



TREES PLEASE REPORT CROWN POINT

**Results of air quality and tree inventorying in the Crown Point
neighbourhood in 2017**



Table of Contents:

Introduction.....3
Project Partners.....4
Why this project is important.....6
The Crown Point Neighbourhood.....7
What We Did.....8
What We Found.....13
Achievements to Date.....17
Recommendations for Action.....18
Appendices.....20



Introduction

The Trees Please project is a collaboration between the Hamilton Naturalists' Club (HNC) and Environment Hamilton (EH). The project is funded through the Ontario Trillium Foundation from 2016-2018.

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 an online application called Open Tree Map and we upload the information directly in the field. The map can be found at: www.opentreemap.org/hamilton/map/

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 tree canopy, through recognizing that trees can help improve air quality and provide myriad other benefits. By layering the two maps (trees and air quality), hotspots may be identified as well as possible solutions.

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





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



**Project
Partners**

The Hamilton Naturalists' Club (www.hamiltonnature.org) is a volunteer-based, charitable organization with an almost 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 pushing for necessary change when required. EH is engaging 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.



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 the Crown Point community for providing us with lots of support and practical insights. Special thanks to the Crown Point Neighbourhood Association for their time, energy, and support. A special mention to ArcelorMittal Dofasco for allowing us to inventory their trees. We collected data on over 70 trees on their property.

We are so grateful to our superstar volunteers, who came out in the heat, rain, and wind to help us collect data: Trevor Goulet, Kerry Bear, Jessica Serafin, Jeff Malley, Carly Stephens, Angie Williams, Emily Edwards, Sophie Munoz, Heather, Beth, Fran Frazier, Hannah Miller, Ray Varey, Lynn Varey, Craig McNeill, Mike Edworthy and Martin.

Thanks to our summer interns, Sean Angel and Sophie Silverton, who diligently collected data and helped us tremendously.

This project is made possible through the generous support of the Ontario Trillium Foundation.



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.

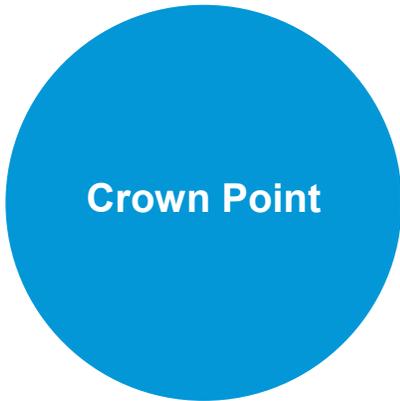
A healthy urban forest can also provide many other ecosystem benefits such as reductions in stormwater runoff and home heating and cooling costs, and much needed shade and relief from the sun.

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



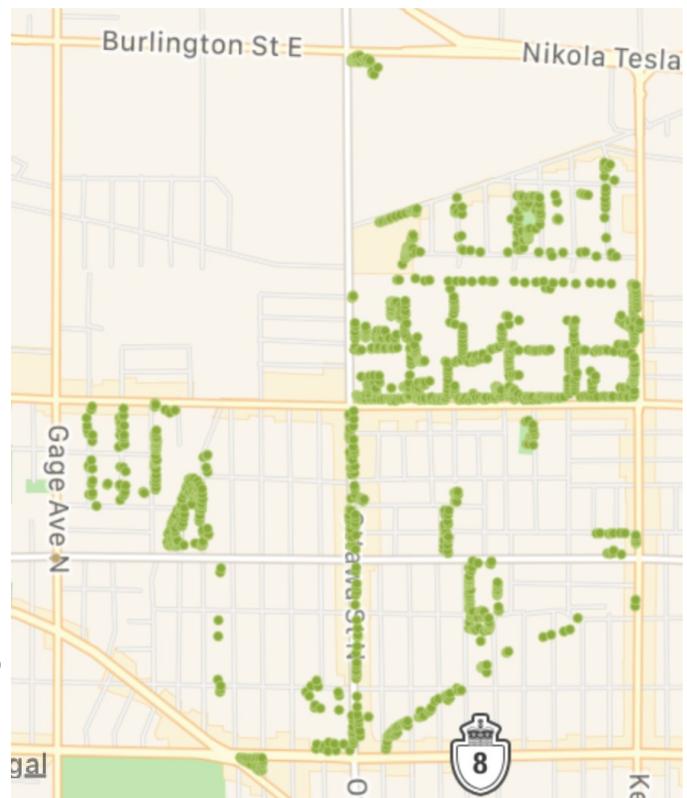
In 2017, the Trees Please project focused on the Crown Point and McQuesten neighbourhoods.

Crown Point is located in the east part of the downtown core., bordered by Main St. to the northern railway tracks, and Gage Avenue to Kenilworth Avenue. The neighbourhood features the dynamic Ottawa Street shopping district and the Pipeline Trail, currently being re-imagined with the help of engaged community members. In the industrial area (along Burlington Street), there is a longstanding reality of residential and industrial zones within metres of each other.

