Trees Please in Parkview

Results of air quality and tree inventorying in the Parkview neighbourhood in 2019

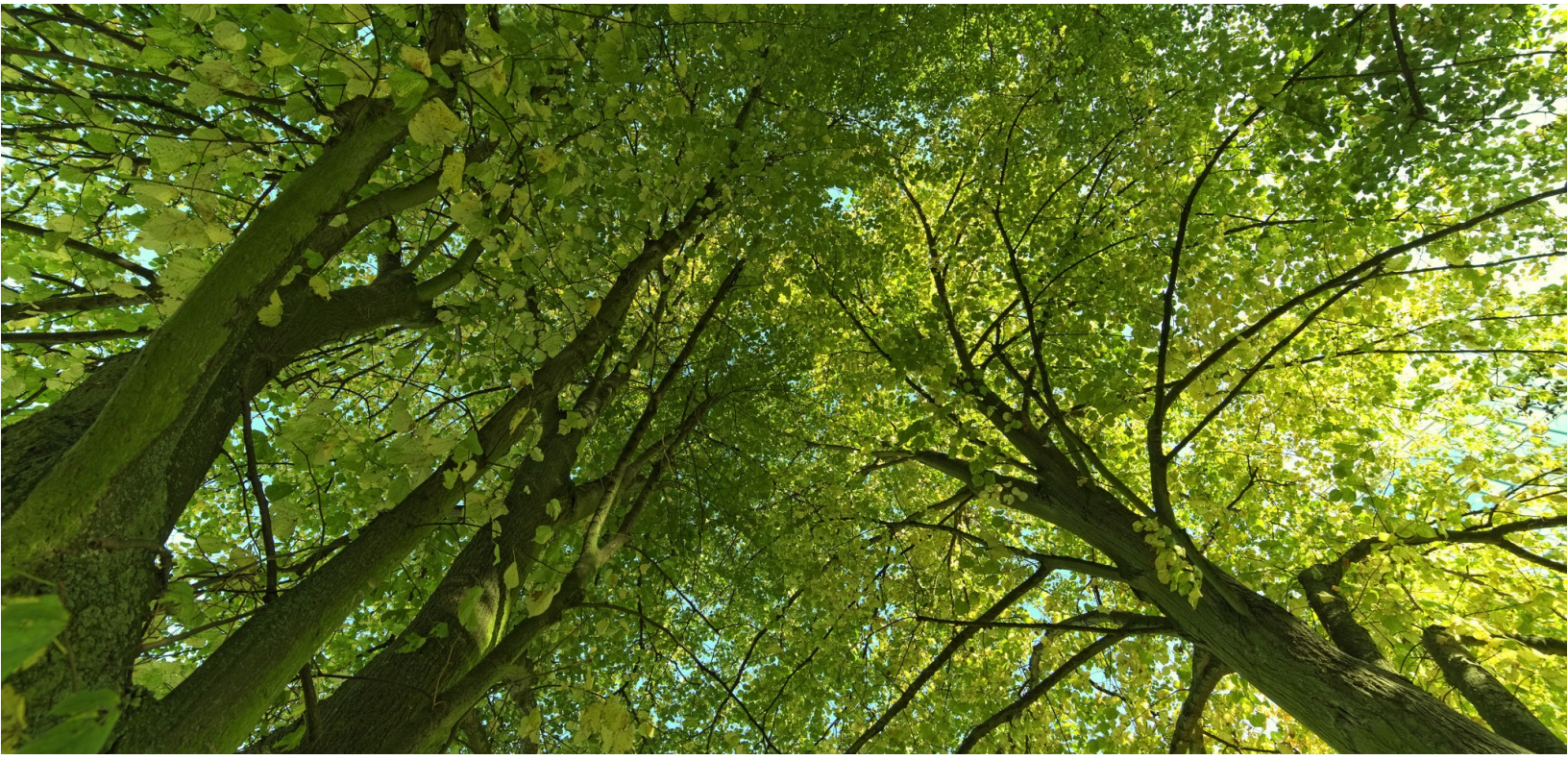


Table of Contents:

Introduction

The Trees Please project is a collaboration between the Hamilton Naturalists' Club (HNC) and Environment Hamilton (EH). The project received a three year Grow Grant through the Ontario Trillium Foundation from 2016-2018, and was financially supported by Clean Air Hamilton in 2019.

Trees Please is a citizen science project; all the data we collect is with the teams of volunteers who have been trained on how to use the equipment. The project comprises two parts: tree inventorying (measuring, identifying and noting any challenges on trees) and collecting air quality data, specifically particulate matter levels. With the tree inventory, we use iTree Eco, a free software from the USDA Forest Service that calculates tree benefits.

For the air quality data, Environment Hamilton has Dylos Particulate Matter monitors that are loaned out. All the information is stored on the device until Trees Please staff upload the information to an online map: inhalemap.com

The goal of this project is to engage residents on local issues around air quality and urban forest health, through recognizing that trees can help improve air quality and provide myriad other benefits. By layering the air quality and tree maps, we can identify areas with high particulate pollution levels and poor urban tree canopy cover. The main solution we aim to implement is to get more trees planted in these locations—what we refer to as "strategic tree planting".

This report details information on the neighbourhood, our data collection process, results, and recommendations.

Trees Please

Project Partners

The Trees Please project is a collaboration between the Hamilton Naturalists' Club (HNC) and Environment Hamilton (EH).

The Hamilton Naturalists' Club (www.hamiltonnature.org) is a volunteer-based, charitable organization celebrating a 100 year history of promoting habitat protection, stimulating public interest and action in conservation, undertaking research and education regarding natural areas and acquiring and managing nature sanctuaries. HNC is working to improve Hamilton's urban forest by conducting neighbourhood tree inventory and tree planting projects, and by facilitating discussions with the city, conservation groups, and residents to identify and implement activities to increase forest cover and species diversity.

Environment Hamilton (www.environmenthamilton.org) is a not-for-profit environmental organization that was established in 2001 with a mandate to provide Hamiltonians with the knowledge and skills required to enhance and protect the environment around them. Environment Hamilton is committed to achieving this mandate by showing leadership, educating the community, and advocating for positive change. EH engages volunteers in efforts to monitor air particulate pollution while cycling and walking, and using this information to generate public conversations about how to improve urban air quality.

Trees Please

We would like to thank our volunteers and supporters who have helped us to gather data, spread the word, and make this important effort a success!

A big thanks to Parkview community for providing us with lots of support and practical insights.

We are so grateful to our superstar volunteers, who came out in the heat, rain, and wind to help us collect data: Jeff, Janina, Joe, Ryan, Zuha, Jade, Anas, Luis, Ashlynn, Abby, Mandy, Mackenzie, April, Dang, Teodora, Kassim, Carolyn, Jordan, Victoria, Kieran, Zara, Neil, Eric, and Tom. Particular thanks to Dave Kebick, Terry Morris, Brian Beck, and Elsie Briggs for additional air quality data collection.

Thanks to the City of Hamilton and the Forestry Division for their support. We are also grateful for the collaboration of the Air and Trees Taskforce! Thanks to the members: the City of Hamilton (Forestry, Public Health, and Planning divisions), Hamilton Street Tree Project, OPIRG McMaster, Trees for Hamilton, Environment Hamilton, and the Hamilton Naturalists' Club.

