

Enhancing the Urban Tree Canopy Through Micro-Nurseries

A White Paper by Nicole Graziano and Brian Baetz



(City of Hamilton, Twitter, 2018)

Introduction:

As the climate crisis continues to worsen, the need for community-based climate mitigation and adaptation solutions will rise even further. In order to mitigate climate change in localized and effective ways, municipalities need to take concrete steps towards becoming eco-conscious and green cities. Within Hamilton, there is an urgent need to increase and improve upon the urban tree canopy. Currently, many of the trees newly acquired by residents are small and throw minimal shade. In place of this, tree growth should first be encouraged and fostered at municipal or community-based nurseries, thus ensuring that when they are planted, they will be of a significant size. Thus, the proposed solution is one that can be easily understood, especially in light of existing tree planting programs such as Hamilton Street Trees (City of Hamilton, 2020). By creating small-acreage nurseries for trees that mirror a neonatal ward for infants, trees can be strengthened and grow to a reasonable size, before being placed in a more aggressive natural environment.

Existing Programs in Hamilton:

City of Hamilton's Street Tree Planting Program: Currently, the Street Tree Planting program offers free trees to homeowners across Hamilton (City of Hamilton, 2020). The City of Hamilton offers a variety of approximately 40 native and non-native trees, which are selected based on their appropriateness for the specific area (City of Hamilton, 2020). This large array of options encourages a diversified Urban Forest that is more resistant to species-specific diseases. After submitting a request for a Street Tree, the planting location is assessed before being approved. The Street Tree Planting program offers free trees from Spring to Fall of each year and enlists City of Hamilton crews to plant trees within the City-owned road allowance of a resident's property (City of Hamilton, 2020). In 2019, the City of Hamilton planted a total of 9109 trees, including 7,259 which were part of a City-wide tree planting program (including 3409 replacements planted due to the Emerald Ash Borer) and 3690 which originated from tree planting service requests from homeowners (City of Hamilton, 2018). The Emerald Ash Borer is an invasive forest pest that has destroyed millions of trees within Canada (Government of Canada, 2019). Comparatively, in 2018 the City of Hamilton planted a total of 11,508 trees. Of these trees planted, 6608 were part of the City-wide tree planting program (which included 1978 replacements planted due to the Emerald Ash Borer) (City of Hamilton, 2018). The City of Hamilton currently gets its trees from a variety of nurseries based on a competitive procurement process which puts

out tenders for various vendors to bid on based on specific needs (Caleb Gibbons [Senior Project Manager – Forestry & Horticulture at City of Hamilton], personal communication, August 25th 2020; Charles Keenan [retired Supervisor Urban Forestry at the City of Hamilton], personal communication, August 24, 2020). The contract is given to the nursery with the most competitive prices that meets the City’s needs (Charles Keenan, personal communication, August 24, 2020). In previous years, the City of Hamilton has worked with several different nurseries, in order to ensure the diversity of species and has even received trees from non-local suppliers such as Uxbridge Nurseries (Caleb Gibbons [Senior Project Manager – Forestry & Horticulture at City of Hamilton], personal communication, August 25th 2020; Charles Keenan [retired Supervisor Urban Forestry at the City of Hamilton], personal communication, August 24, 2020). Although the City’s existing programs are an important step towards climate mitigation, it falls short of being a comprehensive solution that completes and connects the entirety of Hamilton’s urban tree canopy.

Oftentimes, as trees age and become more vulnerable to diseases and invasive pests such as the Emerald Ash Boer, they must be removed. This is an especially pertinent issue for Hamilton’s aging tree population. Although the Urban Tree Canopy within Hamilton steadily decreased over the past 15 years (Charles Keenan [retired Supervisor Urban Forestry at the City of Hamilton], personal communication, August 24, 2020), newly emboldened attempts to restore the urban forest has led to an increase in street tree coverage. Now, “the number of trees planted each year outnumbers the trees removed by a considerable amount” (Caleb Gibbons [Senior Project Manager – Forestry & Horticulture at City of Hamilton], personal communication, August 25th, 2020). However, this is not a flawless program as many residents are opposed to the City of Hamilton planting a street tree within their front yard. Although, attitudes are slowly changing, having local, pocket nurseries, may encourage residents to become more involved in environmental and reforestation efforts. Despite the City of Hamilton currently procuring trees from third-party nurseries, they once operated a municipal tree nursery in Kings Forest which was used from the late 1960s to 2010s (Charles Keenan [retired Supervisor Urban Forestry at the City of Hamilton], personal communication, August 24, 2020). However, the nursery unfortunately closed due to its large operating costs, with the City eventually concluding that it was cheaper to buy trees than to grow them. Although this argument may still be true, growing trees in local, volunteer-led pocket nurseries will eliminate some of the larger costs associated with growing trees

and it will also reduce emissions caused by shipping trees from a distant nursery into the City. Overall, pocket nurseries can be a financially and environmentally wise decision.

