Planting trees in low-income communities in Toronto:
A look at the pilot TCHC Planting and Stewardship Initiative

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Abstract

The distribution of the urban forest, and by extension its benefits, are not as low-income communities typically have fewer trees in their communities and exposed to environmental health impacts. In recognizing this, a pilot project (The TCHC Planting and Stewardship Initiative) was undertaken which aims to increase native trees and shrub planting on three low-income properties in Toronto while engaging the community in stewardship. The objective of this capstone is (1) to confirm whether Toronto Community Housing (TCHC) properties tend to be located in neighbourhoods with lower canopy cover, (2) to examine the relationship between the number of TCHC properties within each neighbourhood and the realized and potential canopy cover, (3) to make the case for why the initiative was an important project in each of the three communities selected in 2018, and (4) to evaluate to progress and perception of the initiative thus far and provide recommendations.

Results suggest that TCHC properties are more likely to be located in neighbourhoods with lower canopy cover but have a high potential for tree planting. Across the three properties, there were more non-native species present than native species, making these sites good candidates for native tree planting. Currently, the initiative is on track to meet most of its objectives. Themes identified from staff surveys and an assessment of the work accomplished thus far was used to provide recommendations for the organizations moving forward.

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1   Introduction

1.1   Background

Urban forestry is the practice of managing city trees for the environmental, economic, and social benefits that they provide to residents (Konijnendijk et al., 2006). Environmental benefits include serving as a food source or habitat for animals, reducing stormwater runoff, and improving the air and water quality (Escobedo et al., 2011; Kuehler et al., 2016; McPherson et al., 2005; Tallis et al., 2011). Economic benefits include attracting businesses, increasing property values, and reducing heating and cooling costs by providing shade and acting as windbreakers (McPherson et al., 2005). Social benefits include mitigating the urban heat island effect, protecting people from UV ways, and enhancing recreational spaces that promote an active lifestyle and sense of community (Harlan et al., 2006; Jennings and Gaither, 2015; McPherson et al., 2005). The wide range of benefits that trees provide are tied to the structure of the urban forest. Larger trees provide up to 16 times more benefits than smaller stature trees (McPherson et al., 2003; Stagoll et al., 2012). In addition, a diverse range of native species is also vital as they support more native species than non-native trees do and make the urban environment more resilient against any stress (Helden et al., 2012; Schlaepfer et al., 2010; Simberloff, 2005). Ensuring that there is an abundant amount of large, healthy, and native urban trees is important because it improves the quality of life for city residents. However, the reality is that the distribution of trees within a city, and by extension their benefits, is inequitable.

1.2   Inequitable Distribution of Canopy Cover

An inequitable distribution of trees means that some residents fail to experience the full range of benefits that trees would provide and are exposed to adverse environmental stress. Communities that have fewer trees are exposed to more sunlight, heat, and poorer air quality that could aggravate respiratory problems (Harlan et al., 2006; Jennings et al., 2017). Lack of vegetation and trees also translates into fewer opportunities to reduce levels of anxiety or stress (Jennings and Gaither, 2015; McPherson et al., 2005). Therefore, having fewer trees can negatively affect the quality of life by impacting a person's physical, emotional, and mental well-being. One community that often lacks tree cover are low-income households.

Harlan et al. (2006) and Jesdale et al. (2013) found that lower socioeconomic groups and ethnic minorities were more likely to live in areas with greater heat exposure because their

neighbourhoods had more impervious surfaces and little vegetation or tree cover. A strong correlation has also been found between canopy cover and median household income where high-income American neighborhoods had more trees and green spaces compared to low-income areas (Mills et al., 2016; Schwarz et al., 2015). In Montreal, Pham et al. (2017) discovered that street tree cover had a positive association with income, so as household income increased, so did street tree cover, providing another example where tree cover was tied to income levels. This phenomenon is not limited to North America, as Kirkpatrick et al. (2011) found that across 6 Australian cities, trees were less dense in neighbourhoods with low-income and low-education compared to areas with higher income and education.

Having fewer trees is worrying for low-income households because these people are already vulnerable. A reality for these communities is that they often lack access to resources or facilities that would increase the livability of the area they live in, such as having swimming pools, air conditioning, or shingled roofs that can provide relief from the summer heat (Harlan et al., 2006; Jennings et al., 2017). Mental health is another concern as these folks can suffer from stigma and often lack access to resources, such as community mental health services, that can properly diagnose or treat their mental illness (Eaton and Muntaner, 1999; Raphael, 2007). Therefore, having plenty of big and healthy trees is one way to help improve the mental health in such communities (Jennings and Gaither, 2015).

1.2.1 Efforts to Address Inequitable Canopy Cover

Steps by municipalities, businesses, and environmental non-government organizations (ENGOs) have been taking to increase equitable canopy cover (Table 1). Municipalities have created educational campaigns and hosted tree giveaways in order to encourage tree planting within the city (Hsieh, 2012; Million Tree Challenge, n.d; OneMillionTreesMissasauga, n.d.). Businesses also help increase tree cover by providing donations or work hours for tree planting initiatives (NeighborWoods, n.d.; TD Bank, n.d.; TD Friends of the Environment Foundation, n.d.). ENGOs also deliver tree planting services where municipalities lack the capacity to do so (Watkins et al., 2017). With a focused objective, ENGOs can direct their resources to achieving their goals while cities or businesses may be balancing other priorities, such as tree removal requests, by-law compliance, or maintaining profits (Watkins et al., 2017; Wilson and Lindsey, 2009). Partnerships between these actors have also been created where a business or ENGO will provide a tree-related service at a subsidized price (Cohrs, 2015; Hsieh, 2012; Sonora Environmental Research Institute Inc., 2018; Special, 2015).

Unfortunately, a common characteristic with tree planting initiatives is that, often times, the resident is expected to reach out and request planting or being part of a program. Furthermore, it should be noted that tree planting efforts are also directed at home owners, which leaves households who rent their property, such as low-income households who rent, in a bind. While programs have been undertaken in the past that target certain low-income communities, most appear to be one-time events rather than ongoing programs (NeighborWoods, n.d. TD Friends of the Environment Foundation, n.d.; Hsieh, 2012; Ottawa Community Housing, 2015; Special, 2015; ReForest London, 2017; Wong, 2017). These instances of short-term engagement around tree planting in low-income communities can fail to have a substantial impact or momentum to carry forwards into other communities across a city.

1.3   Toronto's Canopy Cover

Toronto's canopy cover hovers around 27%, with an estimated 10.2 million trees (0.6 million trees are on city property, 3.5 million trees are in parks and natural areas, and 6.1 million trees are on private property) (City of Toronto et al., 2013a; Nowak et al., 2013). The urban forest within the city has a structural value of $7.1 billion dollars and a value of $28 million in ecological services, such as carbon storage, carbon sequestration, pollution removal, and lower energy costs and avoided emissions (City of Toronto et al., 2013a; Nowak et al., 2013). In recognizing the benefits that the urban forest provides, Toronto has a goal to expand its canopy cover from 27% to 30-40% (City of Toronto et al., 2013b).

1.3.1 The Distribution of Canopy Cover in Toronto Neighbourhoods

The canopy cover across the city differs between neighbourhoods and has been found to have a positive correlation with neighbourhood income. Greene et al. (2018) have determined that there is a positive relationship between canopy cover and median household income, where neighbourhoods with higher median income had significantly higher canopy cover. These results confirm that, like many other cities, Toronto does not have an equitable distribution of canopy cover within the city, and the number of trees is correlated with income. It is also interesting to note that neighbourhoods with the highest average real estate value also have some of the highest canopy cover percentages in Toronto (City of Toronto et al., 2013a). What these findings suggest is that low-income communities in Toronto have fewer trees. This can expose residents to adverse environmental health impacts, such as higher heat and UV exposure, lower air quality, and negatively impact their mental wellbeing, thus affecting their quality of life (McPherson et

al., 2005; Harlan et al., 2006; Jennings and Gaither, 2015; Jennings et al., 2017).

1.3.2 Efforts to Address Uneven Canopy Cover in Toronto

While the city has a goal to increase its canopy cover to 40% by 2050, there are no explicit plans to concentrate tree plantings in low-income communities. Unfortunately, city efforts to increase tree planting is made difficult because of the emerald ash borer (EAB) infestation that has devastated approximately 10% of the trees in the city (City of Toronto et al., 2013b). Currently, a main focus of the City of Toronto centers around educating and encouraging residents to plant trees on their own private property, given that the majority of trees within the city are on private property (City of Toronto et al., 2013b). Without directing efforts to plant in low-income communities, these residents are at a disadvantage because they have a low capacity to plant and care for the trees themselves. Where the city lacks the resources or time to dedicate tree planting in communities that need them the most, other actors can step up.

1.4   The Pilot "TCHC Planting and Stewardship Initiative"

In 2018, a pilot project named the 'TCHC Planting and Stewardship Initiative' was undertaken by the Toronto Community Housing Corporation (TCHC), Toronto's social housing provider, Local Enhancement and Appreciation of Forests (LEAF), a non-profit focused on growing and sustaining the urban forest, and Park People, a non-profit that helps animate and encourage residents to use their park spaces. This initiative was created because the organizations recognized that low-income communities often have fewer trees. As Canada's largest social housing provider, TCHC manages 2,100 buildings in 106 communities across the city for 110,000 tenants (Toronto Community Housing [TCHC], 2018a). Within the past few years, upwards of 80% of the trees on TCHC properties were impacted by the 2013 ice storm or EAB infestation (Local Enhancement and Appreciation of Forests [LEAF], 2018b). These impacts have lowered the canopy cover and left behind a high proportion of non-native species that suggests the communities are less resilient to any environmental stress (LEAF, 2018b).

The objectives of the initiative are as follows:

1. <u>Increase native tree and shrub planting on privately-owned land</u> by planting 100 native trees and 230 native shrubs across three sites.

2. <u>Support tree care activities</u> by conducting an inventory and identifying planting

opportunities, engaging TCHC staff and tenants in the development of a planting plan, and engaging tenants in the planting and ongoing tree care via a stewardship team.

3. Support inclusive community engagement between the project partners and TCHC tenants, provide tree planting, stewardship training, and a resource package to stewardship teams and YouthWorx (TCHC's youth employment program).

4. Build community capacity, knowledge sharing, partnerships, and networks by working with YouthWorx to provide arboriculture training and post-program employment or education opportunities.

5. Facilitate community driven, locally-owned tree stewardship efforts by providing an honoraria or budget for each stewardship team to facilitate and support participation in the project, and working with the teams and YouthWorx to engage other tenants.

The sites chosen for the initiative were identified by TCHC Facilities Management staff, with higher consideration given to properties were tenants requested planting. After site visits by TCHC and LEAF staff to identify properties with the most planting potential, the following three sites were chosen: 111 Kendleton Drive hereby referred to as 'Kendleton', 1901 Sheppard Avenue West, hereby referred to as 'Sheppard, and Scarlettwood Court, hereby referred to as 'Scarlettwood'.

Funding for the initiative was secured through a one-time grant through the Toronto Parks and Trees Foundation, as part of the Every Tree Counts program supported by the City of Toronto. Additional in-kind support was provided in the form of trees and planting services by Cohen & Master Tree and Shrub Services and City of Toronto Forestry.

1.5   Capstone Objectives.

Given that the TCHC Planting and Stewardship Initiative is a pilot project, there are plenty of learning opportunities that the project partners can draw on to refine how the initiative is implemented in the future at other properties, if it were to receive further funding. My capstone will determine the environmental context behind the initiative, strengthen the rationale for the project, and highlight themes that will be used to suggest recommendations. The objectives of my capstone are as follows:

1. Confirm what Greene et al. (2018) have established, but specifically looking at whether TCHC properties, which are low-income communities, tend to be located in neighbourhoods with lower canopy cover.

2. Examine the relationship between the number of TCHC properties, TCHC apartment complexes, and TCHC houses, and the realized canopy cover (RCC) and potential canopy cover (PCC). RCC refers to existing canopy cover and PCC refers to areas that can support trees (Greene et al., 2018). Determining these characteristics will identify broad planting constraints or opportunities across the city landscape.

3. Make the case for why the initiative was a good project by looking at the urban forest structure at each property chosen for the pilot project.

4. Evaluate the progress and perception of the initiative thus far in order to provide recommendations moving forward.

2 Methods

2.1 Neighbourhood Canopy Covers and the TCHC Properties

The first and second objectives follow the same methodology where the area of RCC and PCC and the number of TCHC properties in each neighbourhood were determined.

Toronto's land cover dataset, a shapefile of Toronto's neighbourhood boundaries, and a shapefile of TCHC developments were downloaded (Table 2). The files were imported into ArcMap and irrelevant land cover types were deleted, leaving behind only the tree canopy, grass/shrub, and bare earth cover types. Next, the remaining land cover types were converted into a raster file, then further into polygons. The polygons were clipped to neighbourhood boundaries, then dissolved by land cover type and neighbourhood code in order to aggregate the same land cover types within one neighbourhood. The area of each land cover type within each neighbourhood was calculated in m^2. A simple count of how many TCHC properties, apartment complexes, and houses existed in each neighbourhood was done. For the purpose of this analysis, apartment complexes included high-rise and low-rise buildings, while houses included townhouses and detached houses.

Next, Poisson distributions were used to determine the probability of finding a TCHC community within a neighbourhood given an increase in the RCC or PCC by comparing the

neighbourhoods to each other. In particular, zero-inflated Poisson regressions were fitted to the data using the zeroinfl function of the PSCL package in R. This was used because the number of TCHC properties per neighbourhood did not always fit a Poisson distribution as there were a high number of zeros (where no properties existed within a neighbourhood). The proportion of canopy cover types in each neighbourhood was used as an explanatory variable to explore its effects on the number of TCHC properties per neighbourhood. The significance of the canopy covers was analyzed using a Log-Likelihood approach, where the model with the explanatory variable was compared to a model that did not contain this variable, known as the null model.

2.2   The Urban Forest at the Three Selected TCHC Sites

For the third objective, the urban forest structure was examined. Components that were looked at include the canopy cover, tree size distribution, and species diversity before and after the initiative. To reiterate, the three sites chosen for the initiative were Kendleton, Sheppard, and Scarlettwood which were selected after careful consideration by TCHC and LEAF.

