Introduction

What do trees really do for people and the environment? Trees provide many economic, ecological, and social benefits. Trees provide shading and cooling, increase property values, prevent water runoff and soil erosion, improve water quality, reduce energy use, clean the air, and enhance wildlife habitats, to name just a few. While we tend to discuss economic, ecological and social benefits separately, they are actually quite interrelated. A tree that is serving a role in watershed protection, also connects people to the land, provides a shaded place to walk and increases property values in the community.

What Do Trees Really Do For Us?

Trees and forests come in a variety of forms, from forest stands and park groves to city streets and the trees in our backyards. Every tree has the natural ability to affect air currents, cool the air, and shade the ground. However, older larger trees maximize these benefits. A mature, continuous canopy is important as well, compared to a tightly trimmed canopy or ornamental trees. The model urban forest emphasizes trees as an equal priority in infrastructure. More trees and forest, large canopy trees, understory plants, vegetative ground cover, soil design, and forest management are necessary to maximize the benefits of trees.

The following are highlights of some of the many benefits provided by the urban forest.

Health Benefits

The primary mission of local, provincial and federal government is the protection of the health, safety and welfare of the citizens in Canada. Trees are an important part of a city's infrastructure contributing to community health and well-being. Trees can help reduce stress in healthy people and can reduce hospital stays and heat-related illness and death.

Trees can improve physical health. Each year, a great number of premature deaths are associated with exposure to air pollutants. Air pollution is a risk factor for asthma attacks and it is an accepted fact that people with asthma experience more restricted activity due to air pollution. Trees help trap airborne particulates and reduce carbon dioxide, thus reducing the risk of asthma attacks. The medical profession in Ontario recognizes the health costs of air pollution. In 2005, the Ontario Medical Association estimated the number of Ontarians admitted to hospitals with health problems related to air pollution exposure was approximately 17,000 while the number of



Health Benefits

- Reduce air pollution
- Improve air quality
- Moderate climate
- Cool the air
- Provide a wind break
- Improve mental and physical health
- Improve neighbourhoods
- Reduce heat islands
- Create visual and sound barriers

emergency room visits was estimated at almost 60,000. By 2026, these rates are expected to jump to over 24,000 and 88,000 respectively.

The studies demonstrated that trees play a role in reducing air pollution. Trees remove gaseous air pollution primarily by uptake via leaf stomata, though some gases are removed by the plant surface. Once inside the leaf, gases diffuse into intercellular spaces and may be absorbed by water films to form acids. Trees also remove pollution by intercepting airborne particles. Some particles can be absorbed into the tree, though most particles that are intercepted are retained on the plant surface.

The Urban Heat Island Effect

With higher temperatures, calmer winds, and more asphalt and concrete surfaces, air in urban areas is often 2 to 8 degrees warmer than rural areas. This is known as the urban heat island effect. Large areas of asphalt such as roads and parking lots are the largest contributing factors of increased urban area temperatures.

"Climatologists refer to cities as heat islands where temperatures can be nine to twelve degrees (Fahrenheit) hotter than the countryside. Trees that survive in most cities are tough trees that can tolerate drought, poor soils, and periodic beatings. According to recent surveys, the average city tree lives only thirty-two years and dies just when it is beginning to reach the most valuable stage of its life. Urban trees, just like forests everywhere, respond to good management. We can extend the lives of urban trees far longer-and in the process double or triple the benefits each tree confers on the community. Good forest management doesn't cost. It pays" (Moll and Ebenreck 1989).

A 2006 study by the New York State Energy Research and Development Corporation on Mitigating New York City's Heat Island with Urban Forestry notes that substantial reductions in New York City's near-surface air temperature can be achieved by implementing heat island mitigation strategies. It concluded that *"A combined strategy that maximizes amount of vegetation in New York City by planting trees along streets and in open spaces, as well as by building living (or green) roofs (i.e. ecological infrastructure), more potential cooling than any individual strategy."* Urban heat islands adversely affect public health, pollution and energy usage. The EPA notes that *"Trees, vegetation, and green roofs can reduce heating and cooling energy use and associated air pollution and greenhouse gas emissions, remove air pollutants, sequester and store carbon, help lower the risk of heat-related illnesses and deaths, improve storm water control and water quality, reduce noise levels, create habitats, improve aesthetic qualities, and increase property values."*

The extent to which urban areas can benefit from heat island reduction strategies depends on a number of factors—some within and some outside of a community's control. Although prevailing weather patterns, climate, geography, and topography are beyond the influence of local



Economic benefits

- Reduce cooling costs
- Increase property values
- Reduce flood damage
- Reduce engineered infra structure needed for storm water management
- Draw business and tourism



policy, decision makers can select a range of energy-saving strategies that will generate multiple benefits, including vegetation, landscaping, and land use design projects, and improvements to building and road materials.

Trees shade paved surfaces and buildings, and cool the air by evapotranspiration. Automobiles parked under a shade tree will have an interior temperature 20 to 30 degrees cooler than an automobile parked in the sun.

Many municipalities have developed action strategies to address climate change, reduce greenhouse gas emissions and respond to poor air quality situations. Urban and community forests can strongly influence the physical/biological environment and mitigate many impacts on urban development by moderating climate, conserving energy, carbon dioxide and water, improving air quality, controlling rainfall runoff and flooding, lowering noise levels, harboring wildlife and enhancing the attractiveness of cities. Urban forests can be viewed as a 'living technology' - a key component of the urban infrastructure that helps maintain a healthy environment for urban dwellers

Economic Benefits

Individual trees and shrubs have value, but the variability of species, size, condition, and function makes determining their economic value difficult. The economic benefits of trees can be both direct and indirect. Direct economic benefits are usually associated with energy costs. Air-conditioning costs are lower in a tree-shaded home. Heating costs are reduced when a home has a windbreak. Trees increase in value from the time they are planted until they mature. Trees are a wise investment of funds because landscaped homes are more valuable than non-landscaped homes. The savings in energy costs and the increase in property value directly benefit each home owner.

The indirect economic benefits of trees are even greater. These benefits are available to the entire community or region. Lowered electricity bills are paid by customers when power companies are able to use less water in their cooling towers, build fewer new facilities to meet peak demands, use reduced amounts of fossil fuel in their furnaces, and use fewer measures to control air pollution. Communities also can save money if fewer facilities must be built to control storm water in the region. To the individual, these savings are small, but to the community, reductions in these expenses are often in the thousands of dollars.

Trees can also have a direct positive impact on the financial success of commercial areas. A recent survey completed at the University of Washington indicates that shoppers are willing to pay as much as 10% more for certain goods and services if the shops are located in districts with street trees and other plantings.

TREE BENEFITS

Adapted from THE SIMPLE ACT OF PLANTING A TREE: A Citizen Forester's Guide to Healing Your Neighborhood, Your City, and Your World, Tree People.

1. A large tree can provide the oxygen requirements for four people.
2. Clean the air by absorbing odors and pollution.
3. Conserve energy by shading and cooling homes and buildings and breaking up urban heat islands, thereby reducing the need for air-conditioning.
4. Reduce water consumption and increase atmospheric moisture.
5. Reduce water runoff and soil erosion by breaking rainfall and holding soil.
6. Provide a canopy and habitat for wildlife.
7. Transform barren areas and provide buffers from harsh urban landscapes.
8. Increase property values and improve business traffic.
9. Add unity, identity, landmarks, and pride to communities working together.
10. Absorb noise, dust, and heat.
11. Reduce glare.
12. Provide employment.
13. Turn vacant lots into parks and



Trees make streets and commercial areas memorable. This in turn encourages numerous return visits. The memory of a beautiful street, with majestic rows of mature trees, providing protection from the sun is hard to forget. A mature overhead canopy, and limbs that are pruned high, creates a welcoming sense of enclosure, highlights store frontages and provides an intimate place for business owners and visitors alike.

