Attachment 1

CanopyTO

TORONTO

Revised October, 2021


TORONTO

SUMMARY OF FINDINGS

Toronto's canopy cover and total tree population has increased over the last 10 years.

Toronto's canopy cover increased from 26.6% to 28.4% between 2008 and 2018. The City's tree population increased from 10.2 million to 11.5 million trees.

Street trees are making a significant contribution to the urban forest.

The condition of street trees has improved significantly, with a 25% increase in trees rated as good or excellent. While representing only 5.4% of Toronto's urban forest, street trees provide 19.4% of the total structural value.

The composition and condition of the urban forest has seen positive and negative changes.

The distribution of trees by size class improved with more larger-growing trees and more young trees. The overall condition rating of trees and shrubs has declined. Invasive species have increased in the city's parks and ravines.

Impervious land cover is increasing across the city.

Impervious land cover has increased by 1.3% since 2008. Plantable space across the city has decreased by 2% while nonplantable space increased by 3%. The most land area converted from pervious to impervious is on Single Family Residential lands.

PURPOSE OF THE 2018 TREE CANOPY STUDY

In order to monitor changes in the structure and function of the urban forest, the City's *Strategic Forest Management Plan 2012-2022* recommended that a canopy assessment be undertaken every 10 years. The 2018 Tree Canopy Study presents an update to the first canopy assessment carried out in 2008 - 2009 and described in *Every Tree Counts: A Portrait of Toronto's Urban Forest*.

The purpose of the 2018 Tree Canopy Study is to:

- Update information on the current composition, structure and distribution of Toronto's urban forest
- Quantify the ecological services and benefits provided by the urban forest
- Identify opportunities for increasing sustainable tree cover
- Compare and evaluate current conditions to the baseline conditions

SCOPE OF THE 2018 TREE CANOPY STUDY

The 2018 Tree Canopy Study provides a snapshot of current conditions, measures changes since the last canopy assessment and identifies issues and trends affecting the urban forest. It provides data on the extent, size class, composition and condition of the urban forest. It also provides information about the amount and dollar value of several key ecological services provided by the urban forest.

USING THE RESULTS

Findings from the 2018 Tree Canopy Study will help the City make evidence-based decisions in the development of the next Strategic Forest Management Plan, due in 2023.

Using methodologies established by Canadian and international jurisdictions, studies of this kind are an important part of the adaptive management cycle. These studies allow municipal staff to work with up-to-date and reliable data to adjust program activities that reflect the changing nature of the urban forest.

The 2018 Tree Canopy Study provides an update on the current state of the urban forest and how it has changed from the previous assessment. The study's findings will be used to inform the development of future strategic directions and priority actions necessary to support a healthy, resilient urban forest. Findings presented in the 2018 Tree Canopy Study will also help inform the implementation of the Ravine Strategy and the Biodiversity Strategy.

BENEFITS OF TREES

Toronto's canopy cover and total tree population has increased over the last 10 years.

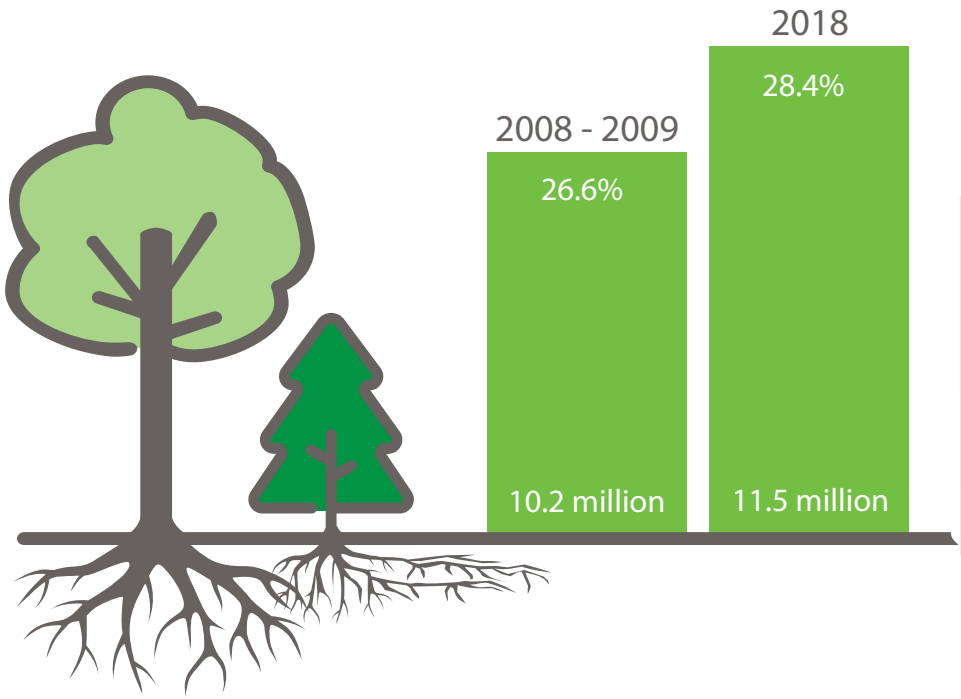
- In 2018, Toronto's tree canopy cover is estimated at 28.4% to 31%, an increase from the 2008-2009 estimate of 26.6% to 28%.
  - 28.4% was derived from a random point sampling method using leaf-on satellite imagery; 31% was derived from an automated land cover classification process using the same leaf-on satellite imagery.
  - Canopy cover increased despite serious impacts due to increased development, the 2013 ice storm and the effects of the Emerald ash borer.
- Toronto's tree population increased from 10.2 to 11.5 million trees between 2008 and 2018.
  - Although the total population increased, the total leaf area decreased by about 11% which impacts the structural value and the value of ecosystem services.
- Unlike grey infrastructure, the urban forest is always changing, growing, maturing and dying. Canopy cover and population size are not the whole story. Urban forest size, condition and distribution are factors in the canopy cover story; pest threats, natural mortality, invasive species impacts, development activities and climate change are realities effecting urban forest sustainability.

Canopy cover is the area of the tree and shrub population as viewed from above.

Leaf area is the total surface area of the living leaves.