The percent canopy cover of each site was determined using i-Tree Canopy v.6.1 (Table 2). This tool is available online and is similar to the methodology used to determine the canopy cover in the 'Every Tree Counts' report using aerial images (City of Toronto et al., 2013a). 550 random points were plotted within the TCHC property of each site and given a land type classification (tree, shrubs, grass, pavement, house, other). Google streetview or aerial image was used to confirm the classification of any points that were hard to determine. The canopy cover was the percentage of points classified as trees.

Tree inventories were conducted before trees were planted for the initiative using the Neighbourhwoods© protocol. Neighbourhwoods©, developed by Dr. W.A. Kenny and Dr. D. Puric-Mladenovic, is a standardized way for communities and professionals to collect tree information based on 30 criteria that can be used to inform strategic management plans (Neighbourwoods, 2018).

Trees were classified to the species level in order to determine if they were native or non-native to southern Ontario. Species that were undetermined, or only classified to the genus level were considered to be 'unknown' species. As access to private yards was not possible, trees in gated yards had their DBH and other height criteria estimated. Lastly, the species and number of

trees planted under the initiative was used to compare the native and non-native species composition before and after the planting.

2.3   Progress and Perception of the Initiative Thus Far

2.3.1 Progress of the Initiative

The progress of the initiative was determined based on whether the objectives and their components were achieved to date and to what degree.

2.3.2 Perception of the Initiative

Project partner staff who had a direct role in the planning and implementation of the initiative were asked to participate in a survey (Appendix 1). The survey was kept open for a period of four days before being closed. Responses to open-ended questions were grouped together based on the themes brought up. Unfortunately, due to the ongoing timeline of the initiative, community engagement activities were still underway during the completion of this capstone. Therefore, tenant perception of the initiative was excluded from the capstone.

My personal experience will be based on interactions with project partner staff and TCHC tenants at each of the chosen project sites during outreach or engagement events, such as meetings or information sessions, that have happened over the course of the summer and early fall. The observations will also be grouped together by themes raised.

3   Results

3.1   Neighbourhood Canopy Covers and the TCHC Properties

There was a significant effect of the RCC (P = 0.01) and PCC (P = 0.02) on the number of TCHC properties per neighbourhood (Table 3; Fig 1; Fig 2). While the number of TCHC properties per neighbourhood did not change with increasing RCC (z = -1.74; P = 0.08), the probability of having neighbourhoods with no TCHC properties, increased with increasing RCC (z = 2.01; P = 0.04) (Table 3). For the PCC, the number of TCHC properties per neighbourhood significantly increased with increasing proportion of RCC (z = 2.21; P = 0.03) (Fig 2).

There was a significant effect of the RCC (P = 0.01) and PCC (P < 0.01) on the number of TCHC apartment complexes per neighbourhood (Table 3; Fig 3; Fig 4). The number of TCHC

apartment complexes per neighbourhood significantly decreased with increasing RCC ($z = -1.99$; $P = 0.05$) and PCC ($z = -3.86$; $P < 0.01$) (Table 3; Fig 3; Fig 4).

Lastly, there was a significant effect of the RCC ($P < 0.01$) on the number of TCHC houses per neighbourhood, but no significant effect of PCC ($P = 0.0972$) on the number of TCHC houses (Table 3; Fig 5; Fig 6). The number of TCHC houses per neighbourhood significantly increased with increasing RCC ($z = 2.54$; $P = 0.01$) (Table 3; Fig 5). In addition, probability of having neighbourhoods with no TCHC properties increased with increasing RCC ($z = 2.26$; $P = 0.02$) (Table 3).

When the TCHC properties are mapped against the RCC and PCC within each neighbourhood, they appear to be clustered in neighbourhoods with lower RCC and medium PCC (Fig 7; Fig 8). When this is separated into property types, the apartments appear to be located in neighbourhoods with lower RCC and PCC, while the houses appear to be located in higher RCC and PCC (Fig 9; Fig 10).

3.2 The Urban Forest at the Three Selected TCHC Sites

At Kendleton, the canopy cover was 18.50 % ±1.66% and comprised of 158 trees. A majority of the trees at this site are considered to be small in size (Fig 11). Of the 22 species present, 8 (36%) were native, while 10 (46%) were non-native (Fig 12). Of the 154 trees present, 55 (33%) were native while 88 (57%) were non-native (Fig 13). The top three abundant species, which made up 39% of the trees, were *Acer negundo* (Manitoba maple) (16%), *A. platanoides* (Norway maple) (15%), and *Quercus rubra* (red oak) (8%) (Fig 14).

At Sheppard, the canopy cover was 14.90% ±1.52% and comprised of 116 trees. A majority of the trees at this site are considered to be small in size (Fig 11). Of the 19 species present, 7 (37%) were native, while 8 (42%) were non-native (Fig 12). Of the 114 trees present, 49 (43%) were native while 48 (42%) were non-native (Fig 13). The top three abundant species, which made up over 60% of the trees, were *Ulmus pumila* (Siberian elm) (24%), *Thuja occidentalis* (white cedar) (20%), and *Gleditsia triacanthos* (honey locust) (17%) (Fig 15).

At Scarlettwood, the canopy cover was 29.80% ±1.95% and comprised of 173 trees. A majority of the trees at this site are considered to be medium in size (Fig 11). Of the 16 species present, 6 (37%) were native, while 8 (50%) were non-native (Fig 12). Of the 172 trees present,

72 (42%) were native while 98 (57%) were non-native (Fig 13). The two most abundant species that made up 58% of the trees here were *G. triacanthos* (31%) and *P. nigra* (27%) (Fig 16).

In total, 74 trees from 12 species (11 native and 1 non-native) were planted across the three sites for the initiative (Table 4). At Kendleton, the number of native species increased from 8 to 14 (36% to 50%), and native trees increased from 50 to 81 (33 to 42%) (Table 5). At Sheppard, the number of native species increased from 7 to 15 (37% to 55%), and native trees increased from 49 to 73 (43 to 53%) (Table 5). At Scarlettwood, the number of native species increased from 6 to 10 (37% to 50%), and native trees went from 72 to 84 (42 to 46%) (Table 5).

3.3 Progress and Perception of the Initiative Thus Far

3.3.1 Progress of the Initiative

An examination of the progress to date is outlined in Appendix 2. Only the first objective has been achieved, but not fully as 67 native trees were planted rather than the targets initially set out. Components around conducting a tree inventory and engaging TCHC staff and tenants in the planting plan have been accomplished. However, other tenant engagement components are still underway. Components involving YouthWorx, TCHC's youth employment program, were not undertaken this year.

3.3.2 Perception of the Initiative

The responses from staff surveys were used to identify themes from the initiative. My personal observations align with what has been identified from the surveys. The following themes raised are organized in a SWOT analysis that will also be explained below (Table 6).

Some strengths of the initiative centered around the flexibility of the organizations and hard-working staff which made it possible to adapt quickly. An example of this is illustrated in how the project partners removed shrubs in order to eliminate potential hiding spots and removing a couple of trees to maintain an open area for recreational sports. Strong collaboration and communication between the organizations made the initiative and a variety of engagement events possible.

There were a number of weaknesses identified. Uncertainty existed around the roles and responsibilities of the staff and organizations, which was made clearer over time. The complex structure of TCHC and unique characteristics at each site chosen for the initiative was a

challenging and unfamiliar environment to navigate. Staff were brought onto the project during various stages which made it challenging to ensure everyone was on the same page. More hours were also dedicated to the project and behind-the-scenes logistics than anticipated, which was challenging as staff were also juggling regular duties within their organizations.

A number of opportunities also exist. Tenants who were engaged were enthusiastic about the project, so there is the potential for successful stewardship. There are opportunities for engagement and education of both TCHC staff and tenants in the future that can get them interested in the project and trees in their communities as both groups were unaware of the urban forest structure and its impact in the community. While the integration of YouthWorx did not happen in 2018, as there was limited time to adequately plan and implement this component, this is an area that can be pursued in the future. Staff were also able to identify programs that can be tapped into in order to build community capacity and increase engagement over the winter.

One obvious threat is the possibility that the initiative may not receive funding in the future. Other threats center around engagement as some tenants expressed disinterest in planting trees since they were concerned with maintenance or safety issues in the community. It was also challenging to connect with tenants because Park People and LEAF could be viewed as outsiders with no vested interest or duty to the community. In addition, the majority of the community at each site has yet to be engaged with thus far, despite engagement efforts made at each site (Table 7). Ensuring that there is adequate training and resources available to support tree care by the tenants is another challenge that was raised.

4   Discussion

4.1   Neighbourhood Canopy Covers and the TCHC Properties

It was found that the probability of having no TCHC properties within a neighbourhood increased with increasing proportions of RCC but the number of TCHC properties increased alongside increasing PCC (Table 3; Fig 2). These results suggest that low-income tenants in TCHC housing tend to be located in neighbourhoods with fewer trees but with potential for trees to be planted in the future. This is illustrated in Figure 7 and Figure 8. When looking at TCHC apartment complexes, it was found that the probability of having a TCHC apartment within a neighbourhood significantly decreased with increasing proportions of RCC and PCC (Table 3; Fig 3; Fig 4). On the other hand, the number of TCHC houses increased significantly with

increasing RCC, but there was no significant impact by PCC (Table 3; Fig 5; Fig 6). This is illustrated in Figure 9 and Figure 10. It should be noted that, while the number of TCHC houses significantly increased with increasing proportions of RCC, the probability of finding no neighbourhoods with any TCHC houses also increased (Table 3). These results imply that tenants in apartment complexes tend to be in neighbourhoods with fewer canopy cover and lower potential for tree planting compared to tenants that live in TCHC houses.

These results are important as poverty is on the rise in Toronto and becoming concentrated in certain neighbourhoods, as areas classified as 'low-income' grew from 19% in 1970 to 53% in 2005 (Hulchanski, 2010; Toronto Public Health, 2011). With more households becoming classified as low-income and living in subsidized housing provided by the TCHC, there is a higher chance that these families will be living within a neighbourhood that has low canopy cover. Fewer trees on and around TCHC property can negatively impact the tenants' physical, emotional, and mental well-being (Eaton and Muntaner,1999; Harlan et al., 2006; Jennings et al., 2017; Raphael, 2007).

These findings also confirm what Greene et al., (2018) have established in Toronto and are consistent with the literature regarding how low-income communities tend to be located in neighbourhoods with fewer trees (Harlan et al., 2006; Jesdale et al., 2013; Kirkpatrick et al., 2011; Mills et al., 2016; Schwarz et al., 2015). However, a major limitation is that the land cover file used in this analysis to determine the RCC and PCC was updated in 2009. Therefore, it is possible that the statistical results would be different if the land cover data was more accurate to reflect recent land cover percentages. In addition, the canopy cover can vary within a neighbourhood, and not all plantable spaces are suitable for sustaining an urban forest.

4.2   The Urban Forest at the Three Selected TCHC Sites

Knowing the canopy cover and tree size distribution at each site is important because it can reveal characteristics of the urban forest that should be managed for. Kendleton and Sheppard both had a lower canopy cover (18.50% ±1.66% and 14.90% ±1.52%) while Scarlettwood had a higher canopy cover (29.80% ±1.95%). The reason for this discrepancy may be because of tree size, as Kendleton and Sheppard had a high abundance of small trees while Scarlettwood had a higher abundance medium trees (Fig 11). For Kendleton and Sheppard, these results highlight the need to have tree stewardship in order to ensure that the young trees on the property will be able to grow into large trees and increase the canopy cover at the site. As for

Scarlettwood, the results show that most of the trees in the community were likely planted around the same time, are roughly the same age, and will most likely begin to decline around the same time in the future. This creates a strong rationale for proactive tree planting and stewardship so that young trees can establish and help maintain the canopy cover at Scarlettwood as the larger trees mature and decline.

At each of the three sites, there were more non-native species and trees than native species or trees (Fig 12; Fig 13). The most abundant species at each site tended to be non-native, and only a few species comprised about half or more of the trees at each site (Fig 14; Fig 15; Fig 16). These results confirm what the organizations believe is on the ground regarding how TCHC properties have higher proportions of non-native species (LEAF, 2018). A possible reason behind the high abundance of non-native species and why so few species dominate the properties is that the species in question (*A. negundo, A. platanoides, P. nigra, U. pumila, and G. triacanthos*) are hardy urban and/or invasive trees. This is concerning as non-native trees fail to support native biodiversity and having so few species dominate the urban forest runs a risk of losing a large portion of the canopy cover if a pest or disease were to target any of the dominant species (Greene and Millward, 2016; Helden et al., 2012; Ordonez and Duinker, 2013; Simberloff, 2005). Therefore, planting native species under the initiative is a positive step towards diversifying TCHC properties, supporting native biodiversity, and making them resilient to any unforeseen impacts in the future.

Under the initiative, the composition of native species and trees increased at each site, but the trees planted were limited to a handful of the hardiest native species, with the exception of one non-native species (Table 4; Table 5). This is because urban growing conditions are notoriously tough, with compacted soil, urban pollution, salt, and physical damage, that can kill sensitive native trees (Mullaney et al., 2014).

It should be noted that there were some limitations associated with the canopy cover and tree inventory data. The accuracy of the canopy cover depended on how well the points were classified into different land cover types. In some cases, points were difficult to classify because they were placed in dark shadows or it was not clear whether the point was over a shrub or small tree. Trees adjacent to the properties could affect the accuracy of the canopy cover, as the canopy was counted within the boundary but TCHC is not responsible for that tree. In other words, if the adjacent property owner decided to cut down these trees, then the canopy cover could go down

but at no fault by TCHC. A potential problem that could arise is also the use of outdated aerial images. Another limitation is that trees in gated yards were not accurately measured as there was no access, which could have slightly skewed the data.

4.3   Progress and Perception of the Initiative Thus Far

4.3.1 Progress of the Initiative

Based on the progress thus far, the TCHC Planting and Stewardship Initiative is on track to achieve most of its objectives (Appendix 2). Fewer trees were planted than what was proposed, and no shrubs were planted due to safety concerns, but the project partners were able accomplish their first objective to increase native tree planting at each property. Consultations with TCHC staff and tenants regarding the planting plan were held and feedback was incorporated into the final planting plan, accomplishing components around supporting tree care activities. Initial steps have been taken in order to pursue tenant engagement as contact with interested tenants was made and a training plan around proper tree care, and a stewardship plan and resource package is being developed in order to ensure that the teams are equipped with the knowledge and skills to care for the newly planted trees in the spring of 2019. Unfortunately, components that revolve around YouthWorx have not been implemented in 2018, meaning that those objectives have not been met. The organizations have accomplished a lot under the initiative over 2018, and while some aspects were not pursued, that is to be expected for a pilot project. There were plenty of learning opportunities throughout the year that will be drawn upon to improve implementation in the future, that will be discussed in the sections below.