We are grateful for the generous funding from the Clean Air Hamilton to support the 2019 Trees Please season and our Free Tree giveaway in the neighbourhood.

CleanAir HAMILTON

Trees Please

Why this project is important

Hamilton has a long history of air pollution problems, particularly in the neighbourhoods closest to our industrial core. Fine air particulate pollution is a significant part of this problem as underscored by a recent report identifying Hamilton as the urban centre with the highest levels of respirable particulate pollution in Ontario (1). This reality is cause for concern as respirable particulate - air particulate pollution that is 2.5 microns in diameter and smaller ($PM_{2.5}$) - contributes to cardiovascular and respiratory illness and is a confirmed cause of lung cancer (2).

Research has shown that trees trap fine particulate pollution on the surface of leaves and needles, effectively reducing human exposure by as much as 50% (3). However, a healthy urban forest is needed in order to maximize the particle-trapping benefits that trees bring. A healthy urban forest canopy provides at least 30% coverage when trees are in full leaf; the average canopy coverage in Hamilton is 18% or lower. The City of Hamilton set a goal of 35% urban forest cover in its 2009 Strategic Plan. A healthier urban forest would bring significant air quality benefits to our city, especially in neighbourhoods closest to industry where air particulate levels are highest. For more information about air particulate pollution and the benefits of healthy urban forests, refer to the appendix.

A healthy urban forest can also provide many other ecosystem benefits such as reductions in stormwater runoff and home heating and cooling costs, and much needed shade and relief from the sun.

A healthy urban forest canopy provides at least 30% coverage when trees are in full leaf; the average canopy coverage in Hamilton is 18% or lower.

(1) See the 2016 Ontario Cancer Screening Performance Report: www.cancercare.on.ca

(2) See Appendix 1 for more details on particulate matter

(3) See Appendix 2 for more on this study

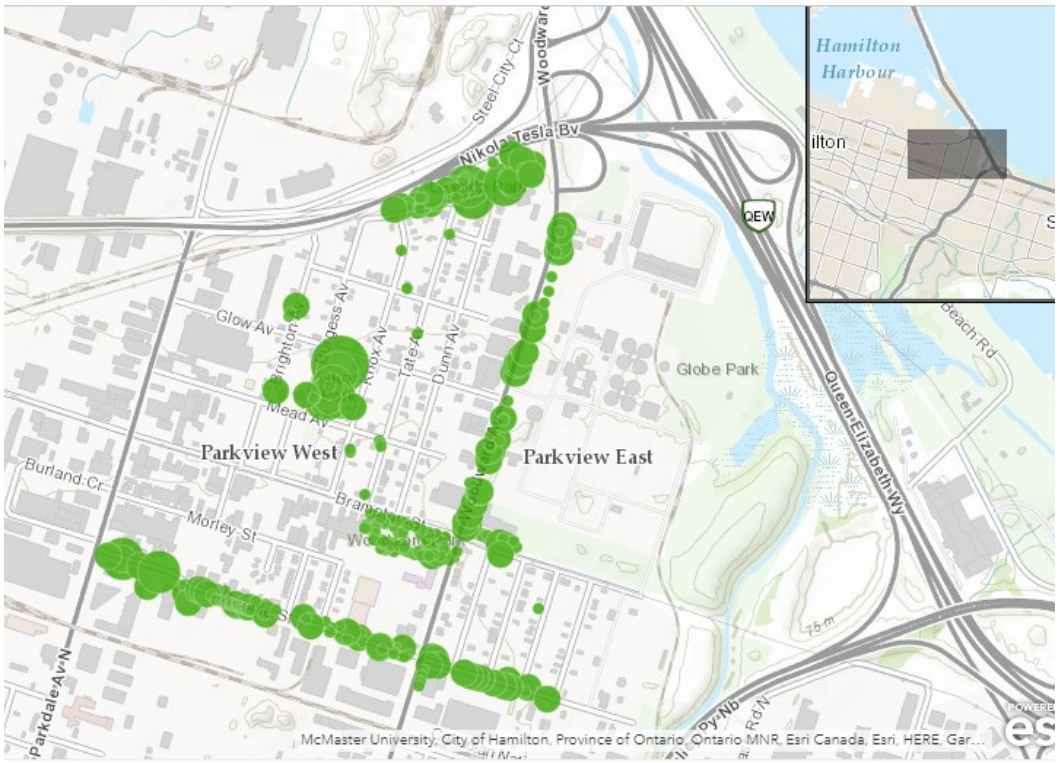
Parkview Neighbourhood

In 2019, the Trees Please project focused on efforts in the Parkview Neighbourhood in east Hamilton.

Parkview is bounded by the CN rail line to the south, the Parkdale Avenue to the west, the Red Hill Valley to the east, and Nikola Tesla Boulevard to the north. The air quality in this neighbourhood is influenced by adjacent industry in the north, as well as by the nearby Queen Elizabeth Way and Red Hill Valley Parkways and active railway. The neighbourhood also features the Hamilton Steam and Technology Museum and the Woodward Avenue Wastewater Treatment Plant.

Trees Please project coordinators worked to recruit and mobilize community volunteers to work as citizen scientists in Parkview, with 24 volunteers helping to audit neighbourhood trees and collect air particulate data. These dedicated individuals contributed 97.5 hours of volunteer time gathering air particulate and tree health information.

This report summarizes the findings of these efforts and sets out recommendations for short, medium, and long term actions that could be undertaken in the Parkview Neighbourhood to improve the health of the urban forest and, in so doing, to reduce fine air particulate pollution in the neighbourhood.



What We Did & How We Did It

The first step in initiating efforts in the Parkview Neighbourhood was to undertake outreach and promotions to generate community interest. The project was promoted through social media, various community events, and through the Parkview Neighbours group. A key event was a community tree planting in the Red Hill Valley in the spring, which attracted people from the neighbourhood and the community-at-large, initiating conversations about the state of the urban forest, native trees in urban environments, and local challenges.

Those interested in volunteering were provided with hands-on training about how to monitor air particulate pollution and/or how to do an urban tree audit. Once trained, most volunteers committed to participate in multiple data collection sessions. In the case of tree audits, these sessions were scheduled at various times of the day in order to provide anyone with an opportunity to help. All tree audit sessions were led by project staff.

In the case of air particulate monitoring, volunteers were provided with basic training in how to use the air monitoring gear and then borrowed the equipment for a week or more to collect air particulate pollution data when it was convenient for them to do so.

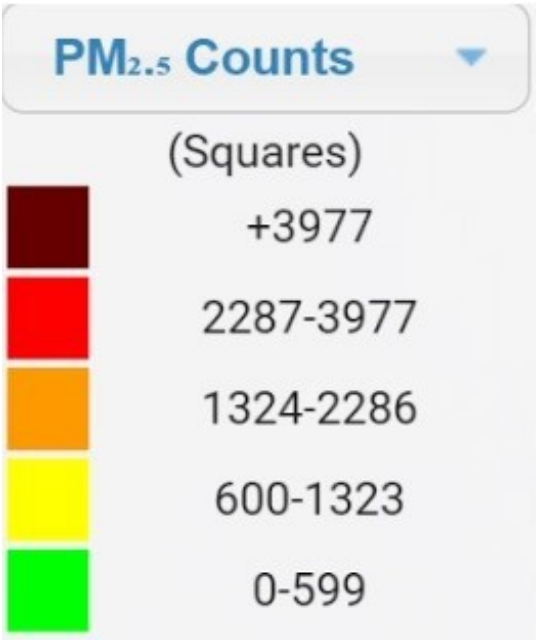
We provide training and tools. We just need you!

