2025 TREE PLANTING SURVIVAL STUDY

City of Toronto

GROWING A RESILIENT CITY







The City of Toronto recognizes the importance of monitoring newly planted trees to better understand the factors that contribute to their survival and long-term success. This study provides valuable insights into how species selection, planting stock, site conditions, planting practices, and early maintenance protocols influence tree survival.

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CITY OF TORONTO | **Environment, Climate and Forestry**

Growing a Resilient City:

2025 Tree Planting Survival Study

Report Summary | City of Toronto Urban Forestry | July 2026

Prepared by Silv-Econ Ltd. in partnership with Urban Forestry, City of Toronto

Executive Summary

A new study conducted on behalf of Urban Forestry assessed the survival and condition of trees planted through the City's street and park tree planting programs. The 2025 Tree Planting Survival Study evaluated a representative sample of 6,672 15-gallon potted and large wire basket caliper trees (trees with stems wider than 4 cm) planted between 2018 and 2023 across four City planting programs: Proactive Plantings, Residential Replacement Plantings, Hard Surface Plantings, and Parks Plantings. A longer-term sample of 1,086 Established Trees, trees planted between 2008 and 2017, was also evaluated. ISA-certified arborists conducted standardized field assessments, supported by soil and foliage laboratory analyses at selected sites. Naturalization plantings, which make up a significant portion of City-led planting efforts, were not included in the study because their goals and outcomes differ from those of other tree planting programs.

Evaluated trees planted across four planting programs from 2018-2023:

92-95%	91%	50 yrs	107
Survival Rate	**Excellent or Good Health**	**Average Life Expectancy**	**Tree Species Planted**

Based on the proportion of trees that may have been replaced since planting, the overall survival rate of trees planted between 2018 and 2023 is estimated to be 92 to 95 per cent (%), with 91% of all trees planted being rated in Excellent or Good condition. The findings place Toronto among the top municipalities in North America for urban tree survival, reflecting the City's sustained investment in thoughtful species selection, professional planting standards, and early tree maintenance. The study identifies clear opportunities where targeted improvements in maintenance practices, soil management, and site design could meaningfully extend tree life expectancy and strengthen the urban canopy for decades to come.

Background: Why This Study Matters

Toronto's urban forest, spanning parks, streets, ravines, and neighbourhoods, is one of the City's most valued public assets. Expanding and sustaining the urban forest to reach 40% canopy coverage by 2050 is a City-wide priority. Toronto's Strategic Forest Management Plan sets the strategic direction for achieving a healthy, diverse, and resilient urban forest. A central commitment of this plan is improving the quality of data on how newly planted trees establish, survive, and grow over time.

To fulfill this commitment, the City commissioned an independent, evidence-based survival study. The results provide decision-makers with the information needed to continually improve tree planting outcomes, guide resource allocation, and strengthen Toronto's position as a leader in urban forestry.

Did You Know? Toronto's Urban Forest by the Numbers

- Toronto's urban forest covers approximately 28.3-31% of the city's land area.
- City of Toronto has adopted the goal of increasing tree canopy coverage to 40% by 2050.
- The City owns and maintains approximately 4.6 million trees in parks, as well as more than 650,000 trees located on streets.
- Since 2007, over 800,000 ash trees were lost to the Emerald Ash Borer, the single greatest loss in Toronto's urban forest history.
- Between 2018 and 2023, more than 84,000 larger-sized trees were planted across the City's four primary tree planting programs included in the study.
- With an estimated survival rate of 92-95% and 91% of all assessed trees in Excellent or Good condition, the City's urban tree planting programs compare favourably with those of similar municipalities across North America and internationally.



About the Study: How Success Was Measured

Field assessments were conducted between October 2024 and August 2025 to evaluate trees planted through four planting programs: Proactive Plantings, Residential Replacement Plantings, Hard Surface Plantings, and Parks Plantings. The study assessed **6,672 trees, representing an 8% sample of more than 84,000 trees** planted between 2018 and 2023. In addition, 1,086 Established Trees, or trees planted between 2008 and 2017, were assessed to track long-term survival trends and inform future monitoring.

Planting Program	Details
Proactive Plantings	City staff proactively plan new tree plantings along residential streets and arterial roads within the City right-of-way
Residential Replacement Plantings	Replacement planting is planned by City staff in residential neighbourhoods when a City tree is removed.
Hard Surface Plantings	Trees are planted in hard surface infrastructure, ranging from tree pits, tree containers, to raised beds or soil cells.
Parks Plantings	City staff plan proactive and replacement tree planting in City parks and open recreational spaces.