4.3.2 Perception of the Initiative

Over the course of the year, changes were made around how the initiative would unfold, such as choosing to not plant shrubs due to safety concerns, revision of planting plans to accommodate feedback, and removal of YouthWorx as a component in the initiative this year. Having a time lag between when a project is planned out to when it is implemented can result in unpredictable events, shifting priorities, budget reallocation, staff turnover, or changing political and social landscapes (Traynor et al., 2015). In the case of this initiative, being flexible and responsive to new developments has been a strength of the project partners (Table 6). This is especially the case for small organizations like LEAF and Park People who can quickly adapt to changes while larger and more hierarchical or structured organizations may have less flexibility

(Watkins et al., 2017). Having strong communication between the project partners is also vital in order to respond quickly to any changes (Traynor et al., 2015).

Points were made regarding the structure and operation of the initiative that highlight challenges associated with engaging in projects that involve multiple actors which included unclear roles and responsibilities, navigating unfamiliar environments, and dedicating more time to the pilot project than anticipated (Table 6). Partnerships between organizations has become a strategy to enhance the efficiency and effectiveness of tackling an issue as resources, knowledge, and technology or skills can be pooled together, and the labor can be divided (Brinkerhoff and Brinkerhoff, 2011). However, these arrangements can be difficult when there are unclear divisions of labour that can make implementing a project inefficient (Babiak and Thibault, 2009; Brinkerhoff and Brinkerhoff, 2011). Garcia-Canal et al., (2003) have found that partnerships between two similar organizations can achieve more than partnerships between multiple, vastly different organizations who may have different structures or focuses. With so many actors involved, another challenge is ensuring that the information is passed through the right channels to key staff (Babiak and Thibault, 2009). Despite the challenges identified, it is important to note that this is the first year that such an initiative has been undertaken by the organizations, so it is expected that there are kinks to be worked out. Constant communications maintained by the staff thus far have worked towards developing a clear plan and understanding of the work involved at each stage of the initiative as the project unfolds.

While the bulk of tenant engagement for the initiative is still ongoing, efforts made so far were met with mixed reactions as some tenants were disinterested in the idea of planting and caring for trees in their community while others were excited. Moskell and Allred (2013) found that a majority of residents in New York believed that the government should be responsible for tree care, rather than placing that responsibility on residents. If TCHC tenants feel this way, it could explain the disinterest and difficulty in getting them animated about stewardship. Another factor may be that there are a number of barriers which can prevent them from investing the time required to care for the trees. This may include a lack of time, unpredictable or unconventional work schedules, family demands, or transportation availability (McBride et al., 2006). TCHC tenants were also aware of the general benefits that trees provide. Therefore, if more emphasis was placed on the benefits that trees provide, especially the intangible, then there may be more uptake and approval of the project (Bair et al., 2016).

By including staff responses and my own experiences, I have been able to identify common themes across multiple perspectives. However, a limitation with this type of data is that it is limited to what each staff and I have experienced. The interpretation of staff responses is also potentially biased if any answers were vague.

5 Recommendations

In recognizing that this is a pilot project, the following are key recommendations drawn from opportunities identified through the work that has been done so far.

5.1 Structural or Operational

- Consider monitoring and evaluating the progress of the initiative using a set of criteria and indicators. A proposed set of criteria and indicators, modified from Anderson and Fellen (2009) and UNICEF (2018), is outlined in Table 8. This will help assess the performance of the initiative and identify areas for improvement in the future.

- Continue to have clearly defined roles and responsibilities for all staff involved.

- Maintain the ability to adapt to changing needs or concerns.

- Have the full support of all TCHC staff who may be involved at a property before beginning tenant engagement. Staff buy-in can increase the likelihood that the tenants will be open to the project.

- Start planning earlier and have a structured plan in place detailing what steps need to be taken by who and when. This will establish an efficient and effective course of action.

- Have consistent communication with each other to ensure staff are all on the same page and updated with new developments. This can be done by designating a liaison within each organization responsible for communications between and within their organization.

5.2 Planting Activities

- Maintain planting ~100 trees at three properties. Shrubs can also be considered if no safety concerns are raised. These numbers can be raised as the implementation is streamlined in the future.

- Monitor newly planted trees over the upcoming years (first, third, and fifth year after planting) to ensure survival, proper care, and health.

- Continue planting on TCHC properties, focusing around apartment complexes where a higher number of tenants live or properties with low canopy cover and few young trees.

5.3   Tenant Engagement

- Continue to involve TCHC staff and tenants throughout the development and approval of the planting plan. This will foster a sense of ownership for the tenants.

- Get feedback from tenants at each community to identify motivations for or against participating. This can be used to tailor tenant engagement strategies in the future.

- Understand how the local community is structured in order to tap into existing community programs or networks to get key tenants to champion the project in their community.

- Continue to increase and diversity tenant engagement. This can be done by handing out flyers or information sheets about specific benefits of the urban forest in their community (determined after a tree inventory is completed), hosting information sessions during various dates and times, and hosting events in conjunction with promoting the initiative.

- Incorporate YouthWorx in the future, if possible, to have a more meaningful impact as the youth will learn new skills and make a positive change in the community.

- Maintain regular communication with Stewardship Teams over the following summer and yearly thereafter to support the tenants and address any barriers or concerns raised.

6   Conclusion

Trees are known to provide a wide range of benefits to people who live within the city. Unfortunately, the reality is that trees are not distributed equitably across the city, as low-income communities tend to have fewer trees. This exposes these communities to a number of adverse health impacts. Toronto is no exception to this phenomenon, and in recognizing that vulnerable populations live in areas with fewer trees, a pilot project called the TCHC Planting and Stewardship Initiative was undertaken in 2018. The objective of the initiative was to increase native trees and shrub planting on three low-income properties in Toronto while engaging each

community in stewardship of the new trees.

The objectives of my capstone were (1) to confirm whether Toronto Community Housing (TCHC) properties tend to be located in neighbourhoods with lower canopy cover, (2) to examine the relationship between the number of TCHC properties within each neighbourhood and the realized and potential canopy cover, (3) to make the case for why the initiative was an important project in each of the three communities selected in 2018, and (4) to evaluate to progress and perception of the initiative thus far and provide recommendations.

Results suggest that TCHC properties are more likely to be located in neighbourhoods with lower canopy cover but have potential for tree planting initiatives given the amount of plantable space. The initiative brought about a positive change in the species composition at each of the three sites as they were all dominated by non-native species prior to the project undertaking. The initiative appears to be on track to meet most of its objectives. Based on the themes identified and work that has been accomplished thus far, a number of recommendations were provided that focus on the structure or operational aspects of the initiative, planting activities, tenant engagement strategies. Through the work that has been, and will be accomplished under this initiative, TCHC, LEAF, and Park People are making Toronto a more livable city by planting trees in communities that need them the most.

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Appendix

Table 1: List of efforts made by municipalities, corporations, and environmental non-governmental organizations (ENGOs) to address inequitable canopy cover.

Actor	Initiative	Description
Government	Million Trees Initiative	• Multiple municipalities (New York, Missasauga) adopted a goal to plant a million trees (Grove et al., 2014; Million Tree Challenge, n.d.; OneMillionTrees- Missasauga, n.d.)
Government	Tree Planting	• 150 trees planted in Ottawa Community Housing property (OCH) in 2014 after losing 3,000 trees on OCH property to the EAB (Ottawa Community Housing, 2015)
Government	Educational campaigns	• Municipalities engage in public awareness campaigns about benefits of trees in order to educate residents and increase tree planting across the city
Government	Free Tree Giveaways	• Goal is to eliminate financial barriers against planting a tree • No data or studies demonstrating that free tree giveaways actually go towards tree planting in low-income neighbourhoods
Government	Urban forest management plans	• Increase tree planting by setting canopy cover targets in the city • Most plans look to increase canopy cover at a city-wide scale without paying attention to focusing efforts in low-income communities (exception of the City of Kingston that considers planting fruit trees in low-income neighbourhoods)
Business	Donations / Sponsors	• Donations towards tree planting initiatives • Nascar Green, Met Life Foundation, Double Tree by Hilton, Puffs, and the US Forest Service are all sponsors of NeighborWoods, an annual initiative in America organized by the Arbour Day Foundation's Alliance for Community Trees where volunteers take actions to plant trees in their community (NeighborWoods, n.d.) • Through their TD Friends of the Environment Foundation, TD has funded over $76 million across 24,000 environmental

		projects and programs (TD Bank, n.d.; TD Friends of the Environment Foundation, n.d.)
Business	Volunteer hours	• TD employees and families of employees engage in TD Planting days (TD Friends of the Environment Foundation, n.d.)
ENGO	Tree Planting	• Keep Indianapolis Beautiful Inc., an ENGO, focused on planting trees in low-income neighbourhoods after realizing these areas lacked trees (Watkins et al., 2017)
ENGO	Tree Planting	• ReForest London in Ontario will plant a tree on behalf of an individual who donates $25 in a public park, $50 in a low-income neighbourhood, and $400 in a school yard (ReForest London, 2017)
Government and Business	Tree planting	• Tucson Electric Power customers or Trico Electric customers can also order shade or fruit trees and pay either $8/tree for Tucson Electric Power customers or $15/tree for Trico Electric customers, given they are planted on the south, west, or east side of the home in order to lower energy costs (Special, 2015)
Government and ENGO	Free Tree Giveaway	• New York Restoration Project partnered with the NYC Parks Department to coordinate their MillionTreesNYC initiative, and have provided 10,000 trees that are given away for free annually (Hsieh, 2012) • Shade Tree Program was created between the City of Tucson, Arizona, and a non-profit called Tucson Clean & Beautiful Inc, that provided over 1,500 shade trees to low-income families and helped improve the understanding of the benefits of having trees (Sonora Environmental Research Institute Inc., 2018)
Government and ENGO	Tree planting	• LEAF has a subsidized tree planting program for home owners in Toronto and areas of the greater Toronto area (Hsieh, 2012) • Portland Friends of Trees planted 4,562 trees over 30 separate events for residents who only paid $35-75/tree (Hsieh, 2012)

		• The Koreatown Youth and Community Centre in Los Angeles got nearly $330,000 from the California Department of Forestry and Fire in order to increase the tree cover in South Los Angeles and Pico-Union, both of which are low-income communities (Cohrs, 2015) • Ottawa Community Housing and Ecology Ottawa planted approximately 20 trees in two neighbourhoods in 2017 (Wong, 2017)

Table 2: List of online resources used in the capstone. The URL and a description of the data is provided in the table.

Resource & Link	Description
Toronto's land cover types https://www.toronto.ca/city-government/data-research-maps/open-data/open-data-catalogue/#808bc73a-df10-284d-9df7-e60dc97b45ae	• Current as of August 29, 2009 • File format: img file • Projection: MTM 3 Degree • Details: (1) tree canopy, (2) grass/shrub, (3) bare earth, (4) water, (5) buildings, (6) roads, (7) other paved surfaces and (8) agriculture • An updated survey to be conducted in 2018
Neighbourhood boundaries https://www.toronto.ca/city-government/data-research-maps/open-data/open-data-catalogue/#a45bd45a-ede8-730e-1abc-93105b2c439f	• Current as of June, 2014 • File format: shapefile • Projections available: MTM 3 Degree Zone 10 NAD27, WGS 84 Latitude/Longitude, UTM 6 Degree Zone 17N NAD27
TCHC properties https://www.toronto.ca/city-government/data-research-maps/open-data/open-data-catalogue/#3cbd0ba7-4bb2-923d-89d2-aff78797fe55	• Current as of July, 2013 • File format: MTM 3 Degree Zone 10 NAD27, WGS 84 Latitude/Longitude • Details: the dataset covers developments larger than 5 units and buildings that had 6 units or larger
i-TREE CANOPY V.6.1 https://canopy.itreetools.org/	• An online tool to estimate the tree cover and tree benefits given an area using a random sampling process

Table 3. Results from the zero-inflation Poisson distribution. 'N/A' indicates no result.

Property Type	Canopy Cover Type	Significant Result	Probability of Finding Property	Probability of Zero-inflation
All TCHC Properties	**RCC**	**Yes** (P = 0.01)	**No change** (Z = -1.74) (P = 0.08)	**Increases** (Z = 2.01) (P = 0.04)
	PCC	**Yes** (P = 0.02)	**Increases** (Z = 2.21) (P = 0.03)	*N/A*
TCHC Apartments	**RCC**	**Yes** (P = 0.01)	**Decreases** (Z = -1.99) (P = 0.05)	*N/A*
	PCC	**Yes** (P < 0.01)	**Decreases** (Z = -3.86) (P < 0.01)	*N/A*
TCHC Houses	**RCC**	**Yes** (P < 0.01)	**Increases** (Z = 2.54) (P < 0.01)	**Increases** (Z = 2.26) (P = 0.02)
	PCC	**No** (P = 0.10)	*N/A*	*N/A*

Table 4. A list of the total number of trees planted at each site under the TCHC Planting and Stewardship Initiative. Kendleton refers to 111 Kendleton Drive, Sheppard refers to 1901 Sheppard Avenue West, and Scarlettwood refers to Scarlettwood Court.

Tree Species	Species Type	Kendleton	Sheppard	Scarlettwood	Total
American elm *(Ulmus americana)*	Native	4	5	3	12
Basswood *(Tilia americana)*	Native	-	1	-	1
Bur oak *(Quercus macrocarpa)*	Native	4	4	-	8
Freeman maple *(Acer xfremanii)*	Native	3	3	1	7
Hackberry *(Celtis occidentalis)*	Native	3	2	2	7
Honey locust *(Gleditsia triacanthos)*	Native	3	1	2	6
Kentucky coffeetree *(Gymnocladus dioicus)*	Native	3	1	-	4
Silver maple *(Acer saccharrinum)*	Native	4	2	4	10
Serviceberry *(Amelanchier canadensis)*	Native	7	3	-	10
Sugar maple *(Acer saccharnum)*	Native	-	1	-	1
Grey dogwood *(Cornus racemose)*	Native	-	1	-	1
Ginkgo *(Ginkgo biloba)*	Non-native	7	-	-	7
Total		38	24	12	74

Table 5. A list comparing the native and non-native species and tree count composition before and after the TCHC Planting and Stewardship Initiative. Kendleton refers to 111 Kendleton Drive, Sheppard refers to 1901 Sheppard Avenue West, and Scarlettwood refers to Scarlettwood Court.