Monitoring Respirable Air Particulate Pollution

In order to monitor respirable air particulate matter ($PM_{2.5}$), volunteers use a hand-held Dylos air quality monitor (4). The monitor measures the actual number of particles in 0.01 cubic feet of air using a laser reader, logging particulate readings every 10 seconds.

The air quality monitor is used in combination with a compact GPS data logger, enabling volunteers to 'go mobile' by collecting air particulate measurements as they move through the neighbourhood.

Each device generates a data set that is uploaded to an on-line air particulate mapping system, which displays $PM_{2.5}$ measurements using a colour scheme ranging from green (lowest $PM_{2.5}$ levels) to deep red (very high $PM_{2.5}$ levels). The colour code corresponds to measured levels of $PM_{2.5}$.

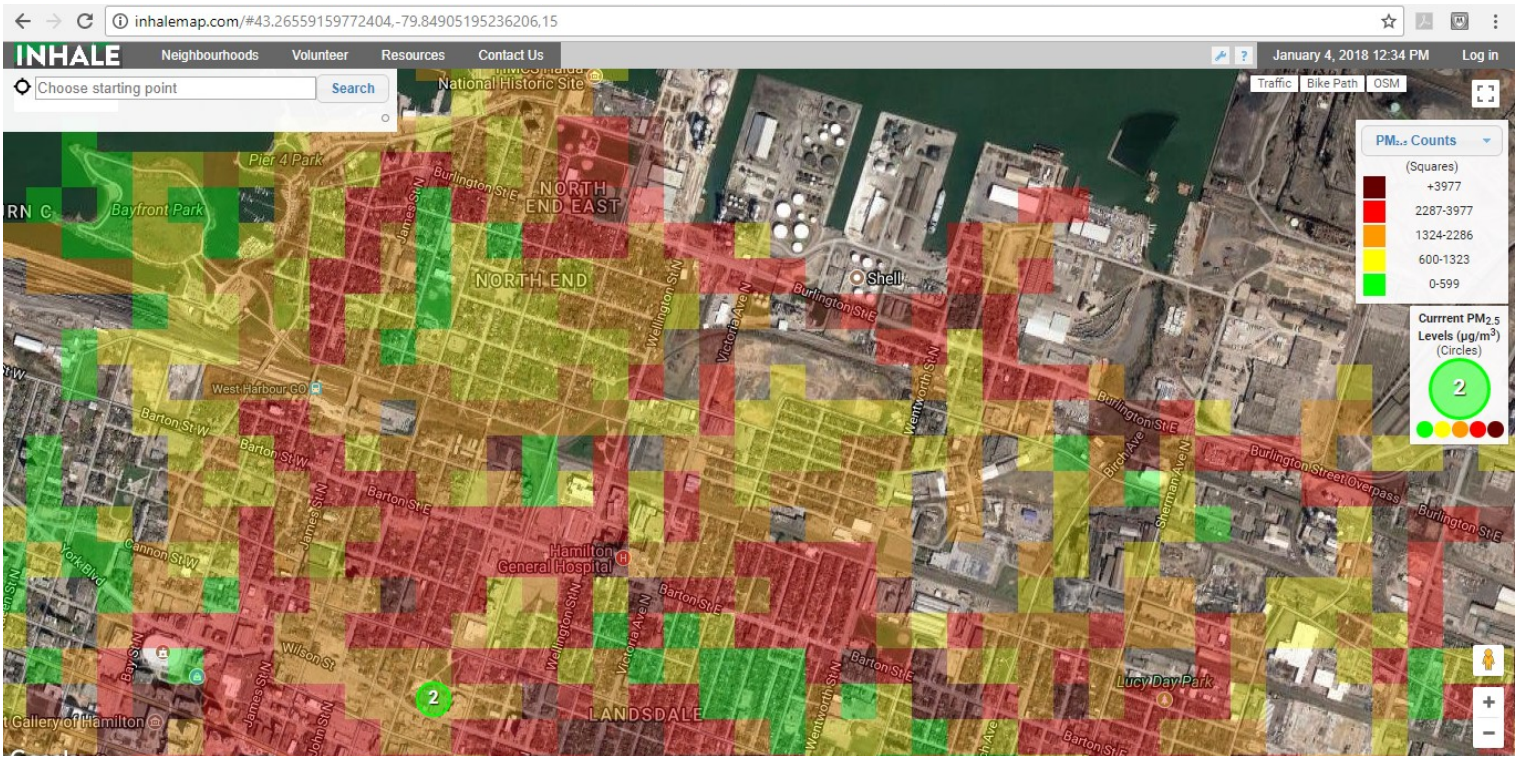


(4) A customized Dylos DC1700 air quality monitor was used. For more information on Dylos monitors see www.dylos.com.

Monitoring Respirable Air Particulate Pollution

While the air quality monitors being used for this project are reliable, they are not as sophisticated as the equipment used by government regulators. That does not mean that the information generated is not useful; community-collected data provides important information about air particulate trends. Areas identified by volunteers as having high $PM_{2.5}$ levels need to be further investigated and action taken to resolve the problem. The map also displays current $PM_{2.5}$ readings from all three provincial Ministry of Environment & Climate Change Air Quality Health Index monitoring stations in the city. These stations appear as large circles on the map. The image below is a screenshot of the online mapping system.

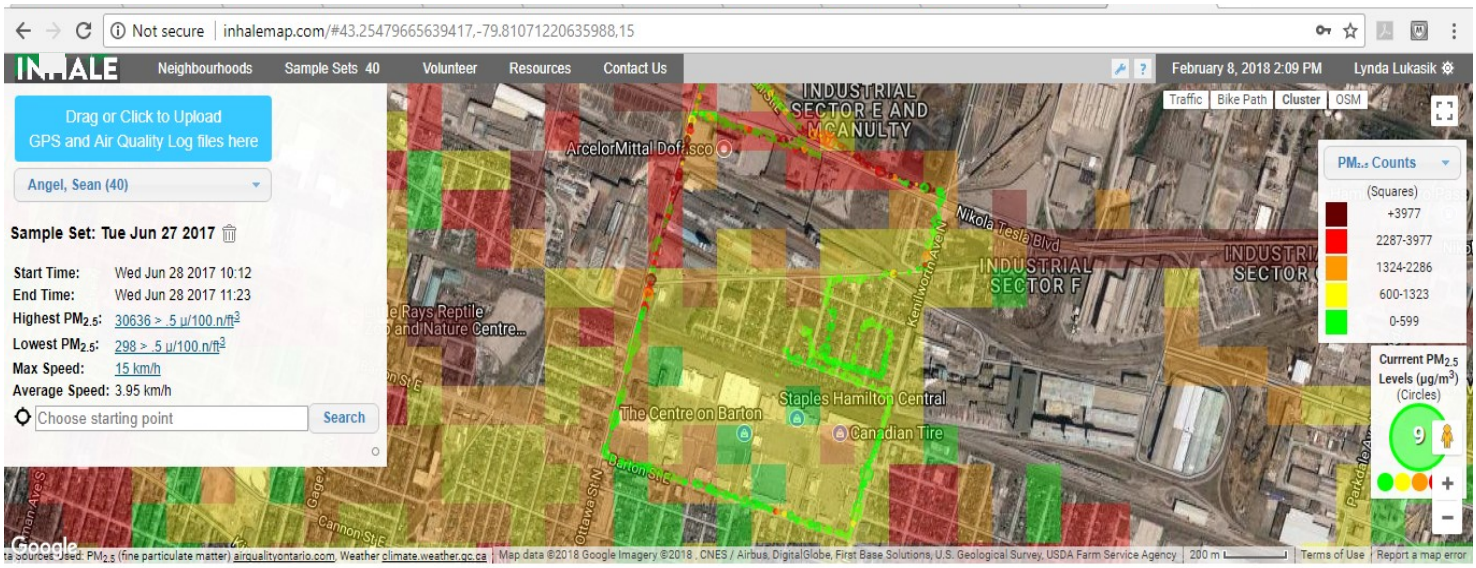
The map's visual representation of $PM_{2.5}$ levels helps to highlight areas with chronic particulate pollution problems. Viewers can click on a coloured square to reveal a bar graph display of the monitoring results for that location. There is also a detailed chart that summarizes monitoring dates and $PM_{2.5}$ levels measured on each date.