Table 1. The City utilizes different approaches to carry out tree planting, and this assessment encompasses four of Urban Forestry's planting programs evaluated in this study.

Study Approach: Tree Assessment Framework

To fulfill the study objectives, a representative sample of trees from each of the four planting programs described in Table 1 was evaluated. The assessment included documentation of cultural practices associated with each tree, analysis of physical and biological characteristics, and evaluation of site-specific environmental factors known to influence tree health.

Data was analyzed by Silv-Econ Ltd. to generate evidence-based recommendations. Structured and repeatable methods were used to evaluate tree performance and to identify factors associated with survival, health, and longevity.

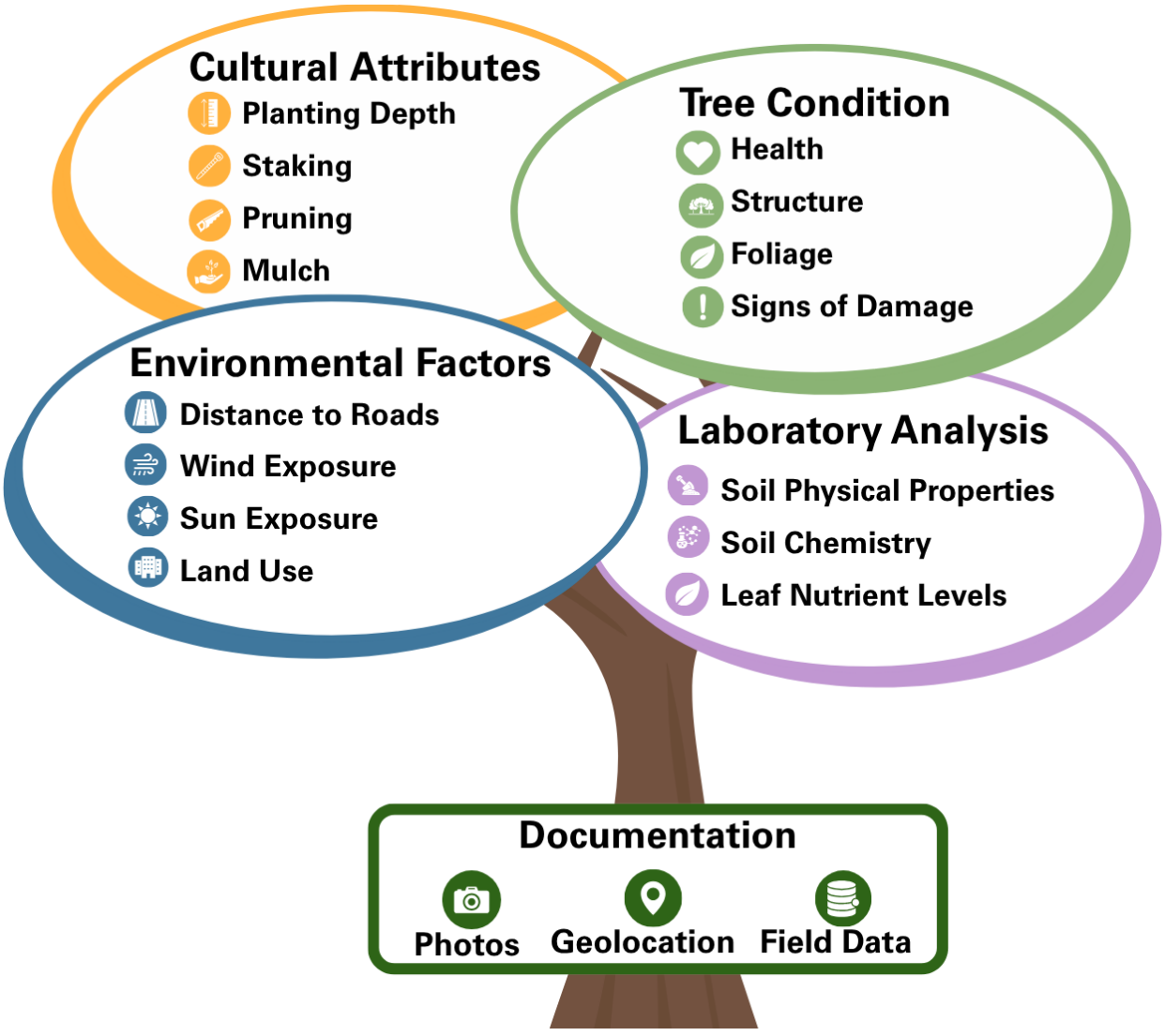


Figure 1. Key assessment components of the 2025 Tree Planting Survival Study, including tree condition, cultural attributes, environmental factors, laboratory analyses, and field documentation.