The neighbourhood is active with their Crown Point neighbourhood association, a community newspaper, *The Point*, and specific groups like the Crown Point Gardening Club and the Pipeline Trail Hamilton. Many of these entities are focused on greening the area which helps to increase the quality of life in the neighbourhood.

In 2017, Trees Please project managers worked to recruit and mobilize community volunteers to work as citizen scientists in Crown Point, with a number of volunteers helping to collect neighbourhood air particulate data and over 20 volunteers helping to audit neighbourhood trees. These dedicated individuals contributed over 100 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 Crown Point 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 Crown Point Neighbourhood was to undertake outreach and promotions to generate community interest. The project was promoted through social media, various community events, and through the Neighbourhood Association. A key event was a Trees Please Tree Tour in Gage Park, 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 in 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 on both weekdays and weekends 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.

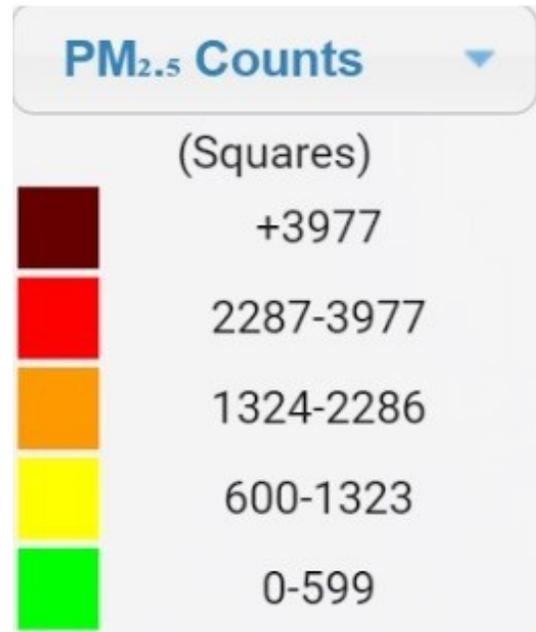
We provide training and tools. We just need you!

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}.