Site	Species	Number of Species		Number of Trees	
		Before	After	Before	After
Kendleton	Total	22	28	154	192
	Native	8 (36%)	14 (50%)	50 (33%)	81 (42%)
	Non-native	10 (46%)	10 (35%)	88 (57%)	95 (50%)
Sheppard	Total	19	27	114	138
	Native	7 (37%)	15 (55%)	49 (43%)	73 (53%)
	Non-native	8 (42%)	8 (30%)	48 (42%)	48 (35%)
Scarlettwood	Total	16	20	172	184
	Native	6 (37%)	10 (50%)	72 (42%)	84 (46%)
	Non-native	8 (50%)	8 (40%)	98 (57%)	98 (53%)

Table 6. A SWOT analysis of the perception of the initiative. Themes were drawn from staff survey responses and my own observations.

	Helpful	*Harmful*
Internal	**Strengths** • Flexible and adaptive organizations • Hard-working staff • Strong collaboration and communication between the organizations • A few tenant engagement events	**Weaknesses** • Unclear roles/responsibilities • Navigating unfamiliar environment (complex TCHC organizational structure and characteristics at each TCHC site) • Limited staff/time available • Incorporation of new staff • Difficulty having everyone on the same page
External	**Opportunities** • Enthusiastic and interested tenants (those who were engaged with) • YouthWorx incorporation in the future • Existing community programs/networks/ agencies identified • Increasing tenant engagement	**Threats** • Funding to continue and expand the initiative • Planting trees was a low priority for some tenants • LEAF/Park People could be viewed as outsiders – tenants not as likely to participate • Majority of community was not engaged with as of yet • Tree care largely up to TCHC tenants

Table 7. Engagement strategy employed at each community under the TCHC Planting and Stewardship Initiative. Kendleton refers to 111 Kendleton Drive, Sheppard refers to 1901 Sheppard Avenue West, and Scarlettwood refers to Scarlettwood Court. An asterisk (*) indicates ongoing efforts at each site.

Engagement Strategy	Kendleton	Sheppard	Scarlettwood
Public meetings (information sessions, presentations)	✓	✓	✓
Community events (BBQ)	✓	✓	
Tree tour	✓		
Opportunities to engage tenants in the review and approval of the planting plan	✓	✓	✓
Working with tenants to establish a Stewardship Team	✓*	✓*	✓*
Established a line of communication with local tenant rep or champions/leaders in the community	✓*	✓*	✓*
Surveys given to tenants in order to understand their perception of the initiative and collect feedback		✓	
Media or press to publicize the initiative	✓	✓	✓
Website/webpage available for tenants interested in learning more about the initiative	✓	✓	✓
Contact information (e-mail address, work number) of project partner staff(s) made available for tenants who are interested in learning more about the initiative	✓	✓	✓
Flyers posted to inform tenants about upcoming events of the initiative	✓	✓	✓
Material handed out to tenants with information about the initiative during the tree inventory (mini flyers, contact info etc.)	✓	✓	
Material handed out to tenants about the benefits of having trees in the community		✓	

Table 8. Criteria and indicators for monitoring and evaluating the success of the TCHC Planting and Stewardship Initiative.

Criteria		Performance Indicators				Key Objective
		Low	**Moderate**	**Good**	**Optimal**	
Structural	Coordination or strategizing	No coordination or strategizing occurred between the project partners over the course of the project	Little coordination or strategizing occurred between the project partners over the course of the project	Some coordination or strategizing occurred between the project partners over the course of the project	High degree of coordination or strategizing occurred between the project partners over the course of the project	Create strong relationships between the project partners for effective planning and implementation
	Roles and responsibilities	No division of labour, roles, and responsibilities between project partner organizations and staff	Division of labour is somewhat divided among project partners, but there are overlaps; uncertainty around the roles and responsibilities still exist between the organizations	Labour is divided and an understanding of the roles and responsibilities between project partners is established; it may be less clear within each organization	Fully developed and clear division of labour, roles, and responsibilities between project partners and within each organization	Have a clear understanding of the roles and responsibilities of each project partner and staff involved in the initiative in order to facilitate effective planning and implementation
	Communicat-ion	Communication between project partners is irregular or does not happen in a timely manner	Communication between project partners is somewhat regular, but long response times	Communication between project partners is regular, with irregular response times	Communication between project partners is clear and consistent; happens in a timely manner	To establish clear and effective channels of communication
	Resources	No resources dedicated to the initiative; no funding secured, no staff hours available	Few resources dedicated to the initiative; little funding secured or staff hours available to meet the objectives	Adequate resources dedicated to the initiative; funding secured, and staff hours set aside to achieve planned activities	An abundance of resources available to the initiative; Adequate funding and plenty of staff hours set aside to exceeding project demands	Ensure funding, time, and staff are available to successfully implement the project
Operational	Monitoring and evaluation	No monitoring or evaluation plan is in place; no findings are drawn or shared	A monitoring or evaluation plan is in place but limited implementation; the findings are rarely shared	A monitoring or evaluation plan is in place and some aspects are implemented; the findings are shared	A monitoring or evaluation plan is in place and implemented; the findings are shared	A monitoring or evaluation plan is in place that is agreed on by all project partners; findings of evaluation is shared between partners or stakeholders
	Adaptive management	Data is rarely analyzed (only at the end of the initiative) and used to inform or make	Data is infrequently analyzed (at the mid-point and end of the initiative) and	Data is sometimes analyzed (monthly) and used to inform or make changes to the initiative	Data is frequently analyzed (weekly) and used to inform or make changes to the initiative	Maintain or enhance the ability to detect changing needs and address challenges

		changes to the initiative	used to inform or make changes to the initiative			
	Flexibility	No degree of adaptability; no changes are made to the initiative despite any concerns or needs raised	Moderate degree of adaptability; a few changes are made to the initiative to reflect some concerns or needs raised in a slow manner	Good degree of adaptability; some changes are made to the initiative to reflect most concerns or needs raised	High degree of adaptability; changes are made to the initiative to reflect all concerns or needs raised in a timely manner	Maintain or enhance the ability to adapt to changes
	Local environmental context	No understanding of the local environment	A limited understanding of the local environment by conducting remote site visits (via Google Earth/ArcGIS online etc.)	Some understanding of the local environment through remote and in-person site visits; visual assessment without a tree inventory	A full understanding of the local environment through multiple in-person site visits and the completion of a full tree inventory	Establish a clear understanding of the local environment and used to inform decision making
	Local social context	No understanding of the local social community	A limited understanding of the local social community by hearing third-hand accounts from local staff or tenants, no contact information acquired	Some understanding of the local social community by acquiring information on existing programs and key tenants	A full understanding of the local social community by following through with connecting existing programs and key tenants	Establish a clear understanding of the local social context and used to inform decision making
Tenant Engagement	Communicat-ion between protect partners and tenants	Tenants do not know their role or responsibilities in participating under the initiative	Tenants largely have an unclear sense of their role or responsibilities in participating under the initiative	Tenants have a good sense of their role or responsibilities in participating under the initiative, but some uncertainties still exist	Tenants are fully aware of their role or responsibilities in participating under the initiative	The tenants have a clear understanding of the initiative and their roles or responsibilities if they choose to participate
	Participation of TCHC tenants	Participation is low with a couple of passive tenants	Participation is moderate, with more passive tenants involved, but no active participants	Participation mainly passive, with a couple of active tenants	Participation is high, with passive participation and plenty of active participation by tenants	Have participation of TCHC tenants under the initiative that are a mix of passive (only come to get information, do not provide feedback or get involved) and active (who repeatedly come out to events, provide feedback, get involved in the initiative)
	Tenant feedback	No channel or opportunity in place so tenants	A couple of channels or opportunities in	Some channels or opportunities in place so tenants	Multiple channels or opportunities in place so tenants can	Ensure that tenants are able to provide

	can provide feedback on the initiative	place so tenants can provide feedback on the initiative	can provide feedback on the initiative	provide feedback on the initiative	feedback on the initiative
Strategies for tenant engagement	No analysis identifying existing structures, social networks, or programs is conducted	A partial analysis identifying existing structures, social networks, or programs is conducted; One engagement strategy is primarily used	A full analysis identifying existing structures, social networks, or programs is conducted; A couple of engagement strategies are used	A full analysis identifying existing structures, social networks, or programs is conducted; A wide range of engagement strategies are used	Identify and employ strategies for effective engagement at each community to anticipate any opportunities or challenges
Working with local capacity	Local structures or social networks are never consulted	Local structures or social networks are rarely consulted (once or twice)	Local structures or social networks are sometimes consulted (once a month)	Local structures or social networks are regularly consulted (multiple times a month)	Establish lines of communication within the local community by working with existing community structures and networks
Increasing local capacity	No support available for local community	Little support available for local community	Some support available for local community	Plenty of support available for local community	To build on local capacity by providing support to local tenants in the form of stewardship training, budget to facilitate and support engagement, resource package
Sense of ownership	No sense of ownership over the project	Little sense of ownership under the initiative	Some sense of ownership over the initiative	High sense of ownership over the initiative	Ensure that tenants feel ownership and control over the initiative
Meaningful participation	No feedback suggested by tenants is incorporated into the initiative	Some feedback suggested by tenants is incorporated into the initiative	Most feedback suggested by tenants is incorporated into the initiative	All of the feedback suggested by tenants is incorporated into the initiative	Ensure that tenants feel they have opportunities for meaningful participation

