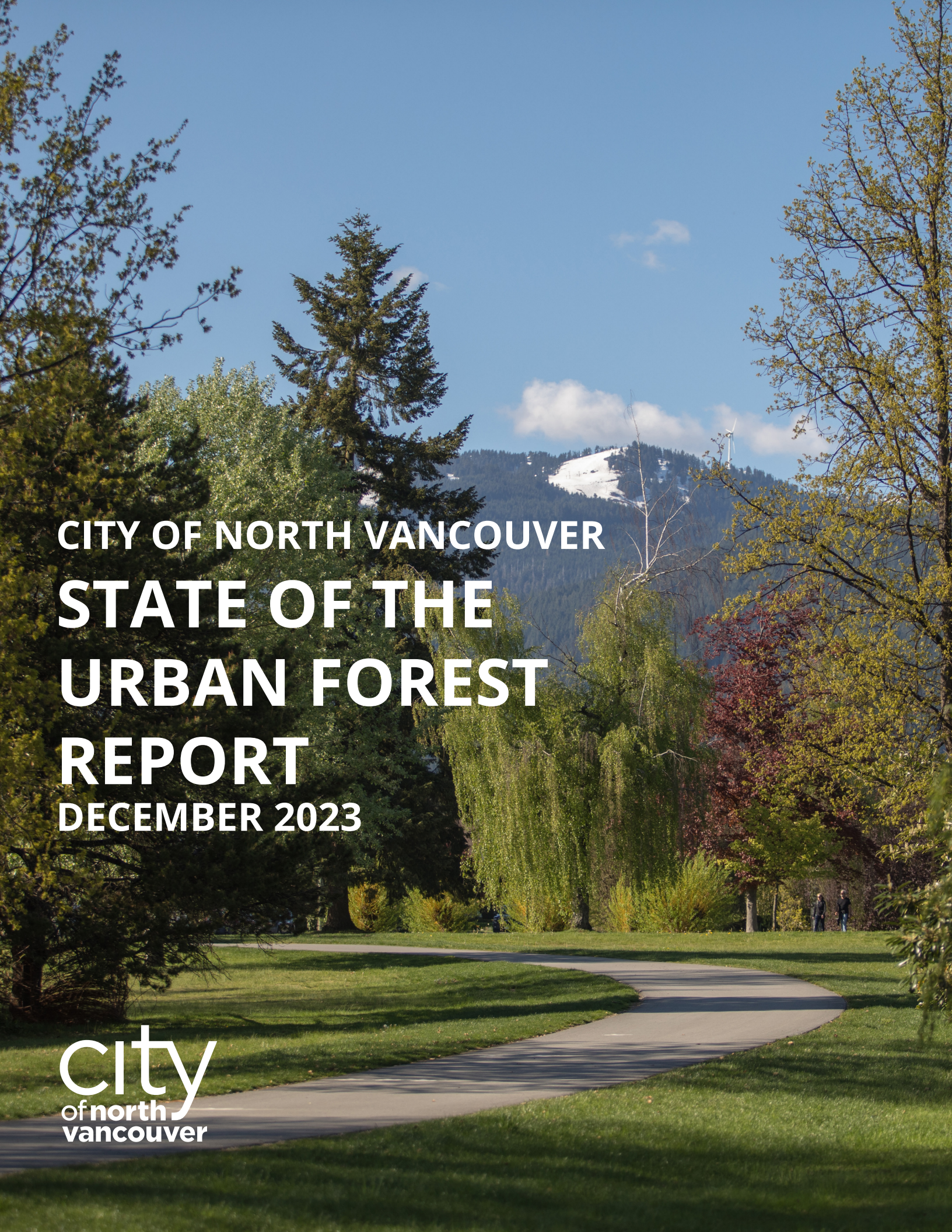


CITY OF NORTH VANCOUVER

# STATE OF THE URBAN FOREST REPORT

DECEMBER 2023

city of north vancouver

## ACKNOWLEDGMENTS

Diamond Head Consulting Ltd. prepared this report for the City. The following City departments and committees provided input, feedback, and support for this project:

- Engineering, Parks and Environment Department
- Planning and Development Department
- Community and Partner Engagement Department

## Land Acknowledgement

The City of North Vancouver acknowledges that it is situated on the ancestral, traditional and unceded territories of the Skwxwú7mesh (Squamish) and səl̓ílwətaɬ (Tsleil-Waututh) Nations. These Nations remain deeply connected to their lands and waters and as we build community here it is critical we acknowledge this has been their home since time immemorial. We thank them for sharing this land with us and for their ongoing partnership with the City on shared priorities.

## A Commitment to Truth and Reconciliation

The City is committed to Truth and Reconciliation. We humbly recognize that we need to learn the truth about Indigenous history in Canada and are at the beginning of our journey of reconciliation with First Nations. The City will work collaboratively, cooperatively, and respectfully with the Skwxwú7mesh (Squamish) and səl̓ílwətaɬ (Tsleil-Waututh) Nations on policy, projects, programs, and services at the City and incorporate the Truth and Reconciliation Commission's Calls to Action, support the principles and objectives of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and the Province of British Columbia's Declaration on the Rights of Indigenous Peoples Act (DRIPA).

# Contents

# EXECUTIVE SUMMARY

**The State of the Urban Forest Report provides background information on the City of North Vancouver's urban forest, as of 2021.**

## BACKGROUND

### WHAT IS THE URBAN FOREST?

The City's urban forest includes all of the trees and supporting vegetation in the community, including on public and private property such as parks, backyards, streets, and commercial and industrial areas. The urban forest is an interconnected ecosystem that also includes the soil, water, and air that nourishes trees.

### WHY DOES THE URBAN FOREST MATTER?

The urban forest is essential for creating a healthy and sustainable community, and is an important part of green infrastructure. It helps to reduce stormwater run-off, clean air and water, regulate temperatures, stabilize soil, and store carbon emissions. The urban forest also enhances biodiversity, beautifies our surroundings, and improves mental and physical well-being.

Urban forests help to make cities more resilient to climate change, with well-treed streets providing shade for walking, cycling, and rolling, and green neighborhoods reducing temperatures and buffering erosion impacts. Additionally, healthy and well-maintained trees can act as net carbon sinks, removing greenhouse gases from the atmosphere.

### WHY ARE WE MAKING AN URBAN FOREST PLAN?

The City's urban forest is facing multiple challenges that put its ability to provide benefits at risk. To address these challenges while also balancing other priorities, an integrated plan for the urban forest is required, which considers the contributions of trees on both public and private property.

### WHAT ARE THE CHALLENGES?

**Impacts of climate change and forest health:** Climate change and forest health are driving a loss of trees across the City, particularly in natural areas. For instance, the western hemlock looper moth outbreak and western redcedar drought dieback have caused trees to die across the City, including over 100 mature trees in just three of the City's parks: Greenwood, Kealy Woods, and Loutet. To address these issues, City Parks

has had to invest additional resources to deal with dead and dying trees, which can pose safety hazards or contribute to wildfire risk. Trees that are stressed due to climate change will be more susceptible to pest and disease outbreaks.

**Outcomes of development:** Development often leads to short-term urban forest loss in the City. Urban densification presents challenges in accommodating trees with sufficient soil volume and permeable surface area, and replacement trees often take years to match the size of those removed. The Urban Forest Plan will include recommendations to address canopy loss through re-development.

**Conflicting priorities for public land and public dollars:** Urban forest management involves recognizing trees as a unique class of assets with specific needs, including sufficient space and water to grow, the right care when needed, and separating trees from other utility infrastructure to prolong the lifespan of both. Urban forest management policies need to be revisited to ensure they work together and reduce conflicts with other public assets.

**Tree removal on public and private property:** The City's Tree Policy for the Management of Trees on City Property prioritizes the protection of trees on City property whenever possible. The City has taken the first step in adding private tree protection through the adoption of its Tree Bylaw 8888 which does not apply to single and duplex zoning. Protecting more private trees through the Tree Bylaw will be reviewed as part of the Urban Forest Plan's visioning and recommendation phase.

# STATE OF THE URBAN FOREST

Findings from the State of the Urban Forest report include City-wide tree canopy cover extent and distribution across neighbourhoods and land uses. Canopy cover has been stable over the last decade but is facing multiple challenges. There are also gaps in the distribution of tree canopy, and the benefits it provides, across the community.

## TREE AND CANOPY STATISTICS

**Canopy cover:** The urban forest is assessed through measures such as tree canopy cover, which refers to the portion of land covered by trees when viewed from above. The City-wide tree canopy cover has remained stable at 20% since 2007. However, there have been changes in the urban forest, with some areas losing canopy due to development or forest health issues, and other areas showing growth from young trees. The City's public planting programs have helped to offset tree removals.

**Number and size of trees:** The number of trees in the City is estimated to be at least 55,000, and is likely to be higher because the canopy cover does not include trees shorter than 2m, or trees growing in the understory. Most of the City's urban forest consists of small trees that are less than 10 meters in height. Despite making up 50% of the tree population, small trees contribute only 20% of the total canopy cover.

**Management responsibility:** The majority of the City's trees (65% of tree canopy, 156 ha) are on publicly managed lands, most of which (91 ha) is in parks. Private landowners manage the remaining 35%. The City has 9,800 street and urban park trees recorded in its inventory, in addition to thousands more trees in forested areas.

**Canopy cover over neighbourhoods:** Tree canopy cover is not evenly distributed across the City, with some neighborhoods having high canopy cover, such as Cedar Village (53%), and others having low canopy cover, such as Lower Lonsdale (12%) and Moodyville (13%). Areas with low tree canopy cover are more vulnerable to climate impacts and offer less suitable habitat for native biodiversity.