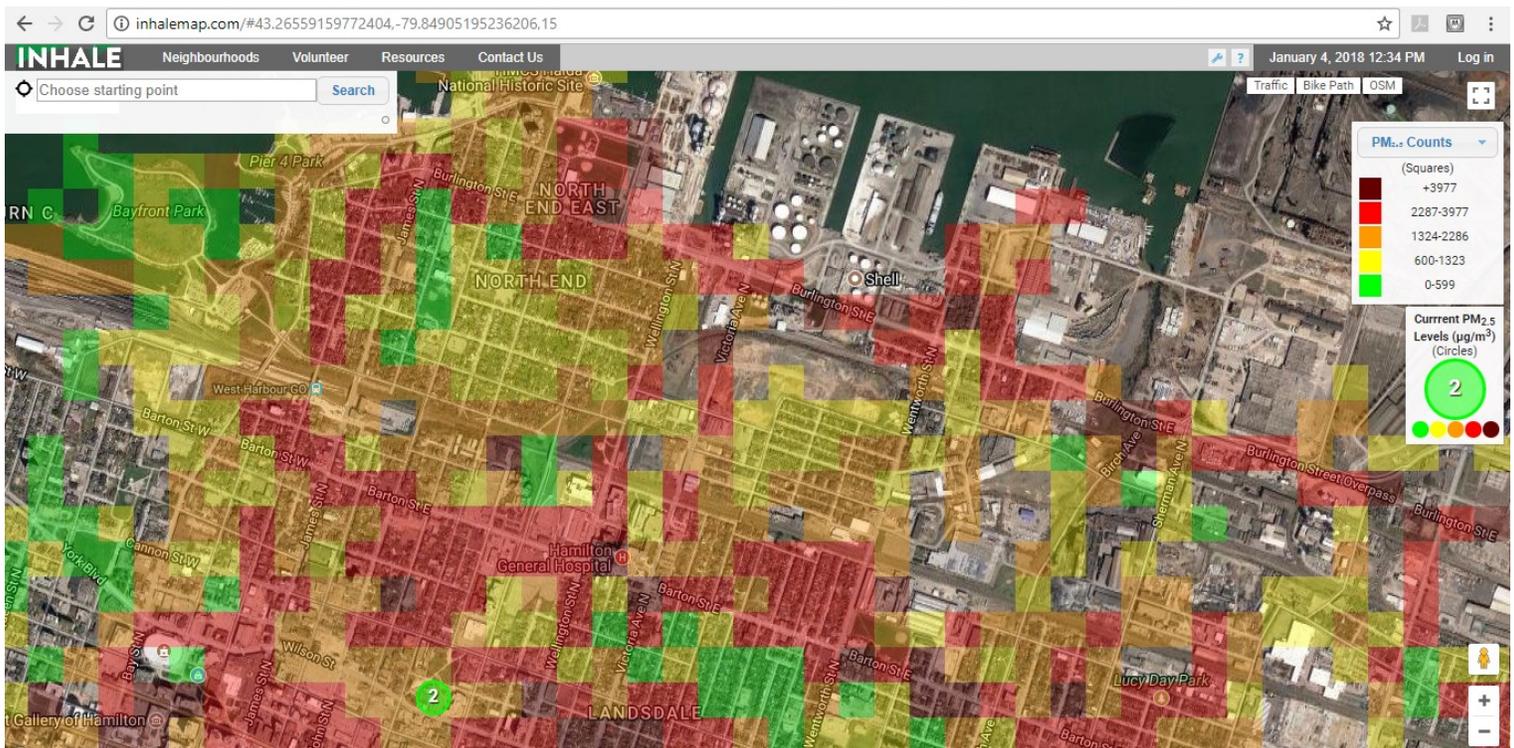


(4) A customized Dylos DC1700 air quality monitor was used. For more information on Dylos monitors see www.dylos.com.

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.

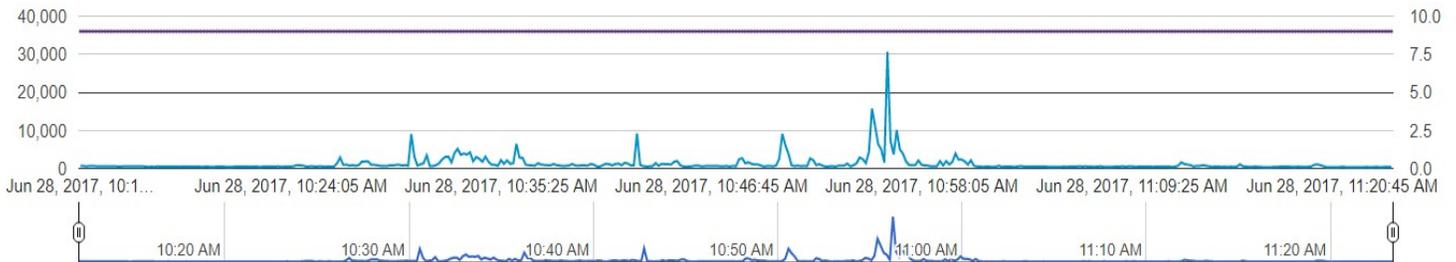
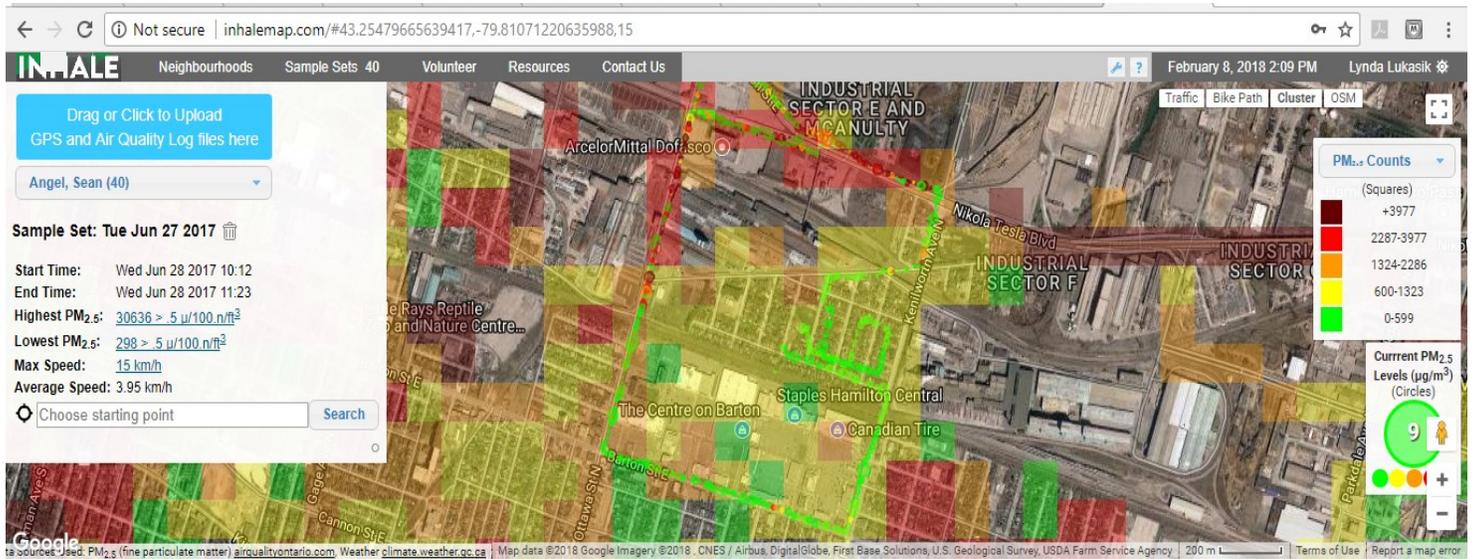
The map's visual representation of PM_{2.5} levels helps to highlight areas with chronic particulate pollution problems. Viewers can click on a coloured square to reveal a bar graph display of the monitoring results for that location. There is also a detailed chart that summarizes monitoring dates and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