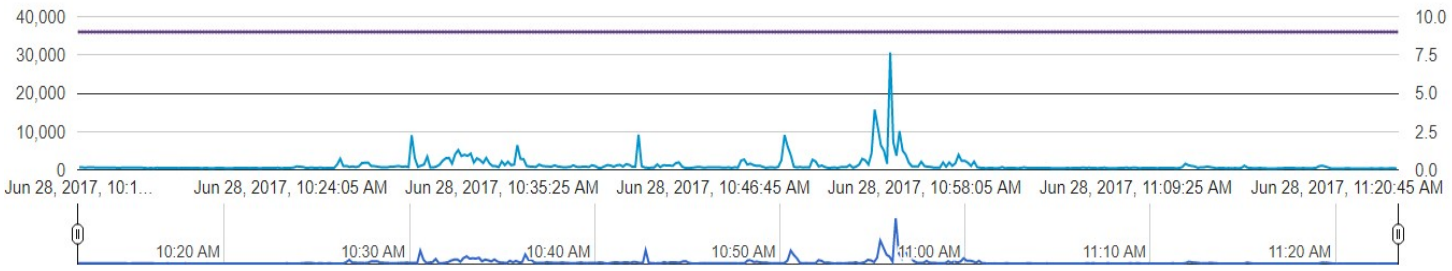


A screenshot of the air particulate mapping system - which uses colour coding to highlight high $PM_{2.5}$ locations.

Monitoring Respirable Air Particulate Pollution

The system also provides volunteers with their own accounts which they can access to view the monitoring data they have collected as seen in the following map and chart.



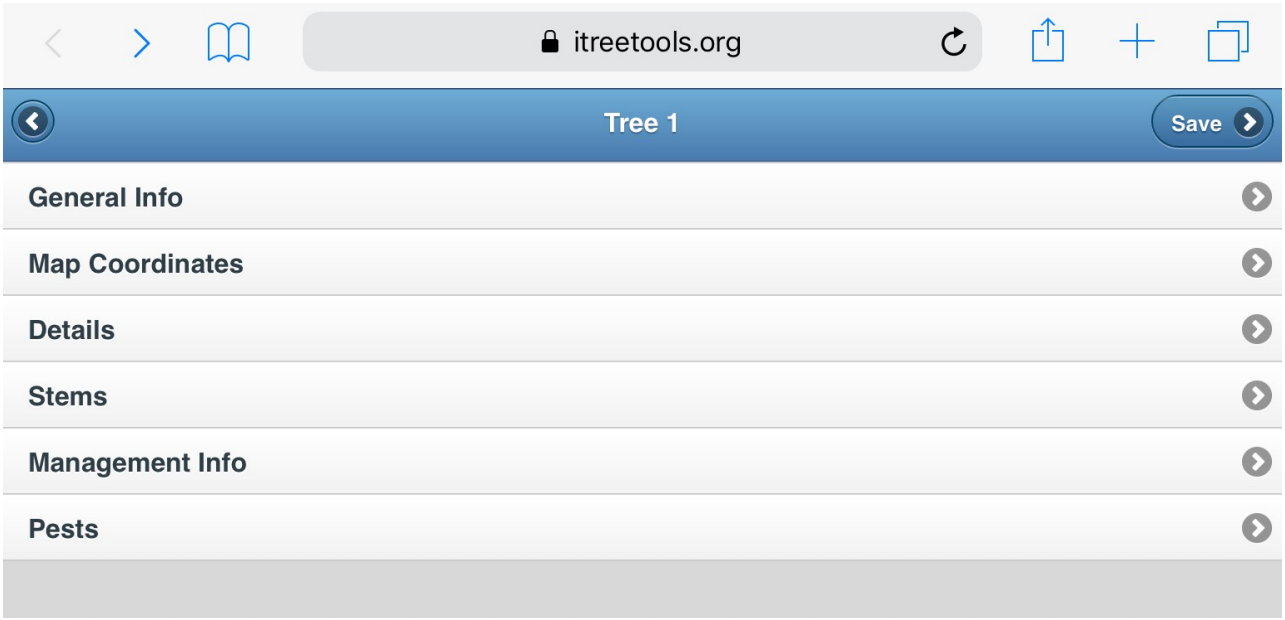


Inventorying the Urban Forest using iTree

Trees Please Inventorying Protocol (5) is used to standardize the tree analysis in each neighbourbood. A list of information is collected for each tree that is inventoried, providing a good understanding of the general health of a tree, as well as any potential hazards posed by or threatening that tree.

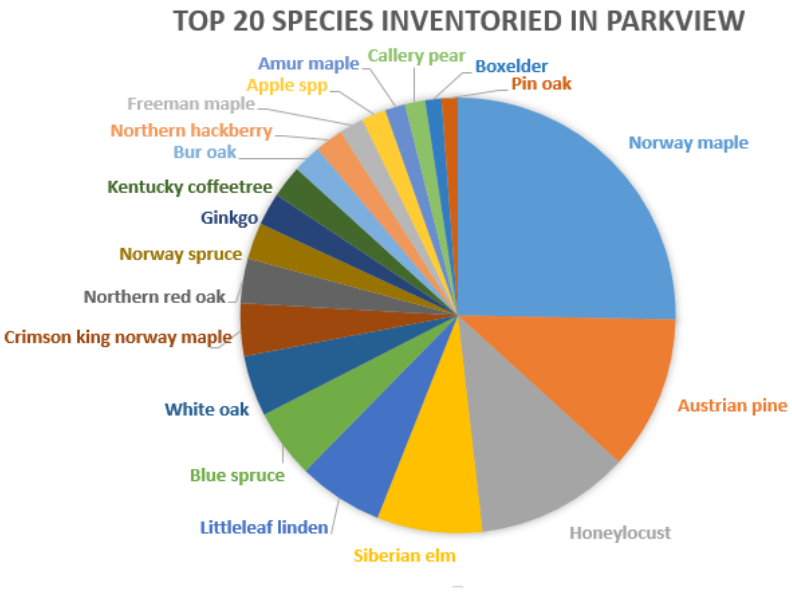
Information collected for each tree includes location data, tree species identification, height, diameter, as well as parameters that contribute to a categorized assessment of tree health and hazards.