Greater leaf area = greater benefits

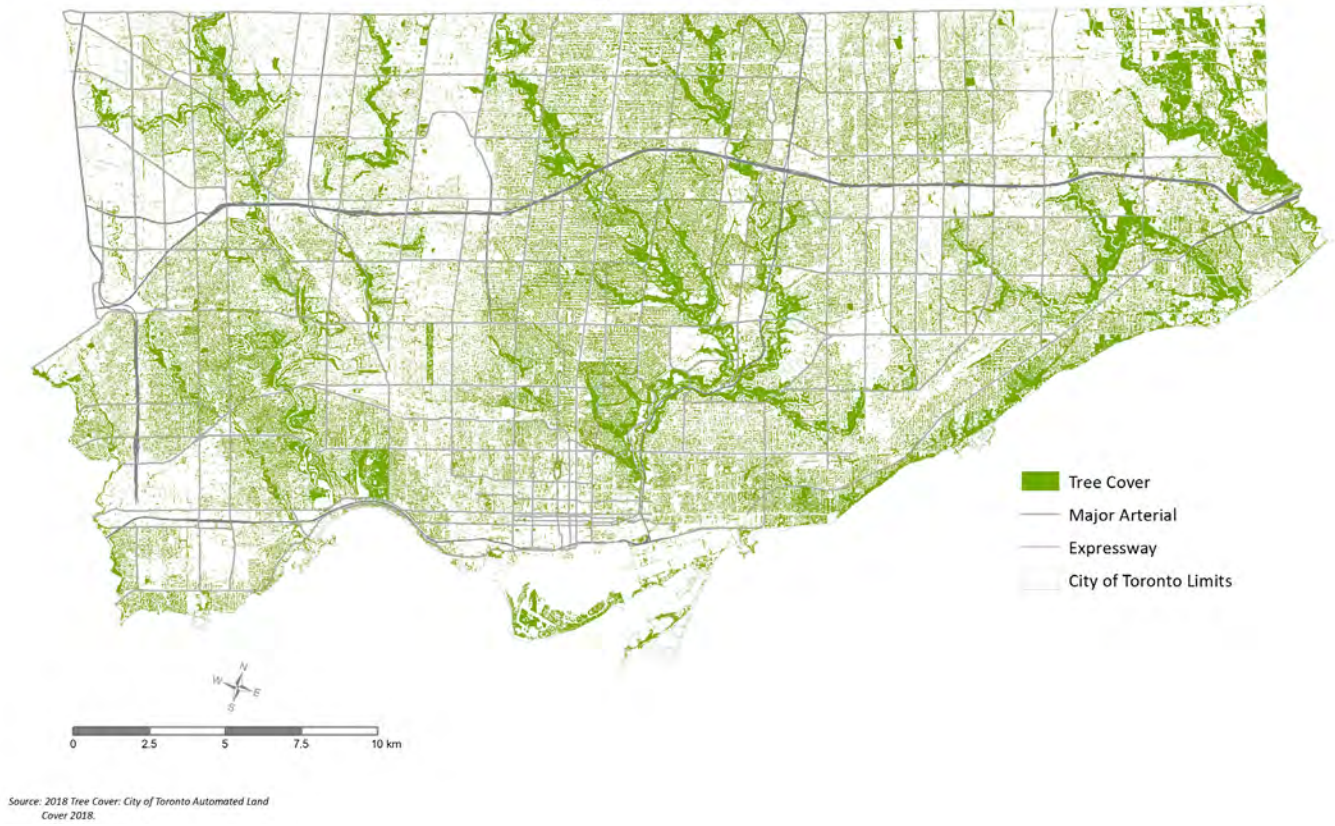
FIGURE 1: Canopy Cover and Population Change in Toronto between 2008 - 2009 and 2018



Random point sampling method is best for reliable estimates and change assessments.

Automated land cover classification is best for mapping spatial extent and distribution.

FIGURE 2: Tree Cover Distribution in the City of Toronto



- The structural value of the urban forest is relatively unchanged since 2008, dipping slightly from $7.1billion to $7.04 billion.
  - This change can be attributed to the decrease in total leaf area and tree condition rating, both of which negatively effect structural value and the value of some key ecosystem services.

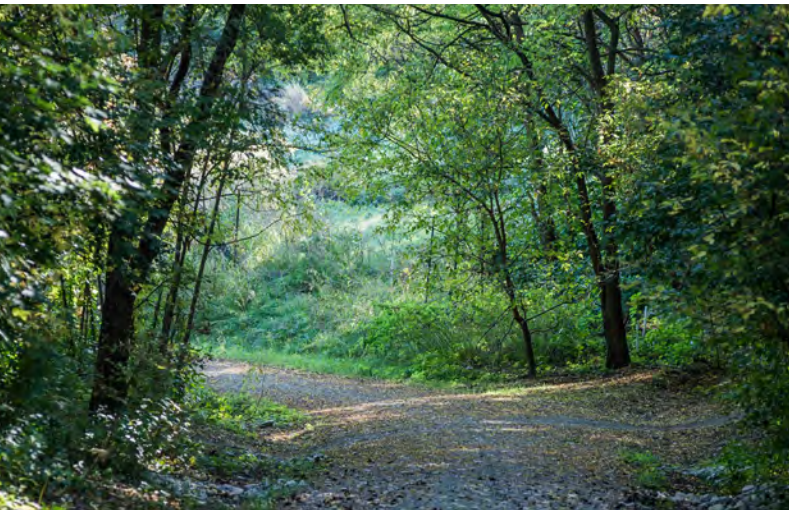
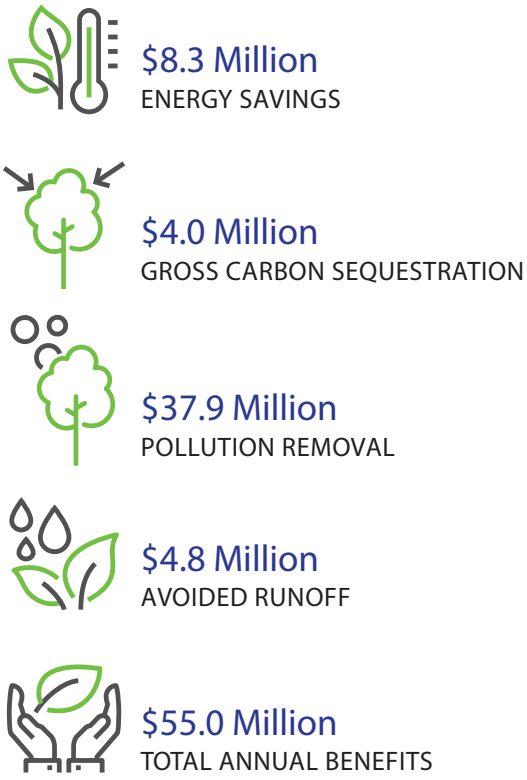


FIGURE 2: Annual Ecosystem Services Provided by Toronto's Urban Forest



Street trees are making a significant contribution to the urban forest.