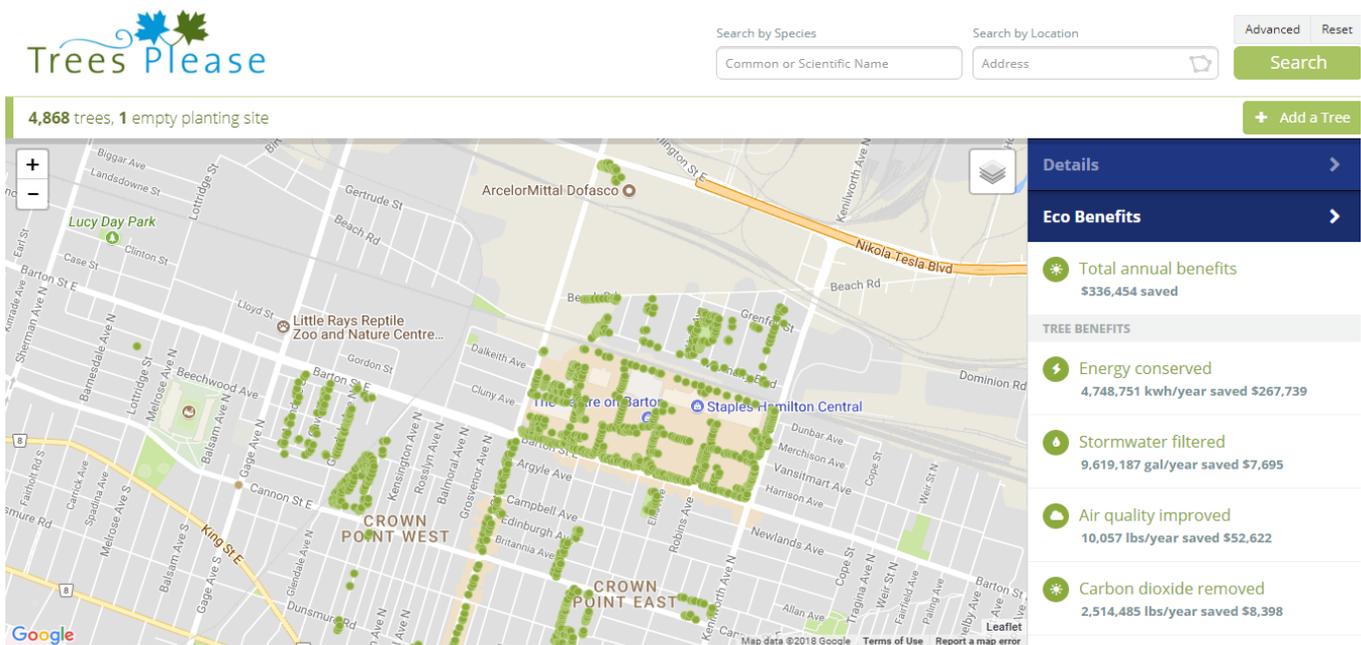


Inventoring the Urban Forest using Open Tree Map

Trees Please Inventoring Protocol (5) is used to standardize the tree analysis in each neighbourhood. A list of 16 pieces 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 (6).

Data are entered into an online application called Open Tree Map in the field as information is collected using a wifi-enabled tablet. Once tree data has been entered, the tree appears as a green dot on the Open Tree Map. Map viewers can click on a dot and access the tree inventory information for that tree. 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.

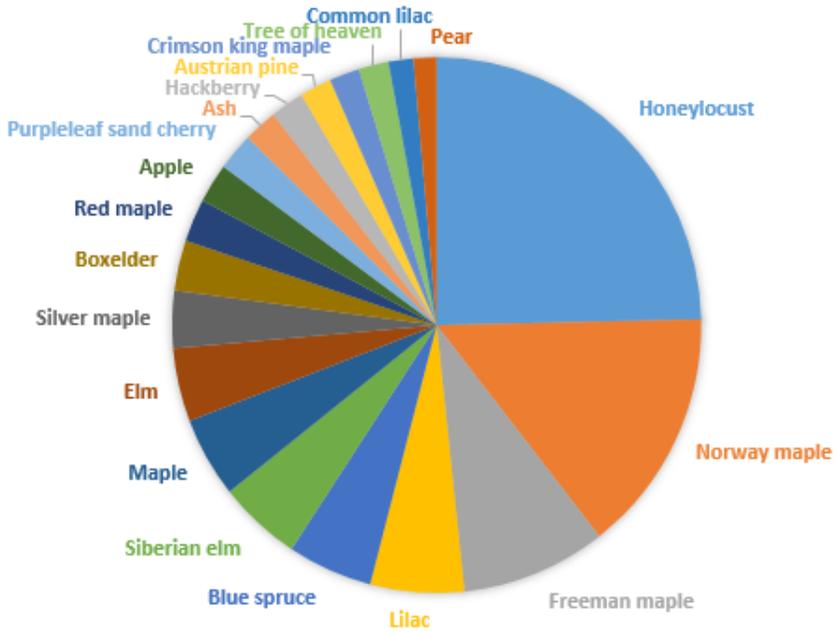


5) The protocol being used has been adapted from the Neighbourhoods inventoring protocol developed by Dr. Andy Kenny from the University of Toronto’s Faculty of Forestry.