**Canopy cover over land use types:** Tree canopy cover also varies among different land uses in the City, with industrial areas having virtually no canopy cover and residential areas having the highest at 17%. Improving canopy cover low canopy areas is important to ensure that all residents can benefit from the urban forest. Mapping shows that areas with high population density and low canopy cover overlap with high land surface temperature, particularly in Central and Lower Lonsdale. This information will be used to prioritize tree planting in areas where benefits, such as shade and cooling, are most needed.

**Species suitability for future climate:** Adapting the urban forest to climate change is essential to ensure its resilience in the future. Trees planted in the City today must be able to withstand hotter, drier summers, more erratic precipitation, and newly introduced forest pests. Diversifying the tree population can improve the overall resilience of the urban forest. However, 29% of tree species in the City's inventory are considered to have "marginal" suitability for the projected local climate in the 2050s, which means that they may not thrive under changing climate conditions. Western redcedar and western hemlock are two common native species that are marginal for future climate, and that are showing signs of decline.

# ASSESSING THE CITY'S URBAN FOREST PROGRAM

## THE URBAN FOREST PROGRAM

The City of North Vancouver prioritizes improving the urban forest and dedicates significant resources to the urban forest program. In 2021, $627,500 was allocated for urban forestry, which was utilized for watering, mulching, fertilization, pruning, and inspecting City trees for risk and health. Additionally, $174,000 was designated for managing natural areas and providing stewardship opportunities to the public in parks, while $210,000 was allocated for tree planting by the City.

The urban forest program comprises both reactive (request-driven) and proactive (scheduled) maintenance of City trees. Every year, City staff plant more than 160 caliper-sized trees in streets and over 500 smaller-sized native trees in City parks and natural areas, adding significant value to habitat and local ecosystems.

As of 2022, five full-time staff and one auxiliary position manage the core of the urban forest program, while two additional positions focus on natural areas maintenance. The department handled 500 service calls for City trees in 2021. With the ever-increasing interest in outdoor recreation and the mounting pressures on tree and forest health due to climate change and development, the demand for urban forest services is increasing.

### THE URBAN FOREST REPORT CARD

The State of the Urban Forest Report assesses urban forest management in the City using a criteria and indicators approach. A criteria is a particular outcome related to urban forest management, while indicators are descriptive statements that reflect poor, fair, good, and optimal performance relative to the criteria.

The City's overall program scores fair on the Urban Forest Report Card for 2023. While the core program is strong, there is room for growth to build on the momentum and ensure the City's urban forest through best management practices. The Urban Forest Plan will provide recommendations for the City's urban forest management to support the growth of the urban forest program and the urban forest itself, ensuring its resilience in the face of challenges.

## NEXT STEPS

The State of the Urban Forest Report establishes baseline information about the City's urban forest. The next steps in developing the Urban Forest Plan involve engaging the public to understand the community's values and priorities for urban forest management. This engagement will allow people to envision the future of the urban forest, understand information in the State of the Urban Forest Report, and learn how they can support the urban forest. Public input collected during the engagement will inform the vision, goals, and comprehensive recommendations in the Urban Forest Plan.

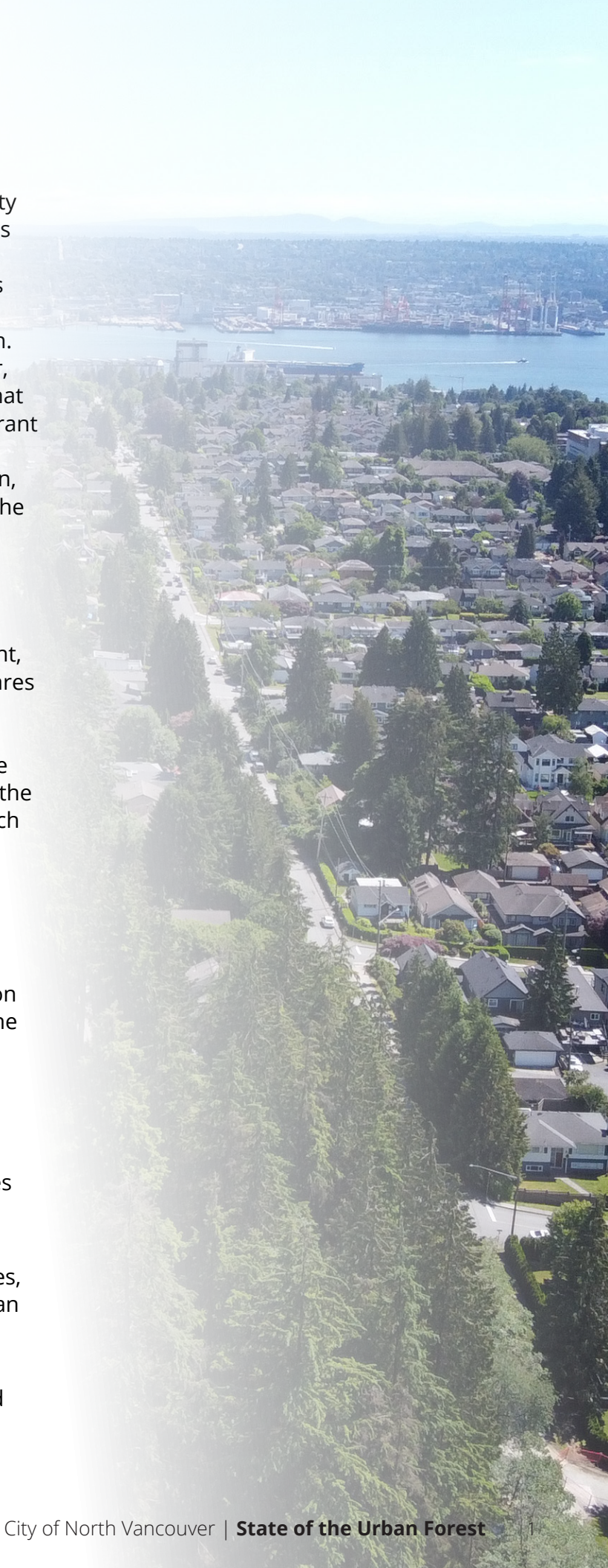
# 1. INTRODUCTION

The urban forest is an essential component of the City of North Vancouver's identity and quality of life. Trees provide a range of benefits, including physical and mental health benefits for people, improved habitats and ecological value in urban areas, cleaner air and water, carbon storage, and climate change mitigation. In a small, highly urbanized city like North Vancouver, trees are a critical element of the urban landscape that connects the forested North Shore mountains to vibrant urban neighborhoods. To manage this important resource, the City is developing the Urban Forest Plan, a master plan that will provide a strategic vision for the City of North Vancouver's urban forest management until 2050.

The State of the Urban Forest Report is the first step in developing the Urban Forest Plan, providing an overview of the City's urban forest, including its extent, value, and management practices. The report compares the City's urban forest management program with those of several other municipalities, using a criteria and indicators approach to assess best practices. The results of this report will inform the development of the Urban Forest Plan and establish a baseline from which to measure future performance.

The report is divided into the following sections:

1. **Introduction** — introduces the report, the urban forest and the upcoming Urban Forest Plan.
2. **State of the Urban Forest** —provides information about the extent, distribution, and character of the urban forest.
3. **Opportunities and Challenges** — identifies opportunities and challenges for urban forest management.
4. **Municipal Urban Forest Program** — summarizes the activities of the City's urban forestry staff and provides comparisons to peer cities.
5. **Urban Forest Policy Context** — describes policies, plans, and other tools the City uses to shape urban forest management.
6. **Urban Forest Report Card** — scores the City's urban forest program against a set of criteria and indicators for urban forest management.
7. **Next Steps** — offers key findings to inform the Urban Forest Plan development.



## 1.1. REPORT PURPOSE

The State of the Urban Forest Report provides background information on the City of North Vancouver's urban forest, as of 2021. The purpose of this State of the Urban Forest report is to:

1. Provide metrics to inform preparation of the Urban Forest Plan and recommendation for the program.
2. Introduce key findings about the urban forest to the community.
3. Set baselines for the City's urban forest program to measure progress in future years.

## 1.2. URBAN FOREST PLAN

To grow, manage and protect the urban forest, the City is developing an Urban Forest Plan, which will provide a comprehensive set of actions and timelines for the next 30 years. The plan will address the complex challenges, including tree loss caused by construction impacts, forest fragmentation, drought, forest health issues and extreme heat. It will also aim to leverage opportunities to preserve trees, create new parkland, and improve conditions for new trees through redevelopment.

The City has already taken significant steps to expand its urban forest canopy, such as implementing recommendations from the 2007 Urban Forest Management Plan, adopting a Tree Bylaw to regulate tree removal on private land, and promoting green streets and retaining and protecting trees when possible during redevelopment. The City has also been growing its inventory of street trees through the Living City Planting Program. Despite these efforts, the City's urban forest management requires a unified vision, measurable goals, and targets to address intersecting challenges.

## 1.3. DEFINING THE URBAN FOREST

The City's urban forest includes all of the trees and supporting vegetation in the community. The urban forest is an interconnected ecosystem that also includes the soil, water, and air that nourishes trees. It is a crucial component of the City's green infrastructure and provides numerous benefits, such as cleaner air and water, carbon storage, and a range of habitats for wildlife.

The urban forest is found across the City, from the single tree shading a bus stop, to a neighbourhood grove where kids and pets play, to forest fragments that cool salmon streams and connect urban areas to the forest landscape of the North Shore mountains. Trees along boulevards, in parks, plazas, private yards, parking lots, and native forests are all part of the urban forest (Figure 1).

Trees in public areas, such as parks and streets, are managed by the City, while private property owners are responsible for trees on their land, which may be subjected to regulations under the City's Tree Bylaw or Streamside Development Permit Areas.