- Research shows that shoppers in well-landscaped business districts are willing to pay more for parking and up to 12% more for goods and services.
- Trees reduce runoff and erosion from storms by about 7% and reduce the need for erosion control structures. In urban areas with trees, the use of smaller drainpipes can save cities on materials, installation and maintenance.
- Trees shade and protect asphalt surfaces used for roads. This reduces the surface temperature of the asphalt, thereby making it less susceptible to movement and damage created when the surface softens. Resurfacing options have been shown to be reduced by 60% on roadways with 50% canopy coverage by trees.
- Desk workers with and without views of nature were surveyed. Those without views of nature, when asked about 11 different ailments, claimed 23% more incidence of illness in the prior 6 months.
- Amenity and comfort ratings were about 80% higher for a tree-lined sidewalk compared with those for a non-shaded street. Quality of products ratings were 30% higher in districts having trees over those with barren sidewalks.

Below are examples of the many energy savings associated with trees:

- The net cooling effect of a young, healthy tree is equivalent to 10 room-size air conditioners operating 20 hours a day.
- Saves \$30 in summertime air conditioning by shading the building and cooling the air (250 kWh) which is about 9% of total annual air conditioning cost.
- Trees properly placed around buildings as windbreaks can save up to 25% on winter heating costs.
- As few as three trees properly positioned can save the average household between \$100 and \$250 annually in energy costs.
- Fifty million shade trees planted in strategic, energy-saving locations could eliminate the need for seven 100-megawatt power plants.
- Shade from two large trees on the west side of a house and one on the east side can save up to 30% of a typical residence's annual air conditioning costs.
- Rows of trees reduce wind-speed by up to about 85%, with maximum reductions increasing in proportion to visual density. Because even a single row of dense conifers can cause large reductions in wind-speed, effective windbreaks can be planted on relatively small house lots. Compared with an open area, a good windbreak that does not shade the house will save about 15% of the heat energy used in a typical home.
- A typical community forest of 10,000 trees will retain approximately

- playgrounds.
- 14. Provide protection against the increase in cancer-causing ultraviolet rays.
- 15. Serve as friends, companions, playmates, and teachers.
- 16. Provide spiritual and creative inspiration.
- 17. Provide social, psychological, health and recreational benefits.



10 million gallons of rainwater per year.

Benefits Each Year of a single mature tree located on a residential property:

1. Absorbs 10 lbs of air pollutants, including 4 lbs of ozone and 3 lbs of particulates. The value of pollutant uptake annually by the tree is equivalent to atmospheric CO₂ emitted by a typical car driven 500 miles.
2. Intercepts 760 gal of rainfall in its crown, thereby reducing runoff of polluted storm water and flooding.
3. Cleans 330 lbs of CO₂ (90 lbs C) from the atmosphere through direct sequestration in the tree's wood and reduced power plant emissions due to cooling energy savings. Adds about 1% to the sales price of the property.

Ontario Power Generation and Toronto Hydro have recognized the benefits of reducing summertime cooling demands and both are making a long term investment by sponsoring a backyard tree planting program ([LEAF Toronto](#)) designed to shade residential properties. Cancer Care Ontario is also looking to the long term and advocating for communities to adopt strategies to increase their tree canopy as a means to combat melanoma. St. Catharines needs to look to the future and develop and implement a tree canopy strategy.

Environmental Benefits

Trees alter the environment in which we live by moderating climate, improving air quality, conserving water, and harbouring wildlife. Climate control is obtained by moderating the effects of sun, wind, and rain. Radiant energy from the sun is absorbed or deflected by leaves on deciduous trees in the summer and is only filtered by branches of deciduous trees in winter. We are cooler when we stand in the shade of trees and are not exposed to direct sunlight. In winter, we value the sun's radiant energy. Therefore, we should plant only small or deciduous trees on the south side of homes.

Wind speed and direction can also be affected by trees. The more compact the foliage on the tree or group of trees, the greater the influence of the windbreak. The downward fall of rain, sleet, and hail is initially absorbed or deflected by trees, which provides some protection for people, pets, and buildings. Trees intercept water, store some of it, and reduce storm runoff and the possibility of flooding.

Leafy tree canopies catch precipitation before it reaches the ground, allowing some of it to gently drip and the rest to evaporate. This lessens the force of storms and reduces runoff and erosion. Research indicates that 100 mature tree crowns intercept about 100,000 gallons



One large tree can absorb up to 10lbs of air pollutants each year. These include ozone (O₃ – the primary component of smog), nitrogen oxides (NO_x) and sulfur dioxide (SO₂), two major contributors to acid rain, and particulate matter (e.g. dust, soot, and smoke). Each of these pollutants have been shown to have adverse health effects, including asthma, lung cancer, and cardiovascular disease.

Trees Ontario



of rainfall per year, reducing runoff and providing cleaner water.

Temperature in the vicinity of trees is cooler than that away from trees. The larger the tree, the greater the cooling effect. By using trees in the cities, we are able to moderate the heat-island effect caused by pavement and buildings in commercial areas.

Air quality can be improved through the use of trees, shrubs, and turf. Leaves filter the air we breathe by removing dust and other particulates. Rain then washes the pollutants to the ground. Leaves absorb carbon dioxide from the air to form carbohydrates that are used in the plant's structure and function. In this process, leaves also absorb other air pollutants—such as ozone, carbon monoxide, and sulfur dioxide—and give off oxygen.

Modest increases of 10% canopy cover in the New York City area were shown to reduce peak ozone levels by up to 4 parts per billion or by nearly 3% of the maximum and 37% of the amount by which the area exceeded its air quality standard.

Heat from the Earth is trapped in the atmosphere due to high levels of carbon dioxide (CO₂) and other heat-trapping gases that prohibit it from releasing heat into space -- creating a phenomenon known as the "greenhouse effect." Trees remove (sequester) CO₂ from the atmosphere during photosynthesis to form carbohydrates that are used in plant structure/function and return oxygen back to the atmosphere as a byproduct. About half of the greenhouse effect is caused by CO₂. Trees therefore act as a carbon sink by removing the carbon and storing it as cellulose in their trunk, branches, leaves and roots while releasing oxygen back into the air. Planting trees remains one of the cheapest, most effective means of drawing excess CO₂ from the atmosphere.

By planting trees and shrubs, we return to a more natural, less artificial environment. Birds and other wildlife are attracted to the area. The natural cycles of plant growth, reproduction, and decomposition are again present, both above and below ground. Natural harmony is restored to the urban environment.

The spatial pattern of trees and forests is significant. The arrangement of land uses and natural systems is critical to the success of planning, design, conservation, and management of trees and forests. One measure of ecological health is the connectivity of the natural systems present. Road and utility line corridors can be barriers to wildlife species, where the ability to move between habitat areas is an important aspect for survival.

Trees also block unwanted lights at night and reduce noise pollution between conflicting uses. Trees reduce noise pollution by absorbing sounds. A belt of trees 98 feet wide and 49 feet tall can reduce highway

A large tree can remove more than 400 L of water from the ground and discharge it into the air in a day. One large tree in a single day can produce the amount of oxygen required by four people.