- Street trees are trees planted within the City road allowance, in turf or specialized planting beds.
- Street tree condition has improved significantly, with a 25% increase in trees rated as good or excellent.
  - This improvement can be attributed to species selection, stock quality, and proactive and newly planted tree maintenance activities.
  - Proactive tree maintenance has reduced vulnerability to pests and diseases, improved aesthetics, increased ecosystem services and property values.
  - Urban Forestry works with other City divisions to maximize street tree success by investing in technologies and practices including the use of soil cells for downtown tree beds.
- Street trees contribute almost 19.4% of the structural value of the urban forest while making up only 5.4% of the population.
  - Street trees provide $1.363 billion of the total structural value of the urban forest, estimated at $7.04 billion.
  - Street trees provide $1.277 million annually in ecosystem services including avoided runoff valued at $771,300 annually.
  - The proportion of large trees (those with diameters above 30.6cm) increased from 25% to 33% between 2008 and 2018 which will result in future increases in ecosystem services.
- The street tree population of Norway maple decreased from 22% to 13.5%.
  - Norway maple is an invasive species that can be particularly destructive in natural areas where it can out-compete native species.
  - The Norway maple species has a large leaf area which means that a decrease in their population has an associated negative impact on ecosystem services.

FIGURE 3: Summary of Positive Trends in Street Tree Indicators

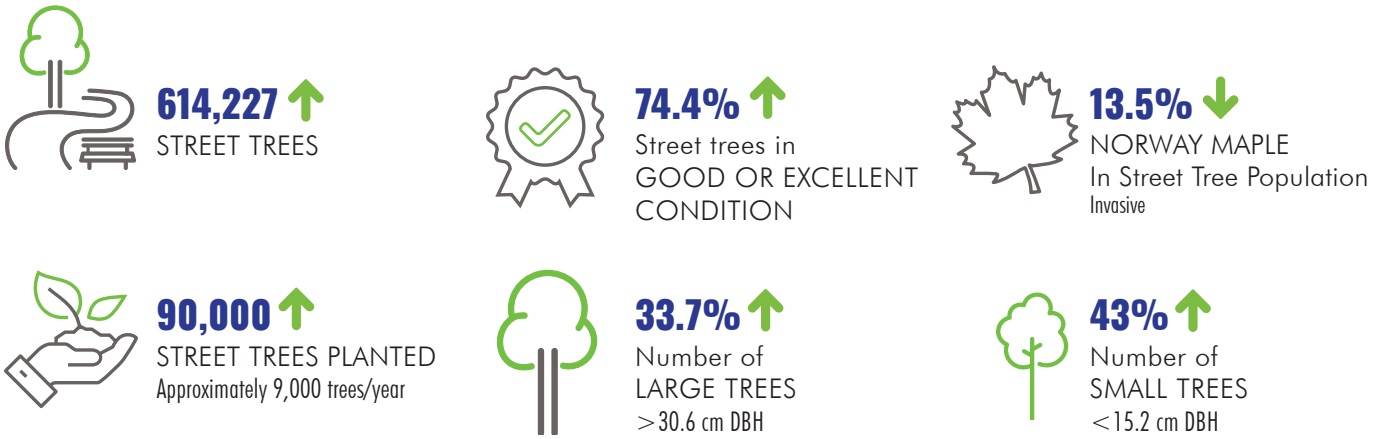
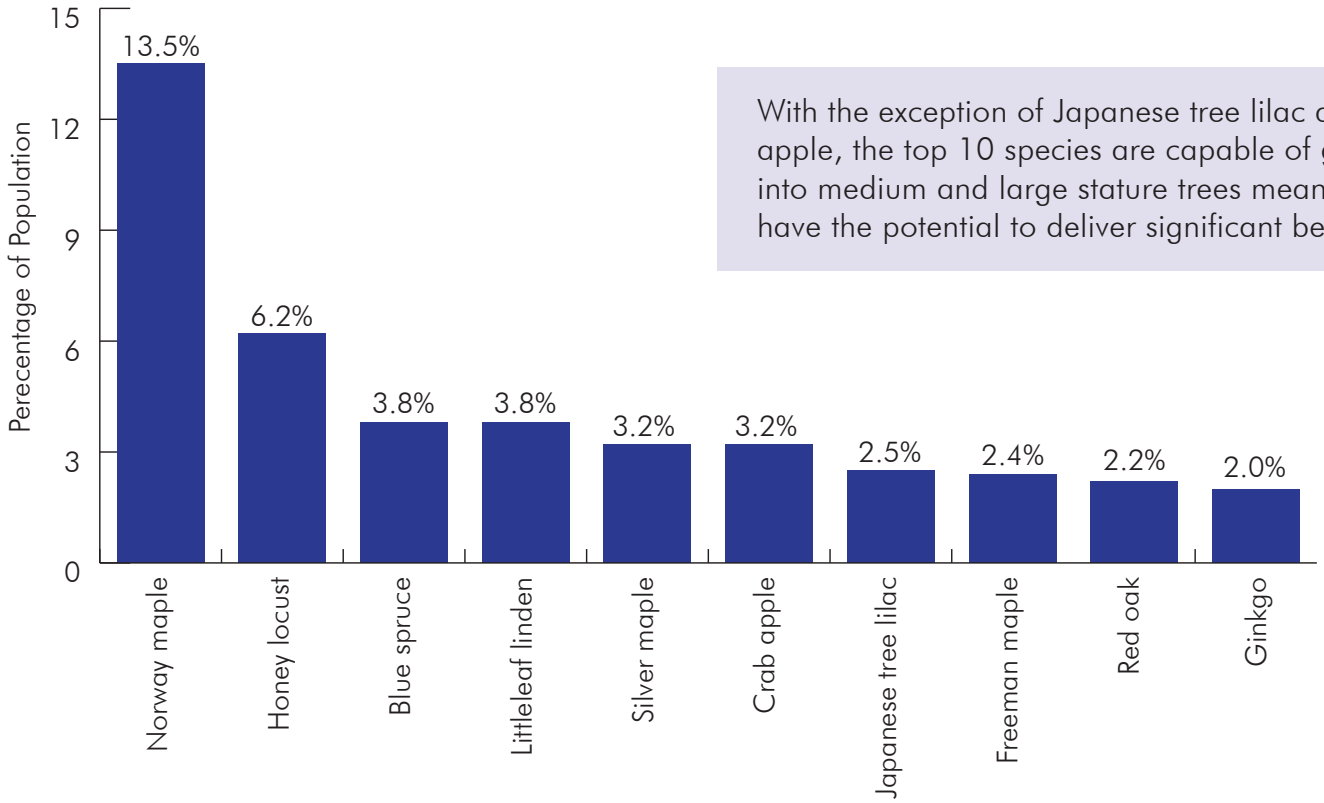