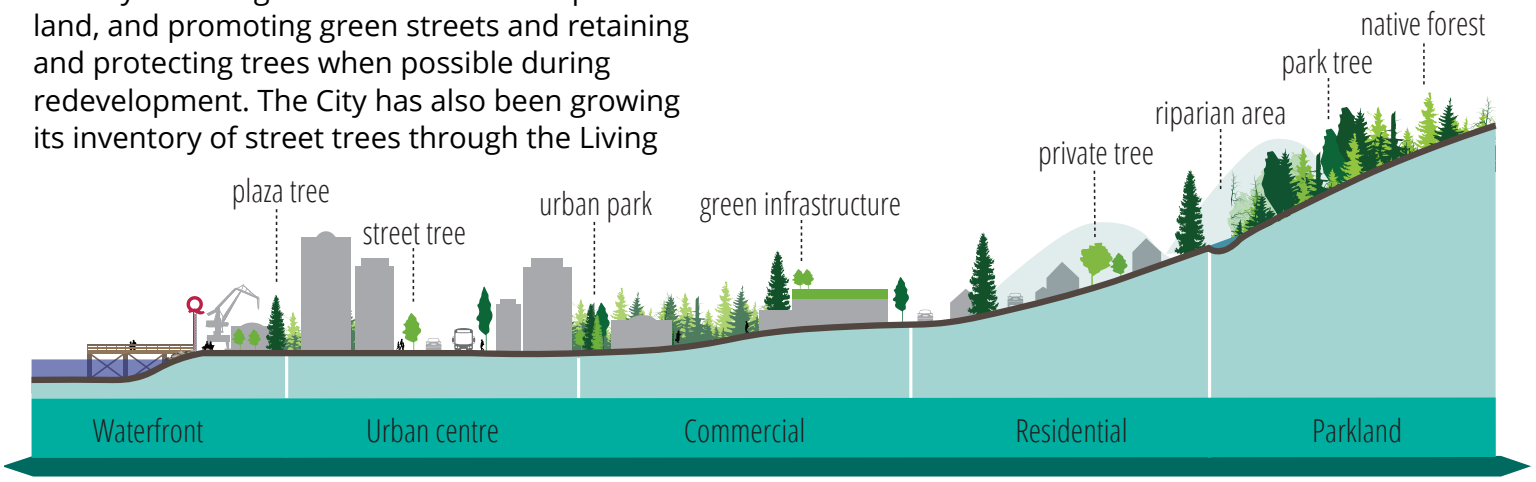



*Figure 1. The urban forest includes all trees on both private and public land in the City.*

## 1.4. URBAN FOREST BENEFITS

The urban forest is a living asset that provides benefits to the City. Trees breathe in air through their leaves and needles and draw water from soils to support photosynthesis, seemingly small acts that are the building blocks of several beneficial effects sometimes called ecosystem services. Ecosystem services are the positive impacts of trees in the City, and include impacts as diverse as shade and cooling, providing food, reducing flooding, capturing carbon from the atmosphere, and supporting emotional well-being (Figure 2). Managing the urban forest is important because of the connections of these ecosystem services to the City's strategic priorities.

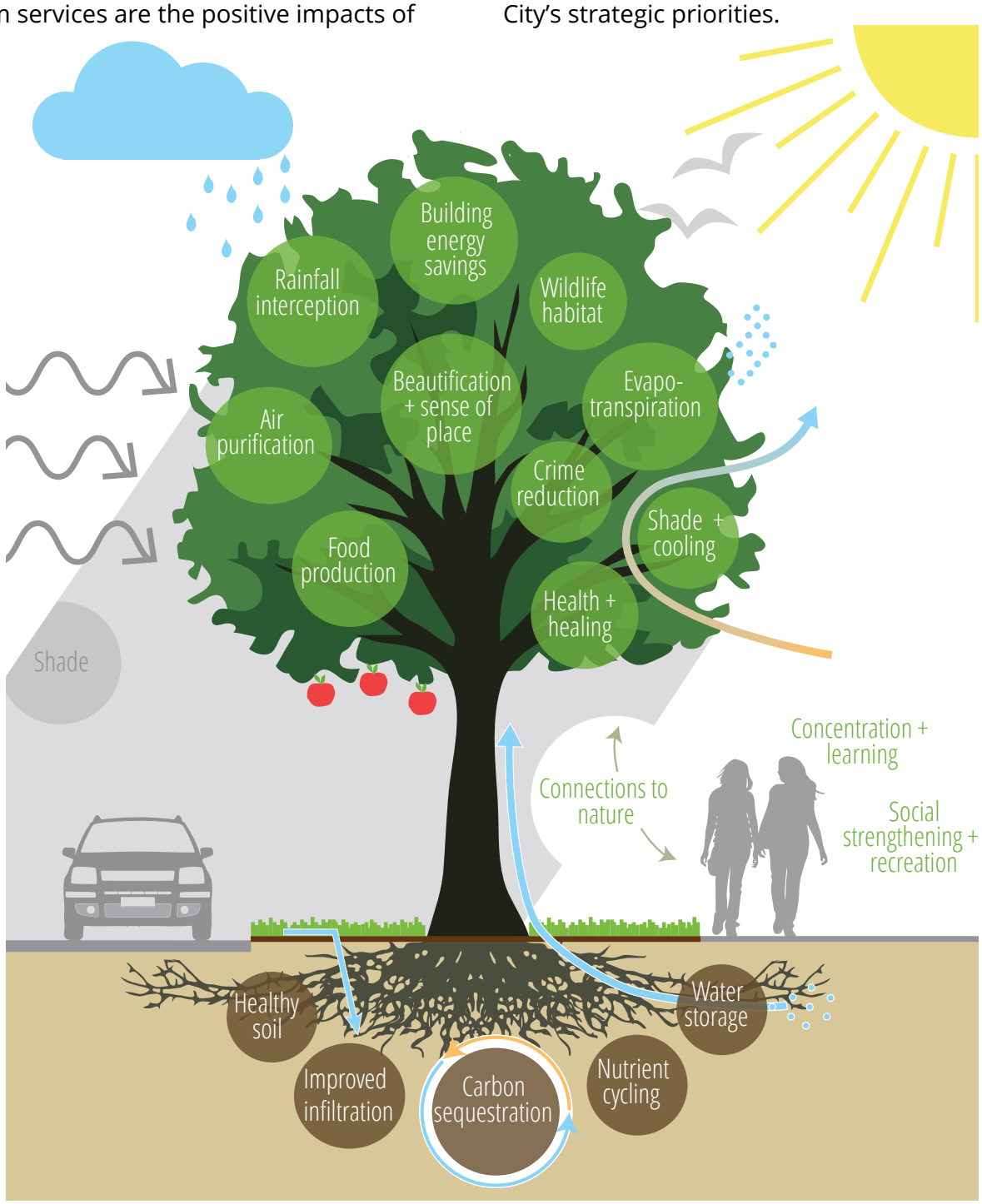



*Figure 2. Trees and the urban forest provide many vital benefits to cities.*

# 1.5. URBAN FOREST ALIGNMENT WITH CITY PRIORITIES

## HEALTHY PEOPLE AND COMMUNITIES

Trees and forests have positive effects on people's mental and physical health. Exposure to greenery has been found to lower stress levels, improve work performance, and even shorten hospital recovery times[1][2][3]. Having nearby trees and natural areas has been shown to increase the likelihood of people achieving recommended levels of physical activity[4] and live longer lives[5][6]. Trees over walking and biking routes can promote active transport[7][8][9]. Forest bathing and other forms of "nature therapy" can be prescribed by doctors in Canada as treatment for medical conditions like stress and depression[10][11], and are showing promise for a much wider range of physical and mental illnesses[12][13].

## CLIMATE RESILIENCE

Due to climate change, the City has been experiencing hotter and drier summers, warmer winters, and more intense rainfall, and these trends are expected to continue. The urban forest helps to mitigate the impact of climate change by absorbing carbon dioxide that would otherwise remain in the atmosphere and contribute to global warming.[14][15]

At the local level, trees and forests play a role in helping us adapt to climate change impacts[16]. One way in which trees contribute is through evapotranspiration, which is the process of water loss from trees through their leaves. This process helps to cool the air in the surrounding area by 1 to 5 °C[17]. The shade provided by trees also helps to keep streets, sidewalks, and buildings comfortable[18]. Shaded asphalt can be 11 to 25 °C cooler than nearby unshaded pavement during a hot summer day[19].

To reduce climate risk to the urban forest, it is crucial to increase tree diversity. Planting a wider variety of species and selecting species that are well-suited to the future local climate can mitigate species vulnerability.

## STRONG ECONOMY

A healthy urban forest stimulates the local economy. The City of North Vancouver has implemented rain gardens, public art, street parkettes and corner plazas along its main commercial corridors to encourage vibrancy and livability. A healthy, dense tree canopy cover can further improve the economic success of commercial streets since it encourages people to stay longer and spend more money locally[20]. The North Shore's forested mountains and parks attract

many visitors to the City, supporting many local stores, restaurants, and a significant recreation industry.

## RECONCILIATION

Native forest ecosystems often have special meanings for Indigenous peoples, who access medicines, support fisheries, operate businesses, and continue cultural practices related to healthy forests. The City is on the unceded territories of the Skwxwú7mesh (Squamish) and səl̓ílwətaɬ (Tsleil-Waututh) Nations. Urban forest management impacts the values and ecosystems found in these traditional territories. For this reason it is important to move the Urban Forest Plan forward in partnership with Indigenous peoples.