Trees Ontario



noise by 6 to 10 decibels.(13)

Heat island mitigation strategies can reduce atmospheric concentrations of greenhouse gases. Urban trees can sequester carbon dioxide through the creation of carbohydrates in the process of photosynthesis, subsequently storing it in trunks as wood. For trees to remain effective, however, they must be properly maintained and periodically replaced, since actively growing trees are needed to sequester carbon. If there are dead or dying trees in an area, the site could become a source of carbon dioxide rather than a sink (Nowak, 1994). A loss of urban trees can also be an indirect source of atmospheric carbon dioxide because tree loss will lead to increased energy demand for cooling. Reducing energy demand will also reduce the amount of carbon dioxide emissions from fossil fuel burning power plants. One study has suggested that if all urban tree spaces in the United States were filled, and if rooftops and parking lots were covered with lighter colors, electricity use would be reduced by 50 billion kilowatt hours each year, reducing the amount of carbon dioxide released into the atmosphere by as much as 35 million tons per year (EREC, 1995).

Environmental benefits

- Provide wildlife habitat
- Decrease erosion
- Decrease flooding
- Protect biodiversity
- Recharge groundwater
- Manage storm water
- Improve air quality
- Reduce greenhouse gases/combat global warming



Appendices



Appendix I: Planning and Development

The protection of trees on development sites and enabling additional tree planting in a municipality are not typically actions that complimentary to one another. One of the primary goals of the UFMP is to create a strategy for development related projects.

The City of St. Catharines has three departments that are directly involved in the preservation of existing trees and the planting of new trees. These departments are:

- The Recreation and Community Services Department
- The Planning Services Department and
- The Transportation and Engineering Services Department

Each of these departments uses varying methods and processes to undertake tree conservation. A standardization of these processes, where possible, will lead to a more consistent approach and will ensure that all departments are working toward the same urban tree strategy.

Recreation and Community Services

The Recreation and Community Services Department is responsible for the planting of trees on all municipal boulevards, in public parks and greenspaces. Each year, the street tree planting contract covers the installation of trees for residential requests, TES road works projects and park planting. This program has been organized on a first come first served basis. If the number of trees requested by homeowners, and required for TES projects deletes the annual budget, no trees are planted within parks, along trails, adjacent to playgrounds or other greenspaces. This has been the case for a number of years.

The master plan will recommend the following changes:

1. Each year a percentage of the tree planting budget be directed towards residential requests and the remaining funds be used for park planting or other RCS projects.
2. That TES include the cost of tree planting on road works projects in the budgets for each project. Trees on TES projects are to be considered part of completing the street, just as curbs or asphalt would be included in the tender.

The official plan supports this change, including allowing space for tree planting, in section 6.6 The Urban Forest. It states that:

- The City shall endeavour to reduce the urban heat island effect by establishing a minimum landscaping and/or tree canopy coverage for parking lots and other major hard surface areas.
- The City shall establish a 2 for 1 boulevard tree replacement program.
- The City shall ensure that appropriate space for tree protection and tree planting within road rights-of-way are included in the design of new roads and road improvements.
- The City shall continue to move to an allocation target of a minimum of 3% of the budget for all road reconstruction project for greening purposes above and beyond the normal landscaping requirements.

To clarify, the normal landscaping requirements for street projects is considered to be street trees, on both sides of the street, at 8 – 9 metres apart.

Planning Services

Planning Services has the opportunity to guide development on both private and public property. Plans submitted for site plan approval provide the municipality with the greatest amount of control over existing trees to be protected and new trees planted. This process involves review of all plans submitted, and the ability for staff to make detailed comments on all issues pertaining to trees. Since 2007, requirements for arborist's reports, native planting, diversity and ecologically sustainable design have been implemented. Plans are required to include as many trees as the site will sustain, with emphasis being placed on parking lot design and the reduction of the urban heat island effect. Some of these new guidelines have been implemented on projects that are submitted for site plan amendment agreements, allowing the municipality to modernize sites that did not fall under these newer planting guidelines when originally submitted.

Until recently, the planning of subdivisions resulted in the greatest number of trees planted per application; however, due to the limited Greenfield space available, this is no longer the case.

Severances and consent applications have processes in place to both protect existing trees and have them replaced if necessary. This usually involves one or two trees per application.

It is the responsibility of the contractor to protect and preserve trees along construction sites. This includes both municipal trees adjacent to or in construction sites or privately owned trees that are adjacent to project limits.

All development applications, through the Planning Services Department have been required to have an arborist's report submitted prior to the application being accepted.

Transportation and Environmental Services

The Transportation and Environmental Services Department is responsible for the work required to repair, change or install streets in the city. As older streets are reconstructed, changes in the layout of the street often necessitate changes to location of curbs, width of road or location of sidewalks. This often affects the existing trees.

The trees that line these streets can be in excess of fifty years old (often 60 – 80+ years) and have helped to define the character of the street. Foresight, in the design stage of roadworks projects is fundamental in the ability of the City to protect mature existing trees. Plans for tree preservation should be prepared prior to the design of the street. This will allow the design of the street to proceed and many of the trees to be preserved and not damaged. If a high value is to be placed on the mature trees of the City, the preservation of trees must be dealt with prior to, or hand in hand with the redesign of the street. Many municipalities, and large cities, including the City of Toronto, have adopted this philosophy.

Tree Preservation and Protection

The preservation of existing trees in heavy construction areas often presents the quandary of which trees are best to preserve and whether the resources used to save trees are well spent. Mature trees are more valuable both aesthetically and ecologically than younger



trees. On the other hand, younger trees are easier to save than mature trees. More emotion is often attached to larger trees even though the trees may not be good candidates to withstand construction impacts. Obtaining a clear and concise plan of existing tree conditions, plans for development and measures for tree protection is the best method of ensuring success. A key component of a sustainable community, as laid out in the Garden City Plan, is that such a community "*conserves its landscape, open space and agricultural areas.*"

Arborists Report

Prior to any construction commencing, the Contractor shall retain the services of an ISA Certified arborist. The arborist shall conduct a detailed site inventory of the trees on the site and within 400 cm of the development. This includes trees or large vegetation that may have either the above or below ground portion of the tree affected by the work. It may also involve trees or large woody plants at a greater distance, depending on the size of the plan material.

The report shall outline the following for each tree:

- The location of all trees in excess of 150 mm diameter at breast height
- The size of the canopy and the trunk
- The botanical and common name
- the condition
- the potential treat to the well being of each tree based on the proposed development
- a threat evaluation
- a monetary value for each tree to be preserved

The study shall be conducted according to the most recent edition of the Guide for Plant Appraisal published by the Council of Tree and Landscape Appraisers shall be used to determine the value of the plants. The evaluation and value report shall include a survey plan, keying the report trees into the plan.

All trees that are determined to be preserved (by either the arborists report or by the City of St. Catharines) shall have full tree preservation measures in place for the duration of the project. It is the responsibility of the Contractor to retain compliance reports, completed by the arborist, indicating that the conditions of the preservation report have been adhered to. The frequency of these reports will be determined based on the time of year the work is being done, the construction schedule, and the PDP.

Upon completion of the work, the arborist shall report on the condition of the trees that were under preservation measures. All developments within the City must adhere to the policies set out in the Tree Preservation and Protection Document, Recreation and Community Services, March 2008.

An important part of tree preservation is community education about the human impact on trees. Harmful activities such as soil compaction, trunk and branching damage, over or under-watering and chemical spills should be made clear to all contractors.