FIGURE 4: Top 10 Species of Street Trees



With the exception of Japanese tree lilac and crab apple, the top 10 species are capable of growing into medium and large stature trees meaning they have the potential to deliver significant benefits.

FIGURE 5: Condition of Street Trees

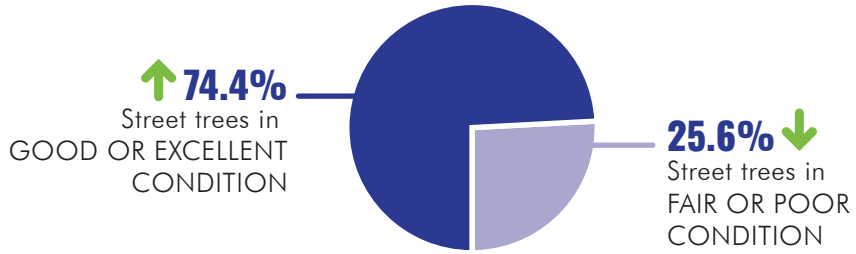


FIGURE 6: Street Trees by Size Class, 2008 to 2018

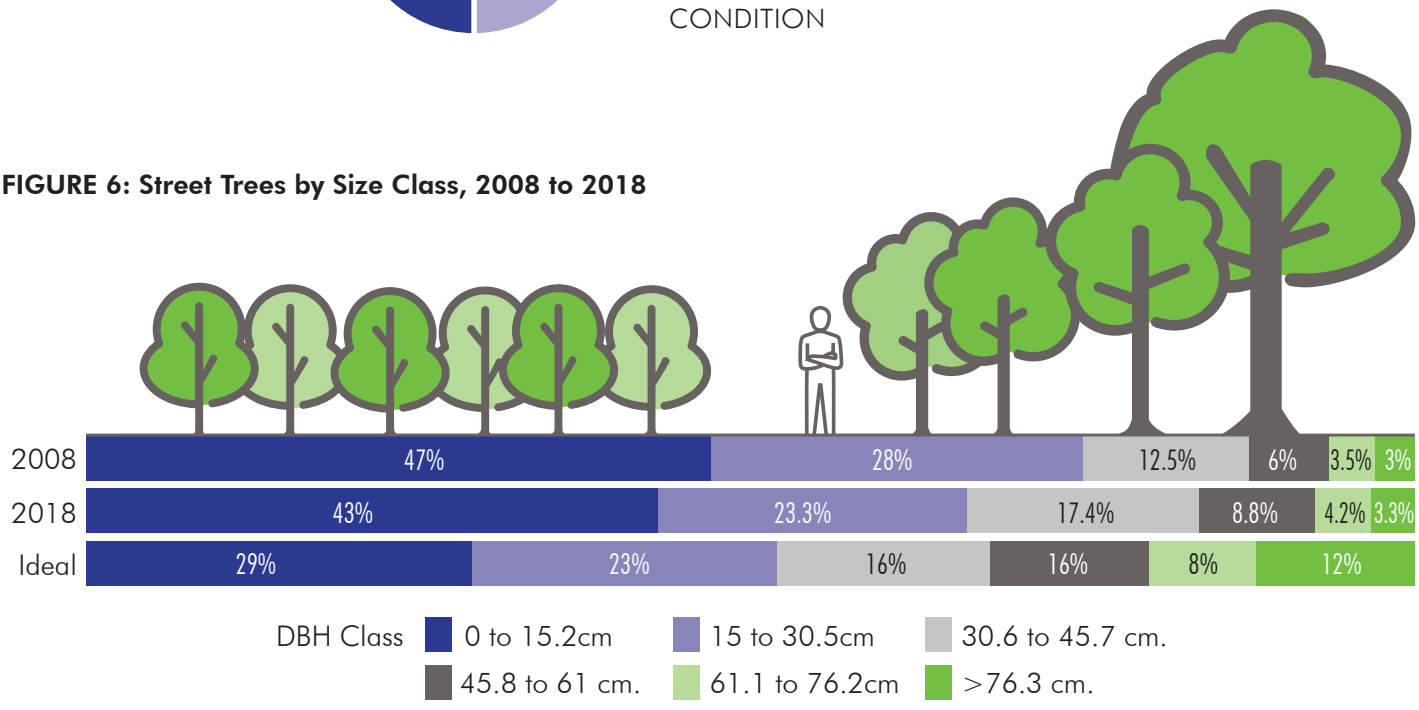


FIGURE 7: Annual Ecosystem Services Provided by Toronto's Street Trees

614,227
STREET TREES

5.4%
of Toronto's
TOTAL TREE POPULATION

$1.363 Billion
TOTAL STRUCTURAL VALUE

$1.277 Million
TOTAL VALUE OF
ANNUAL ECOSYSTEM SERVICES

173,355 Tonnes
GROSS CARBON STORAGE
Associated Value of $19.882 Million
15.8% of total carbon stored

2,877.9 Tonnes
ANNUAL CARBON SEQUESTRATION
Associated Value of $330,750
8% of annual carbon sequestration

125.5 Tonnes
POLLUTION REMOVED ANNUALLY
Associated Value of $175,450
12.9% of total annual polution removed

331,745 m³
ANNUAL AVOIDED RUNOFF
Associated Value of $771,300
15.6% of total avoided runoff volume

Toronto maintains a database with individual street trees as point data.

