

Improving Street Tree Performance – York Region Experience

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Abstract

The Regional Municipality of York is located in the Greater Toronto Area of Ontario, Canada. With a population of 1,073,158 people, the Region covers 1,766 square kilometres. The Region's Urban Forestry program includes strategic management of urban forests including more than 80,000 street trees. Street trees have been planted along Regional Roads since the early 1900s and the Region's current street tree planting program began in the mid 90s. Significant population growth in the 90s and early 2000s along with the adoption of a Streetscaping Policy resulted in a significant increase in street tree planting.

A health assessment in 2003 showed that 72% of recently planted trees were in failing health. Poor stock quality, inadequate planting and maintenance practices, lack of water and poor soil were identified as contributing factors. In response, a series of continuous improvements were made to stock quality, planting practices, watering and design guidelines.

Street tree performance has improved; today 75% of recently planted trees are in good health. However, there is still room for improvement. With continued growth and urbanization in the Region, there will be many challenges and it will take everyone's efforts to ensure street trees persist as an integral component of a sustainable urban forest.

Introduction

In the early 2000s the Region experienced significant decline in many of its newly planted street trees. To address the decline in tree health, the Region undertook several studies and implemented numerous program improvements. A philosophy of continuous improvement for our street tree planting program has been adopted at the Region. The results of monitoring and evaluating our practices are used to identify improvements. This paper provides an overview of studies completed, improvements made and the positive results achieved.

The Regional Municipality of York is an upper tier municipality located in the Greater Toronto Area of Ontario, Canada. The Region has a population of 1,095,000 and covers 1766 square kilometers. It is comprised of nine lower tier municipalities. The Region provides a variety of services including:

- Regional land use planning
- Water and Wastewater treatment
- Police and land ambulance services
- Regional transportation system including Regional or arterial roads and transit

The Natural Heritage and Forestry section is responsible for delivering Regional services in five key business areas:

1. Urban Forestry
2. York Regional Forest Management
3. Forest Conservation By-law
4. Greening Strategy
5. Invasive Species Management

The Urban Forestry Program includes strategic urban forest planning and the management of street trees along Regional roads. Street tree management includes planning, planting, maintenance of 50,000 + street trees. The Region plants over 2000 street trees and conducts maintenance on over 11,000 trees annually.

Street Tree Planting Program

Street trees have been planted along Regional Roads since the early 1900s. The current program began in 1996. In the late 90s and early 2000s significant population growth combined with the adoption of the Region's Greening Strategy and Streetscape policy lead to a significant increase in the number of street trees planted. By 1999, 2000 street trees were being planted annually. The increase quickly surpassed the forestry section's capacity to manage the newly planted trees. Early successes in survival of planted trees were overshadowed by significant concerns with the performance of newly planted trees, which was evident to staff, the public and politicians. Newly planted trees were declining significantly following planting and by

the second growing season replacement rates exceeded 40%. Many factors contributed to the poor survival rate, including the harsh environmental conditions of Regional roadsides, the poor quality of planting stock and planting practices, and a lack of care following planting.

Assessing Performance: 2003 Street Tree Health Assessment

In 2003 a street tree health assessment was commissioned to examine trees planted between 1996 and 2003, identify factors affecting performance, and make recommendations to improve survival and health. The study included the assessment of 1094 trees planted between 1996 and 2003 (8% of all trees planted in this period). Each tree was assessed to determine the health of its crown, stem and roots, and assigned an overall health rating. In addition, information on species, size, year planted, and location (road side, adjacent land use and boulevard soil conditions) was collected.

Street Tree Health Assessment Results

The assessment found that 72% of trees were in failing health, the majority of which were planted after 1999. The crowns of many of the trees had dieback and were mainly composed of epicormic shoots. Many of the stems had large scars and areas of tissue necrosis.

Using the data collected investigators identified a multitude of factors affecting the survival and performance of street trees. However four factors were identified as having the most influence:

1. Available water.
2. Boulevard soil quality and quantity.
3. Stock quality and planting practices.
4. Environmental conditions including salt from winter maintenance and exposure to wind.

Several trends in tree health were identified including:

1. Some species performed well despite the harsh growing conditions.
2. Survival was much lower on open exposed sites, especially in rural areas.
3. Tree health was poorer on the east and south side of roads (prevailing wind is from the north west).

4. Newly planted trees have a three to five year establishment period during which care is critical to survival.

Based on the findings of the assessment several recommendations were made to improve the survival and performance of newly planted trees including:

1. Increase watering of newly planted trees in the critical establishment period.
2. Review design guidelines/standards for planting and acceptable species lists.
3. Review specifications for and implementation of street tree planting contracts.
4. Continue to monitor performance of street trees.

Taking Action: Implementing Recommendations of the 2003 Street Tree Health Assessment

The results of the street tree health assessment were brought forward to Regional Council in 2004 along with recommendations to implement specific program improvements including:

1. Enhanced tree watering program.
2. Improved species selection.
3. Enhanced tree planting specification.
4. Improved implementation of tree planting contracts.
5. Integration of trees into infrastructure design and construction.
6. Continued monitoring.

Planning for Success

The short and long term success of planting begins with good planning, and the health assessment identified the need to improve design practices. New Street Tree Protection and Planting Design Guidelines were developed to address this. In the past, trees were an afterthought in design, but the new guidelines ensured trees were considered throughout the process and that planting locations were suitable.

Regional roads are major transportation corridors designed to accommodate multiple modes of transportation including vehicles, transit, cyclists and pedestrians. Environmental conditions are very hostile and limit the number of species that grow successfully to a small number that are tolerant to urban conditions. To ensure only the most appropriate trees are planted the guidelines include a “Top Performing Street

Trees Species List”. The species list is reviewed on an annual basis and species are added and removed based on the most current information.