Hamilton Urban Forest Strategy

2018 iTree Eco Study – Value of Urban Forest in Hamilton

- Estimated cost to replace trees within Hamilton’s urban forest: \$2.13 billion
- Pollution Removal: 393 metric tons/year (\$1.59 million/year) - calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter less than 2.5 microns
- Storm Water Management - Avoided Runoff: 815 thousand cubic meters/year (\$1.896 million/year)
- Climate Change Mitigation - Building Energy Savings: \$3.63 million/year
- Carbon Sequestration: 13.41 thousand metric tons (\$1.54 million/year)

Software from the USDA Forest Service that stores and analyses urban forest data; calculates value of services trees provide



[*www.itreetools.org](http://www.itreetools.org)

Figure 1: The many benefits of Hamilton’s Urban Forest (Plosz, 2019).

Hamilton Urban Forest Strategy

Canopy Cover Target

- Canopy cover is the area of leaves and branches (tree crowns) measured, when viewed from above, as a proportion of total land area.
- It is usually expressed as a percent of total ground area covered by tree crowns.
- Hamilton has 21.2% canopy cover (2018)
- The City’s Official Plan target is 30% - based on the minimum amount of forest cover needed to sustain basic watershed function.
- Forestry has a target of 35%.



Figure 2: Hamilton’s urban tree canopy goals and statistics (Plosz, 2019).

- *Environment Hamilton's Trees Please Program:* Environment Hamilton's Trees Please Free Tree Giveaway aims to add 1000 new native trees to urban Hamilton (Environment Hamilton, 2020). Unlike the Street Tree Planting program, as a participant in this giveaway, a resident will pick up their own tree from a tree depot and plant it themselves. The deadline to request a tree is Monday September 21st 2020, however there is a limited number of trees available (Environment Hamilton, 2020). Environment Hamilton's Trees Please project is supported by private organizations, including Arbor Day Foundation and TD Bank (Environment Hamilton, 2020). This free tree giveaway is a part of the larger Trees Please project, a Citizen Science initiative in partnership with the Hamilton Naturalists' Club which is creating an inventory of Hamilton trees and collecting air quality data (Juby Lee, personal communication, August 19, 2020). Through this study, areas are identified where particulate matter is high and an attempt is made to increase the urban tree canopy through the Free tree Giveaway (Juby Lee, personal communication, August 19, 2020). The giveaway started in 2017 and continues annually. Trees are purchased from Verbinnens Tree Nursery, in Dundas (Juby Lee, personal communication, August 19, 2020). In order to encourage biodiversity, the list of available trees varies year to year. More recently, Environment Hamilton has begun to explore growing trees from seeds. In 2019, Environment Hamilton hosted two workshops that engages residents and allows them to plant these seeds and care for them (Juby Lee, personal communication, August 19, 2020). Once trees begin to grow, residents can either keep them or re-distribute them to other locations. The tree seed program more closely aligns with the proposal in this white paper, however it can be enhanced and expanded.

Proposed Improvements:

Although these existing programs are meaningful steps in the right direction, they are not comprehensive solutions to Hamilton's tree shortage. Moreover, they fail to adequately involve residents and thus miss an important opportunity to educate residents on the importance and value of trees. The continuation of these policies needs to be conjoined with bottom-up plans that allow all Hamiltonians to participate in tree planting. In light of these shortcomings, the viability of pocket or micro nurseries, located throughout the city, should be considered. In accordance with this plan, small nurseries would be located within each neighborhood and help service the needs of the surrounding area. This will encourage climate change solutions, tailored to the specific local

area. As an extension of this project, even smaller micro-nurseries that grow only two to five trees could be placed in participants' driveways and front yards. In turn, families and children would be able to help grow trees which are later planted across their neighborhood. Fundamentally, this plan is tailored to an increasing demand for trees. In a post-COVID world, where clean air and public health are more important than ever before, the need for trees will only rise. It is for these reasons that Hamilton needs to increase its urban canopy, on both private and public lands. This idea enhances Environment Hamilton's existing tree seed programs and expands the public's involvement in climate change mitigation.