6) The full list of parameters assessed for each tree can be found in the Trees Please Inventoring Protocol, available at treespleasehamilton.org

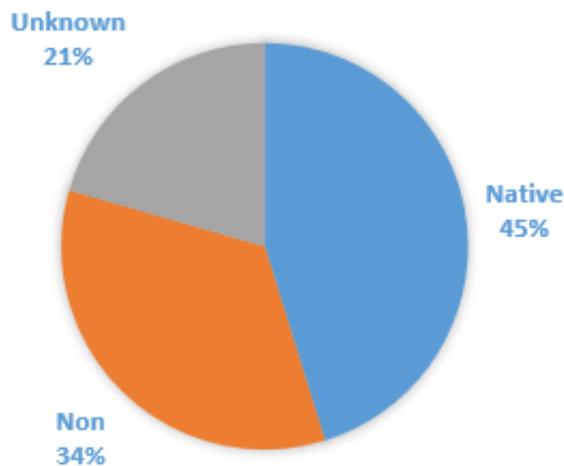
Species Diversity in Crown Point

TOP 20 SPECIES INVENTORIED IN CROWN POINT



The top 20 trees by individual inventoried in Crown Point are represented. The most commonly observed tree was the Honeylocust. Sunburst Honeylocusts are a commonly used street tree cultivar that Trees Please will continue to classify as native. Norway Maples were the second most common and considered non-native and invasive.

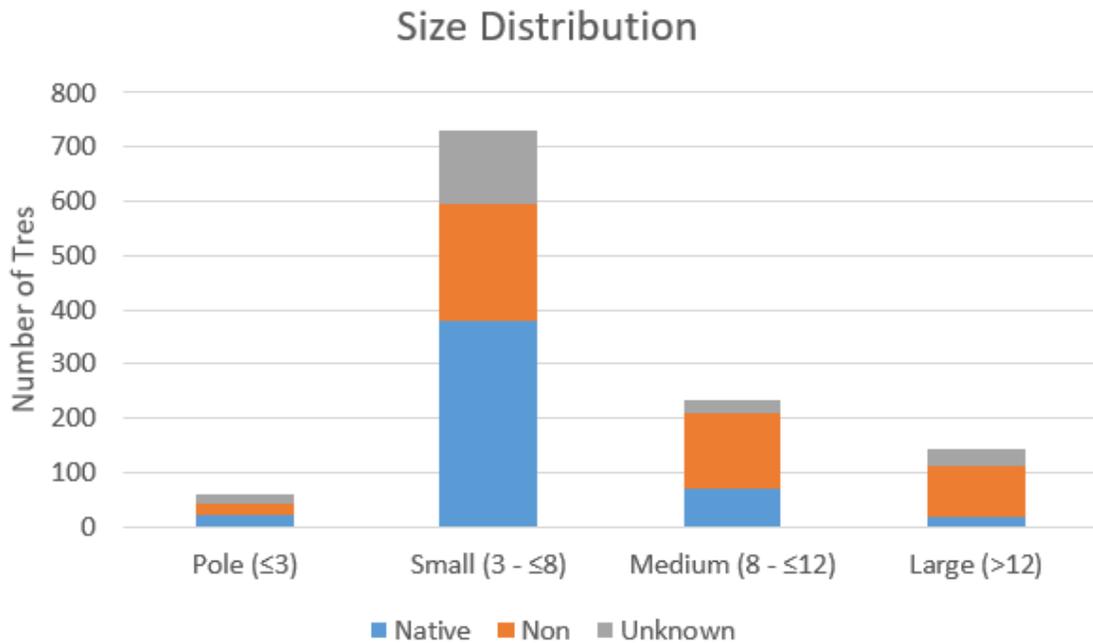
TOTAL BY SPECIES



The inventoried trees can be categorized as native species or non-natives. With Honeylocust being classified as native, the majority of trees in Crown Point fall into this category—21% 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 Crown Point neighbourhood shows that there is a much higher number of small trees in the area, mostly found in the new Centre Mall parking lots. Special care should be taken to increase and maintain the pole, medium, and large size classes of trees which provide more benefits such as increased air quality, shade, stormwater control and wildlife habitat. Fortunately, there are a large number of small trees which, with good maintenance, will 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

 Total annual benefits
\$49,444 saved

TREE BENEFITS

 Energy conserved
729,054 kwh/year saved \$40,572

 Stormwater filtered
1,032,041 gal/year saved \$825

 Air quality improved
1,377 lbs/year saved \$6,955

 Carbon dioxide removed
326,574 lbs/year saved \$1,090

 Carbon dioxide stored to date
999,413 lbs saved \$3,338

Open Tree Map generates a number of annual benefits that each tree or any selected group of trees provide for an area. In Crown Point, the 1,210 trees inventoried are providing over \$49,400 in benefits, including over \$40,500 in energy conservation when the trees are planted close to buildings, where they provide shade in the summer and block the wind in the winter.