## CLEAN AIR AND WATER

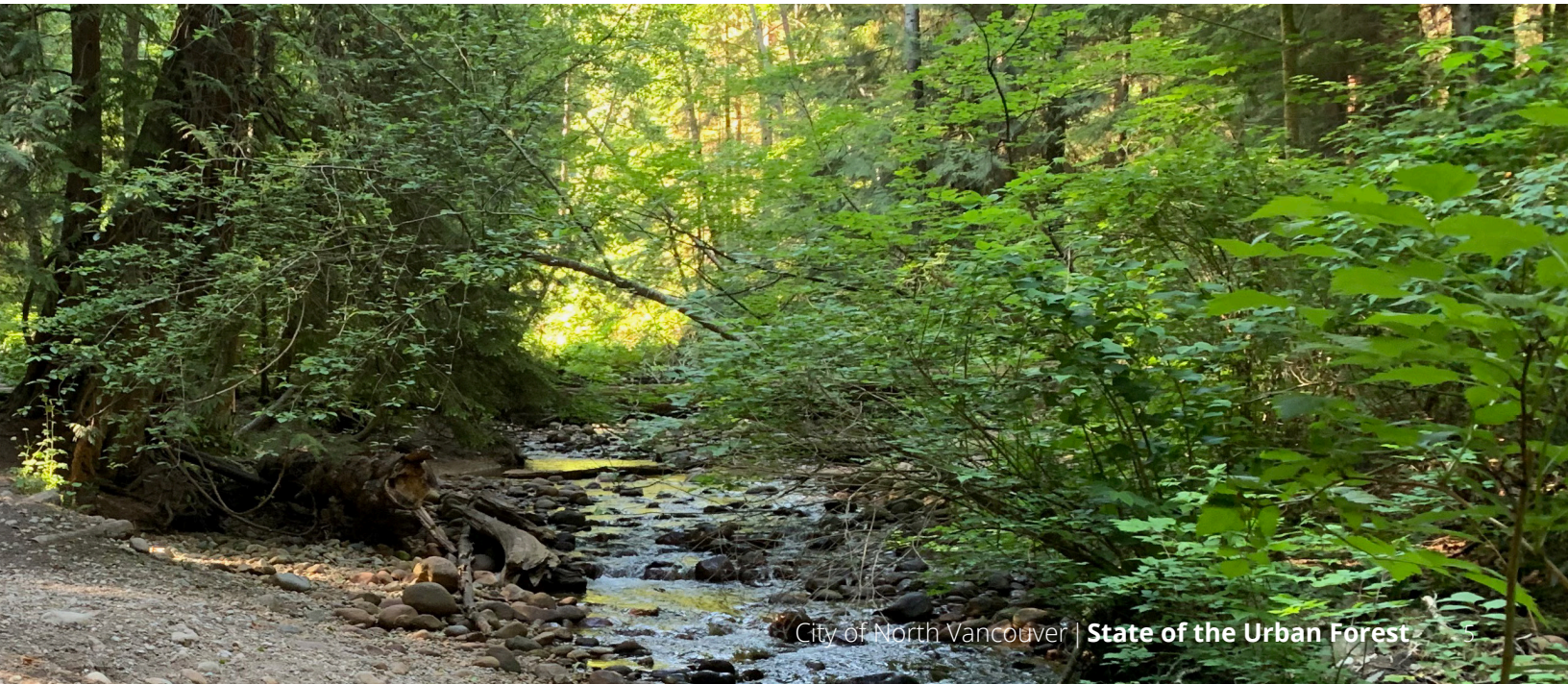
Trees and forests capture rain and stormwater runoff, which is filtered by roots and surrounding soils in the ground[21][22]. Some of this water resurfaces in streams, lakes, wetlands, and ponds – aquatic habitats used by protected fish and other wildlife. The urban forest cleans the air by taking in pollutants like carbon monoxide, road particulates, and nitrogen dioxide and releasing oxygen[23][24].

## HABITAT AND BIODIVERSITY

The urban forest is a source of biodiversity in the urban environment, as trees and soils provide habitat for many other plants, animals, fungi, and microbes[25]. Forest restoration efforts in urban areas are helping to protect salmon streams, and eagles have been observed nesting nearby. Having a high level of biodiversity is crucial for protecting ecosystem services such as stormwater capture, nutrient cycling in soil, and pollination of gardens[26]. In addition, the plants, animals, and fungi in the urban forest also benefit from the same ecosystem services that humans value, such as clean water and cooler temperatures.

## A SENSE OF PLACE, TIME, AND IDENTITY

Forests and trees offer individuals and communities layers of meaning that contribute to cultural benefits like strong civic identity and pride[27]. As long-lived organisms, trees age with us and help mark the passage of time. The forested mountains and large coniferous trees are part of the City of North Vancouver's identity and provide a sense of place to residents.



# 2. STATE OF THE URBAN FOREST

The City's urban forest is a dynamic and complex system, always growing and changing. Setting a framework for management in the Urban Forest Plan requires knowledge about how much urban forest there is, what it is composed of, the ecosystem services it provides, and where these services are distributed. This analysis helps understand issues and challenges faced by the urban forest as well as gaps in the City's urban forest management program. Our knowledge about the urban forest comes from several sources like remote sensing of the City's tree canopy cover, data from the City's tree inventory, and census data to establish indicators of social vulnerability.

The mapping methods used to prepare data for this section allow data summaries to be made for different parts of the City's land base. Different management units/land ownerships, land uses, and neighbourhoods are all used to summarize data where appropriate. This section reports on the following characteristics of the City's urban forest:

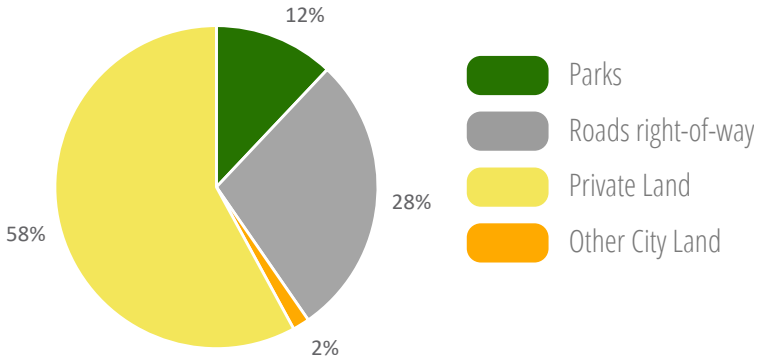
- **Canopy cover**
- **Change in the urban forest canopy** between 2007, 2013, and 2021
- **Estimated ecosystem service provision** City-wide and from the street-tree inventory
- **Forested natural areas**
- **Forest structure**
- **Inventoried trees in streets**
- **Priority areas to increase canopy cover**

## 2.1. GEOGRAPHIES FOR SUMMARY

These maps illustrate the geographies used to summarize canopy cover in the following sections.

### MANAGEMENT UNITS

Management units define where the primary caretakers of the urban forest vary by land ownership (Figure 3). The City manages the urban forest in parks, streets and rights-of-way, and on other City property. Private land owners look after trees on their properties. The City is made up of 58% private land and 42% public land. The public land can be divided into 28% road rights-of-way, 12% parks, and 2% other City land.




***Management units as a proportion of land area.***

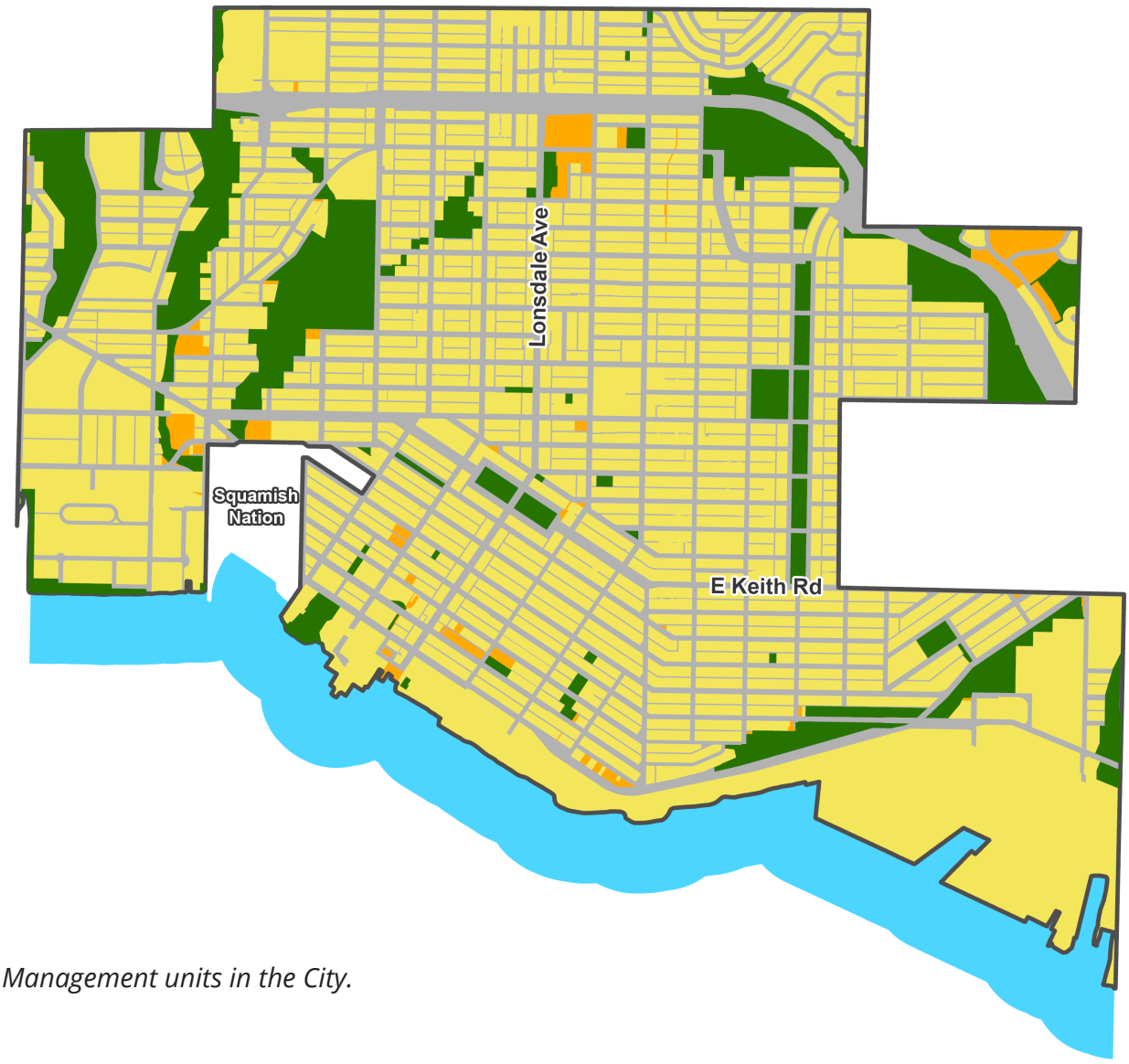



*Figure 3. Management units in the City.*

## OFFICIAL COMMUNITY PLAN LAND USE

To guide the growth and development of an area, the Official Community Plan designates different land uses (Figure 4). The amount of canopy cover in an area often varies depending on the land use. For instance, in areas where high lot coverage is allowed, there may be little space for trees.