In addition to placing micro-nurseries on participants' lawns or driveways, remnant lands could be repurposed into prolific and immensely important local pocket nurseries. Pocket nurseries can revitalize what is otherwise vacant land (see Image 1). This may provide an interesting solution to Hamilton's surplus of municipal golf courses, which are experiencing rapidly declining membership (McKee, 2011). These relatively empty areas have the opportunity to transform the surrounding community while combating climate change, through being repurposed as a tree nursery.



Figure 3: Remnant land parcel outside the Canadian Tire property in Dundas, which could be transformed into a pocket tree nursery for tree planting in adjacent neighbourhoods.

Benefits of Trees:

Air Pollution: As urban sprawl reduces natural land and industrial practices continue to pollute the environment, the health impacts of anthropogenic climate change are becoming more apparent. According to the World Health Organization (WHO) (2020a) air pollution alone is responsible for approximately seven million deaths annually. Globally, nine out of ten people breathe polluted air (WHO, 2020a). Moreover, air pollution has been definitively linked to bronchitic symptoms, glaucoma, heart attacks, blood pressure issues, cognitive development problems in children heart failure, and mortality (Turner- Skoff & Cavender, 2019). As urban air is becoming increasingly more polluted, experts call for the global reduction and mitigation of emissions. A well-known means of managing air pollution is by the planting and protection of trees. Trees purify the air by trapping air-borne pollutants and carbon emissions through their leaves and the process of photosynthesis (Halifax, 2020). In turn, trees produce clean oxygen, necessary for humanity's survival. Experts estimate that in the contiguous United States, trees planted in urban areas remove 711,000 metric tons of air pollution each year (Turner- Skoff & Cavender, 2019). Within Halifax alone, trees capture about 1,478 metric tons of air pollution annually, which can be equated to "\$9.6 million each year in air pollution mitigation benefits" (Halifax, 2020). Even when there are no other successful efforts to combat climate change, a reduction in air pollution alone could save millions of lives each year (WHO, 2020a).

Health and Mortality: Eric Windhorst has written on the connection between green spaces and wellbeing, specifically focused on the C2EP (2014). In addition to the vast mental health benefits which will be discussed, exposure to green space has been linked to improved physical wellbeing (Windhorst, 2014). Citing E.O Wilson's *biophilia hypothesis*, Windhorst asserts "that the ever-increasing urbanization of human life is detrimental to our health: just like all humans need social contact with other people, we also need nature contact with other living things" (2014). Just as the presence of trees helps prevent and heal illnesses, the absence of trees has been linked to an increased mortality rate. A study by Donovan, Butry, Yvonne, Prestemon, Liebhold, Gatzliolis, & Mao (2013), illustrated that when 100 million trees were infested by the emerald ash borer, an invasive forest pest, mortality rates related to cardiovascular and lower-respiratory disease rose. Donovan et al., found that across the fifteen states studied, the presence of the borer and the consequential loss of trees was tied "an additional 6113 deaths related to illness of the

lower respiratory system, and 15,080 cardiovascular-related deaths” (2013). Within Canada, millions of ash trees both in urban and rural areas have been destroyed by the borer, and managing this invasive pest has become an issue of ongoing national and provincial concern (Government of Canada, 2019). Protecting trees can help combat cardiovascular and lower-respiratory related mortality.

Climate Change Mitigation: Although meaningfully addressing climate change requires extensive and diverse work and serious changes in human and corporate behaviour, trees are a well-known means of trapping pollutants. By removing emissions from the air and producing oxygen, trees act as powerful air purifiers (Buis, 2020). Greenhouse Gas Emissions are directly tied to climate change and their reduction is an important part of protecting people and the planet from the dangerous effects of climate change (Buis, 2020).

Stormwater Management: Trees and natural lands provide important natural infrastructure that can address a major concern of Hamilton’s municipal government: stormwater. As climate change continues and extreme weather events become more frequent, storm water is becoming a growing issue. Trees and natural lands not only absorb excess storm water that would otherwise gather on streets, they also intercept and improve the quality of runoff water (Donovan, 2017; Turner- Skoff & Cavender, 2019). Whatever water is not absorbed is filtered through trees, cooled through this process, and possesses less pollution when it enters local waterways (Donovan, 2017; Turner-Skoff & Cavender, 2019).