Storm water filtered refers to the amount of rain water the trees capture and filter through their root systems, slowing down run-off. By doing this, each tree helps ease the pressure of rainwater from our sewer systems, particularly during intense rains.

Air quality is improved through the amount of particulate matter trees capture. Over 1,300 pounds of pollutants are filtered annually through the 1,210 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.



Achievements to Date:

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

- In Crown Point in 2017, we inventoried over 1,200 trees.
- 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.
- In 2017, in partnership with the Forestry division and many volunteers, we planted 250 trees along Windermere Basin, a greenspace close to industry and the Highway 403.
- We piloted an Air and Trees Walk-about and with the help of our summer intern, touring specific streets in Crown Point and McQuesten and highlighting air quality challenges. This is something we will be repeating in 2018.
- We piloted building air sensors with youth in the McQuesten neighbourhood. We toured the neighbourhood collecting Particulate Matter levels and uploaded the data online.
- We created a lichen, air quality, tree inventorying and tree identification series of workshops that we ran throughout the summer into the fall. The program was presented to Green Venture, Sprouts Camp at Winston Churchill Park, a summer camp in Waterdown, as well as a number of elementary schools: Hess, Ryerson, Billy Green, Dr. Davey and Huntington Park.
- With thanks to funding from Hamilton Community Foundation and their Canada 150 grant, we offered a Free Tree giveaway of 150 native trees and approximately 60 trees were distributed within the Crown Point area.

Conclusion

With all this data, we are working on a number of recommendations to carry forward in 2018 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 recommendations that we can do, that you can do, and what we can do together.



Recommendations in the Short Term

Recommendation (Short Term 2018)	Lead	Task
Identify key locations as possible tree planting spots	Trees Please team, Air and Trees Taskforce, interested community members	Locations such as St Christopher's Park Another possible planting location is the Beach Road and Grenfell Triangle. Identify possible funding sources.
Highlight Street Tree Program at the City of Hamilton	Trees Please and interested community members	Recommend this free program: in 2018, Trees Please will be promoting this program in a very targeted way during the summer inventory sessions.
Engage community members with the benefits of trees (ie, improving air quality, habitat, energy saving potentials) and highlight sources of affordable trees	Trees Please	The Native Plant Sale at the Royal Botanical Gardens includes a couple of native tree vendors. In 2018 the date is Saturday, April 21st.
Continue air monitoring in the Crown Point 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. When problematic emissions occur, there are lists of contacts of who to call or email to file complaints.



Recommendations in the Medium Term

Recommendation (Medium Timeline 2018-2019)	Lead	Task
<p style="text-align: center;">Public Tree Planting</p>	<p style="text-align: center;">Trees Please team, Forestry division, Air and Trees Taskforce, community members</p>	<p style="text-align: center;">Identify larger areas that a possible tree planting could take place</p>
<p style="text-align: center;">Where there is space to plant a tree or two, once locations have been identified, work on necessary permissions to have trees planted</p>	<p style="text-align: center;">Trees Please team, interested community members, possibly City Forestry division</p>	<p style="text-align: center;">Identify ownerships, ie schools, churches, parks and Trees Please can help identify priorities based on the data we have collected (air quality and tree inventorying)</p>
<p style="text-align: center;">Addressing challenges</p>	<p style="text-align: center;">Trees Please, Air and Trees Taskforce</p>	<p style="text-align: center;">One of the challenges with increasing tree canopy in Crown Point is limited space. Brainstorm ideas to include shrubs in planting discussions. For example, Trees Please will be including a shrub option in our Free Tree Giveaway in 2018.</p>