Tree species and size information are used to carry out benefits analysis.

Structural value is based on the trunk formula method, which is used to calculate the economic value of the physical tree based on its relative size. Additional factors that can influence value include tree species, condition, and location.

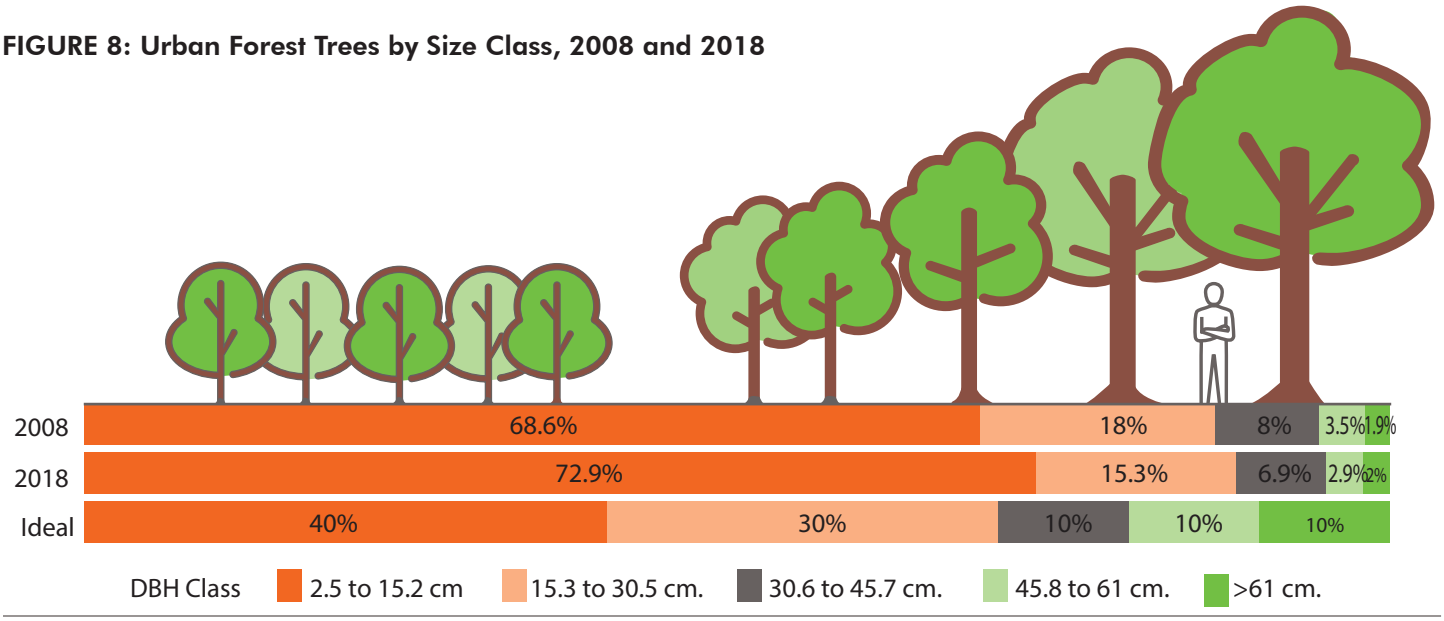
The composition and condition of the urban forest has seen positive and negative changes.

- Species composition has changed slightly with more larger-growing species which will likely result in future increases in structural value and ecosystem services.
- Native tree cover in parks and ravines remains relatively stable with 70% native tree species.
- 50% of Toronto's canopy is made up of species native to southern Ontario.
- The distribution of trees in the urban forest decreased in all size classes except for smaller trees, those with diameters less than 15.2 cm.
  - This change may be a factor of the loss of mature trees to the Emerald ash borer pest and an increase in annual tree planting over the last 10 years.
  - Approximately 120,000 trees and shrubs are planted on public land each year.
- The overall condition of the urban forest has declined, with 70% of trees rated good or excellent compared to 82% in 2008.
  - This change could be a reflection of the stress of climate change, including the 2013 ice storm, drought and/or heat stress, effects of the Emerald ash borer pest on the remaining ash trees as well as other insect pest cycles such as European gypsy moth.
  - Trees found on Single Family Residential lands have an above average condition rating, with 79% rated good or excellent.

Tree species distribution, size and condition ratings are based on field data collected at 407 permanent sample plots, established in 2008 and revisited in 2018.

The principle of size class distribution is to maintain a consistent proportion of young trees in the population to maximize urban forest benefits, recognizing mortality is a factor as trees mature. This is key to sustainable and equitable distribution of forest cover across the city.