Key Findings

1. Toronto's Newly Planted Trees are Performing Well

Toronto's urban tree planting programs are performing well, with assessed trees generally exhibiting good health, structure, foliage condition, and limited signs of damage. With an estimated **survival rate of 92-95%** and **91% of all assessed trees in Excellent or Good condition**, the findings indicate that Toronto is a leader in urban tree survival among municipalities in North America and internationally.

Tree mortality is low overall, an average of 1.4% annually, and is heavily concentrated in the first two years after planting. This is consistent with established arboricultural research showing that the establishment phase, typically the first one to three years after planting, is the most critical period for tree survival. Once a tree is well established, its long-term prospects improve substantially.

A small sample of Established Trees planted between 2008 and 2017 showed an even lower observed mortality rate of 0.8% with an estimated life expectancy of 86 years. While the sample was limited and additional historical information would be needed to understand the factors influencing these outcomes, the findings suggest that trees that successfully establish can provide benefits for many decades.

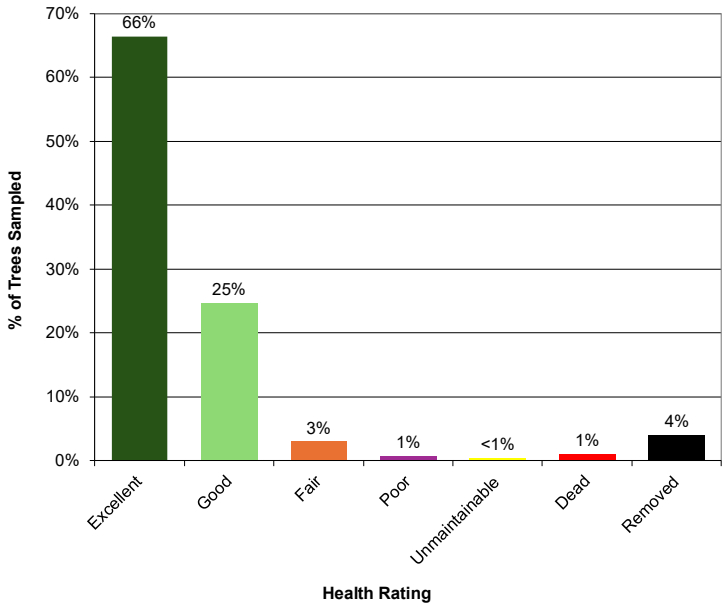


Figure 2. Health Rating of sampled trees planted between 2018 and 2023 across all planting programs.



2. Tree Performance Varies across Programs and Planting Environments

While overall results are strong, tree condition and survival varies meaningfully across the four planting programs (Residential Replacement Plantings, Proactive Plantings, Parks Plantings, Hard Surface Plantings). Understanding these differences is essential to improving outcomes where challenges persist.

How Do Toronto's Planting Programs Perform? (2018-2023)

Residential Replacement Plantings

Highest Health Rating

72% Excellent Health

1.5% / yr Mortality

46 yrs Life Expectancy

Health Rating:



Proactive Plantings

Longest Lifespan

64% Excellent Health

1.3% / yr Mortality

53 yrs Life Expectancy

Health Rating:



Parks Plantings

Consistent Performance

64% Excellent Health

1.6% / yr Mortality

43 yrs Life Expectancy

Health Rating:



Hard Surface Plantings

Most Challenging

60% Excellent Health

6.5% / yr Mortality

11 yrs Life Expectancy

Health Rating:



Tree Health Rating Distribution (Trees Planted 2018 - 2023)

Excellent | Good | Fair | Poor | Unmaintainable | Dead | Removed

Figure 3. Comparison of tree health, annual mortality rates, and estimated life expectancy across four of Urban Forestry's planting programs evaluated in this study.

Proactive plantings exhibited the lowest mortality and had positive health ratings despite arterial road environments, with vehicle and mechanical damage being the primary risk factor for these trees. **Residential Replacement Plantings had the highest proportion of trees rated in Excellent condition** and slightly higher mortality compared to Proactive Plantings. **Parks offer high quality growing environments, but also increased exposure to threats** from mechanical damage, vandalism and wildlife browse. **Hard Surface Plantings experience fundamental challenges** such as constrained soil space, road salt exposure, and physical damage which was reflected in the health ratings observed.