Recommendations in the Long Term

Recommendation (Long Term Timeline 2018-ongoing)	Lead	Task		
<p>Push to include monitoring Particulate Matter 2.5. levels (a pollutant that is not monitored at the City or provincial level)</p>	<p>Community members, Air and Trees Taskforce Trees Please team, City departments</p>	<p>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 .</p>		
<p>Engage with emitters to reduce particulate matter emissions overall</p>	<p>Environment Hamilton and community members</p>	<p>Clean Air Hamilton HAMN to start monitoring PM 2.5 levels in the Crown Point neighbourhood.</p> <p>Attend Community Liaison Committee meetings (at both Stelco / ArcelorMittal Dofasco sites). These meetings are mandated by Ministry of Environment and Climate Change.</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <p>Stelco’s 2018 meeting details</p> <p>5:30pm at Waterfront Trust (47 Discovery Drive)</p> <ul style="list-style-type: none"> • Wednesday June 20, 2018 • Wednesday October 17, 2018 <p>Questions / register info@stelcocanada.com</p> <p>www.stelco.com/community/environment/hamilton-clc</p> </td> <td style="vertical-align: top; width: 50%;"> <p>Dofasco’s 2018 meeting details</p> <p>6:30pm at ArcelorMittal Dofasco's Main Office (1330 Burlington Street East)</p> <ul style="list-style-type: none"> • Thursday April 19th, 2018 • Thursday July 19th, 2018 • Thursday October 18th, 2018 (to be confirmed) </td> </tr> </table>	<p>Stelco’s 2018 meeting details</p> <p>5:30pm at Waterfront Trust (47 Discovery Drive)</p> <ul style="list-style-type: none"> • Wednesday June 20, 2018 • Wednesday October 17, 2018 <p>Questions / register info@stelcocanada.com</p> <p>www.stelco.com/community/environment/hamilton-clc</p>	<p>Dofasco’s 2018 meeting details</p> <p>6:30pm at ArcelorMittal Dofasco's Main Office (1330 Burlington Street East)</p> <ul style="list-style-type: none"> • Thursday April 19th, 2018 • Thursday July 19th, 2018 • Thursday October 18th, 2018 (to be confirmed)
<p>Stelco’s 2018 meeting details</p> <p>5:30pm at Waterfront Trust (47 Discovery Drive)</p> <ul style="list-style-type: none"> • Wednesday June 20, 2018 • Wednesday October 17, 2018 <p>Questions / register info@stelcocanada.com</p> <p>www.stelco.com/community/environment/hamilton-clc</p>	<p>Dofasco’s 2018 meeting details</p> <p>6:30pm at ArcelorMittal Dofasco's Main Office (1330 Burlington Street East)</p> <ul style="list-style-type: none"> • Thursday April 19th, 2018 • Thursday July 19th, 2018 • Thursday October 18th, 2018 (to be confirmed) 			
<p>Urban Forest Strategy</p>	<p>Hamilton Naturalists’ Club</p>	<p>Work with the City to create a policy that will help shape a healthy, urban forest that includes native tree species as one of the priorities.</p>		
<p>Track progress in increasing urban tree canopy in the neighbourhood</p>	<p>Trees Please team, City departments, other organizations Air and Trees Taskforce</p>	<p>Focused on air and trees and what can be done regarding strategic tree planting to help increase air quality.</p>		

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 PM₁₀ and PM_{2.5} compared to beach sand and human hair. In this example, over five PM₁₀ particles can fit in a strand of hair or a grain of sand and over four PM_{2.5} particles can fit in one PM₁₀ particle.

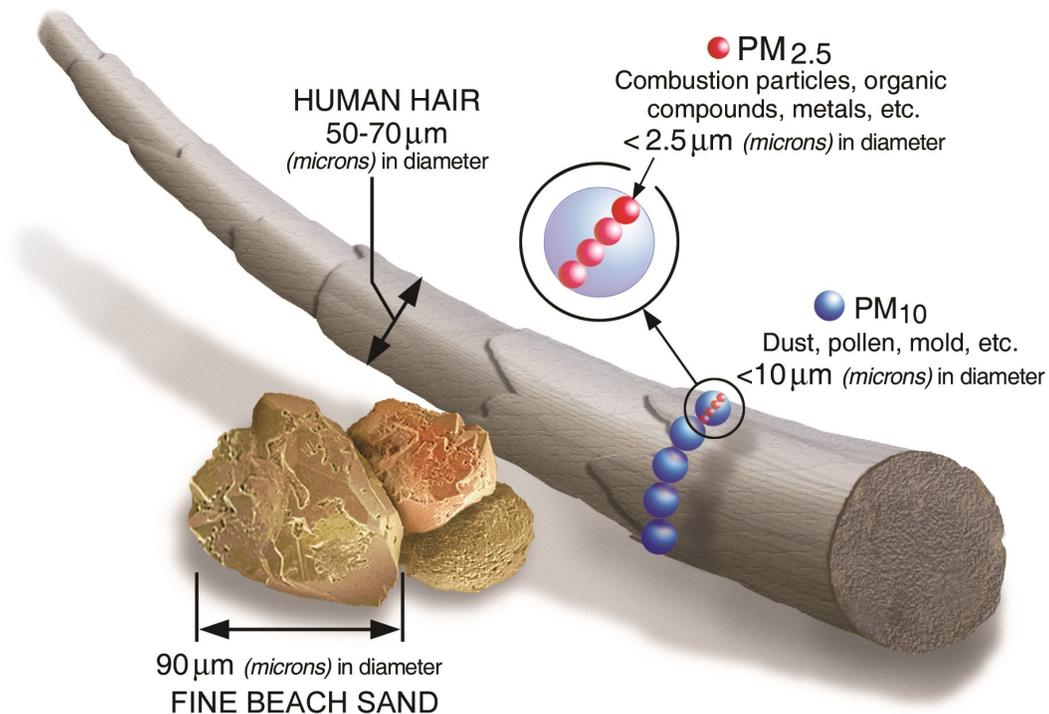


Image credit: www.epa.gov/pm-pollution/particulate-matter-pm-basics

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.