Proportion of Land Area (excluding roads)
Land Uses

| | |
|---|---|
| Residential | 52% |
| Parks, Recreation & Open Space | 16% |
| Industrial | 11% |
| Mixed Use | 8% |
| Mixed Employment | 5% |
| School & Institutional | 4% |
| Commercial | 3% |

The percentage of the City occupied by each land use, excluding roads, is shown above. Residential areas account for the most significant portion of land use in terms of area, followed by parks and open spaces, industrial land, and mixed-use land.

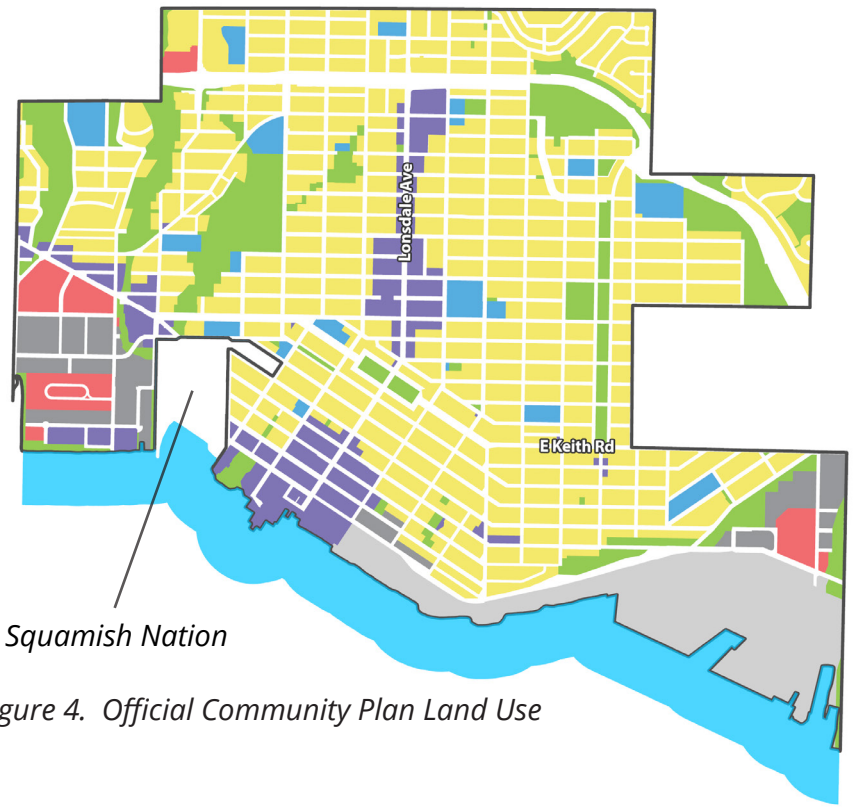



*Figure 4. Official Community Plan Land Use*

## NEIGHBOURHOODS

Neighbourhoods (Figure 5) can be a useful means of summarizing data related to the urban forest. They are familiar to the City's residents and may also reflect the socioeconomic diversity that affects priorities for tree planting. The City of North Vancouver is divided into nine neighbourhoods.

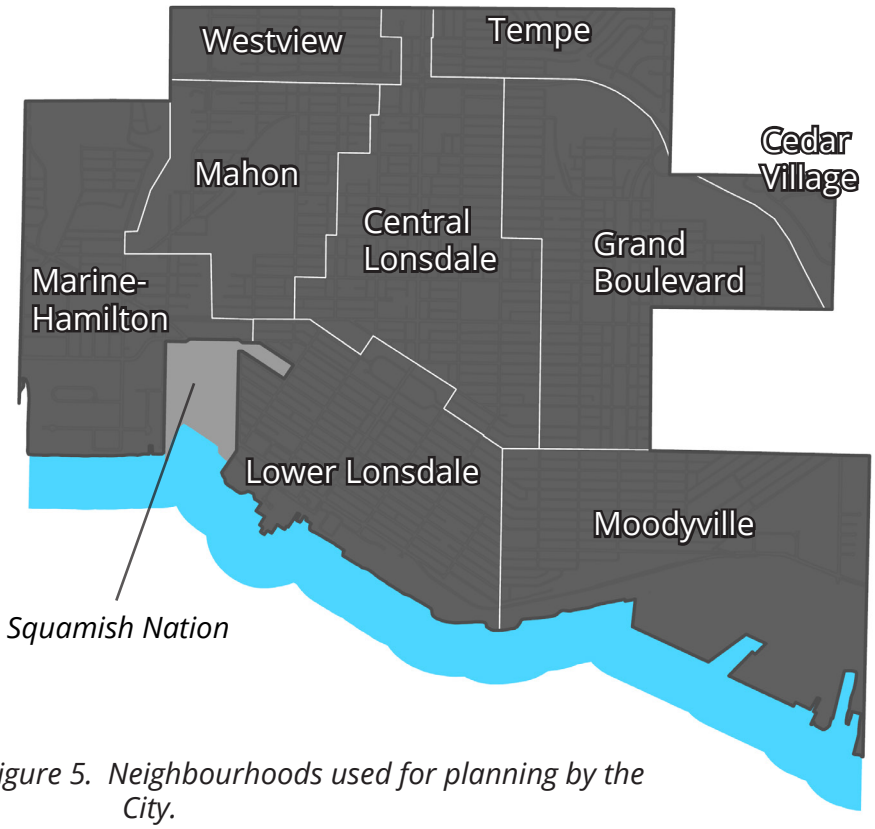



*Figure 5. Neighbourhoods used for planning by the City.*

## 2.2. CANOPY COVER

Canopy cover is an essential metric used by municipalities to measure the extent of their urban forest over time, identify where there are gaps in tree canopy and quantify tree benefits such as stormwater management and carbon storage. Canopy cover measures the percentage of an area that is covered by tree crowns when viewed from above (as shown in Figure 6). It is a cost-effective a and easily understandable metric that can be compared across different jurisdictions and between areas.

In this report, canopy cover was determined using a combination of aerial orthoimagery and Light Detection and Ranging (LiDAR) data. LiDAR is a method of data collection that involves using a plane or a drone to send non-visible beams of light vertically towards the ground as it travels over the surface. This data is then used to create a map of heights for buildings, trees, and open spaces. This information is combined with aerial orthophotography to classify it into tree and non-tree surfaces. Figure 7 shows the City's urban forest canopy cover (green) over aerial orthoimagery.

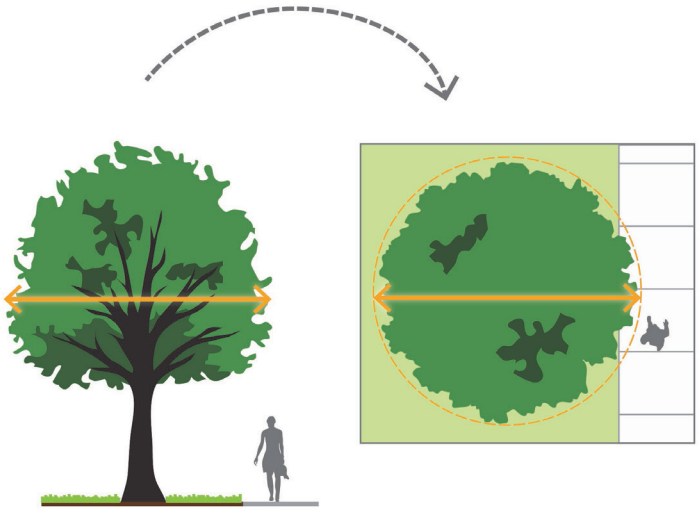


*Figure 6. A city's tree canopy refers to the bird's eye view down onto tree crown within the City boundaries*


*Figure 7. Tree Canopy Cover in 2021 derived from LiDAR data (a tree is mapped in green if it is at least 2 meters tall).*

## CITY-WIDE CANOPY COVER

In 2021, the City of North Vancouver estimated its tree canopy cover to be 20%, which is equivalent to 240 hectares out of the City's total land area of 1189 hectares. The canopy cover of cities in Metro Vancouver typically ranges from 10% to 40%, with an average of 34% for lands within the urban containment boundary (as of 2014). Communities with high proportions of farmland and low forested areas, like Richmond and Delta, have the lowest canopy cover. Meanwhile, highly urbanized cities such as the City of North Vancouver, New Westminster, and Vancouver have canopy covers ranging from 18% to 23%, with fewer natural forested areas and more industrial and commercial land.