Pre-construction preparation and post-construction follow-up are essential to tree success, especially for larger trees. The older the tree is, the more difficult it is for the tree to recover. Ensuring that the tree is in a healthy state, prior to construction dramatically increases the chances for success. The older the tree is, the longer the length of time



requires for “post construction” care. This could involve root and crown pruning, deep root watering and deep root fertilization.

The project budget and schedule should be sufficient to accomplish the project goals. The costs of tree preservation work and soil improvement are often underestimated and project schedules are unrealistic. Many tree practices such as root pruning, fertilization, insect control, and tree planting are very season-specific. These practices may be ineffective if undertaken too close to the onset of construction impacts. In the case of the preservation of large trees, preparation of the tree for construction should begin a year or more before the start of construction. At the end of active construction, additional efforts to help the tree through the recovery process should include supplemental watering, disease and insect control, and pruning. These efforts may last several years.

Municipally owned trees may not be removed without City review and approval, except by authorized agencies in certain emergencies. The purpose of City involvement is to prevent unauthorized and unnecessary removal of trees and to ensure their safe removal. There are varying circumstances and conditions that govern the removal of City trees and their replacement. In the case of a private residential property owner, the removed tree may require replacement with a tree that is acceptable to the City or the provision of a cash deposit to cover the purchase and installation of a tree by the City. Developers who have construction projects that require the removal of trees may be required to either replace the trees with new street trees in the same location, or if space does not permit, provide the City with a cash allowance to cover the cost of the supply and installation of new trees in other locations of the City that are tree deficient. The value of the deposit will be determined by the value of the removed trees as determined by the detailed tree value report.

The urban forest needs to be recognized as the ‘green infrastructure’ of the community. For example, when federal programs are announced for new infrastructure, trees - as a “public utility” - should be included along with roads following a linked approach for the grey and green infrastructure.

The complete urban forest is an amalgam of trees of various ages and species that contribute to and are essential to a viable and healthy eco-system. The principles for survival of these existing forests and trees are:

- set high community standards for tree canopy coverage requirements.
- prepare and follow tree preservation plans.
- prepare trees well in advance of construction.
- protect the land and soil within the tree or forest critical root zone.
- increase community awareness of the importance of trees and tree preservation.
- preserve urban remnant areas of forest that can remain as wildlife habitat or which are important as an environmental resource such as wetlands or riparian buffers.
- improve urban forest management.

Trees that are to be protected may not be removed, injured or destroyed in any way. The term tree refers to all parts of the tree, including all the roots.

Alternatives When Trees Cannot be Replaced on Site



In some circumstances, crowding or other physical constraints make it impossible or undesirable to replace a tree of equal value in the same place. In that case, the value of the tree shall be calculated according to the detailed tree report outlining the condition and value of the tree(s). Once the value has been determined, that sum of money shall be used in the following order of preference, as approved by the PDP: (1) to provide additional trees elsewhere on the site; (2) to add or replace street trees or other public landscaping in the vicinity, or (3) to add trees or other landscaping to City property.

Security deposits shall be required for all existing trees on construction or development sites that

Planning and Community Standards

Determining a regional community standard for an acceptable amount of tree cover is difficult. Conditions vary considerably from community to community. Topography, history, soils and geology and economics all play a role in the amount of tree canopy that exist and how challenging it is to protect existing coverage or increase future coverage. While the amount of tree canopy coverage is important, the location of the tree cover is even more significant and can dramatically improve its effectiveness. The closer the canopy coverage is to areas of human activity, the more valuable it becomes. Buildings low enough to be shaded by tree canopy, parking lots, and other large paved surfaces (such as streets, sidewalks, commercial and industrial sites) are prime areas that should be addressed when improving canopy coverage. This canopy will cool buildings and pavement, reducing air conditioning cost and runoff water temperature. Cars parked under shade trees will lose significantly less fuel due to evaporation in addition to requiring less air conditioning when first driven. Trees covering paved areas also dramatically reduce storm water runoff as demonstrated every time you see people huddled under trees during a summer rain. Pavement shaded by trees is cooler and more comfortable to the pedestrian. Water running off this pavement is also cooler which benefits aquatic habitat down stream. Forested areas that buffer waterways or other sensitive environmental areas are very important in protecting these ecological systems from human impact.

Due to human activity, tree canopy in urban areas is worth significantly more than an equivalent area of canopy on the rural edge of town. But, urbanized areas are the places where it is most difficult to achieve successful tree growth. It is, however, reasonable to maintain a very high percentage of canopy coverage even in intensely developed areas, provided that the building footprint is removed from the calculation. This high percentage is possible through new tree planting techniques, coupled with a higher regard for the benefits of trees. Acceptance of the benefits of trees translates into acceptance of spending higher amounts per tree, as the planting site becomes more difficult. In large parking lots the geometry of car movements and economic pressure to reduce the percentage of green areas, makes it difficult to plant enough trees to completely cover the paved area. However, even in parking lots, canopy coverage standards should be raised above current levels.

Alternative Planting Locations

Maintaining the forest cover in urban centers is becoming an increasing challenge, especially for trees situated near roads, in parking lots and on boulevards. Other municipalities have created very detailed rules about the sizes of tree to be planted in new developments; the required soil volumes, the amount of tree cover relative to paved surface; and the spacing of trees for property frontages. Working out such rules would be a



worthwhile initiative in light of the province's plan for urban intensification under its 'Places to Grow' initiative. Some urban forests are aging and dying, often without a replacement plan or budget at the local level. For all of these reasons, greater resources and attention will need to be paid to the trees of our urban forest in order to maintain the forest cover that exists at present and expand the canopy cover as we move forward.

Urban trees experience a litany of environmental insults: soil and air pollution, heat loads, de-icing salts, and impacts from utilities, vehicles, and buildings. The most significant problem that urban trees face, however, is the lack of useable soil volume for root growth since trees are often an afterthought in city planning and streetscape design. Healthy trees need a large volume of non-compacted soil with adequate drainage and aeration and reasonable fertility

There are several solutions to these issues.

1. *Access available planting spaces.* The estimated amount of available space to accommodate tree planting is referred to as 'plantable space.' These areas are typically open park spaces void of tree cover, watercourses, ravines, right-of-ways, natural areas and schoolyards.
2. *Design plantable space to support trees.* In such cases new park design will incorporate mass tree plantings for the purpose of providing continuous canopy cover within areas of our parks. The same principles can be applied to roadways for the purpose of providing 'complete streets'.
3. *Improve the quality and quantity of potential planting locations.* This would require establishing the optimum soil quantity required in order for an urban tree to attain its growth potential over time, or ecological 'service life' as well as maintaining design standards that ensures proper tree spacing. Techniques such as wider boulevards and expanded tree lawns provide a greater volume of soil for a tree to grow. Traditional tree pits in many municipalities are no longer as common. Structural soil cells or linear tree pits have proven to provide better infrastructure for urban tree planting. In a natural environment, tree roots may reach hundreds of feet from the trunk in search of nutrients. In the confined spaces of the city, sites designed that are more fertile pound for pound than the average rural site create a healthier living environment. This includes systems to allow roots to drain and access water. Structural soils provide the porosity for growth and the structure to allow pavers to be used at street level. What our spaces lack in size, they must pick up in quality. Trees have long been fit into spaces left over after everything else is written into design. This approach will not work if we want our trees to be a major element in a city's structure. These areas would typically include the planting of trees on all roadway projects, streetscapes and new developments.