Data are entered in the field as collected into iTree, a free online tool. The system calculates details about the ecosystem services provided per tree, including the estimated weight of air particulate pollution filtered out of the air by that tree each year. The ecosystem services feature can also be used to calculate the contributions of all of the trees inventoried in a neighbourhood.

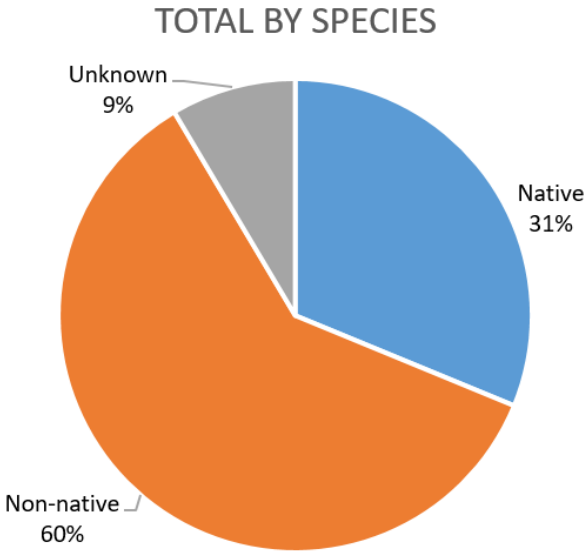


5) The protocol being used has been adapted from the Neighbourwoods inventorying protocol developed by Dr. Andy Kenny from the University of Toronto's Faculty of Forestry.

Species Diversity in the North End



The top 20 trees by individual inventoried in Parkview are represented. Norway Maples were by far the most inventoried tree. Along with the cultivated Crimson King Norway Maple, *Acer platanoides* accounted for 24% of all the trees inventoried.

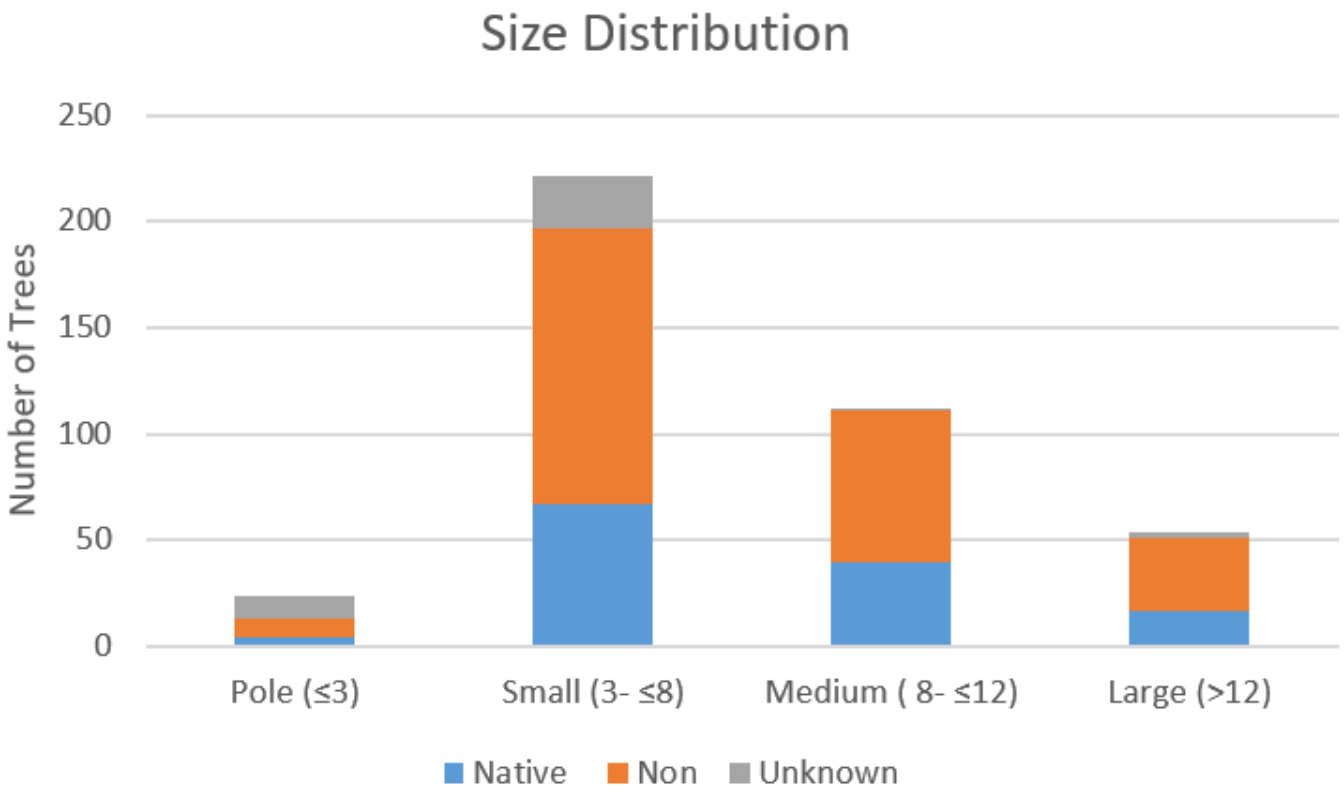


The inventoried trees can be categorized as native species or non-natives. The majority were non-native at 60%, compared to 31% native.

9% are unknown as they were identified by their genus (ex, maple) but not by their species (ex, sugar) and cannot be assumed to be native or non-native. While we do our best to identify the trees to species, there are a number of cultivars that make it hard to do so every time.

Size Distribution of the Inventoried Trees

The size class distribution for the Parkview neighbourhood shows that there is a much higher number of small trees (3-<8 metres tall) in the area. Special care should be taken to increase and maintain the pole (<3 m), medium (8-<12 m), and large (>12 m) size classes of trees which provide more benefits such as increased air quality, shade, stormwater control and wildlife habitat. Fortunately, the large number of small trees will, with good maintenance, become medium and large trees.



As small trees grow, it is imperative to maintain these trees to mature fully, while continuing to care for our established trees, which contribute most significantly to the ecosystem services provided by the urban forest. Providing a sense of the variety of trees and size classes helps guide decisions on what kind of trees to plant and where to plant them.