Where trees are planted in open lawns or boulevards, they benefit from greater soil volume, reduced salt exposure, and improved rooting conditions. In many Hard Surface Plantings, trees face fundamental constraints that limit their ability to grow, access water and nutrients, and resist stress. The study found that Hard Surface Plantings installed in well-designed raised planting beds with adequate soil volume and irrigation outperformed those in smaller, constrained infrastructure, highlighting the role that soil compaction, soil volume and sidewalk salt may play in tree survival.

3. Diversity Is Toronto's Competitive Advantage

One of the most encouraging findings of the study is the breadth of species diversity across Toronto's urban forest. Since 2018, the City has planted **107 distinct species and cultivars** spanning 47 genera and 22 plant families, an extraordinary level of variety for any urban tree program as per a jurisdictional review. No single species makes up more than 8.1% of the planted population, a critical safeguard against the threat of urban tree pests and diseases; the kind of catastrophic loss Toronto experienced when the Emerald Ash Borer devastated the city's ash tree population.



Urban Forestry prioritizes the planting of large-growing, native tree species whenever possible. The five most frequently planted species across the evaluated programs, **honey locust**, **Kentucky coffeetree**, **Freeman maple**, **hackberry**, **and red oak**, and account for approximately one-third of all trees planted between 2018 and 2023. These species are performing well, with **60-71% assessed in Excellent condition**. The study also identified several high-performing, but underutilized species, including tulip tree, London planetree, northern catalpa, Ohio buckeye, yellow buckeye, and sugar maple, which had a high proportion of trees in Excellent condition. While some of these species are not native to Ontario, species selection considers a range of factors including climate resilience, species diversity, and tolerance to urban stressors.

Fast Facts: Species That Are Thriving

- **Princeton elm** (*Ulmus americana* 'Princeton'): 82% Excellent health, strong performance across proactive and residential plantings.
- **tulip tree** (*Liriodendron tulipifera*): 72% Excellent, outstanding climate adaptability.
- **Ohio buckeye** (*Aesculus glabra*): 80% Excellent, strong performance in residential and proactive plantings.
- **London planetree** (*Platanus x acerifolia*): 79% Excellent, one of Toronto's best street tree options.
- **northern catalpa** (*Catalpa speciosa*): 76% Excellent, thriving in proactive and residential plantings.

4. Early Interventions Contribute to Long-Term Success

One of the most actionable findings of the study is the significant influence that early establishment practices have on long-term outcomes. Trees do not need major interventions, but they do need the right care, applied consistently, in the first one to three years after planting.

Currently, the City waters newly planted trees regularly for the first 2 to 3 years after planting through tree planting and maintenance contracts. The Newly Planted Tree Maintenance Program inspects and maintains young trees 2 and 3 years after planting which may include pruning, mulching, staking, watering, and fertilizing.

Mulching makes a measurable difference. Trees with deep mulch rings, 20 centimetres or more, achieved an Excellent health rating 84% of the time, compared to 62% for unmulched trees. Applying deep, good quality mulch free of stones, weeds, contaminants, and debris helps retain moisture, suppress weeds, improve soil health, and reduce salt infiltration at the root zone by at least 50%. Only 2% of trees in the study had mulch this deep; nearly half had shallow, cosmetic layers under 5 centimetres that provided little functional benefit. Many of the trees assessed had aged out of the City's establishment maintenance period, during which mulch would typically be applied.



Weed competition in the early years pose a threat to tree survival. Trees with weed-free mulch rings achieved a 71% Excellent health rating and showed no early mortality. Where weeds covered more than half the root zone, Excellent health decreased to 62% and early mortality increased. The solution: deep, wide mulching that is well-maintained while trees establish will address weed competition threats and is the same intervention that also addresses moisture and salt stress. Study findings will inform current and future Urban Forestry program planning and operational adjustments and the implementation of the second Strategic Forest Management Plan.

Staking left too long can cause harm. Stakes are removed in year 3 after planting as part of scheduled newly planted tree maintenance. However, the study found that 6-10% of trees aged 3 to 6 years retained stakes, while 1% of trees aged 8 to 16 years also retained stakes (although, generally poorly attached). Stake conditions varied by program with 33% of stakes in Residential Replacement Plantings were loose or broken, compared to 13% in the Proactive Plantings. These findings suggest an opportunity to improved stake management, as stakes left in place too long can restrict trunk development and affect long-term tree health.