Appendix II: City of St. Catharines Urban Forestry Management Plan Survey Results

1) AGE:

Under 18	19-24	25-29	30-34	35-39	40-44	45-49	50-54	55 or older	No Response
0	3	3	8	5	5	4	6	33	2

Almost 50% of respondents were over the age of 55
The next highest age category of respondents is 30-34 with 12%

2) GENDER:

Male	Female	No Response
37	31	1

3) RESIDENTIAL:

Own your own home	Rent	Other	No Response
58	6	3	2

An overwhelming 84% of respondents are home owners.

4) EMPLOYMENT STATUS:

Full Time	Part Time	Self-Employed	Student	Retired	Un-employed	Prefer not to Answer	Other	No Response
27	1	8	3	24	1	2	2	1

Almost 40% of respondents are employed full time, with the next highest category being Retired at 35% - a direct correlation between the age bracket and employment.

5) CHILDREN:

Yes	No	No Response
46	21	2

6) TREES ARE AN ESSENTIAL FEATURE OF A LIVABLE COMMUNITY:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
63	5	1	0	0	0

Over 90% of respondents Strongly Agree that trees are an essential feature of a livable community.

7) A PRIMARY FUNCTION OF MUNICIPAL GOVERNMENT SHOULD BE THE PROTECTION OF GREEN INFRASTRUCTURE:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
46	18	3	1	1	0

2/3 of respondents Strongly Agreed that a primary function of municipal government should be the protection of green infrastructure.

8) TWO THIRDS OR 67% OF ALL TREES WITHIN THE CITY'S URBAN BOUNDARY ARE LOCATED ON PRIVATE PROPERTY. THE URBAN FORESTRY MANAGEMENT PLAN WILL RECOMMEND A PRIVATE PROPERTY TREE BYLAW TO REGULATE THE REMOVAL OF CERTAIN TREES BASED ON AGE, SIZE, HISTORICAL VALUE, ETC. A PRIVATE PROPERTY TREE BYLAW IS ESSENTIAL TO PROTECT AND MANAGE THE URBAN FOREST.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
25	19	6	7	11	1

Almost 2/3 of respondents Agree or Strongly Agree that a private property tree bylaw is essential to protect and manage the urban forest.

9) COMPLETE STREETS WITH TREES ON ALL MUNICIPAL BOULEVARDS ARE ESSENTIAL TO CREATE AESTHETICALLY PLEASING AND WELCOMING NEIGHBOURHOODS:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
50	17	1	0	0	1

An overwhelming 97% of respondents reacted positively that "complete streets" with trees on all municipal boulevards are essential to creating aesthetically pleasing and welcoming neighbourhoods.

10) IN ORDER TO ACHIEVE THE GOALS OF THE URBAN FORESTRY MANAGEMENT PLAN, IT WILL BE NECESSARY TO INCREASE THE ANNUAL BUDGET FOR TREE PLANTING. DO YOU SUPPORT AN INCREASE IN THE TREE PLANTING BUDGET?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
17	42	2	7	0	1

Over 85% of respondents support an increase in the tree planting budget.

11) AN INCREASE IN THE COST OF ROAD CONSTRUCTION TO INCLUDE TREES AND PLANTABLE SPACES IS BENEFICIAL:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
35	24	2	5	1	2

Over 85% of respondents believe an increase in the cost of road construction to include trees and plantable spaces would be beneficial.

QUESTION 12 DIFFERENT FOR ONLINE AND INFO SESSION SURVEY

12) TO MEET THE CANOPY COVER GOAL OF 30%, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
17	4	2	0	1	2

Over 80% of respondents agree that to meet the canopy cover goal it will be necessary to plant more trees on both public and private property.

12) TO MEET THE CANOPY COVER GOAL OF 30%, IT WILL BE NECESSARY TO PLANT MORE TREES ON BOTH PUBLIC AND PRIVATE PROPERTY. AS A PROPERTY OWNER, WOULD YOU BE WILLING TO PLANT A TREE ON YOUR PROPERTY?

Yes	Maybe	No
32	5	6

Almost half the respondents are willing to plant a tree on their private property to help meet the canopy cover goal of 30%

13) THE CITY SHOULD CREATE PUBLIC EDUCATION PROGRAMS TO INCREASE AWARENESS AND UNDERSTANDING OF TREE CONSERVATION:

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
37	20	7	2	2	1

Over 80% of respondents reacted positively to the city creating public education programs to increase awareness and understanding of tree conversation.

14) WOULD YOU CONSIDER BECOMING INVOLVED IN COMMUNITY PROJECTS THAT PROMOTE CONSERVATION AND ENVIRONMENTAL AWARENESS?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
11	25	22	8	0	3

Appendix III - Municipalities

Species by Municipality

	Brantford	Waterloo	Peterborough	Thunder Bay	Tecumseh	Kitchener	Hamilton	York	Owen Sound	St. Catharines	Barrie	Burlington	totals	% species
Abies concolor								1					1	0.30
Acer campestre	1					1	1	1		1	1	1	7	2.11
Acer x freemanii			1	1		1	1	1			1	1	7	2.11
Acer ginnala	1			1		1	1	1		1	2		8	2.42
Acer griseum							1						1	0.30
Acer mandshuricum							1						1	0.30
Acer negundo				1									1	0.30
Acer nigrum			1				1				1		3	0.91
Acer platanoides	3		5			2		2	1		9	6	28	8.46
Acer pensylvanicum							1						1	0.30
Acer pseudoplatanus							1						1	0.30
Acer rubrum	1	1	1	1	1	1	1	1		1	3	1	13	3.93
Acer saccharinum	1	1		1				1			1		5	1.51
Acer saccharum	1		1	1		1	1	1		1	2	1	10	3.02
Acer tataricum	1												1	0.30
Acer triflorum							1						1	0.30
Acer truncatum x A. Plat											1		1	0.30
Aesculus carnea													0	0.00
Aesculus glabra						1	1	1					3	0.91
Aesculus hippocastanum								1					1	0.30
Amelanchier canadensis	1	1				1	1	1	1	1		1	8	2.42
Betula papyrifera				1					1				2	0.60
Carpinus caroliniana						1	1		1				3	0.91
Catalpa bignonioides								1					1	0.30
Catalpa spp.								1					1	0.30
Corylus colurna	1					1	1						3	0.91
Celtis occidentalis	1	1		1	1	1	1	1	1		1		9	2.72
Cercidiphyllum japonicum							1						1	0.30
Cersis canadensis							1						1	0.30
Cladrastis kentukea							1						1	0.30
Cornus alternifolia							1						1	0.30
Cornus kousa													0	0.00
Crataegus spp.								1	1				2	0.60