Canopy cover in the City of North Vancouver is not evenly distributed (Figure 8), with the highest coverage found in natural parklands that contain

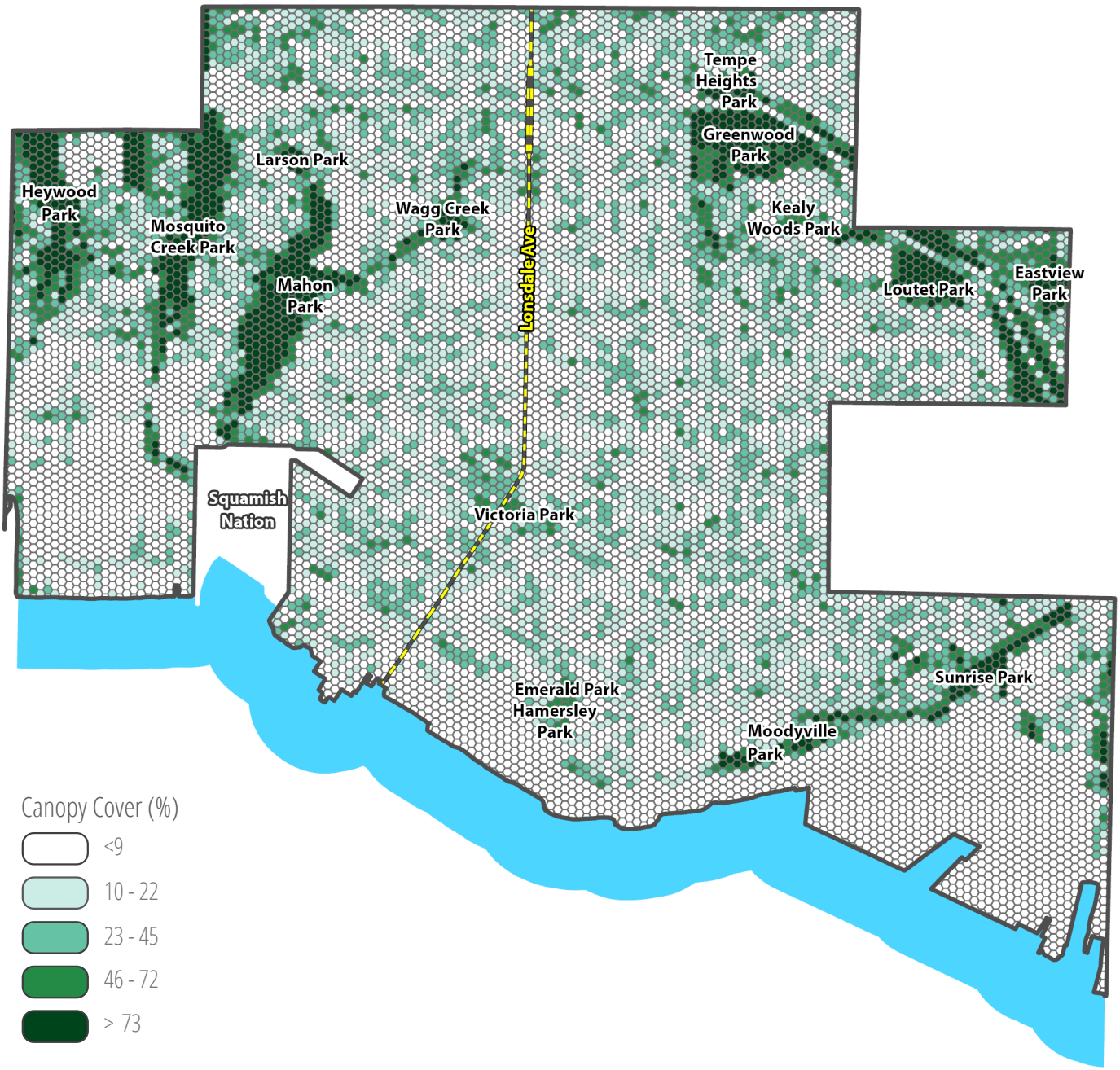



*Figure 8. The City's tree canopy cover derived from 2021 LiDAR data by grid distribution.*

fragments of second-growth forest, particularly near freshwater fish-bearing streams. The parks along Mackay Creek, Mosquito Creek, Lynn Creek, Mission Creek, and Wagg Creek to the west have the highest canopy cover, while the forested Greenwood and Loutet parks in the east also have a high coverage. Port and industrial lands along the City's waterfront and the employment lands around Capilano Mall and Harbourside have very little tree canopy cover, and low canopy blocks are common within Lower and Central Lonsdale. The distribution of canopy cover in the City can be explained by the land uses that allow for impermeable surfaces, such as industrial yards, port facilities, shopping and retail areas, strip malls, automotive businesses, and some high-density urban areas, which have less room for trees.

## CANOPY COVER BY MANAGEMENT UNITS

More than half (65%) of the City's canopy cover is situated on publicly managed land, with 38% located in parks, 25% in streets and rights-of-way, and another 2% on other City land. The remaining 35% of the City's canopy cover is managed by private property owners (Figure 9).

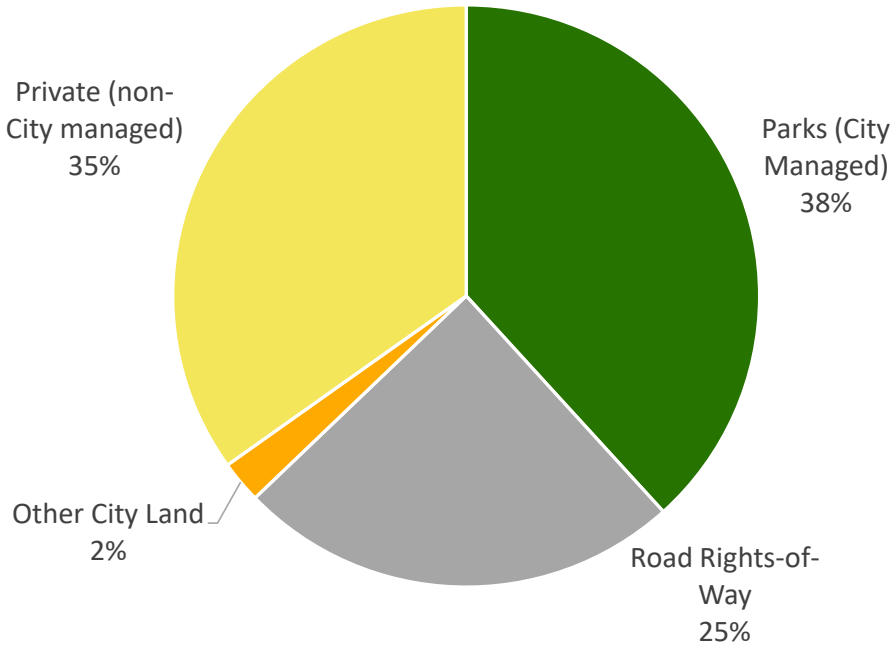



*Figure 9. Proportion of Citywide tree canopy in each management unit.*

Within each management unit, parks have the highest canopy cover at 64%, followed by other City land at 25% and road rights-of-way with 17% canopy cover (Figure 10). Private lands average 12% tree canopy cover.

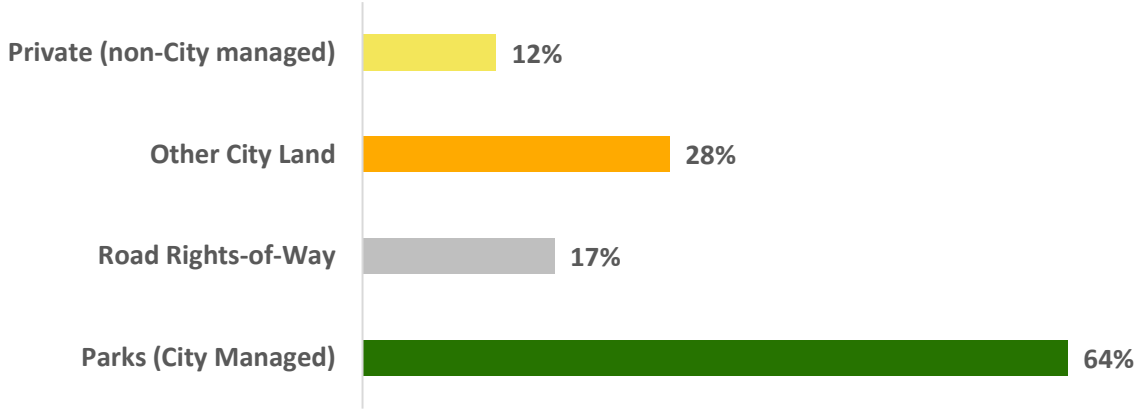
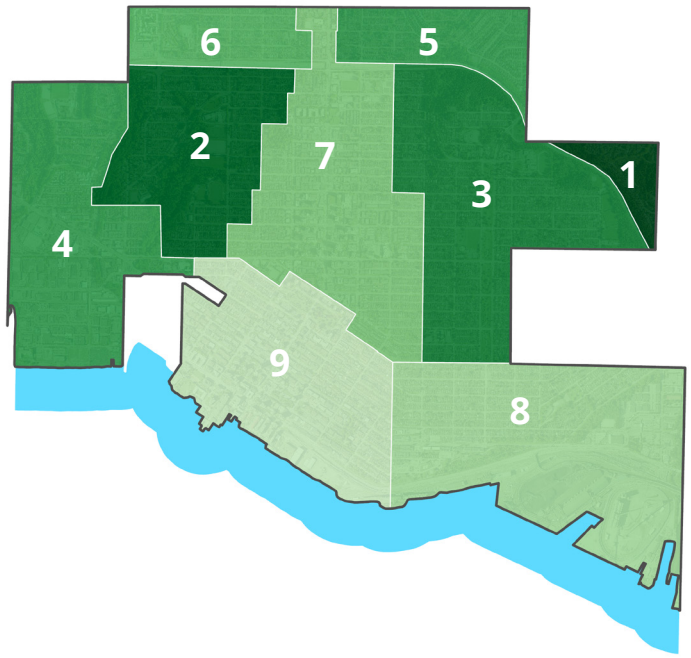



*Figure 10. Canopy cover over each management unit.*

**65% of the city's tree canopy is on public land**

## CANOPY COVER BY NEIGHBOURHOOD

The City of North Vancouver's canopy is not equally distributed across neighbourhoods. The neighbourhoods with highest canopy cover are Cedar Village (53%) and Mahon (34%). Three more neighbourhoods, Grand Boulevard (25%), Marine-Hamilton (24%), and Tempe (24%) have canopy cover higher than the City's 20% average. Lower Lonsdale, Moodyville, and Central Lonsdale all have canopy cover below 15%.