FIGURE 8: Urban Forest Trees by Size Class, 2008 and 2018



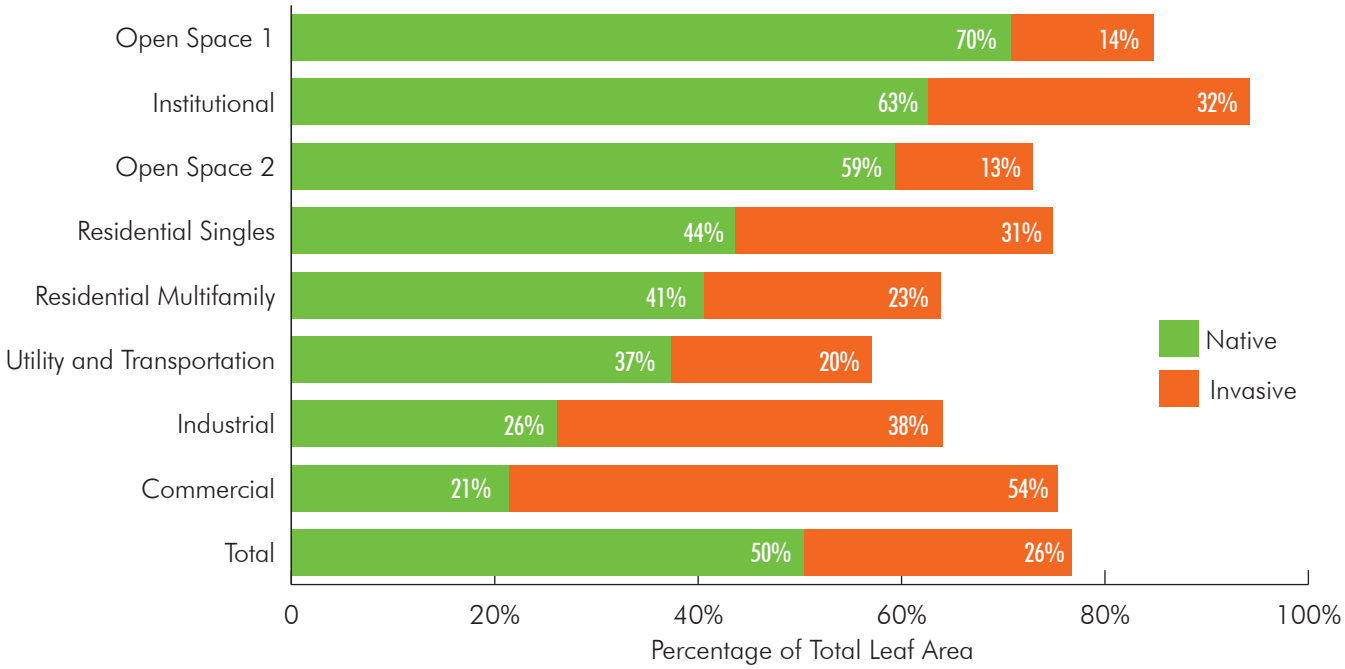
- About 59% of the carbon stored in Toronto's urban forest is stored by trees found on Single Family Residential lands.
- Toronto's trees are estimated to provide $55 million in annual ecosystem services.
  - $8.3 million per year in home energy savings
  - $4.0 million per year in carbon sequestration
  - $37.9 million per year in pollution removal, such as ozone, nitrogen dioxide, sulphur dioxide and particulate matter
  - $4.8 million per year in avoided runoff

Native Species
A species living within its natural range that is naturally self-sustaining.

Invasive Species
A non-native species that aggressively out-competes native species and comes to dominate the ecosystem.

- Invasive tree species increased from 10% to 14% in parks and ravines between 2008 and 2018.
  - The increase in invasive species is not unique to Toronto as the management of invasive species is a concern worldwide.
  - Urban Forestry manages 40 species of invasive plants following best practices promoted by the Ontario Invasive Plant Council using physical, mechanical and chemical control methods.
- Invasive shrub cover more than doubled over the 10 year study period, from 15% to 32.5% in parks and ravines, much of it common buckthorn.
  - Common buckthorn is now the second most prevalent species of shrub in the urban forest.
  - The spread of the common buckthorn was also reported in Oakville's 2015 canopy study, increasing from 2% to 10.6% over the 10 year study period.

FIGURE 9: Native Versus Invasive Species by Land Use



Note: The remaining percentage is made up of non-invasive exotic species.

Impervious land cover is increasing across the city.

- The amount of impervious cover increased across the city by 1.3% over 10 years, from 47.9% to 49.2%.
- Looking back at data from 1999, the 19-year trend shows impervious cover has been increasing (by 3.6%) while pervious cover is decreasing (by 6.9%).
  - o This change has negative implications for stormwater management, water quality, retention of healthy soils, biodiversity, urban heat island effects and the amount of potential planting space for trees.
- The most land area converted from pervious to impervious cover is found on Single Family Residential lands, a total of 349 hectares or about the size of two High Parks.
  - o The greatest amount of available land for canopy growth is found on Single Family Residential lands.
  - o Plantable space across the city has decreased by 2% while non-plantable space (impervious cover) has increased by 3%.
  - o The change in land cover from pervious to impervious is often permanent meaning that the land would never again be considered plantable space for tree canopy expansion.

Pervious surfaces absorb water that supports tree growth. Pervious surfaces are potential plantable space for new tree planting. These surfaces include tree, grass, shrub and bare earth land covers.

Impervious surfaces do not absorb water and do not support tree growth. Instead, impervious surfaces increase surface water runoff. These surfaces include buildings, roads and other impervious land covers.