	Accessibility	No efforts to identify or address barriers to participation or communication are made	Few efforts to identify or address barriers to participation or communication are made	Some efforts to identify or address barriers to participation or communication are made	Consistent efforts to identify or address barriers to participation or communication are made	Ensure steps are taken to accommodate tenants; awareness of barriers to participation and efforts to address them are made (using appropriate meeting spaces, adapting schedules to local availability, clear and simple language)
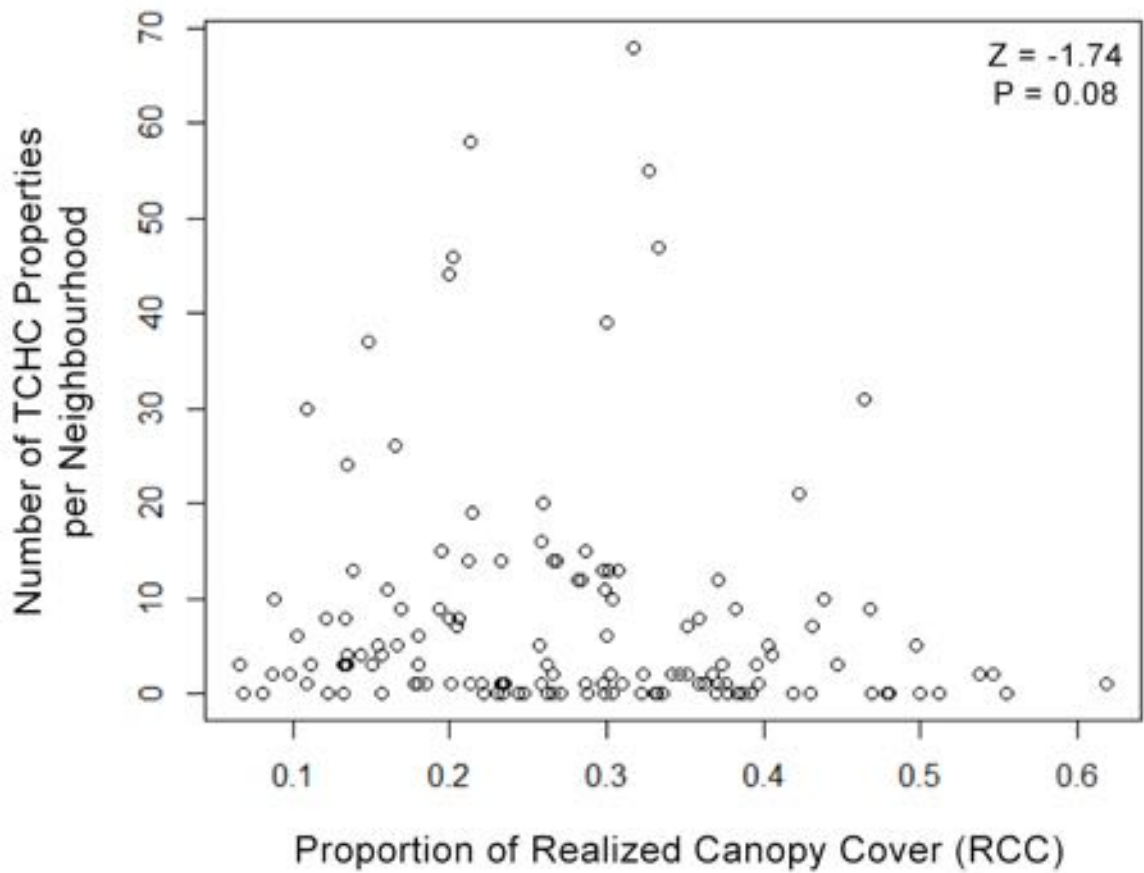
Figure 1. The influence of realized canopy cover (RCC) on the total number of TCHC properties per neighbourhood. The properties include high-rise and low-rise buildings, as well as dethatched and semi-detached townhouses.
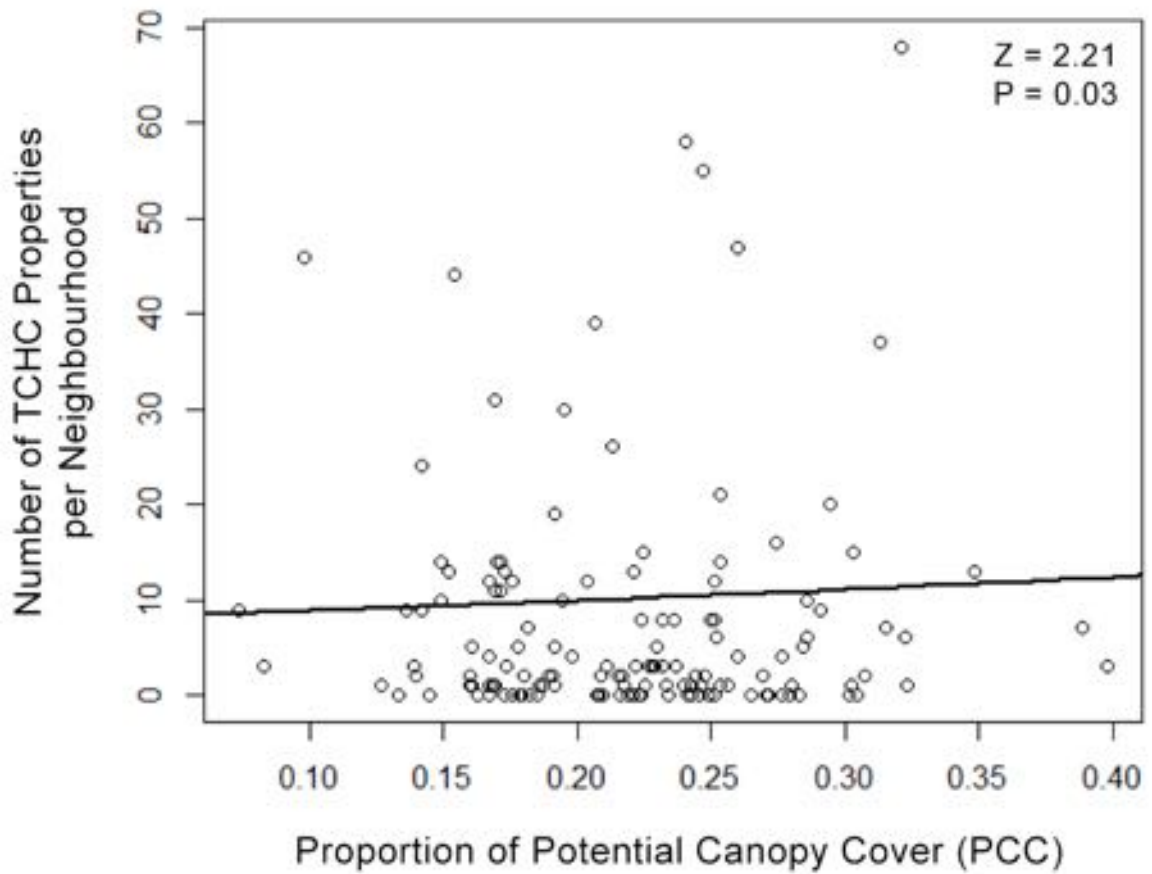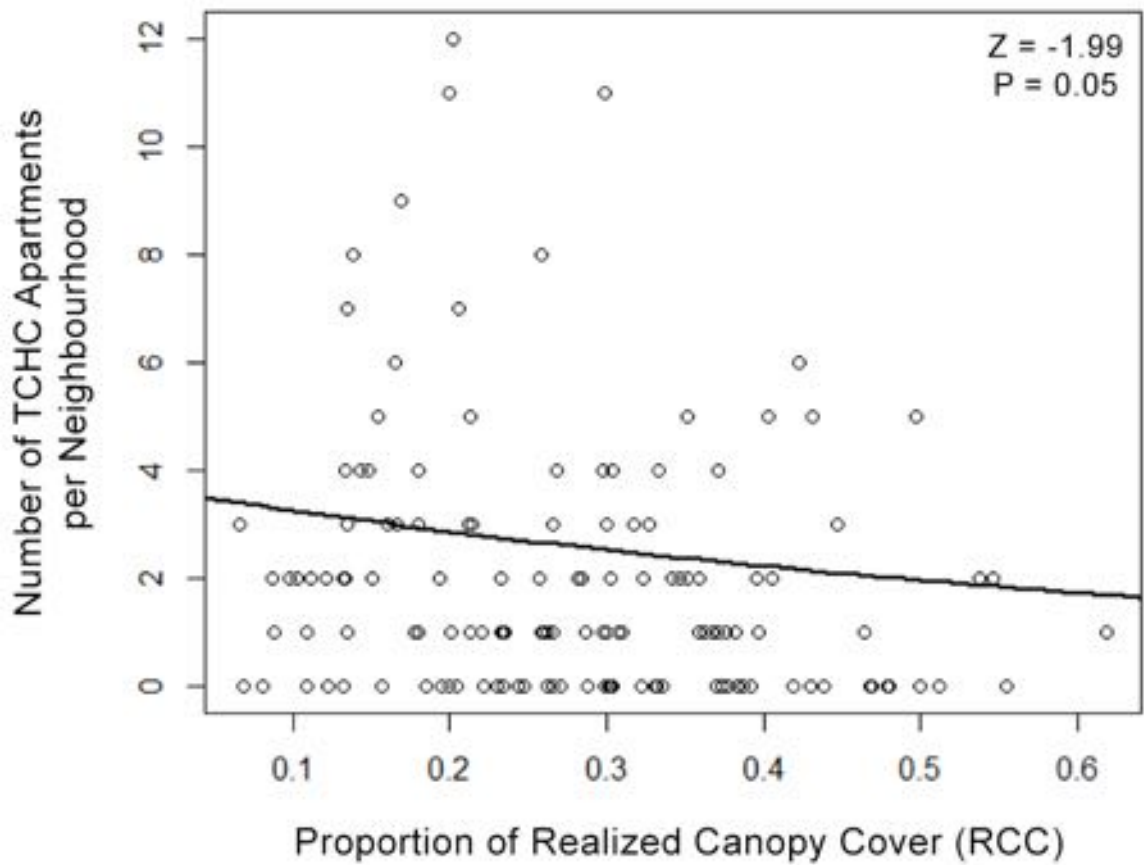
Figure 2. The influence of potential canopy cover (PCC) on the total number of TCHC properties per neighbourhood. The properties include high-rise and low-rise buildings, as well as dethatched and semi-detached townhouses.

Figure 3. The influence of realized canopy cover (RCC) on the number of TCHC apartment complexes per neighbourhood. The TCHC apartment complexes include high-rise and low-rise apartments.
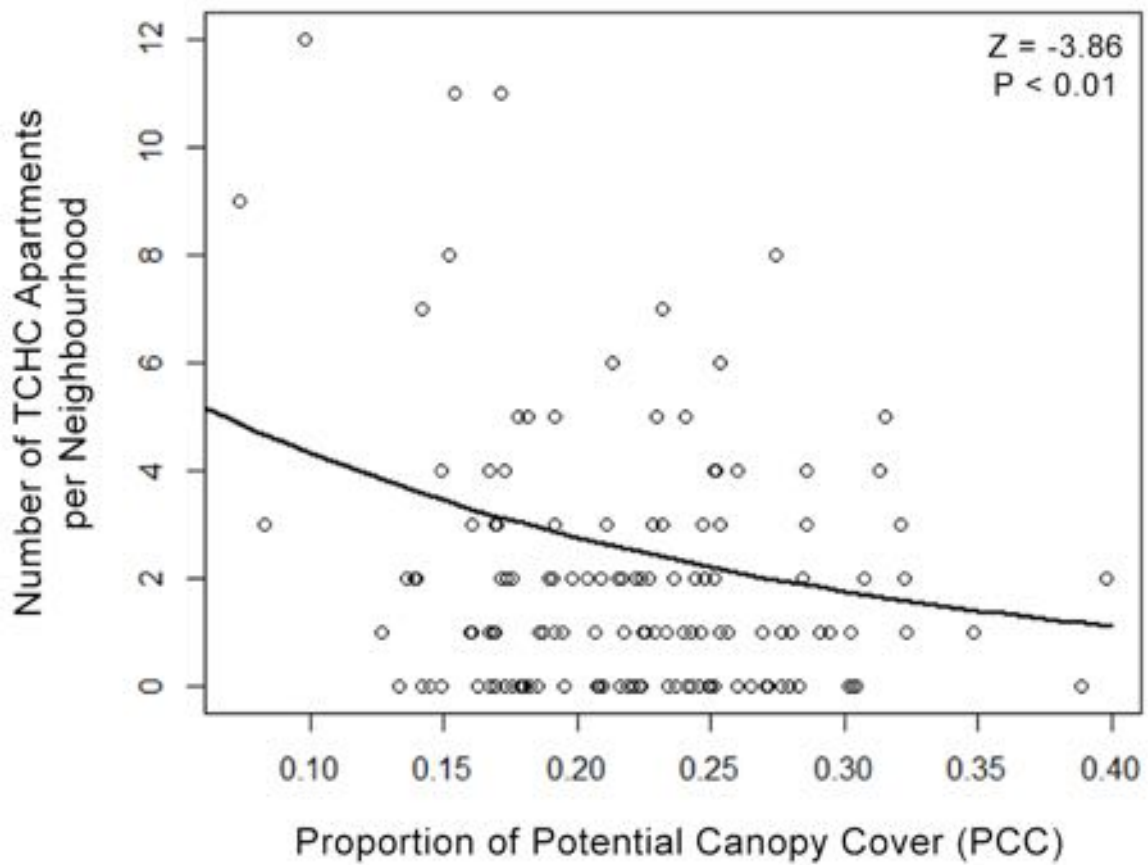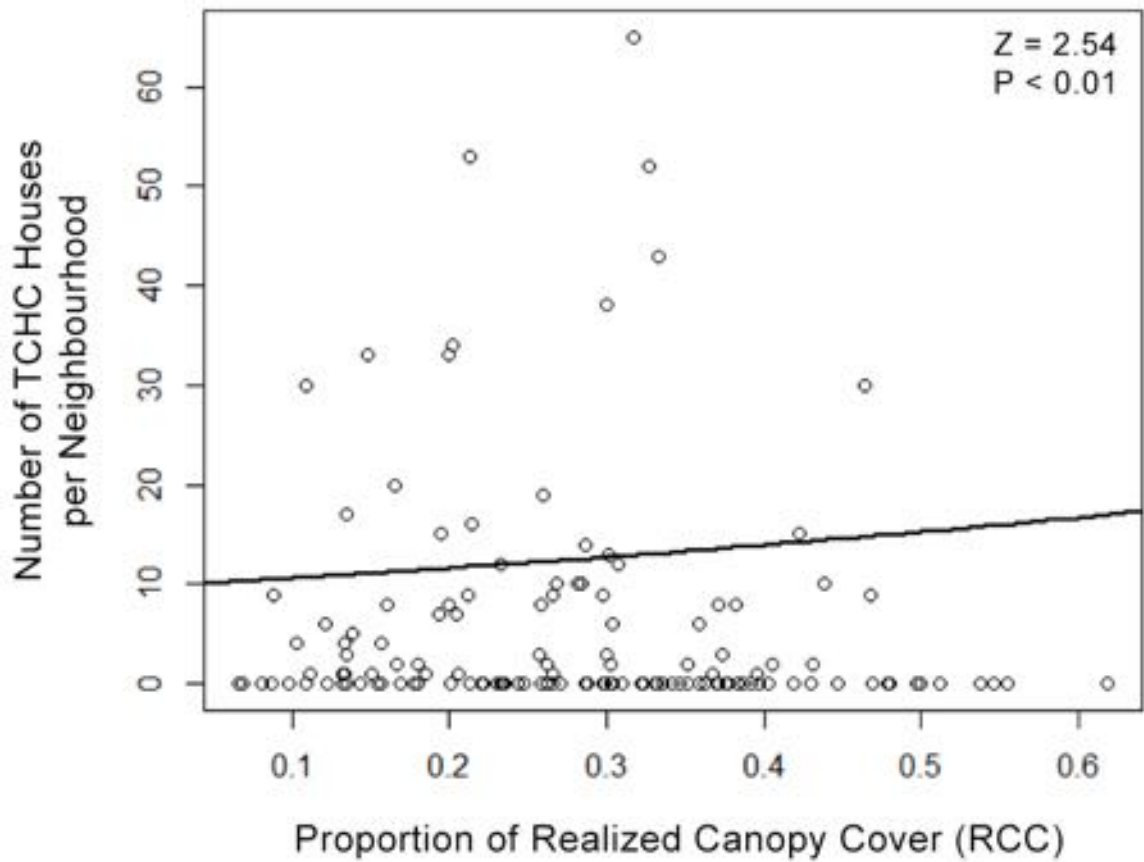
Figure 4. The influence of potential canopy cover (PCC) on the number of TCHC apartment complexes per neighbourhood. The TCHC apartment complexes include high-rise and low-rise apartments.