Eleagnus augustifolia				1								1	0.30
Fagus grandifolia							1		1	1		3	0.91
Fagus sylvatica	1						1					2	0.60
Fraxinus americana				1					1			2	0.60
Fraxinus excelsior												0	0.00
Fraxinus mandshurica	1											1	0.30
Fraxinus nigra				1								1	0.30
Fraxinus pennsylvanica				1			1					2	0.60
Fraxinus quadrangulata	1											1	0.30
Ginkgo biloba	2		1			1	1	1		1	1	1	2.72
Gleditsia triacanthos	1	1	1	1		1		1		1	1	2	3.02
Gymnocladus dioica	1				1	1	1	1	1			6	1.81
Juglans cinerea				1			1					2	0.60
Juglans nigra								1	1		1	3	0.91
Juniperus virginiana								1	1			2	0.60
Koelreuteria paniculata							1					1	0.30
Larix laricina				1			1		1		1	4	1.21
Liquidambar styraciflua							1					1	0.30
Liriodendron tulipifera	1						1	1	1	1		1	1.81
Maackia amurensis							1					1	0.30
Magnolia accuminata							1					1	0.30
Magnolia soulangeana										1		1	0.30
Malus baccata								1				1	0.30
Malus spp.				1								1	0.60
Nyssa sylvatica							1					1	0.30
Ostrya virginiana							1		1			2	0.60
Phellodendron amurense				1			1					1	0.91
Picea abies								1				1	0.60
Picea glauca				1		1	1	1		1	1	7	2.11
Picea pungens				1				1			1	3	0.91
Pinus nigra								1				1	0.60
Pinus banksiana				1								1	0.30
Pinus resinosa				1			1					2	0.60
Pinus strobus				1		1	1		1		1	6	1.81
Platanus occidentalis							1		1			2	0.60
Platanus x acerifolia	1				1	1	1		1			1	1.81
Populus sp.									1			1	0.30
Prunus cistena								1				1	0.30
Prunus maackii				1								1	0.30
Prunus serrulata	1											1	0.60
Prunus serotina							1					1	0.30
Prunus virginiana				1				2		1		4	1.21
Pyrus calleryana	1		1		1	1	1	1		1		3	3.02
Quercus alba							1		1			2	0.60

Quercus bicolor					1		1	1	1				4	1.21
Quercus coccinea							1						1	0.30
Quercus macrocarpa	1	1	1	1	1		1	1	1	1	1		10	3.02
Quercus palustris							1	1	1	1	1		5	1.51
Quercus robur	1							1				2	4	1.21
Quercus rubra	1		1	1		1	1		1	1	1	1	9	2.72
Salix sp.									1				1	0.30
Syringa reticulata	1					1	1	1			2	1	7	2.11
Sophora japonica							1						1	0.30
Sorbus aucuparia				1									1	0.30
Sorbus decora									1				1	0.30
Sorbus x thuringiaca	1	1					1		1				4	1.21
Tilia americana	1	1		1			1	1	1				6	1.81
Tilia cordata	1		1	2	1	1	1	1	1	1	2	2	14	4.23
Tsuga canadensis									1				1	0.30
Thuja occidentalis											1		1	0.30
Ulmus americana				1					1				2	0.60
Ulmus davidiana				1									1	0.30
Ulmus parvifolia							1						1	0.30
Ulmus x (hybrids)	1				1		1	1			1		5	1.51
Ulmus thomasi									1				1	0.30
Zelkova serrata					1		1						2	0.60
													0	0.00
													0	0
														100.00
Total # of species planted	31	8	15	32	10	22	56	39	32	16	40	30	331	662

*98 species planted

Appendix IV - Recommended Tree List

Botanical Name	Common name	Location	Spr.	Ht.	Form	Salt Tolerance
<i>Acer ginnala</i>	Amur Maple					
<i>Acer griseum</i>	Paperbark Maple					
<i>Acer x freemanii</i> var.	Freeman Maple					
<i>Acer rubrum</i>	Red Maple					
<i>Acer saccharum</i>	Sugar Maple					
<i>Acer saccharum</i> 'Endowment Columnar'	Endowment Sugar Maple					
<i>Acer saccharum</i> 'Green Mountain'	Green Mountain Maple					
<i>Acer tataricum</i>	Tatarian Maple					
<i>Aesculus hippocastanum</i> (sterile c/v's only)	Common Horse Chestnut					
<i>Amelanchier canadensis</i>	Serviceberry					
<i>Betula populifolia</i>	Gray Birch					
<i>Betula utilis</i> var. <i>jacquemontii</i>	Himalayan Birch					
<i>Carpinus caroliniana</i>	American Hornbeam/Bluebeech					
<i>Cercidiphyllum japonicum</i>	Katsura Tree					
<i>Celtis occidentalis</i>	Common hackberry					
<i>Cercis Canadensis</i>	Redbud					
<i>Cladrastis lutea</i>	Yellowwood					
<i>Carya cordiformis</i>	Bitternut Hickory					
<i>Fagus grandifolia</i>	American Beech					
<i>Ginkgo biloba</i>	Maidenhair Tree					
<i>Gleditsia triacanthos</i> spp.	Honeylocust					
<i>Gymnocladus dioicus</i>	Kentucky Coffee Tree					
<i>Hippophae rhamnoides</i>	Sea Buckthorn					
<i>Koelreuteria paniculata</i>	Golden Rain Tree					
<i>Laburnum x watereri</i>	Golden Chain Tree					
<i>Liquidambar styraciflua</i>	Sweet Gum					
<i>Liriodendron tulipifera</i>	Tulip Tree					
<i>Magnolia x soulangea</i>	Saucer Magnolia					
<i>Maackia amurensis</i>	Amur Macckia					
<i>Nyssa sylvatica</i>	Sour gum/Black Tupelo, Black Gum/ Pepperridge					
<i>Ostrya virginiana</i>	Ironwood/Hophornbeam					
<i>Phelledendron amurense</i>	Amur Corktree					
<i>Pyrus calleryana</i>	Ornamental Pear					
<i>Quercus bicolor</i>	Swamp White Oak					
<i>Quercus macrocarpa</i>	Burr Oak					
<i>Quercus palustris</i>	Pin Oak					
<i>Quercus rubra</i>	Red Oak					
<i>Sophora japonica</i>	Japanese Pagoda Tree					
<i>Syringa reticulata</i> 'Ivory Silk'	Ivory Silk Lilac Tree					
<i>Tilia americana</i>	Basswood					
<i>Tilia cordata</i>	American Linden					
<i>Ulmus Americana</i> 'American Liberty'	Liberty Elm					
<i>Zelkova serrata</i>	Zelkova					

Appendix V – Specifications

1. TOPSOIL AND FINE GRADING

PART 1 - GENERAL

1.1 Scope of Work

- .1 This section includes the supply and installation of topsoil for planting of trees.

PART 2 - MATERIALS

2.1 Topsoil

- .1 Topsoil shall be a fertile, friable, natural loam; containing not less than 4% organic matter for clay loams and not less than 2% organic matter for sandy loams to a maximum of 15%, and capable of sustaining vigorous plant growth, free of subsoil contamination, roots and stones over 50 mm diameter, reasonably free of weeds, and having a pH range from 6.0 to 7.6.
- .2 No material will be supplied under this item without the approval of City of St. Catharines Recreation and Community Service staff. The Contractor shall supply a sample of the intended topsoil and planting mix material to the Landscape Architect one week in advance of placement with soil testing results. RCS staff is to be notified of placement of topsoil.
- .3 The Contractor shall haul topsoil to the areas of the site to be topsoiled and fine-graded along approved routes and shall carefully avoid damage to existing site features, streets and all on-site construction whether complete or in-progress.
- .4 Topsoil and sub-soil contamination of granular and paved surfaces shall be cleaned-up to the satisfaction of the General Contractor/RCS staff and at no extra cost to the Owner.

PART 3 - EXECUTION

3.1 Preparation

- .1 Grade sub-grade, eliminating uneven areas and low spots, ensuring positive drainage. Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove topsoil that has been contaminated with oil, gasoline, or calcium chloride. Dispose of removed materials as directed.
- .2 Cultivate the entire area which is to receive topsoil to depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading had compacted sub-grade. Contractor to determine amount of available on-site topsoil.
- .3 Spread topsoil in dry weather over a dry, unfrozen sub-grade. Do not perform operations during heavy rain conditions.