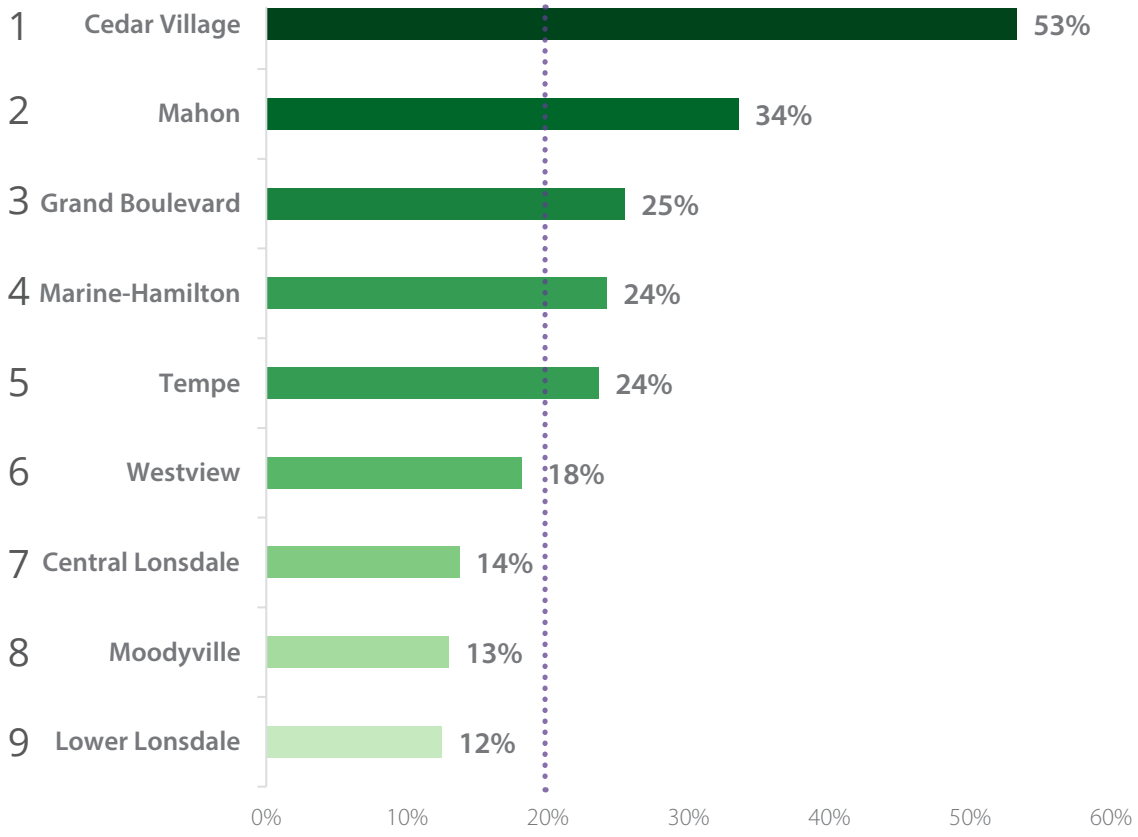




*Figure 11. Canopy cover by neighbourhood*

## CANOPY COVER BY LAND USE

Parks, recreation and open spaces have the highest canopy cover of all land uses at 64%, followed by school and institutional lands, and residential lands with 18% and 17% cover respectively (Figure 12). Mixed use lands have 7% and commercial and mixed employment lands have 6% cover. Industrial zones have virtually no canopy cover at all (<1%). This pattern is common across Metro Vancouver, with residential land uses tending to have more open, unpaved space in which to plant trees than commercial, industrial, or mixed use lands.

The largest land use in the City is residential (Figure 13), followed by parks, mixed use and industrial. Because of their large land area, policies and programs that target tree retention and planting in these land uses will have the greatest influence on the future of City-wide canopy cover.

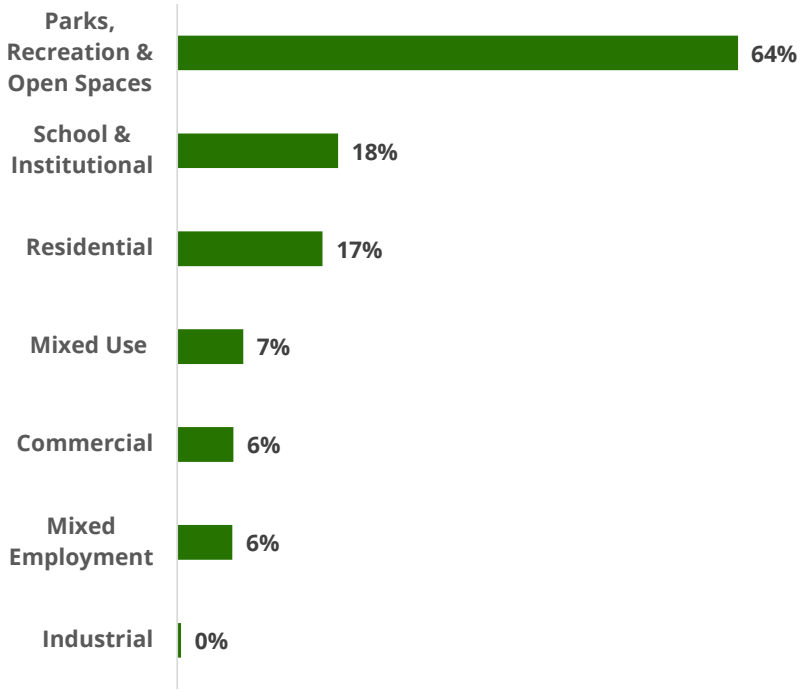



*Figure 12. Canopy cover by OCP Land use.*

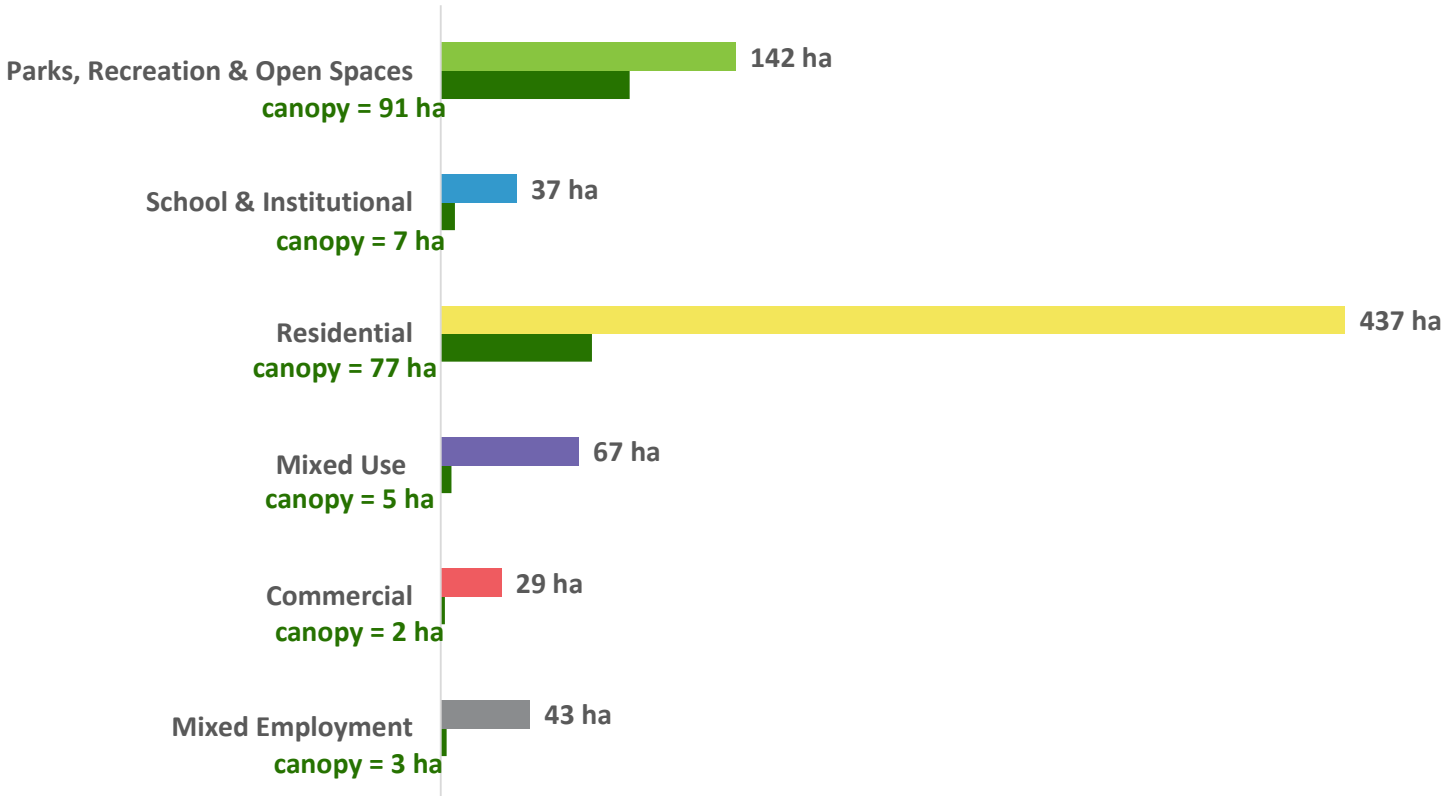



*Figure 13. Land area and canopy area in hectares by OCP land use*

## 2.3. CANOPY COVER CHANGE

Monitoring changes in the amount of tree canopy is an important step in measuring the performance of urban forests across a city. In order to determine the amount of tree canopy cover in the City for 2013 and 2021, LiDAR data was used. However, since there was no LiDAR data available for 2007, i-Tree Canopy software was used instead. This software is a tool created by the USDA Forest Service that estimates land cover using random points that are validated through high-resolution imagery by the user.