FIGURE 10: Top Three Land Uses with Increasing Pervious to Impervious Cover

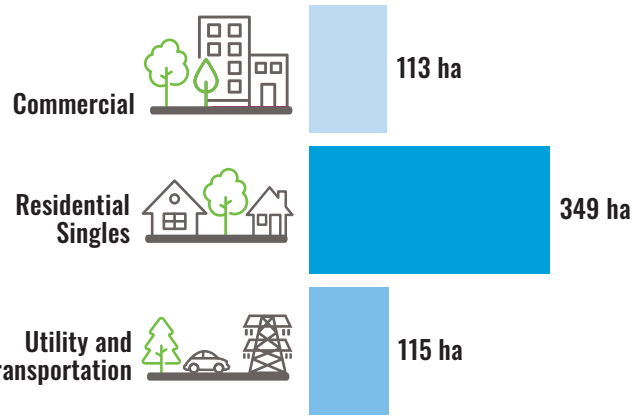


FIGURE 11: Summary of Land Cover Change Between 1999 and 2018

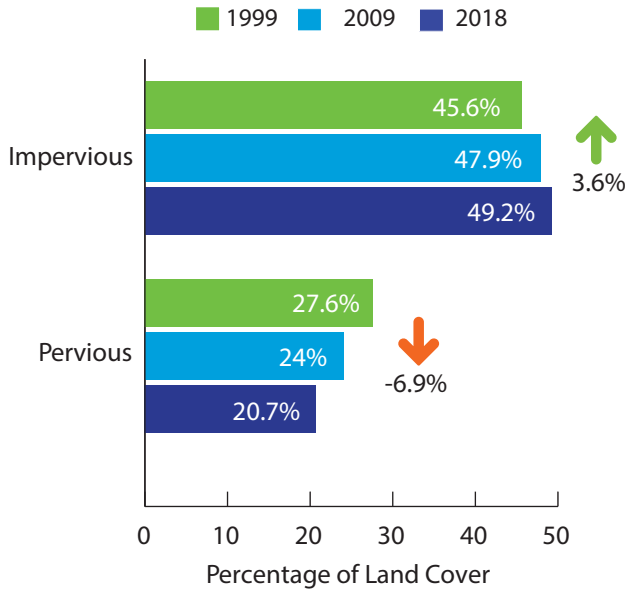


FIGURE 12: Top Five Land Uses for Potential Canopy Growth

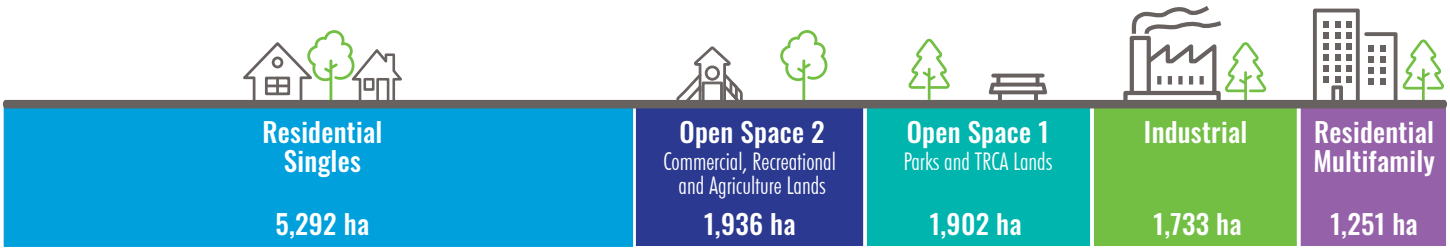
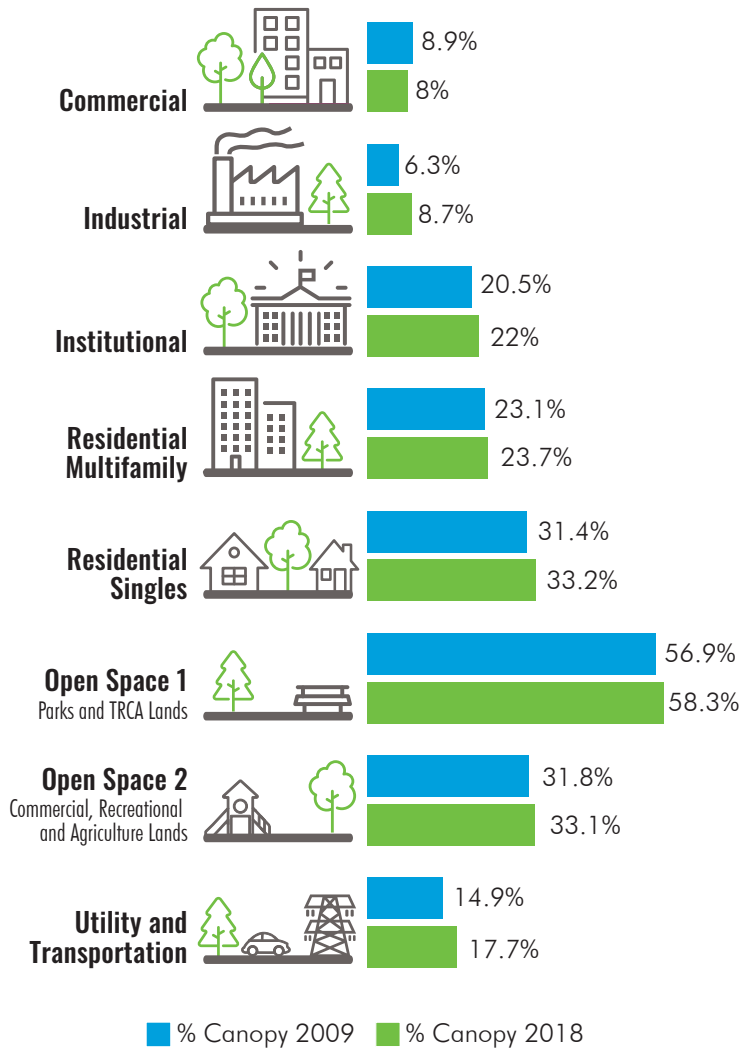
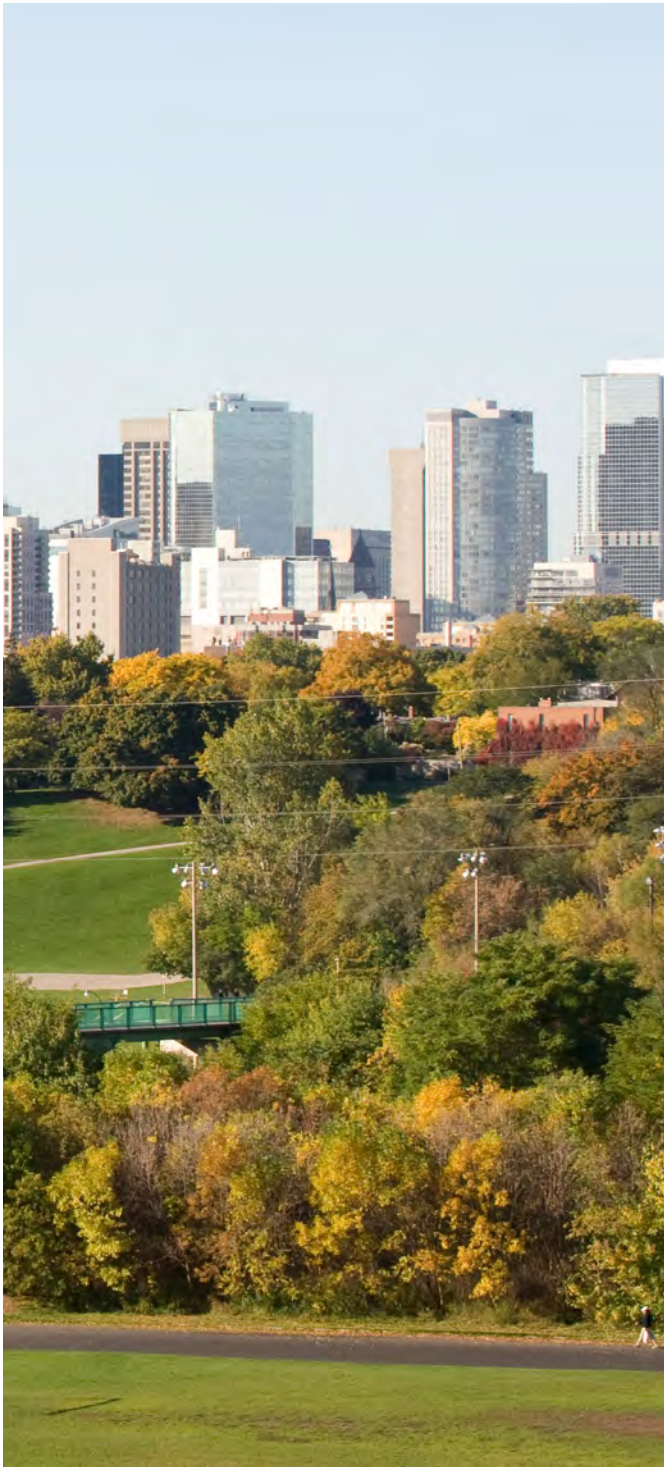