Ecological Benefits of the inventoried trees

- Number of trees: 411
- Tree Cover: 1.563 hectares
- Most common species of trees: Norway maple, Honeylocust, Austrian pine
- Percentage of trees less than 6" (15.2 cm) diameter: 31.9%
- Pollution Removal: 78 metric tons/year (Can$113 thousand/year)
- Carbon Storage: 107.2 metric tons (Can$12.3 thousand)
- Carbon Sequestration: 2.269 metric tons (Can$261/year)
- Oxygen Production: 6.049 metric tons/year
- Avoided Runoff: 216.7 cubic meters/year (Can$504/year)
- Building energy savings: N/A – data not collected
- Avoided carbon emissions: N/A – data not collected
- Structural values: Can$706 thousand

Urban trees in Trees Please 2019 have the following structural values:

- Structural value: Can$706 thousand
- Carbon storage: Can$12.3 thousand

Urban trees in Trees Please 2019 have the following annual functional values:

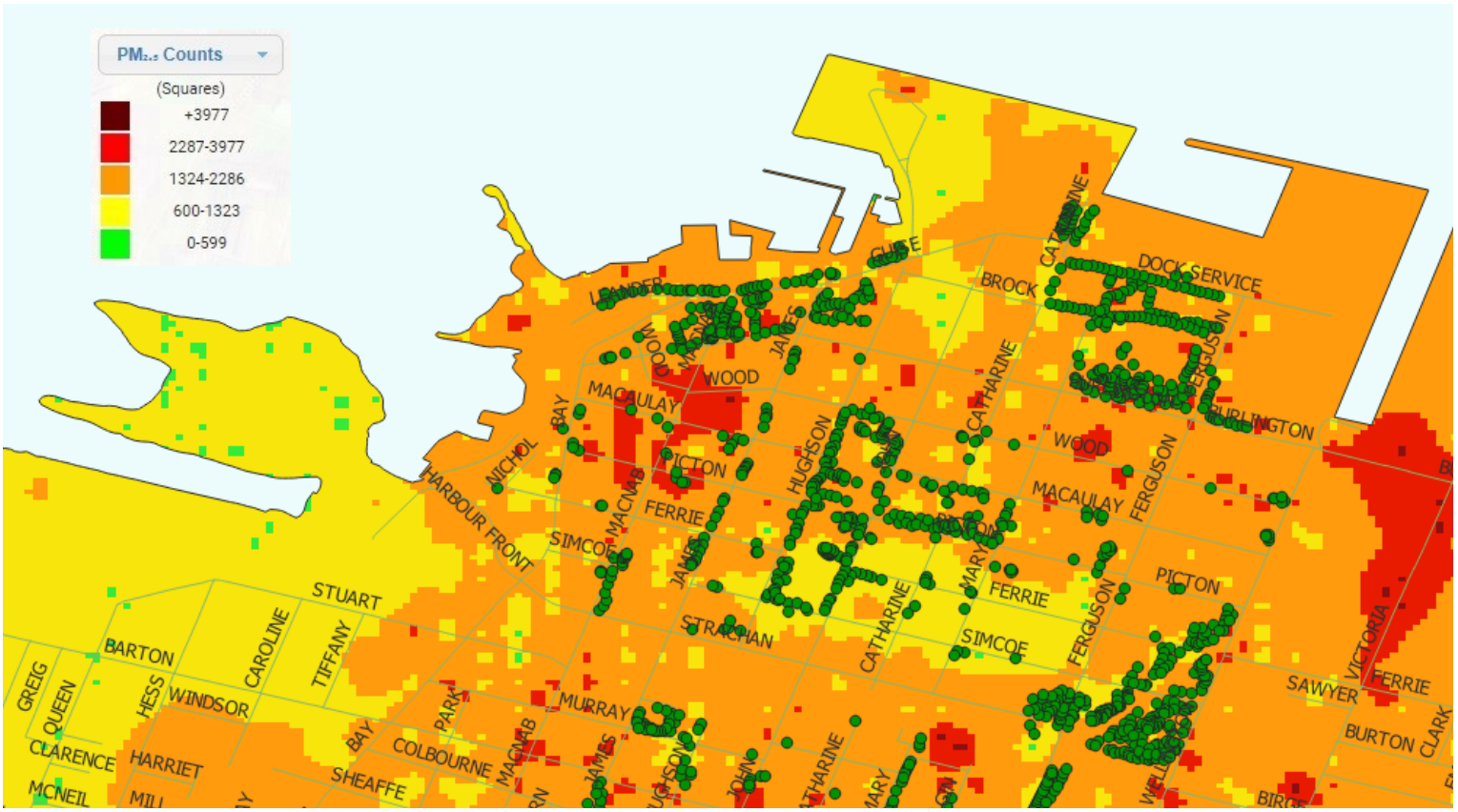
- Carbon sequestration: Can$261
- Avoided runoff: Can$504
- Pollution removal: Can$113 thousand

iTree generates a number of annual benefits that each tree or any selected group of trees provide for an area. In Parkview, the 411 trees inventoried are estimated to provide around $113,000 in benefits annually, including over $12,300 in carbon storage.

Air quality is improved through the amount of particulate matter trees capture. Over 78 metric tons of pollutants are removed annually through the 411 trees inventoried. Carbon dioxide is removed from the air and sequestered in each tree during the respiration process, contributing thousands of dollars worth of ecosystem services.

Air and Trees Together

The Parkview neighbourhood has a tree canopy of 12.6%, while the City aims to be at 35%. With 24.8% being other vegetation, like mowed lawn, there is room to grow. Much of the canopy is found in the Red Hill Valley, with some mature pockets in backyards near Glow Park and along the Pipeline Trail. The community has recently expressed concerns about noise and pollution from nearby industry and roadways.



This map shows both the air quality data and tree inventory data, and highlights the poor air quality hotspots.

Trees Please

Achievements

Alongside our goal of engaging residents to gather air quality and tree information, we are pleased by our achievements this year:

- In Parkview in 2019, we inventoried over 400 trees and collected around 75 kms worth of air quality data in the neighbourhood. Furthermore, volunteers collected hours of data on their own initiative, massively contributing to this dataset.
- Recommended that the City investigate planting trees in Leaside Park to help with noise and particulate pollution.
- In 2016, we created an Air and Trees Taskforce made up of a number of city divisions (Planning, Public Health and Forestry) as well as community organizations (Trees for Hamilton, Street Trees by McMaster Public Interest Research Group). The mandate of this taskforce is to improve air quality through strategic tree plantings. It is a strong networking tool to build connections between our team (Environment Hamilton and Hamilton Naturalists' Club), different city divisions, and other community groups. This group continued to meet in 2019, and will continue past the lifetime of this project.
- In 2010, in partnership with the City of Hamilton Forestry Division and many volunteers, we planted 250 trees along Windermere Basin, a greenspace close to industry and the Queen Elizabeth Way, and 400 trees along the Red Hill Trail in the Parkview neighbourhood near the Queen Elizabeth Way.
- We held a series of workshops revolving around gardening with native plants, improving stormwater retention, and identifying invasive species, as well as a lichen identification for air quality monitoring series.
- Hundreds of students participated in hands-on activities learning about lichen, air quality, tree inventorying and tree identification in their schools and neighbourhoods.
- With thanks to funding from Clean Air Hamilton, we offered a Free Tree giveaway of 30 native trees in the Parkview neighbourhood. Addressing space concerns, we included more shrub options in our species list.
- Cohosted a BioBlitz and Native Plant Sale at the Royal Botanical Gardens on September 21, 2019, helping to make it easier to access native species.

Conclusion

With all this data, we are working on a number of recommendations to carry forward in 2020 and beyond. We feel strongly that we need to increase our tree canopy because it will help improve our air quality, and provide many other benefits to Hamiltonians. We have outlined a number of

Trees Please

What you can do

Ready to help?