Figure 5. The influence of realized canopy cover (RCC) on the number of TCHC houses per neighbourhood. The TCHC houses include detached houses and semi-detached townhouses.
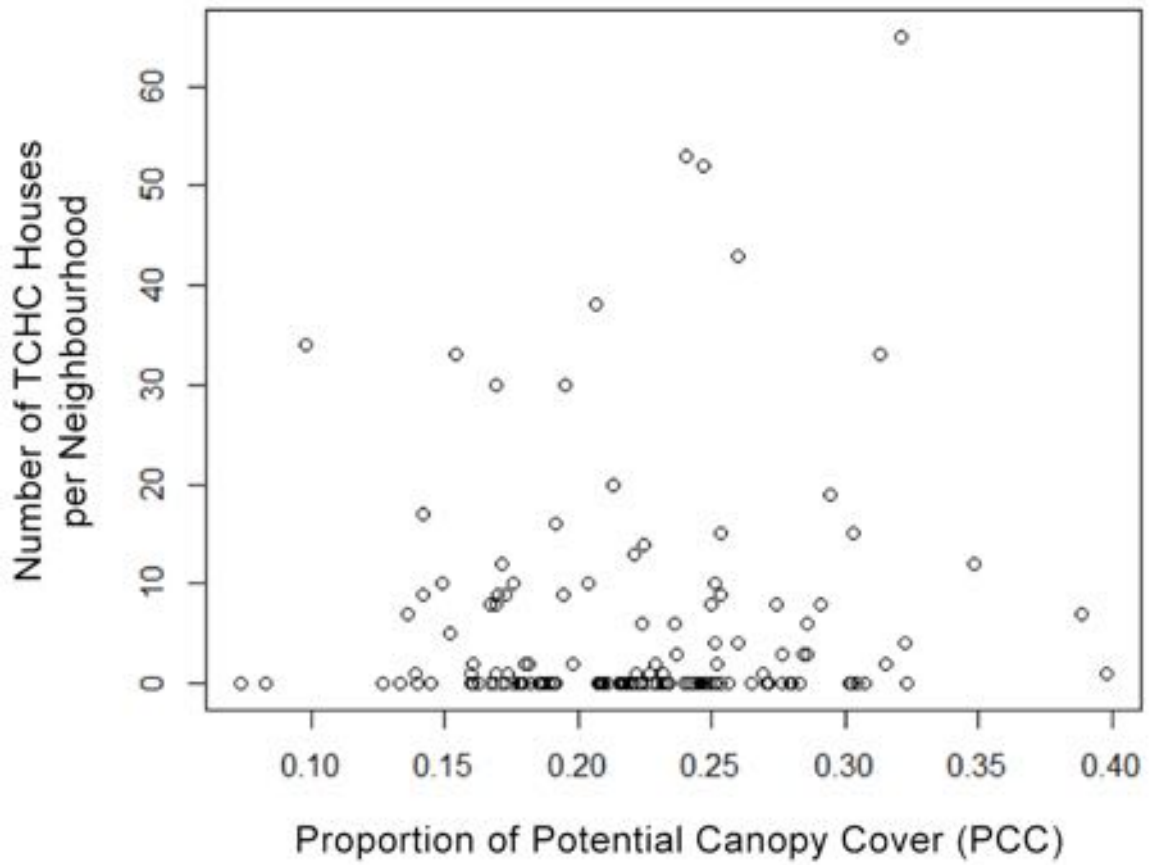
Figure 6. The influence of potential canopy cover (PCC) on the number of TCHC houses per neighbourhood. The TCHC houses include detached houses and semi-detached townhouses.
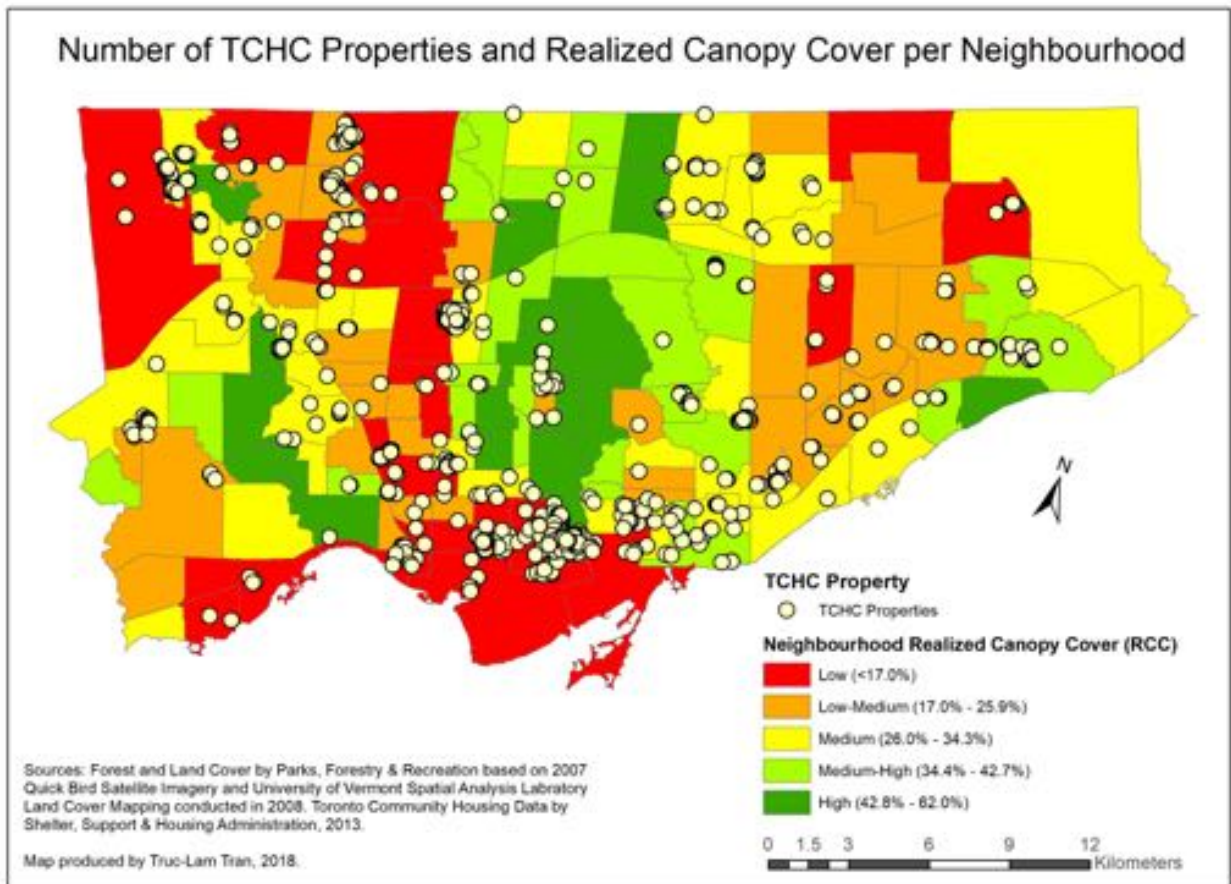
Figure 7. A map of TCHC properties and the realized canopy cover (RCC) in each neighbourhood in Toronto.
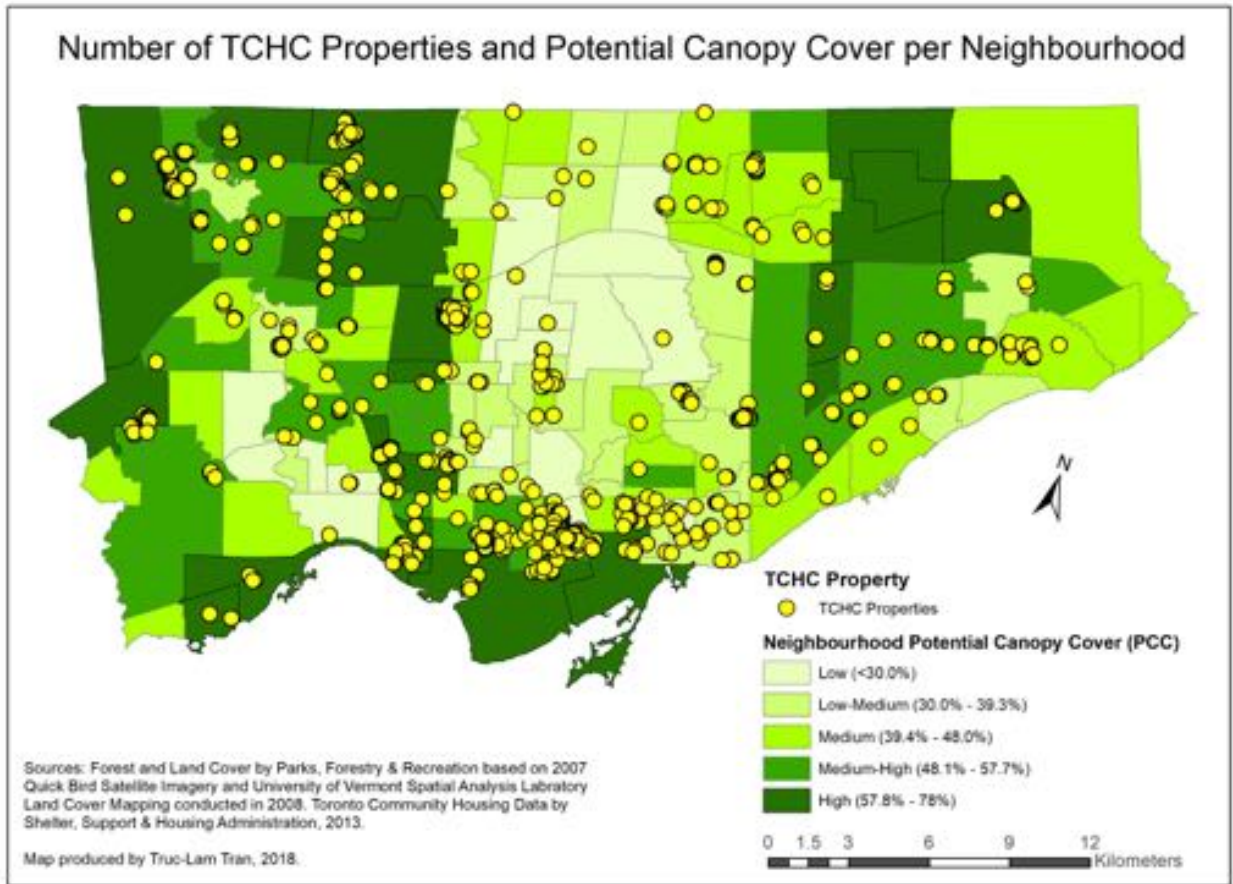
Figure 8. A map of TCHC properties and the potential canopy cover (PCC) in each neighbourhood in Toronto.
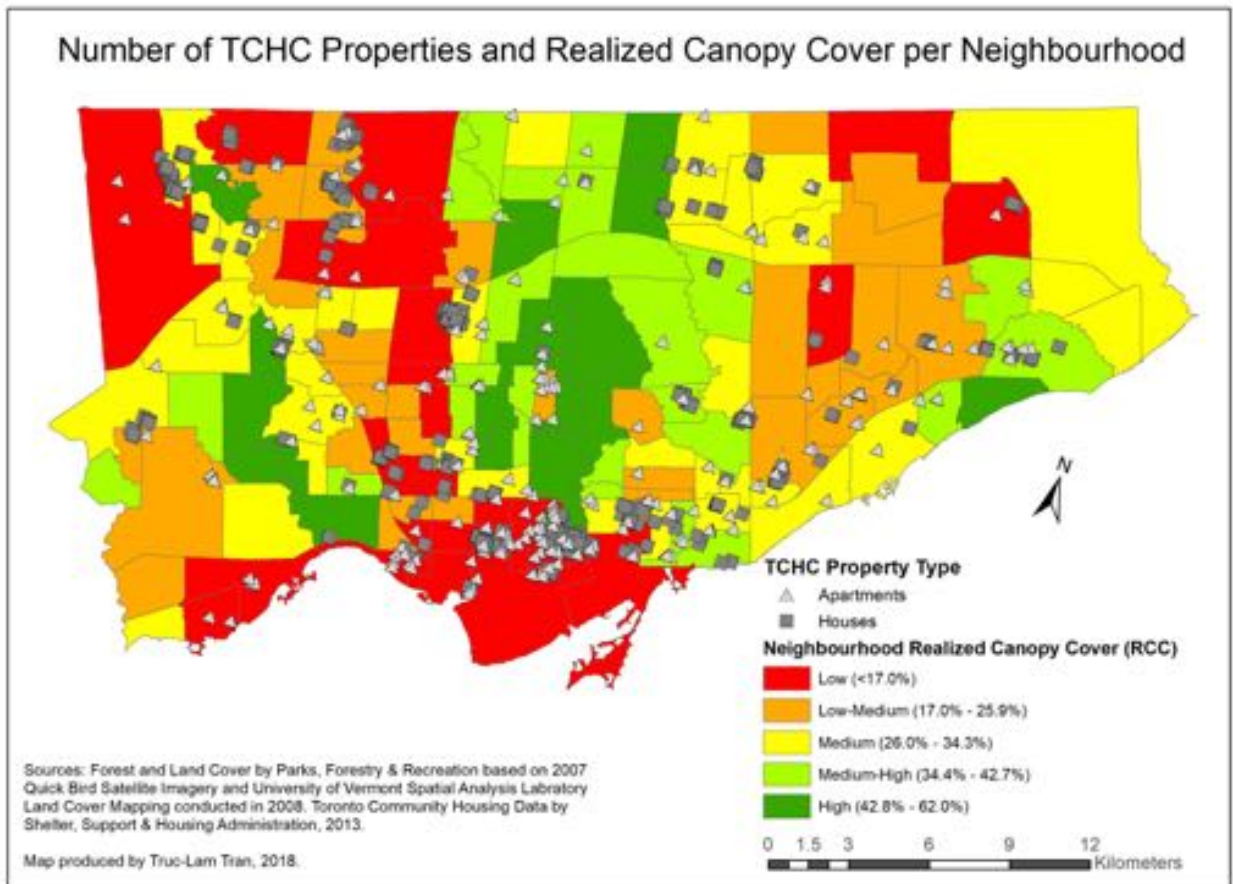
Figure 9. A map of TCHC apartment and house complexes and the realized canopy cover (RCC) in each neighbourhood in Toronto.
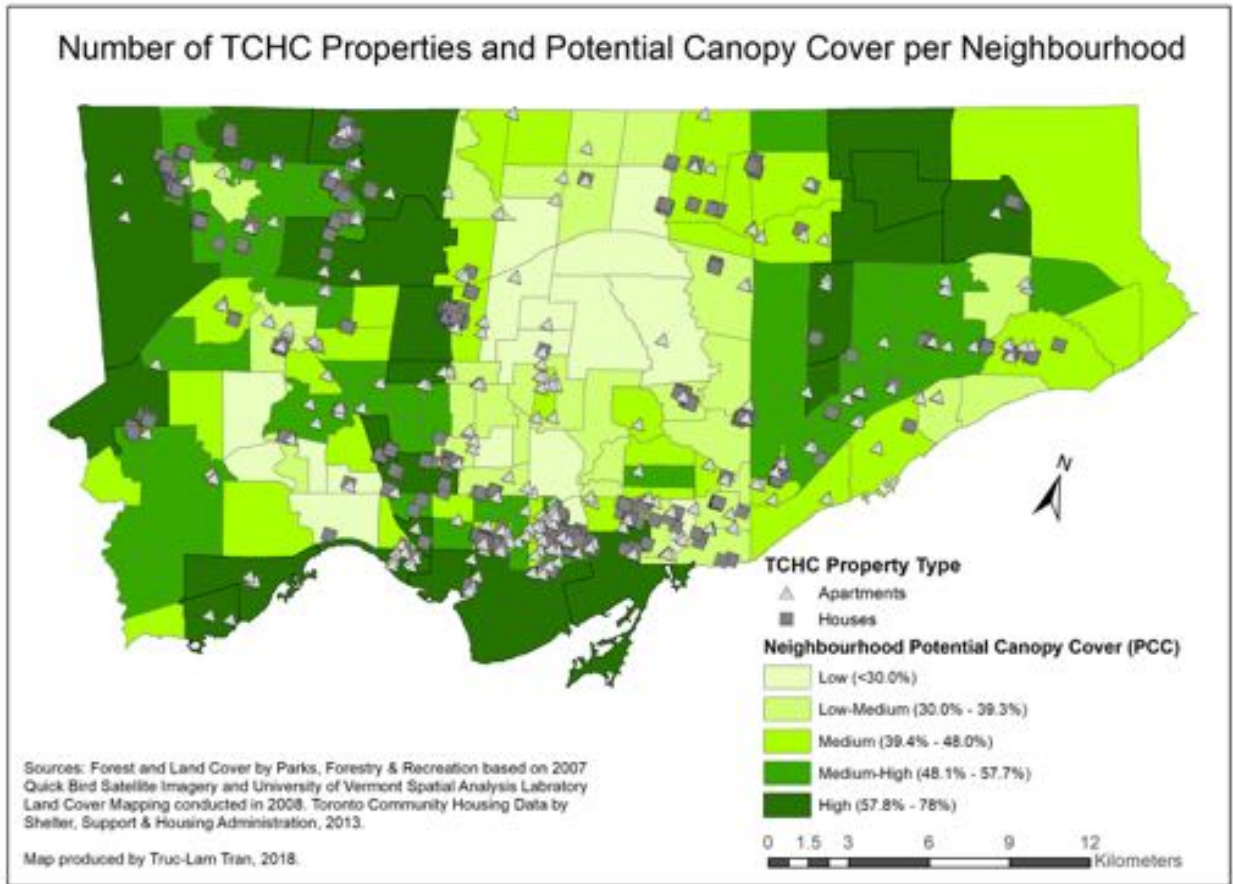
Figure 10. A map of TCHC apartment and house complexes and the potential canopy cover (PCC) in each neighbourhood in Toronto.
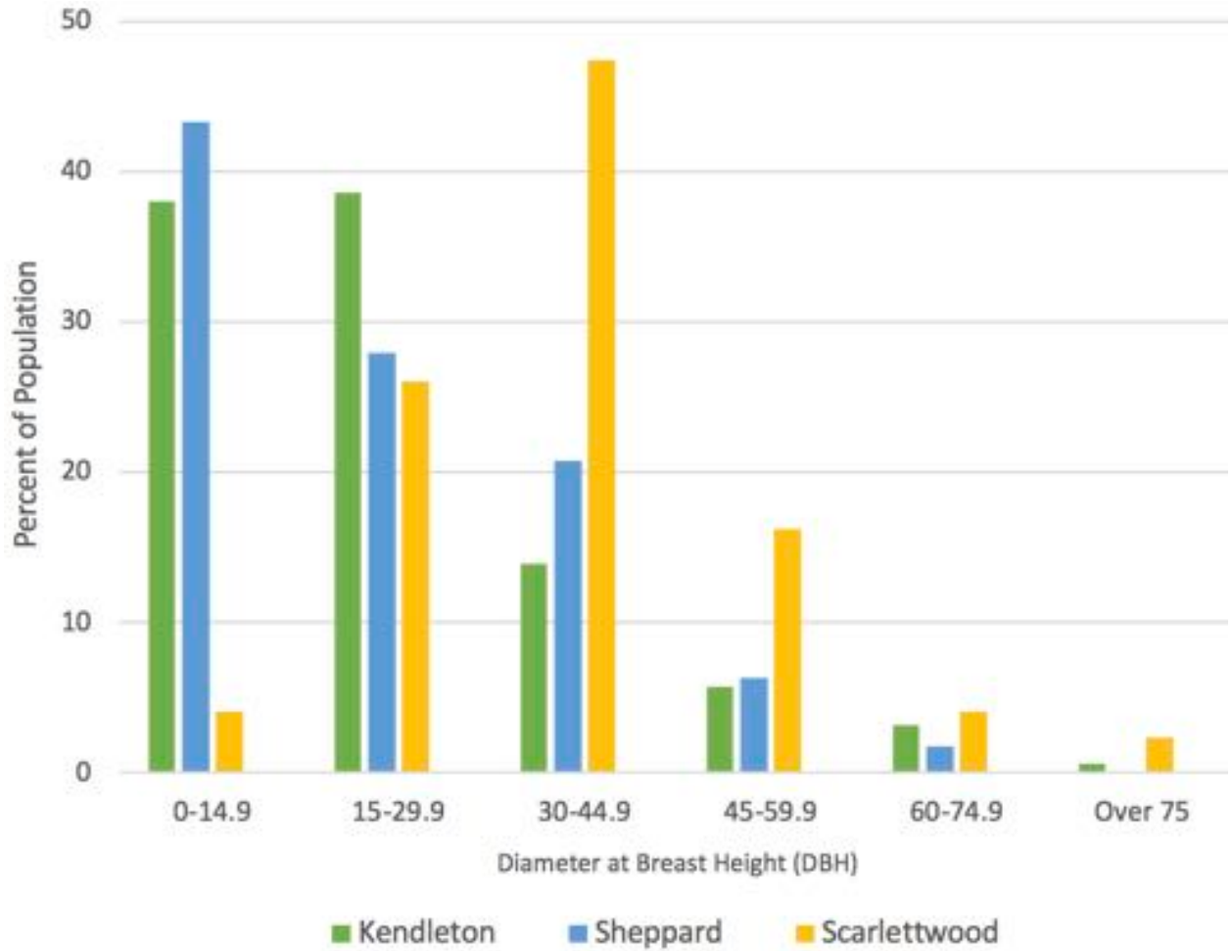