3.2 Spreading of Topsoil



- .1 Keep topsoil 15 mm below finished grade for sodded areas, elsewhere, bring topsoil up to finished grade.
- .2 Topsoil shall be placed in a uniform layer in all boulevards of 600 mm and compacted to 85% SPD.
- .3 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil.
- .4 Manually spread topsoil around and existing trees.
- .5 Ensure that ditches and swales are properly graded with adequate percentage fall to maintain the specified drainage.

3.3 Finish Grade

- .1 Fine grade the topsoil surface to eliminate rough and low areas and so as to ensure positive surface drainage.
- .2 Fine grade surface of topsoil to a smooth, even, loose-textured surface suitable for sodding and/or seeding.
- .3 Roll topsoil with 59 kg roller, minimum 900 mm wide, to compact and retain surface.
- .4 Maintain compaction of 85% Standard Proctor Density on all topsoil areas.

3.4 Excavation - Planting Pits and Beds

- .1 Excavate planting pits to the following depths unless specified otherwise on the drawings:

Deciduous and coniferous trees - same depth as rootball and 300 mm on all sides, greater than the rootball diameter.
- .2 The sides of all plant holes shall be vertical and the bottoms horizontal. On slopes, the depth of excavation will be measured at the centre of the hole. Unless otherwise specified, the excess materials excavated from the holes shall be spread in the immediate area as directed by RCS staff. The excavated material shall not be stockpiled on turf or in ditches. The sides of holes shall not be grazed or smooth.

2.0 PLANTING

PART 1 - GENERAL

1.1 Scope of Work

- .1 This section describes the supply of all labour, materials, tools, services, and incidentals to do all tree planting, whether in boulevards or park locations..

1.2 Qualifications

- .1 All planting and related work shall be done by experienced, qualified personnel under the direction and supervision of foremen with at least ten (10) years of horticultural and planting experience. Company must provide evidence of two other projects completed in the past five years of similar scale, nature and budget.
- .2 The work shall be done to conform with best horticultural practice and the specifications.

1.3 Testing

- .1 Testing is required for all imported topsoil.
- .2 Test for N, P, K and minor element values, soluble salt content, organic matter and pH value using an approved, independent inspection and testing agency.
- .3 Arrange for and be responsible for costs related to soil testing.
- .4 Submit soil testing report before commencing work.
- .5 When topsoil from one source is exhausted and more topsoil is required, topsoil from new source shall be tested before continuing work.
- .6 Conform to recommendations from soil testing agency with respect to improvement of tested topsoil.
- .7 Adjust fertilizer requirements and rates as well as addition of other additives to conform to soil testing report recommendation, at no extra cost to the Contract.

1.4 Samples

- .1 Submit samples of topsoil, planting mix, mulches and accessories for tree guying.
- .2 All work shall conform to approved samples.
- .3 Retain approved samples on site until all work has been inspected, approved, and accepted. Provide duplicate samples for Landscape Architect.

1.5 Inspection

- .1 Make all materials available for inspection on site.

- .2 Give timely notice, in writing, to the inspecting individuals when materials are available for inspection or deliveries are scheduled.
- .3 Planting of plant materials, prior to inspection by RCS staff, will be the Contractor's responsibility. RCS staff reserves the right to reject any plants, whether planted or not, which do not conform to the specifications and/or drawings. Remove all rejected materials from the site immediately.
- .4 Furnish all inspection certificates as may be required by federal, provincial, and other applicable regulations.
- .5 Do not remove any labels from plants until plants have been inspected and approved by RCS staff.
- .6 Substantial completion inspection will be made at the completion of all planting.

1.6 Shipment and Pre-Planting Care

.1 Plants:

- (a) Each species or variety shall be handled and packed in the manner approved for that plant, having regard for the soil and climatic conditions at the time and place of digging and of delivery, and to the time that will be consumed while in transit or delivery. All precautions that are customary in good trade practice shall be taken to ensure the arrival of the plants in good condition.
 - (b) Protect plants from damage and drying out from the time of digging until planting.
 - (c) When shipment is made by enclosed vehicle, the vehicle shall be adequately ventilated to prevent any "heating" in transit.
 - (d) Plants with broken or abraded trunks or branches or with broken or cracked rootballs or plants which are strongly desiccated will be subject to rejection upon arrival on the project site.
 - (e) All plant materials which cannot be planted immediately upon arrival on site shall be properly heeled in or well protected with soil or similar material to prevent drying out and shall be kept moist until commencement of planting.
- .4 Co-ordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
 - .5 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure, and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches, or destroy natural shape of plant. Give full support to root ball of large trees during lifting.
 - .6 Proceed with planting operations only during suitable weather conditions. Do not plant when weather goes below 10 degrees C, or during heavy rain conditions.

1.7 Maintenance

- .1 Maintain all plant materials and planting areas immediately after plants have been planted and continue such maintenance until final acceptance of all project work by RCS staff.

- .2 Maintenance shall include all measures necessary to establish and maintain plant materials in a vigorous, healthy, growing condition.
- .3 Maintain all plant and tree accessories, such as tree guys, stakes, turnbuckles, etc. from time of installation until acceptance of work by RCS staff.
- .4 Repair or replace accessories where necessary.
- .5 Cultivate and keep planting beds and tree saucers free of weeds at all times. Remove all debris, broken branches, etc., and maintain planting beds in a neat condition at all times. Water, when necessary, with sufficient amounts to saturate root system.
- .6 Inspect plants and trees regularly for diseases and insect infestations, and take immediate measures necessary to eliminate such diseases and infestations.
- .7 Use of chemicals for weed control, disease, and insect control shall be done in strict accordance with municipal and provincial regulations.
- .8 Assume full responsibility and repair, replace, or remedy otherwise all damages resulting from the use of such chemicals at no extra cost.
- .9 At time of final inspection, all trees shall be completely free of diseases and/or insect infestations. Tree guys shall be taut and all accessories in good condition as specified. All planting beds and tree saucers shall be freshly cultivated and free of all weeds and debris.

1.8 Warranty (Scope of Work)

- .1 Submit written guarantee to the effect that all:
 - (a) Plants accepted during the period from January 1st to July 15th, shall be guaranteed until July 15th two years later.
 - (b) Plants accepted during the period from July 15th to December 31st, shall be guaranteed for a period of twenty four (24) months from the date of acceptance.
 - (c) The guarantee periods, listed above, shall apply to all "nursery-grown plants".
- .2 Contractor to submit written guarantee before acceptance by RCS staff.
- .3 All trees shall be guaranteed for a period of two (2) years commencing the date of final acceptance.

1.9 Warranty (Plants)

- .1 Notify RCS staff, in writing, of any corrective or preventative measures necessary to safeguard plants.
- .2 During the guarantee period, make periodic inspections and replace all plants which are dead, missing, or which are not in a healthy, vigorous growing condition. Loosen guy wires regularly to prevent girdling. Any girdled trees will not be accepted at the end of the two year warranty.

- .3 All plant materials will be inspected by RCS at the end of the warranty period.
- .4 At time of such inspection, all plants shall be in a healthy, vigorous growing condition as per specifications.
- .5 Plants shall be completely free of diseases and insect infestations, and all accessories shall be removed.
- .6 Tree saucers shall be freshly cultivated and free of debris and weeds.
- .7 Owner reserves the right to extend Contractor's warranty responsibilities for an additional year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.10 Warranty (Replacements)

- .1 During warranty period, remove from site any plant material that has died or failed to grow satisfactorily as determined by RCS staff.
- .2 Replace plant material immediately or in the next planting season.
- .3 Extend warranty on replacement plant material for a period equal to the original warranty period.
- .4 Continue such replacement and warranty until plant material is acceptable.
- .5 Notify RCS staff of source of material at least 7 days in advance of shipment. No work under this Section is to proceed without approval.
- .6 All required replacements shall be plants of the same size and species as specified on the plant list and shall be supplied and planted in accordance with the specifications.