- Plant a native tree in your yard. The greatest opportunity to increase our urban tree canopy is through private property. Native trees are available at local retailers like Verbinnens (verbinnens.com). Let other plant retailers know that you want to see more native species!
- Water your trees and newly planted public trees in your area. If you see a green gator bag on the tree, it is relatively new and could use some extra help. For example, new City trees were planted along Brampton Street near Woodward in 2019.
- Request a free street tree from the City, and let your neighbours know about this great program. Visit treeshamilton.ca for details.
- Take care not to damage trees while lawnmowing and weed wacking.
- If you know a spot in your neighbourhood that could use more trees, contact your city councillor or put in a request with the City Forestry Division.
- Borrow an air quality monitor from Environment Hamilton to gather data for your neighbourhood.
- We offer lawn signs to highlight the value in planting native trees. Contact us at treespleasehamilton@gmail.com for more information.
- Follow our social media (@EnvHamilton and @HamiltonNature) to hear about upcoming plantings, events, volunteer opportunities, and plant sales.
- Take a look at our recommendations as part of this report, we have outlined short, medium and long term goals and we could use your help.
- If you have additional recommendations, we would love to hear them!

Trees Please

Recommendations in the Short Term

Recommendation (Short Term 2019)	Lead	Task
Identify key locations with poor air quality as possible tree planting spots.	Trees Please team, Air and Trees Taskforce, interested community members	Locations such as around Leaside Park (recommended to City, under investigation). More planting potential along Pipeline Trail Identify possible funding sources.
Highlight Street Tree Program of the City of Hamilton.	Trees Please and interested community members	Recommend this free program and spread the word.
Engage community members with the benefits of trees (i.e., improving air quality, habitat, energy saving potentials) and highlight sources of affordable native trees.	Trees Please	The Native Plant Sale at the Royal Botanical Gardens includes a couple of native tree vendors. In 2020, the date is Saturday, April 25.
Continue air monitoring in the Parkview area.	Environment Hamilton and interested community members	Portable Particulate Matter monitors are available to loan out. Contact Juby at jlee@environmenthamilton.org Help with Stack Watch (environmenthamilton.org/air_quality). When problematic emissions occur, there are lists of contacts of who to call or email to file complaints.

Trees Please

Recommendations in the Medium Term

Recommendation (Medium Timeline 2019-2020)	Lead	Task
Public Tree Planting(s).	Trees Please team, Forestry division, Air and Trees Taskforce, community members	Identify larger areas that a possible tree planting could take place.
Where there is space to plant a tree or two, once locations have been identified, work on necessary permissions to have trees planted.	Trees Please team, interested community members, possibly City Forestry division	Identify ownerships, i.e. schools, churches, parks, and Trees Please can help identify priorities based on the data we have collected (air quality and tree inventorying).
Addressing challenges.	Trees Please, Air and Trees Taskforce	Limited space is a challenge with increasing tree canopy in many parts of the City. Brain-storm ideas to include shrubs in City planting discussions. Trees Please now includes several shrub and small tree options in our Free Tree Giveaways.

Trees Please

Recommendations in the Long Term

Recommendation (Long Term Timeline 2019-ongoing)	Lead	Task
Push for a regulation to legally limit allowable levels of particulate matter 2.5 while continuing to engage the community in air quality monitoring.	Community members, Air and Trees Taskforce Trees Please team, City departments	As technology emerges, air monitors are becoming more affordable. While waiting for officials to include monitoring Particulate Matter 2.5, Environment Hamilton is looking at creative ways to engage citizen scientists to build air sensors and collect data. Over time, this method will add to our existing data and indicate levels of PM 2.5.
Engage with emitters to reduce particulate matter emissions overall.	Environment Hamilton and community members	Clean Air Hamilton HAMN to start monitoring PM 2.5 levels in the Crown Point neighbourhood. Attend Community Liaison Committee meetings (at both Stelco / ArcelorMittal Dofasco sites). These meetings are mandated by Ministry of Environment and Climate Change. **Stelco's 2020 meeting details** 5:30pm at Waterfront Trust (47 Discovery Drive) • Thursday, March 19 Visit www.stelco.com/community/environment/hamilton-clc for up-to-date information and meeting times. Questions / register info@stelcocanada.com **Dofasco's 2020 meeting details** 5:30pm at ArcelorMittal Dofasco's Main Office (1330 Burlington Street East) • Monday, January 27 • Monday, April 20 • Monday, July 20 • Monday, October 26
Urban Forest Strategy.	Hamilton Naturalists' Club	Engage in the process with the City as a policy is developed to help shape a healthy, urban forest that includes native tree species as one of the priorities.
Track progress in increasing urban tree canopy in the neighbourhood.	Trees Please team, City departments, other organizations, Air and Trees Taskforce	As the Urban Forest Strategy roles out, remain focused on air and trees and what can be done regarding strategic tree planting to help increase air quality, while monitoring canopy loss and maintaining existing trees.

Appendix 1: Particulate pollution

WHY FOCUS ON AIR PARTICULATE POLLUTION?

Particulate Matter (PM) is fine dust that is created by traffic, industry, and construction. PM less than 10 microns in diameter is respirable, and linked to a number of respiratory and cardiac related illnesses. $PM_{2.5}$ is much smaller, penetrating deeper into the lungs and into the bloodstream. Heavy metals (ex. cadmium, mercury, lead) can attach themselves quite easily to $PM_{2.5}$, making this tiny particulate a serious concern.

The following image shows the size of PM_{10} and $PM_{2.5}$ compared to beach sand and human hair. In this example, over five PM_{10} particles can fit in a strand of hair or a grain of sand and over four $PM_{2.5}$ particles can fit in one PM_{10} particle.