Pruning plays a role in long-term tree structure and health. Structural pruning of young trees helps establish strong form, reducing the risk of future defects. By year 5, approximately 50% of trees showed signs of pruning, increasing to nearly all trees assessed showing signs of pruning by year 17. While most pruning appeared appropriate, about 12% of trees showed pruning stubs, improper cuts that can delay healing and increase vulnerability to decay and pests. These findings highlight the importance of proper pruning techniques, and proactive maintenance.

5. Location Matters: Growing Conditions Impact Survival

Where a tree is planted influences long-term health and performance. The study found measurable differences between trees planted along arterial and residential roads, driven by environmental exposure, physical disturbance, and site conditions.



Trees along arterial roads (characterized by high traffic volumes) face exposure to heavier traffic, more road salt, snow and ice loading, limited soil space, and greater wind and damage compared to local roads in residential areas. Average soil sodium levels were 69% higher along arterial roads than on local roads. **Approximately 10% of arterial roadside trees were rated in Fair or worse condition, compared to just 3–5% for residential roadside trees**.



Residential areas provide more favourable growing conditions for trees, including protective site features such as surrounding vegetation, fencing, or buildings. Unlike trees in commercial areas, trees in residential areas were not observed to experience high wind exposure. Positive effects were observed among trees growing in close proximity. Research suggests that nearby trees may benefit from shared networks of beneficial soil organisms, improving nutrient uptake and resistance to pests and pathogens. Proximity may also protect trees from wind and sun exposure. Damage from vehicle impacts or turf mowing was more than three times as likely in commercial areas as in residential settings. These conditions likely contribute to the **higher proportion of trees rated in Excellent condition in residential areas (72%) compared to commercial areas (50%)**.

6. What's Happening Underground: Toronto's Soil Challenge

The study examined soil chemistry at 40 selected sites through laboratory analysis conducted by A&L Canada Laboratories. The results reveal a city-wide challenge that extends beyond individual planting sites: **Toronto's urban soils impose fundamental constraints on tree nutrition and health that affect virtually the entire tree population.** This is not an issue that can be solved on a site-by-site basis; rather, it requires a proactive, city-wide approach to soil improvement. To address this, City of Toronto is engaging with researchers from University of Toronto and the Vineland Research and Innovation Centre to identify practical solutions including organic compost, biochar, and biofertilizers.





What's in Toronto's Soil?	
Soil pH	**7.6-7.8** Nearly universal across all sampled sites, soil pH was 7.6-7.8 which is well above the optimal range for most tree species. Driven by naturally calcareous (lime-rich) parent material beneath the city.
Calcium Saturation	**86-94%** Calcium occupies 86-94% of the soil's nutrient-holding capacity (cation exchange sites), crowding out iron, manganese, zinc, and phosphorus, even in trees that appear healthy.
Road Salt (Sodium)	**Up to 2,249 ppm** Sodium levels reached 2,249 ppm in Hard Surface Plantings and 308 ppm along some turf boulevards, far above tolerance thresholds. Sodium levels in park and lawn soils were found to be much lower (high of 43 ppm). Salt displaces nutrients, injures root hairs, and impedes water uptake.
Mulch Protects Roots	**≥50% reduction** Active mulch rings cut electrical conductivity, sodium, and chloride by 50% or more in the soil beneath them, acting as a physical barrier against road-salt spray at the root zone.

Table 2. What's in Toronto's Soil? Key findings of soil testing, including soil chemistry, nutrient availability, road salt impacts, and the benefits of mulch for urban trees.

The interaction between high-pH, calcium-rich soils and de-icing salt creates a compounding stress on tree roots. Trees that appear healthy may still be developing subtle nutrient imbalances in iron, manganese, and zinc, which are known to contribute to decline under prolonged exposure. This

finding is particularly important for long-term canopy planning: maintaining and expanding the urban forest requires not just good planting practices, but better **soil management**, including proactive mulching, targeted amendments, and informed site design that accounts for what's happening below the surface.

Community and Environmental Impact

Every tree counts. Toronto's urban forest has an estimated structural value of over $7 billion, and delivers $55 million in ecosystem services annually, intercepting rainfall, filtering air pollutants, shading streets, reducing energy consumption, sequestering carbon, and providing habitat for hundreds of species of birds, insects, and other wildlife. The survival and long-term health of newly planted trees is central to realizing these benefits over time.