FIGURE 13: Canopy Change by Land Use, 2009 to 2018





GROWING A RESILIENT URBAN FOREST

- Approximately 45% of the urban forest is found on publicly-owned lands.
  - o Toronto has planted over 1 million trees and shrubs since 2008. Approximately 120,000 trees and shrubs are planted on public land each year.
- Recognizing that 55% of the city's land area is privately owned, the City initiated a suite of grant and incentive programs to encourage tree planting and tree stewardship on private land. Since 2018, 27,000 trees have been planted on private land through these programs.

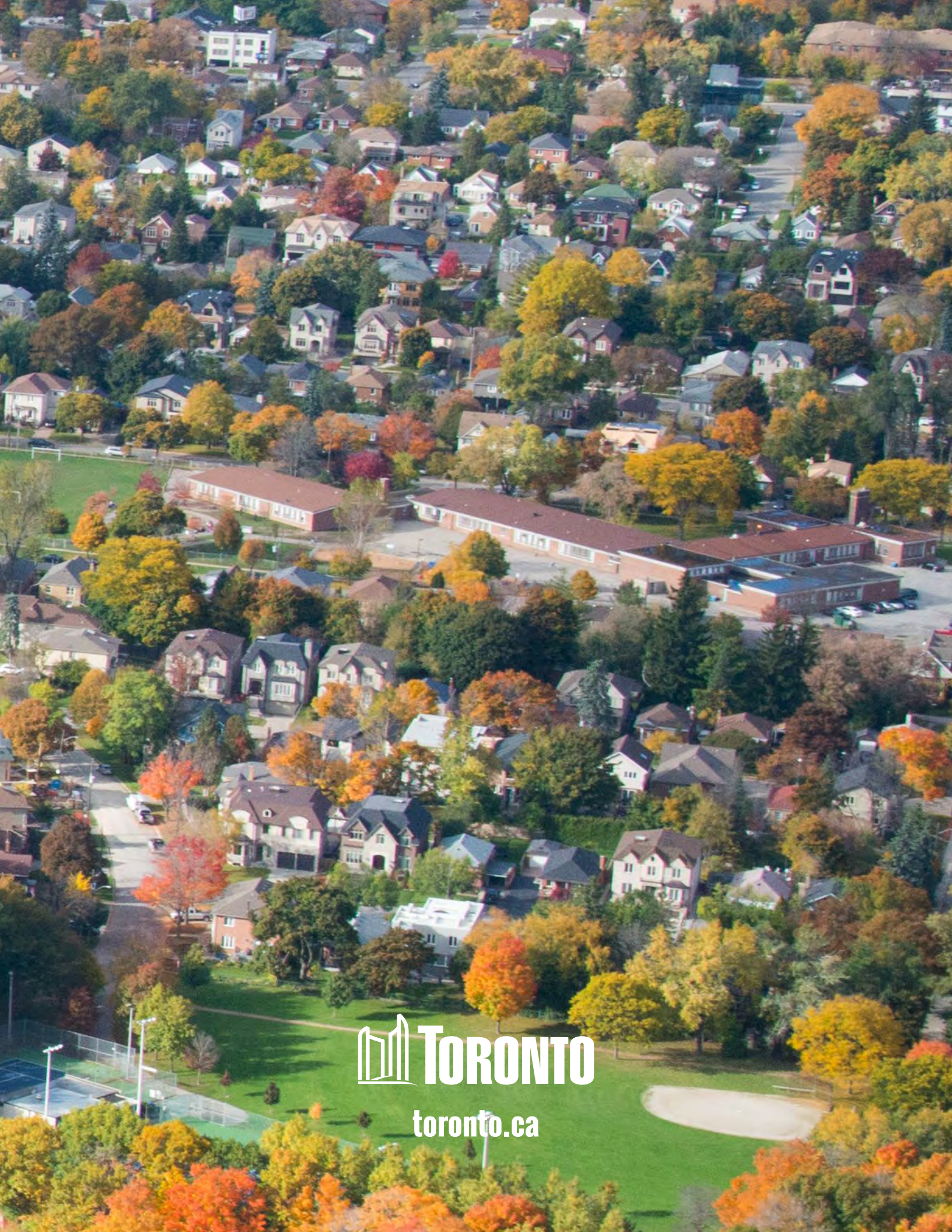
WHAT YOU CAN DO

- Consider volunteering to plant and maintain the urban forest by checking out suggestions on Toronto's website.
- Become familiar with Toronto's tree protection bylaws and plan for tree and soil protection at the beginning of any construction project on your property.
- Request that Urban Forestry plant a tree on the road allowance in front of your home by contacting 311.
- When thinking of planting a tree on your property, it's important to choose the right tree for the right location. To maximize the benefits, select a large-growing native species as these trees make the most valuable contribution to the urban forest.

NEXT STEPS

- Urban Forestry will continue to analyze the study data, sharing this analysis with other City divisions and local municipalities to develop potential responses and actions.
- Study findings will inform current and future Urban Forestry program planning and operational adjustments.
- Urban Forestry will continue to promote the Community Stewardship Program which supports urban forest resilience through community tree planting and stewardship activities.
- Study findings will inform implementation of the second Strategic Forest Management Plan in addition to recommended actions related to monitoring and invasive species management in the Ravine Strategy Implementation Plan.

For more information about Urban Forestry, or the 2018 Tree Canopy Study, visit: https://www.toronto.ca/trees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