PART 2 - MATERIALS

2.1 Planting Mix

- .1 Planting amendments to be used shall be one part well-rotted manure, one part leaf mould, 2 parts on site topsoil and one part imported sandy loam topsoil.
- .2 Planting amendments shall be placed on deeply cultivated planting areas and thoroughly incorporated by deep tilling or shall be premixed before placement in beds. Landscape Architect is to be present on site during placement of soil in all planting areas. Should Landscape Architect not be notified of soil placement, and thereby make a periodic site inspection and find planting soil in place, a Stop Work Order may be issued if planting mix is not as specified. Contractor will be fully responsible for replacement of soil to meet specifications and must accept full responsibility for subsequent delay in work.

2.2 Fertilizer

- .1 Inorganic fertilizers complete, commercial fertilizers of approved manufacturer not less than 60% ureaformaldehyde by weight.



2.3 Bonemeal

- .1 Bonemeal: commercial, raw bonemeal, finely ground, and with a minimum analysis of 2% nitrogen and 11% phosphoric acid. Bonemeal must be mixed into planting soil before placement in beds.

2.4 Plant Accessories

- .1 Mulch shall be finely shredded hardwood bark mulch produced when raw round wood products are mechanically debarked by conventional type debarking units. The processed shredded bark material shall consist of an array of bark shreds and particle sizes ranging from fines up to and including coarse shreds and particles large enough to be refused by a 25 mm mesh screen. Bark slabs and particles greater than 50 mm will not be permitted. Bark seeding mulch particle size distribution shall be ascertained and approved as acceptable by RCS staff prior to application. Mulch shall be source from Submit sample of mulch for approval.

PART 3 - EXECUTION

3.1 Excavation

- .1 Remove water which enters excavations prior to planting. Ensure source of water is not ground water.
- .3 Excavated soil to be removed by Contractor.
- .4 Excavate planting pits for trees to the following minimum diameters unless detailed otherwise:
 - (a) two and one half times root ball width and one time rootball depth
- .5 Scarify sub-grade under tree pits to a minimum depth of 150 mm.

3.3 Soil Preparation

- .1 Add bonemeal to the soil mixture at the rate of 1 lb. per m³.
- .2 Mix topsoil, and other additives thoroughly on the site, not more than two (2) days before backfilling.
- .3 Do not mix or backfill when topsoil or soil mixture is in a muddy or frozen condition.
- .4 Backfill to a height above finished grade sufficient to allow for normal, natural settlement.
- .5 Finished grade, after settlement, shall be 25 mm below all hard surfaces. This is without cover of mulch.
- .6 Backfill soil mixture in layers not exceeding 200 mm in depth.
- .7 Tamp each layer firmly before placing subsequent layers.



3.4 Planting

- .1 Planting shall be done during periods suitable with respect to weather conditions and locally accepted practice. Plants shall be set plumb in the centre of the pit at the same relation to grade as originally grown, after settlement has taken place.
- .2 Trees shall be faced to give the best appearance or relationship to adjacent structures, and to the approval of the Landscape Architect.
- .3 Remove all ropes, wires, etc. and pull burlap away from top of root ball. Wire baskets shall be left in place.
- .4 Constantly tamp soil around root ball to eliminate air pockets.
- .5 Soak soil mixture thoroughly with water when hole is filled halfway.
- .6 Fill hole completely, leaving a shallow saucer directly over root ball, slightly smaller in diameter than the excavation.
- .7 Water trees and planting beds thoroughly immediately after planting.
- .8 Planting shall be done in a continuous operation, completing total areas rather than individual species.
- .9 All planting soil, additives, mulch, broken plant parts to be removed from adjacent lawn, sidewalks and parking areas.

3.6 Tree Staking

- .1 Samples of all accessories must be approved by RCS staff prior to the start of planting and consistency of materials shall be maintained throughout the project.
- .2 After planting and wrapping, support all trees as detailed on drawings.
- .2 The positioning of the tree staking is to be determined on site according to the prevailing wind direction.
- .3 Wires for fastening to anchors shall be pliable # 9 gauge minimum galvanized iron wire for trees.
- .4 New black rubber nose, two-ply, reinforced and 1/2" (12.5mm) in diameter, or approved equal, shall be used to encase wires where they circle trunk or branches.
- .5 Trees shall be supported with two (2) wires fastened around two (2) Steel (Snow-Fence Type) 'T' bars. Post wires shall be covered with two pieces of rubber hose at points of contact with the bark. 'T' bars to be new.
- .6 Keep wires taut at all times without subjecting tree to undue strain.
- .7 Do not damage root ball when staking trees. Stakes are not to be driven through root ball.

- .8 Trees not staked are subject to all requirements of this specification including guarantee.
- .9 During the life of the contract, if trees blow down, sway excessively, or are otherwise injured because of improper bracing, RCS staff will reject such injured trees and they shall be replaced by the Contractor at his/her own expense.

3.7 Pruning

- .1 Do pruning only as necessary to remove dead and broken branches and to compensate for the loss of roots as a result of digging operations in the nursery.
- .2 Preserve the natural form and character of plants and do not remove small twigs along tree trunks.
- .3 Use only sharp, clean tools, sanitized and make cuts flush without leaving stubs and treat all cuts 25 mm in diameter and larger with approved tree paint.
- .4 Trace back to living tissue all cuts, bruises, and scars on the bark and treat with tree paint. Smooth and shape wood so as not to retain water.

3.8 Watering

- .1 Keep all plants well watered from time of planting until acceptance.
- .2 Apply sufficient water to saturate root system, but do not overwater.

3.9 Mulching

- .1 Install approved mulch in all tree saucers and where shown on drawings to a minimum depth of 100mm around trees.
- .2 Cultivate soil and remove weeds before placing mulch.

3.10 Cleanup

- .1 Immediately after planting, remove all debris and excess material from the site leaving the area neat and tidy. Clean all areas which are contaminated as a result of planting operations.
- .2 Maintain all areas neat and tidy at all times until acceptance.

3.11 Protection and Maintenance

- .1 Assume full responsibility for protection and maintenance of all planted areas until expiration of guarantee.
- .2 Maintenance shall include, but is not limited to, weeding, pruning, watering, disease control, adjustment of accessories.

3.12 Final Inspection and Acceptance

- .1 At time of final inspection, all plants shall be in a healthy, vigorous, growing condition and planted in full accordance with drawings and conditions.
- .2 Tree saucers shall be freshly cultivated and free of all weeds and debris.
- .3 Any trees found dead, missing, or unacceptable at time of final inspection may delay acceptance of other work included in the Contract.
- .4 No partial acceptance requests will be approved..

3.13 Guarantee

- .1 All plant material will be inspected by the Landscape Architect and Owner at the end of the guarantee period.
- .2 At time of such inspection, all plants shall be in healthy, vigorous growing condition as per specifications.
- .3 Tree saucers shall be freshly cultivated and free of debris and weeds.
- .4 Plants shall be completely free of diseases and insect infestations and all accessories, such as guys, stakes, etc. shall be in place, in strict accordance with details, drawings, and specifications.

Appendix VI – Details