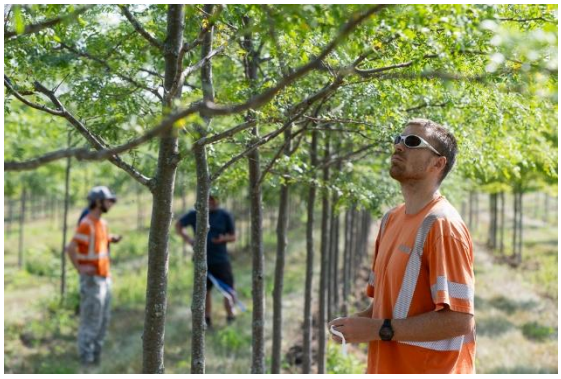
The findings of this study reinforce the value of the City's investment in urban forest management. Trees in Excellent or Good condition today are more likely to provide urban forest benefits for decades. Conversely, premature mortality, especially in high-impact environments like Hard Surface Plantings, reduces the long-term environmental and community benefits of trees while increasing costs associated with replacement planting and maintenance.

For residents, the study is a reminder that the trees outside your home, along your street, and in your local parks depend not just on City programs, but on community care, avoiding damage, and reporting trees that appear stressed, damaged, or in need of attention. The City's data shows that trees in residential settings often receive informal neighbourhood support that contributes meaningfully to their long-term success.

- **Residents can submit a tree planting request** for the City-owned road allowance in front of a home or business at toronto.ca/treeplanting
- **To get involved**, volunteer tree planting and stewardship events run from spring through fall every year at toronto.ca/services-payments/water-environment/live-green-toronto/environmental-volunteer-opportunities/
- To learn about **supports for tree planting and stewardship on private land**, visit toronto.ca/treegrants

Recommendations: Opportunities to Apply These Findings

The findings from this study translate directly into opportunities for improvements across Urban Forestry's programs. The City will evaluate the evidence in the following priority areas:



- **Refine large-growing native species selection**. Where possible expand planting of high-performing, underutilized species, including tulip tree, London planetree, Ohio buckeye, northern catalpa, and Princeton elm, while limiting the use of lower-performing species to environments where they are demonstrably suited. Maintain or exceed current species richness targets across all programs.
- **Strengthen establishment standards**. Standardize deep mulching (minimum 20 centimetres, minimum 2-metre diameter ring) and timely stake removal (within 12 months of planting) across all planting programs. Prioritize weed control in the root zone during the first two years.
- **Improve hard surface outcomes.** Prioritize the design and funding of raised planting beds with adequate soil volume (minimum 30 m^3 per tree, in line with Toronto Green Standard targets), irrigation, and companion planting as the primary strategy for hard surface environments. Develop a long-term retrofitting plan for the most constrained existing planting sites.



- **Advance soil health management**. Implement a city-wide mulching maintenance program and pilot targeted soil amendments, including gypsum, biochar, and compost, on sites with confirmed salt or pH issues. Integrate soil testing results into planting design decisions.
- **Invest in urban forestry where trees are needed most**. Direct enhanced establishment care, improved site design, and additional planting efforts to Neighbourhood Improvement Areas (https://toronto.ca/neighbourhoods) and communities with lower Tree Equity Scores (https://treeequityscore.org) where possible. Closing the canopy gap is both an environmental and a social priority.
- **Enhance monitoring and data systems**. Continue to optimize the City's digital tree asset management system. Conduct independent third-party re-surveys every five years, building a long-term record of tree health and survival. Use monitoring data to support adaptive management cycles and program efficacy.

Credits and Acknowledgements

This study was made possible through the collaboration of dedicated professionals across multiple disciplines. The City of Toronto wishes to recognize:

- Silv-Econ Ltd. - for conducting the field assessments, data analysis, soil and foliage sampling, and technical report preparation. The Silv-Econ team brought over two decades of expertise in municipal tree health assessment to this project, delivering a dataset of exceptional quality and analytical depth.
- A&L Canada Laboratories - for providing soil chemistry and foliage nutrient analysis that significantly deepened our understanding of the relationship between soil health and tree performance.
- The ISA-certified arborists who conducted field assessments - for their expertise, consistency, and dedication in collecting more than 6,600 individual tree assessments under diverse weather and site conditions.
- City of Toronto staff across multiple teams - for data verification, logistical support, and the day-to-day work of planting, maintaining, and caring for Toronto's urban forest.



For more information about Toronto's Urban Forestry programs, visit toronto.ca/trees