Species Diversity

With the arrival of Asian Longhorn Beetle and Emerald Ash Borer, the need to ensure species diversity in the urban forest became even more evident. This presented a dilemma. The Region could either plant from a short list of known performers, or plant to maximize diversity and accept the resulting lower survival rate. The Region’s approach to this challenge is to ensure diversity at the *urban forest scale* by promoting the use of a wider range of species in less hostile environments including local roads, parks and private lands, and using species proven in harsh conditions on Regional Roads.

Soil Quality

Soil quantity and quality was identified as a key factor impacting tree performance. Much of the soil contained in Regional boulevards is good road building material, but not good tree-growing material. To guide the design and construction of future Regional roads, an Enhanced Tree Planting Strategies document was prepared. It contains a variety of options for improving soil conditions and specifies minimum soil volume requirements. A 40 cm diameter tree has been set as the Region’s performance target. To support this target a minimum soil volume of 16 cubic metres per tree with access to 30 cubic metres (shared root space) has been identified.

Planting for Success

Stock quality and planting practices were identified as significant factors affecting the performance of street trees. A review of planting practices confirmed that a single supply-and-install contract was the best method to deliver the service, but improvements to specifications and quality assurance were required. Planting specifications were revised to incorporate new ideas and solutions, including removing the sod from a 30 cm bed preparation area around the planting hole, cultivating the existing soil, and covering the area with mulch to improve soil conditions.

To ensure compliance with the specifications, a new contract audit and inspection protocol was implemented that included pre-selection of stock and onsite and post-planting inspection. An important component of this protocol was the addition of staff. Currently, every tree planted is pre-selected in the nursery and tagged by staff, and every tree is inspected by staff post-planting to ensure compliance with the specifications. Onsite auditing at the beginning of planting allows inspectors to identify and correct issues early in the process and build a working relationship with the contractor.

Critical Establishment Period

Trees enter a critical establishment period after their initial planting where they require care to ensure their survival and health. Simply put, it is not good enough to plant a tree and walk away. Providing adequate water was identified as one of the most important factors affecting a tree's health during the establishment period.

Prior to 2004, the planting contractor was responsible for watering trees at their discretion during the establishment/warranty period. To ensure trees received water, the contract was revised to identify watering as a separate item implemented at the Region's discretion. Today, each tree planted is watered 14 times per year for the first three growing seasons. In addition the Region is using 75-liter TreeGator watering bags to increase efficiency and effectiveness of watering. To ensure watering is completed the Region requires that all watering trucks be equipped with an Automated Vehicle Locating (AVL) System. The AVL system allows staff to locate operations for onsite inspection and to verify watering is completed. Implementation of this watering regime is funded as part of the planting costs rather than the maintenance costs and is thus considered a capital cost.

Measuring Success: 2010 Street Tree Health Assessment

The Region repeated the street tree health assessment in 2010 to measure the success of program improvements implemented. The health assessment showed a significant improvement in overall health of recently planted trees. Seventy-six per cent of the trees were in good condition, compared to 28% in 2003. While their overall health had improved, many trees still showed signs of decline following planting. And while the improvements were impressive, one in four trees were still performing poorly, which is not acceptable. The study concluded that while the improvements made were having a positive result, there were still opportunities for continuous improvement in the program. The recommendations from the study included:

1. Further increase watering from 10 times to 14 times per year.
2. Improve the quantity and quality of boulevard soil.
3. Conducting a street tree health assessment every five years.

Continuous Improvement: Implementing Recommendations of the 2010 Street Tree Health Assessment

Inadequate boulevard soil quality and quantity continued to be a significant barrier to both the initial establishment of street trees and their long-term performance. Following the assessment, a review of existing practices/standards for the construction of

boulevards was completed, including a field investigation of soil conditions. Most boulevards were constructed with 10 cm of topsoil, which was not enough to support the Region's expectations for tree performance. To address these concerns, a two to three-metre-wide-by-30-cm-deep boulevard soil trench standard was developed for implementation on capital road improvement projects with softscape boulevards. The trench includes an optional sub drain to provide adequate drainage. For projects with hardscape boulevards soil cell technology is utilized to meet minimum soil volume requirements. In addition, a new planting soil specification was developed for the boulevard soil trenches, boulevard planters and medians. The new soil specification is a blend of topsoil, coarse sand and organic matter (high lignin and compost). The specification identifies the required amounts of each component and testing.

The Region continues to review and test new techniques and products to improve performance of street trees. In 2013 the Region will be implementing a soil remediation trial utilizing biochar. The trial will involve the incorporation of compost and a compost/biochar blend at the time of planting.

Future Challenges: Urbanization of Regional Roads

The introduction of new Provincial legislation regarding growth in the Greater Toronto Area (GTA) has resulted in a shift from suburban development to more urban development and intensification. To support this intensification a new rapid transit system, VivaNext, is being constructed. It will include bus rapid transit (BRT), and an expansion of subway service from the City of Toronto.

The urbanization of these transit corridors presents new challenges for the establishment and long-term performance of street trees. Sodded boulevards are being replaced with hard surface treatments, tree grates and raised planters. The provision for adequate amounts of quality soil is even more important. Implementation of new technologies such as soil cells are occurring to ensure that trees are provided with the resources they need to establish and thrive.

Continued monitoring and a philosophy of continuous improvement will be critical to sustaining the Region's street tree population as the Region evolves and the challenges of climate change and invasive species continue to shape the demands of urban forest management.