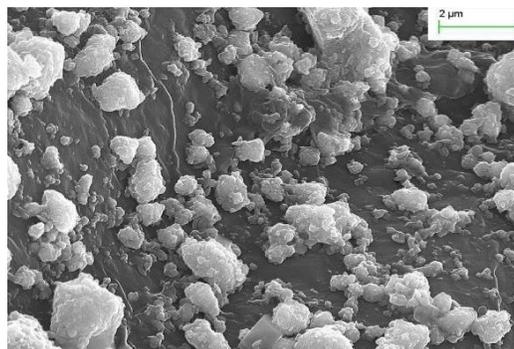
After placing a line of young birch trees in front of half the homes, they continued to test for particulate matter and heavy metals. They found that the trees were able to filter 50% of the particulate matter and over 50% of the heavy metals in the homes.

That is amazing!

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



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

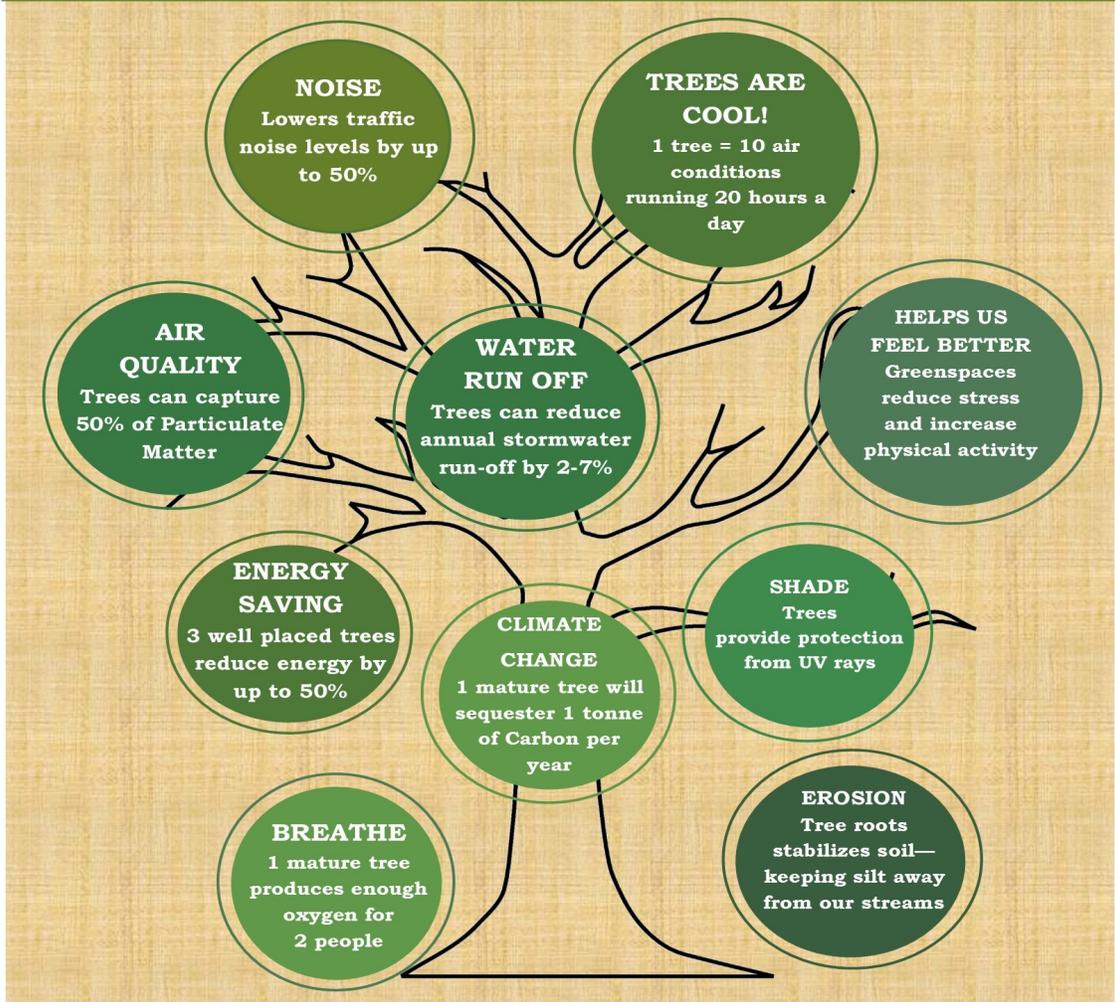


A scanning electron micrograph shows particulate matter captured on the surface of a silver birch leaf.

Credit: Environ. Sci. Technol.

Trees Please presents

We trees—here's why!



CANOPY
In 2007 Hamilton's tree canopy was 18.5%. Our target is 30-35%

DIVERSITY
Hamilton is home to 70 native tree species. We're at the most northern part of the Carolinian Forest

TIME IS NOW
The best time to plant a tree was 20 years ago. The second best time is now
-Chinese Proverb

This project is a collaborative project between Environment Hamilton and the Hamilton Naturalists Club



This project is possible through the generous support of the Ontario Trillium Foundation



treespleasehamilton.org



www.treespleasehamilton.org