Energy Moderation and Cooling: Trees provide valuable temperature management services that function year-round. In the hotter months, trees provide shade and shelter. They also transpire large amounts of water, which in turn cools the air of the surrounding area (Halifax, 2020). In cooler months, once the leaves have fallen, trees provide protection from winter winds (Halifax, 2020). Trees urban areas can directly reduce the urban heat island effect, a process through which the many reflective and heat-producing surfaces within a city emit more heat, during the already hot, summer months (Halifax, 2020)

Economic Return: In addition to reducing the economic burdens associated with managing the temperature of the surrounding area, natural lands and the trees within them present a number of economic benefits. In particular, trees can enhance the value of a neighbourhood by 25% (Halifax, 2020). Moreover, as the built infrastructure depreciates over time, as trees mature, they rise in

value (Turner- Skoff & Cavender, 2019). It is estimated that for everyone one dollar invested in trees, you can expect to receive eight dollars in return (Halifax, 2020).

Crime Reduction: Vegetation, including trees and natural areas, have been found to reduce crime in the surrounding area. A study by Sullivan and Kuo illustrated that “the greener a building’s surroundings are, the fewer crimes are reported” (2001, p.343). Moreover, this pattern exists is evident in the reduction of both property and violent crimes (Donovan, 2017; Sullivan & Kuo, 2001). Thus, enhancing natural space can increase the safety of Hamilton communities.

Indigenous Reconciliation:

The benefits of trees are closely connected to the preservation of indigenous knowledge and its integration within contemporary society. Ken Parker, co-owner of Sweet Grass Gardens in Hagersville, Ont. on the Six Nations of the Grand River Reserve, aims to promote native plants and highlight their importance to our culture and the environment (Tierney, 2004). Sweet Grass Gardens is believed to be the first North American nursery that is native owned and operated (Tierney, 2004). Through his business, Parker stresses the importance of native plants while illustrating how indigenous people use these native species (Tierney, 2004). A crucial step towards reconciliation calls on municipalities to recognize the importance of trees to indigenous cultures, preserve native tree species and ensure that trees are well integrated within urban areas.



Figure 2: Some of the many benefits of the social, economic and environmental benefits of trees in Halifax (Halifax, 2020).

Best Practices from Neighboring Urban Centers:

In collaboration with a coalition of city agencies, nonprofit organizations and businesses, American Forests is working in Detroit to create neighborhoods “teeming with healthy street trees, verdant parks, vacant lots transformed into centers of community revitalization, and a skilled, local workforce to manage it all”. American Forests aims to create two local tree nurseries that can supply inexpensive trees to the City of Detroit. One of these nurseries is on a once-vacant lot that has been revitalized. Similar, to Hamilton, many Detroit neighborhoods with low urban tree canopies are located in inner-city areas. These growing nurseries are intertwined with workforce development programs, while encouraging tree planting.

Although Hamilton's and Detroit's tree planting programs do not directly replicate each other, many of both communities' needs are the same. Tree planting and increasing the urban canopy not only mitigates climate change, it also improves the wellbeing of the surrounding community and creates important work opportunities. While Detroit's programs rely on two large nurseries, one of which is a prolific use of vacant space, Hamilton may be well suited to the more novel concept of pocket or micro nurseries. Micro nurseries scattered throughout the city and potentially concentrated in lower-income communities, will encourage the growth of the urban tree canopy. As illustrated by American Forests in Detroit, future programs must involve underserved community members and create meaningful work opportunities in the ever-growing field of the green infrastructure.

Summary:

To improve the health of both people and the planet, we must begin to combat climate change at a local level, where the effects of rising global temperatures and extreme weather are often the most severe. By making growing and planting trees more accessible, all residents, especially those from lower socio-economic brackets, can be included in a meaningful fight against climate change. Micro tree nurseries which serve each neighborhood can involve children, seniors and differently-abled people, thus ensuring that the divides in wealth, health and tree coverage, are not worsened. Micro nurseries could also directly serve a participant's own home and the needs of their neighbors. By enhancing existing programs within Hamilton, trees in a front yard could become commonplace and the city can become greener than ever before. The need for trees is only growing more prominent, especially in the age of COVID which stresses the importance of preventive healthcare. Hamilton has the power to take concrete steps towards climate mitigation, all within our own yards and city streets.

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