Figure 11. Tree size distribution across each of the three sites chosen for the TCHC Planting and Stewardship Initiative before the initiative took place. Kendleton, in green, refers to 111 Kendleton Drive. Sheppard, in blue, refers to 1901 Sheppard Avenue West. Scarlettwood, in yellow, refers to Scarlettwood Court.
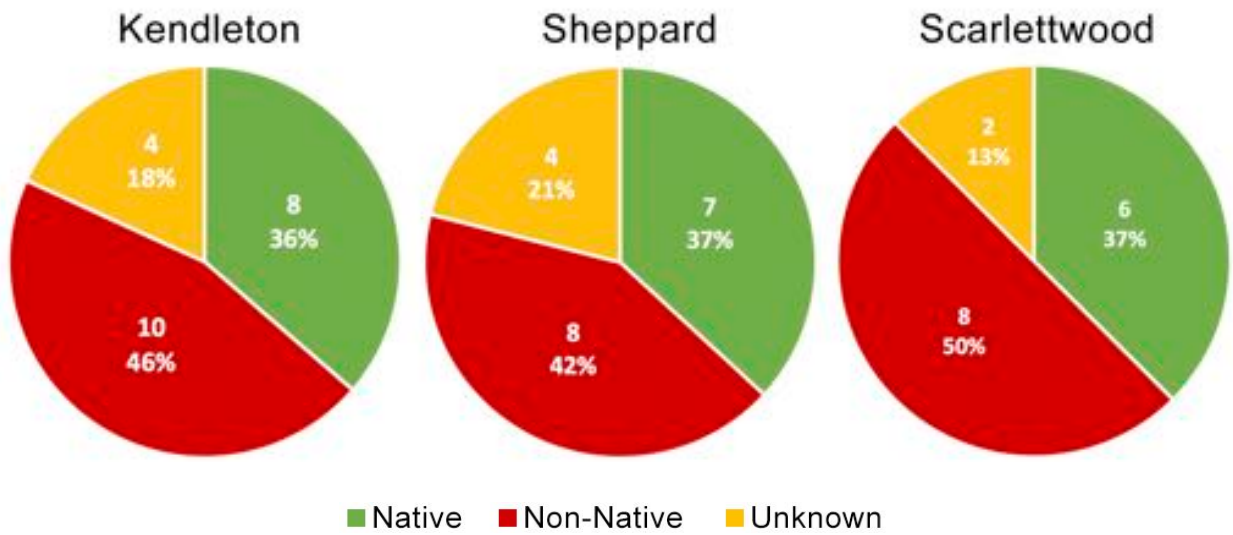
Figure 12. Species diversity across each of the three sites chosen for the TCHC Planting and Stewardship Initiative before the initiative took place. Kendleton refers to 111 Kendleton Drive, Sheppard refers to 1901 Sheppard Avenue West, and Scarlettwood refers to Scarlettwood Court. Native species are in green, non-native species are in red, and unknown species are in yellow.
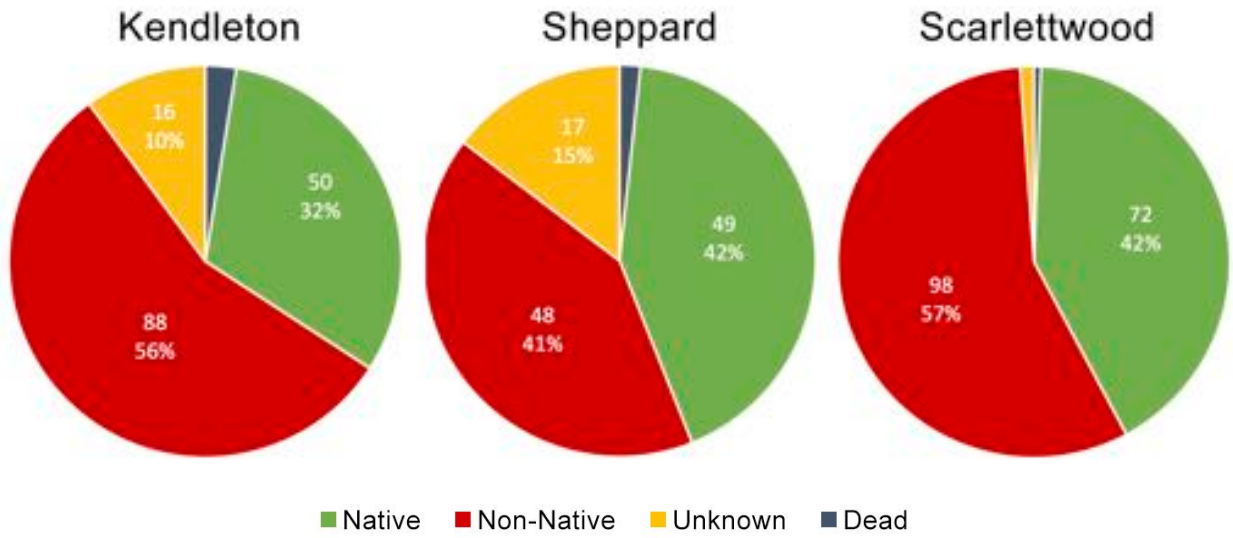
Figure 13. Tree diversity across each of the three sites chosen for the TCHC Planting and Stewardship Initiative before the initiative took place. Kendleton refers to 111 Kendleton Drive, Sheppard refers to 1901 Sheppard Avenue West, and Scarlettwood refers to Scarlettwood Court. Native trees are in green, non-native trees are in red, unknown trees are in yellow, and dead trees are in blue.