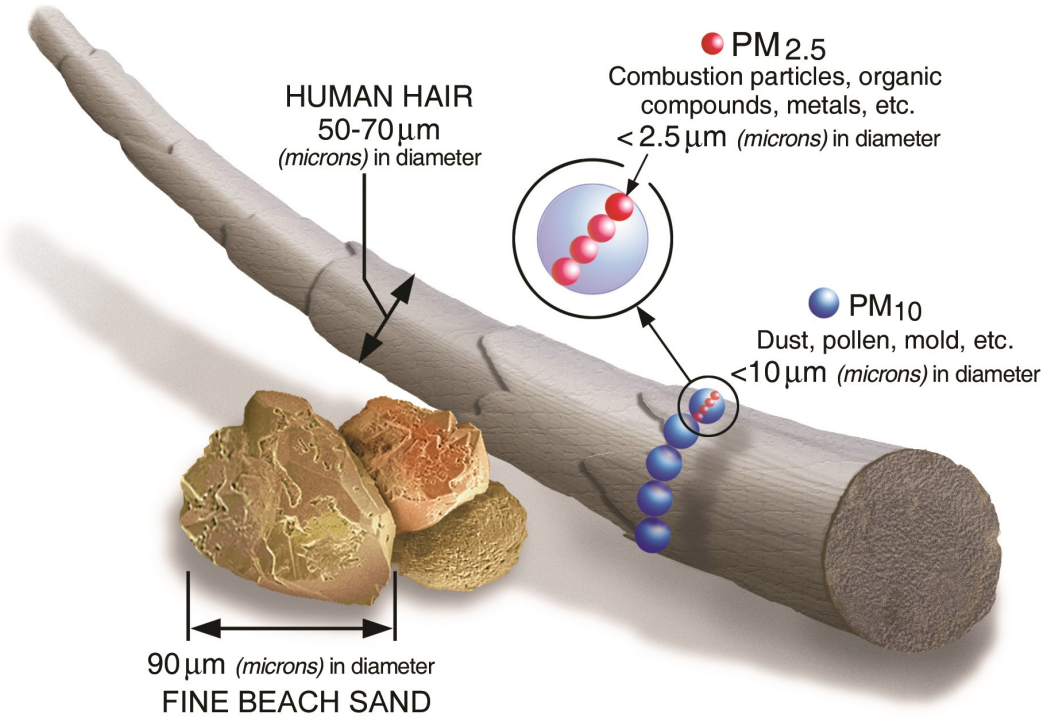


Image credit: www.epa.gov/pm-pollution/particulate-matter-pm-basics

Appendix 2: Connecting trees and their ability to capture Particulate Matter

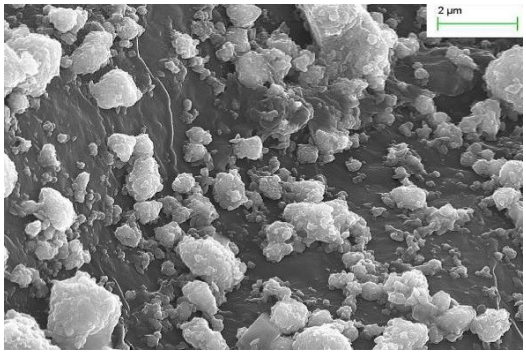
In 2014, Environmental Science and Technology journal published an article by Maher et. Al through the University of Lancaster titled, "Impact of roadside tree lines on indoor concentrations of traffic-derived particulate matter". Researchers tested the levels of Particulate Matter and heavy metals in a row of townhouses along a treeless street.

After placing a line of young birch trees in front of half the homes, they continued to test for particulate matter and heavy metals. They found that the trees were able to filter 50% of the particulate matter and over 50% of the heavy metals in the homes.

That is amazing!

To read the full study: http://bit.ly/2nwpryk

The trees and birches used in the study. Credit: Environ. Sci. Technol.

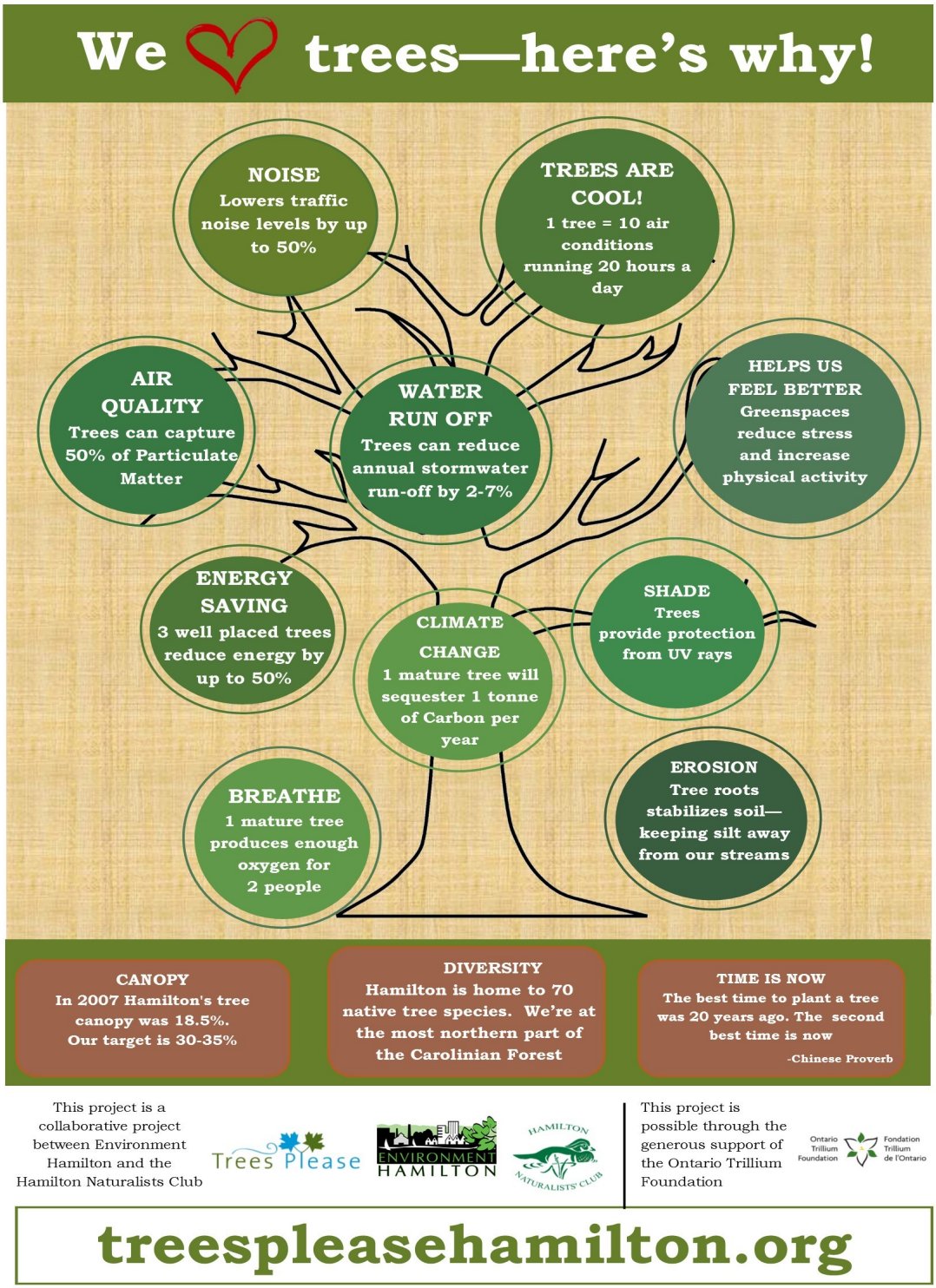


A scanning electron micrograph shows particulate matter captured on the surface of a silver birch leaf.

Credit: Environ. Sci. Technol.

We created several resource as part of our project.
Below, this infographic outlines some of the benefits of trees. On the following page, the three years of Trees Please are summarized in an infographic.

Trees Please presents



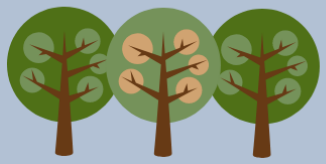
Trees Please

Green solutions to air pollution

SINCE ITS LAUNCH IN 2016, TREES PLEASE HAS RESULTED IN:

6,800 of 158 varieties, most commonly Honeylocust and Norway Maple. The largest was a Willow with a diameter of 250 cm!

TREES INVENTORIED



NATIVE TREES PLANTED

3,300 throughout Hamilton, in partnership with City's Forestry Department and through community giveaways.

1,600 as volunteers, neighbourhood groups, at tree walks, workshops, through school sessions, and more.

PEOPLE ENGAGED

VOLUNTEER HOURS

1,100 spent identifying and measuring trees, tracking air quality, and planting trees.

550 travelled collecting air quality data throughout our six neighbourhoods: Beasley, Beach Strip, Crown Point, McQuesten, North End, Sherman, and Parkview.

KILOMETRES

SEE THE RESULTS, BREATH IN THE IMPACT

Visit environmenthamilton.org/trees_please to see our tree and air quality maps, and explore the reports for each neighbourhood.

Trees Please is a project of Environment Hamilton and the Hamilton Naturalists' Club, supported by the Ontario Trillium Foundation from 2016-2018, and by Clean Air Hamilton in 2019.

Trees Please

Thank you!

environmenthamilton.org

hamiltonnature.org