Figure 14. Urban forest composition at 111 Kendleton Drive. Native trees are in green, non-native trees are in red, unknown trees are in yellow, and dead trees are in blue

Figure 15. Urban forest composition at 1901 Sheppard Avenue West. Native trees are in green, non-native trees are in red, unknown trees are in yellow, and dead trees are in blue.

Figure 16. Urban forest composition at Scarlettwood Court. Native trees are in green, non-native trees are in red, unknown trees are in yellow, and dead trees are in blue.
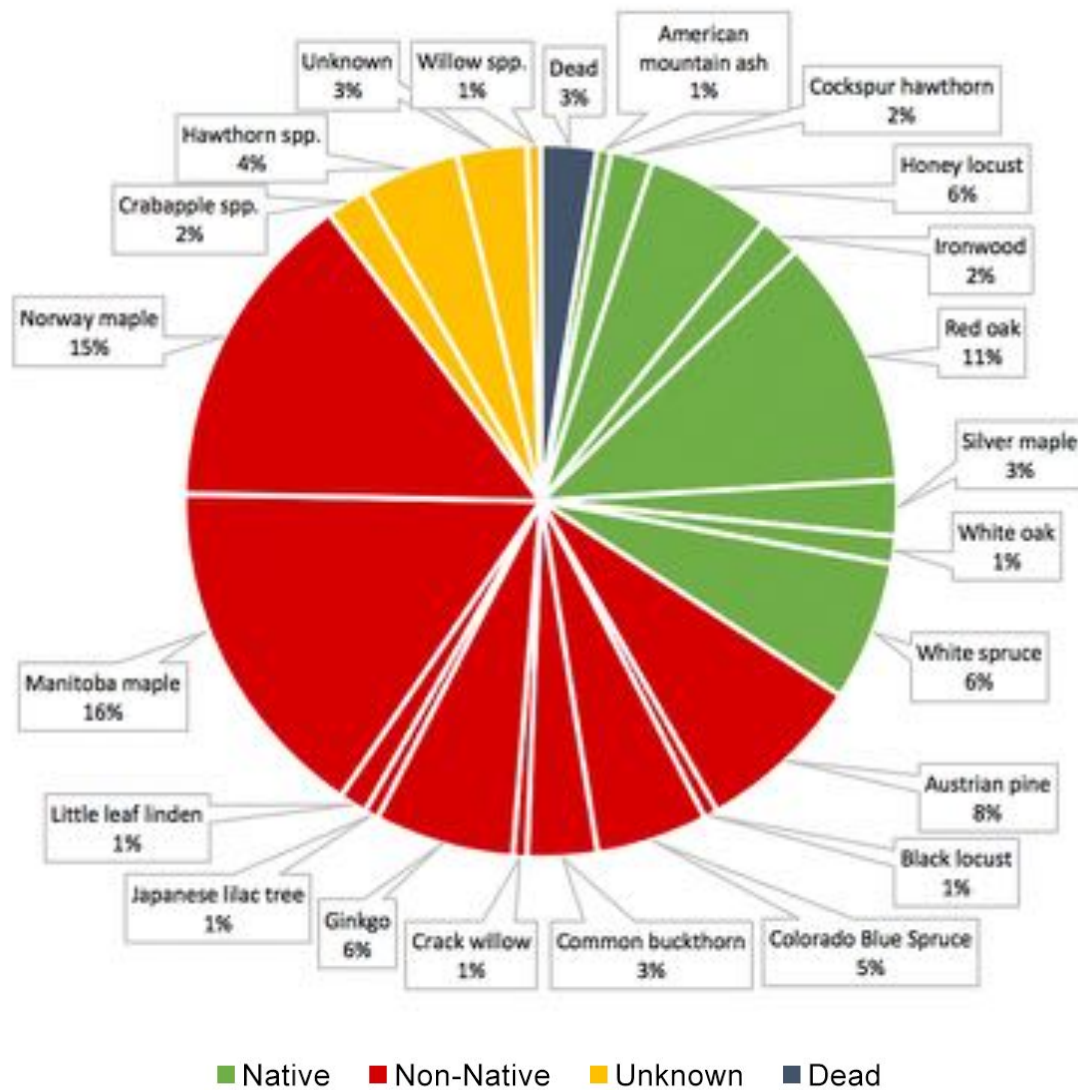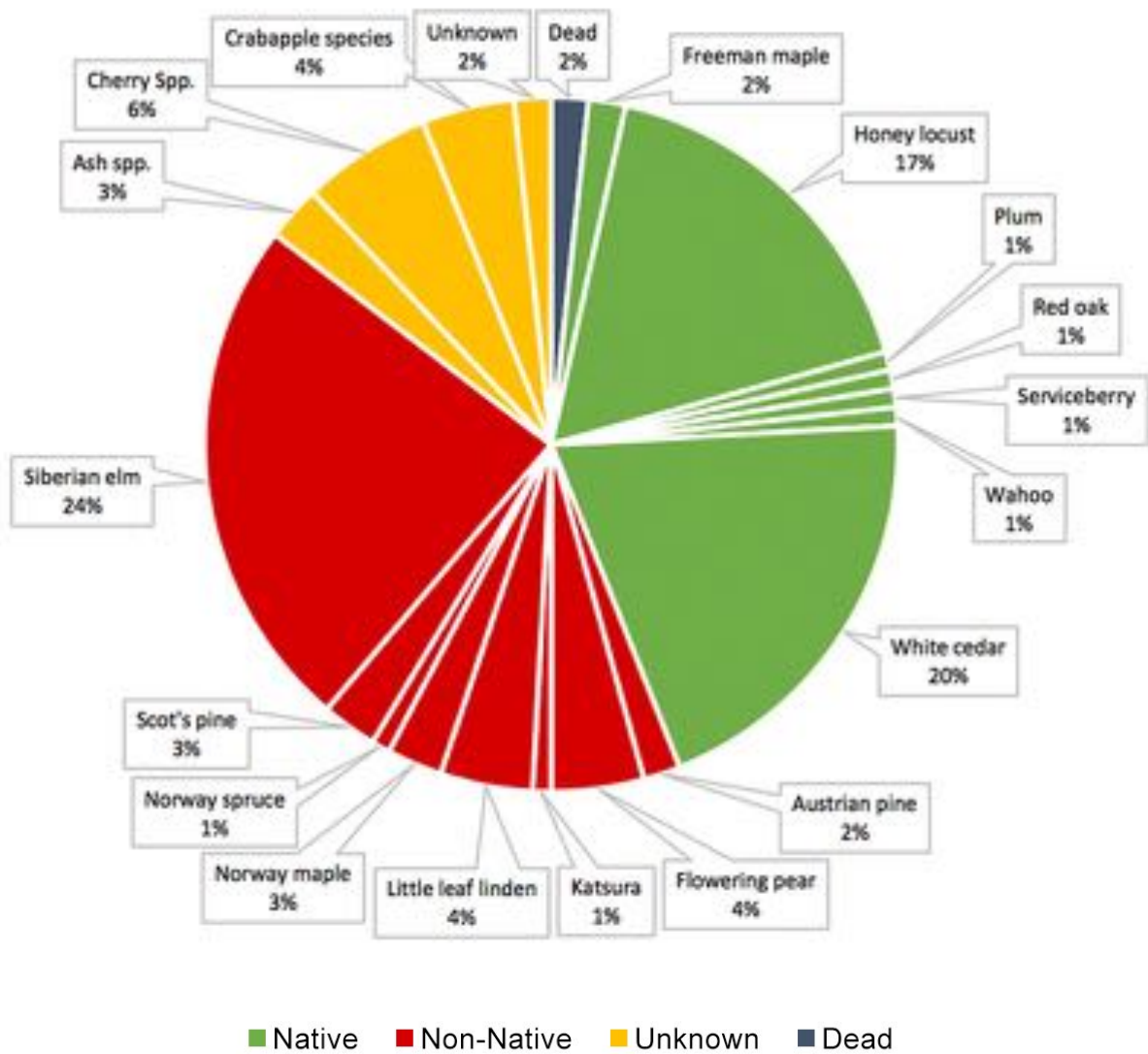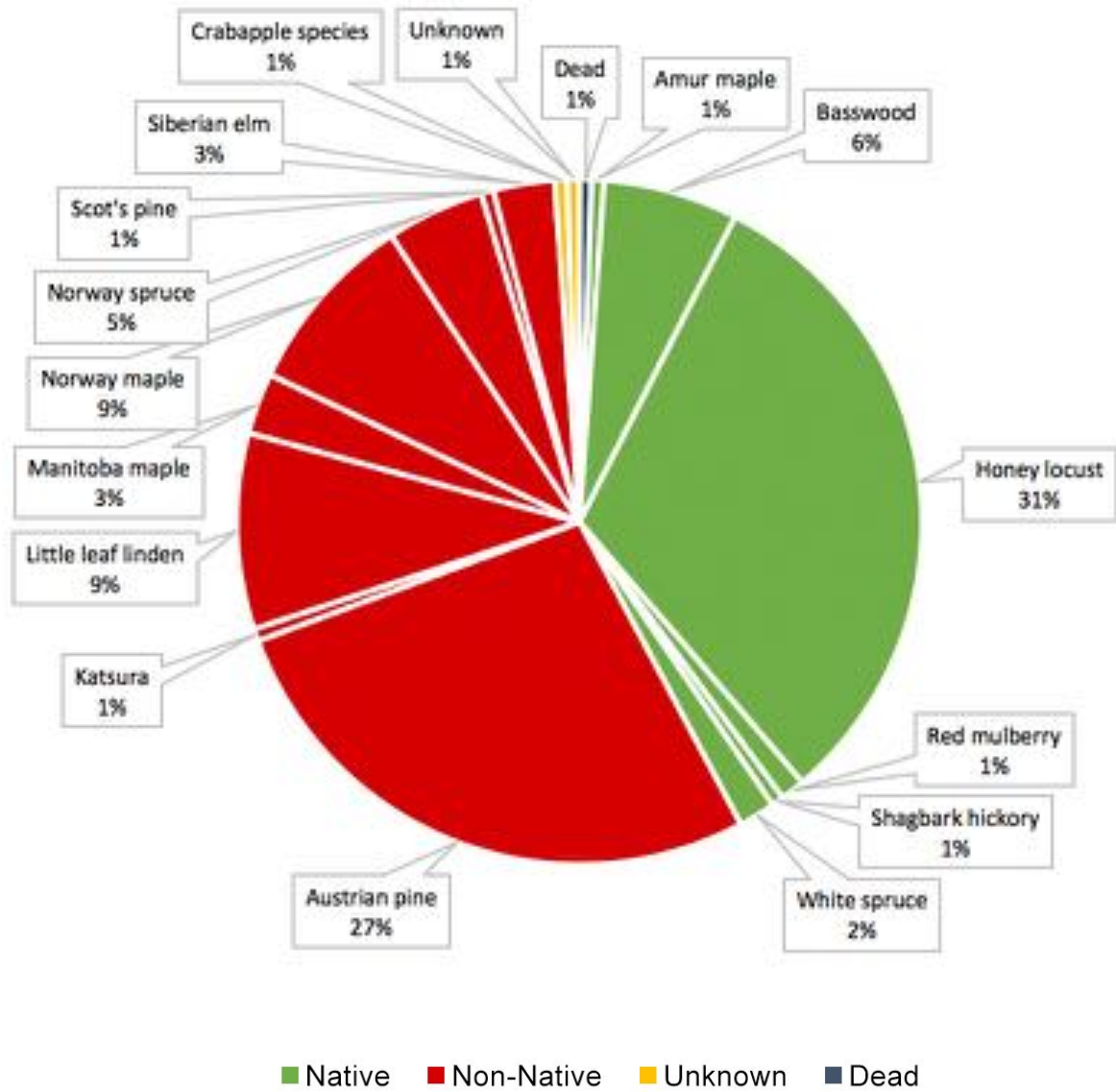
Appendix 1. The staff survey given out to project partner staff who were involved in the planning and implementation phase of the TCHC Planting and Stewardship Initiative.

Staff Survey

1. Your role and responsibilities in the project were clearly defined
    i. Yes   ii. Somewhat   iii. No   iv. N/A

2. There was enough tenant engagement at each TCHC site in order to foster interest in tree planting and care activities.
    i. Yes   ii. Somewhat   iii. No   iv. N/A

3. a. Do you feel the tenants have the capacity to continue stewardship into the future?
    i. Yes   ii. Somewhat   iii. No   iv. N/A

    b. Please explain the answer you chose.
    _____
    _____

4. Overall, give a rating on a scale of 1-5, with 1 being unsuccessful and 5 being successful, of the project's success to date.
    1   2   3   4   5

5. What has been the biggest learning experience in this project for you?
    _____
    _____

6. What are some ways the project could be improved?
    _____
    _____

7. Do you have any additional thoughts or items you want to share?
    _____
    _____

Appendix 2. A breakdown of which components of each objective for the TCHC Planting and Stewardship Initiative have been achieved thus far, and to what degree.

Objective 1: Increase native tree and shrub planting on privately-owned land
   a) by planting 100 native trees and 230 native shrubs across three sites
   - *Result*:
      → Only 74 trees were planted; 67 native trees and 7 non-native trees
      → 12 species planted – 11 were native, 1 was non-native and non-invasive
      → 0 shrubs planted due to safety concerns raised by TCHC staff and tenants

   - *Objective achieved?*
      Yes, but not fully as 1 non-native species was planted, and no native shrubs were planted

Objective 2: Support tree care activities
   a) By conducting an inventory to identify planting opportunities at each site
   - *Result*:
      → A tree inventory was conducted at each site and planting opportunities were identified during site visits

   - *Objective achieved?*
      Yes

   b) Engaging tenants in site plans, planting, and ongoing tree care
   - *Result*:
      → TCHC staff and tenants were consulted during the creation of the planting plan at each site
      → Their feedback was incorporated into the final planting plan that was carried out in November, 2018
      → The TCHC tenants did not plant the trees because the project partner staff decided upon planting larger caliper trees
      → As the trees were planted in the fall of 2018, tree care was not necessary in 2018, but will be required in spring of 2019
      → Contact information of tenants from each site who were interested in being part of the stewardship team was collected and the project partners are currently working on ensuring the tenants are equipped with the knowledge and skill to care for the trees in spring of 2019

   - *Objective achieved?*
      Yes; Ongoing work as individuals for the Stewardship Teams at each site were identified and project partners are working to develop a stewardship training schedule and stewardship plan for the tenants

Objective 3: Support inclusive community engagement

    a) The project will engage TCHC staff and tenants
- *Result*:
  → TCHC staff and tenants were a part of the implementation process of the initiative by reviewing and providing feedback on the planting plan
  → Information sessions at each site, a community BBQ and tree festival at Sheppard, and a tree tour at Kendleton was able to engage with tenants

- *Objective achieved?*
  Yes

    b) Those engaged will receive tree planting and stewardship training
- *Result*:
  → Tenants were able to sign up to be part of the Stewardship Teams that will be responsible for looking after the newly planted trees in the spring of 2019
  → A training plan around proper tree care is being developed and tenants of the Stewardship Teams will receive training before the spring of 2019

- *Objective achieved?*
  Ongoing work as project partners are working to develop as stewardship training schedule for the tenants

    c) Practical arboriculture training for stewardship teams and youth will be provided through the YouthWorx project
- *Result*:
  → Due to the unpredictable nature of the pilot project and difficulties associated with navigating a new environment, YouthWorx was not a part of the initiative in 2018

- *Objective achieved?*
  No, but there were learning opportunities that will be applied in the future if the project were to receive funding

    d) A stewardship plan and resource package will be developed and provided to TCHC staff, tenants who are part of the stewardship team, and youth leaders at each site to ensure long-term care of the plantings
- *Result*:
  → The project partners are currently working on developing a training plan and stewardship plan and resource package to guide tree care efforts at each site in the spring of 2019

- *Objective achieved?*

Ongoing work as project partners are working to develop a stewardship plan for the tenants

Objective 4: Build community capacity, knowledge sharing, partnerships, and networks
  a) Spring and fall training program for stewardship team and summer YouthWorx that will provide enriching learning opportunities for participants
   - *Result*:
     → Due to the unpredictable nature of the pilot project and difficulties associated with navigating a new environment, YouthWorx was not a part of the initiative in 2018

   - *Objective achieved?*
     No, but there were learning opportunities that will be applied in the future if the project were to receive funding

  b) Connect YouthWorx participants with avenues for post-program employment or education in arboriculture and urban forestry through relationship building with local employers
   - *Result*:
     → Due to the unpredictable nature of the pilot project and difficulties associated with navigating a new environment, YouthWorx was not a part of the initiative in 2018

   - *Objective achieved?*
     No, but there were learning opportunities that will be applied in the future if the project were to receive funding

  c) YouthWorx provides summer maintenance and care, while supporting the stewardship team in preparation for their fall projects
   - *Result*:
     → Due to the unpredictable nature of the pilot project and difficulties associated with navigating a new environment, YouthWorx was not a part of the initiative in 2018

   - *Objective achieved?*
     No, but there were learning opportunities that will be applied in the future if the project were to receive funding

Objective 5: Facilitate community driven, locally-owned tree stewardship efforts
  a) An honoraria or budget will be made available for each stewardship team that will facilitate and support participation
   - *Result*:

→   Contact information of tenants from each site who were interested in being part of the stewardship team was collected and the project partners are working on ensuring the tenants are equipped with the knowledge and skill to care for the trees in spring of 2019

- *Objective achieved?*
  Yes; Ongoing work as the tree care component of establishing a stewardship team at each site and ensuring they are well prepared to care for the newly planted trees is still underway

b) Stewardship teams will work with YouthWorx to engage other tenants in the community in education, planting, and stewardship activities, thereby ensuring tenants feel a sense of ownership in their communities

- *Result*:
  →   Has yet to be done as of December 2018, but a plan is being developed by project partners in order to engage other tenants in the community (who have yet to be engaged with) in the spring of 2019
  →   Due to the unpredictable nature of the pilot project and difficulties associated with navigating a new environment, YouthWorx was not a part of the initiative in 2018

- *Objective achieved?*
  Work is underway to achieving aspects of this component