The City's canopy cover between 2007 and 2021 has been stable. Although the overall amount of tree canopy cover in the City has remained stable, there have been changes at a finer scale that have reshaped the urban forest. Figure 15 shows these changes between 2013 and 2021. Canopy gain and loss are mixed throughout the City. Areas with canopy loss tend to have higher levels of development, such as infill housing and residential redevelopment, where smaller replacement trees take years to grow to the size of the trees that were removed. Loss is also seen in some natural areas and may be due to forest health factors, such as damage from the western hemlock looper moth. Canopy gain is associated with tree growth in areas with little development activity, new tree planting with redevelopment, and the growth and planting of street trees (Figure 14).

In areas of the City where there are currently few trees, such as industrial port lands and commercial or mixed employment areas like Harbourside, near Capilano Mall, and at Park and Tilford, the amount of tree canopy cover has remained stable.

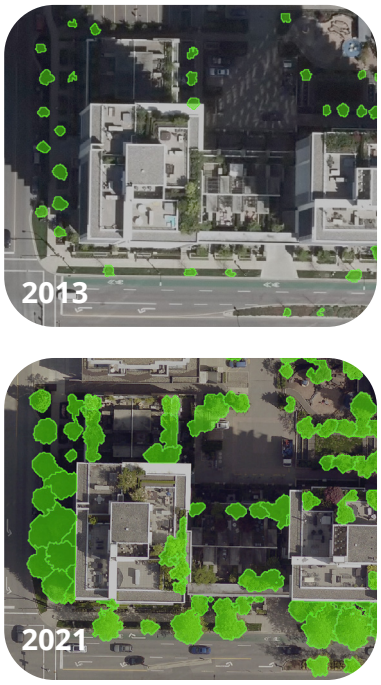
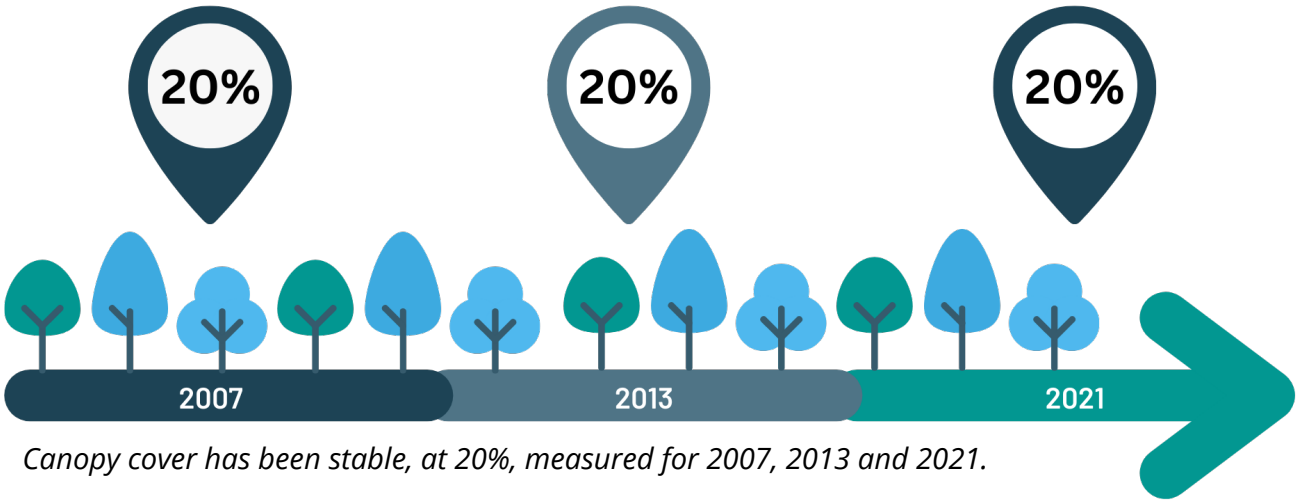



*Figure 14. Example of canopy gain between 2013 and 2021 at 13th St W and Chesterfield Ave.*




*Canopy cover has been stable, at 20%, measured for 2007, 2013 and 2021.*

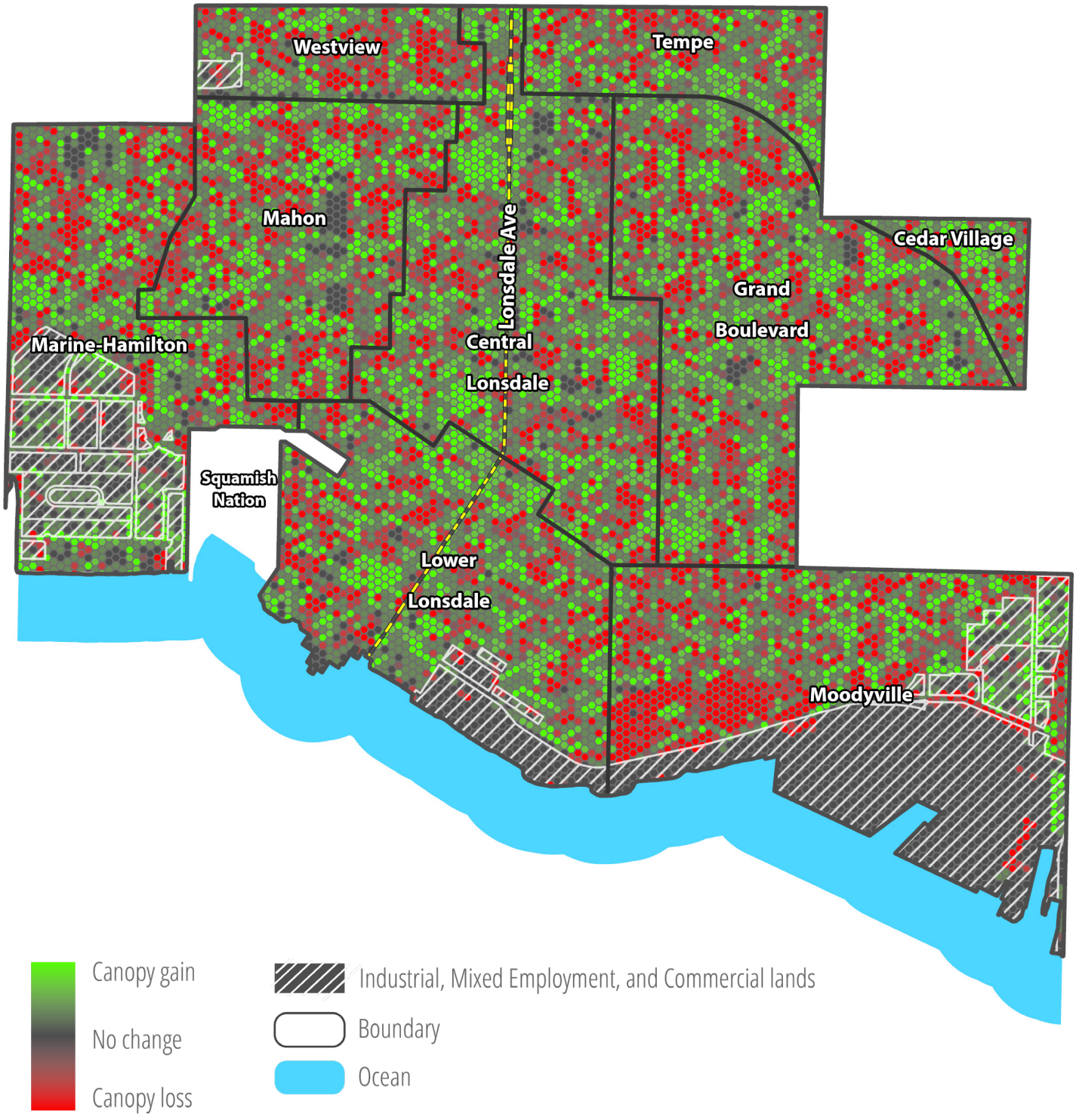



*Figure 15. Canopy cover gain and loss between 2013 and 2021 by grid distribution.*

## 2.4. URBAN FOREST STRUCTURE

The analysis of the City's canopy cover includes a technique called segmentation analysis, which uses information on the height of tree canopies to distinguish between individual trees. This method provides information about tree heights and counts, which can be used to describe the structure of the urban forest in different parts of the City. This section maps the City's tallest trees and describes the structure of the urban forest in different neighbourhoods.

### THE BENEFITS OF LARGE TREES

The City has some very tall trees, over 50 meters, that grow in mature forests along streams and in parks (Figure 16, Figure 17). Mahon Park, Heywood Park, and Loutet Park contain some of the largest trees reaching more than 55 meters in height, the equivalent of a 17-storey building. These tall trees are crucial for providing habitat for wildlife, adding structural diversity to the forest, and preserving cultural and amenity values. Tall trees tend to indicate older forests with high habitat value. Therefore, they are highly valued and priorities to preserve.

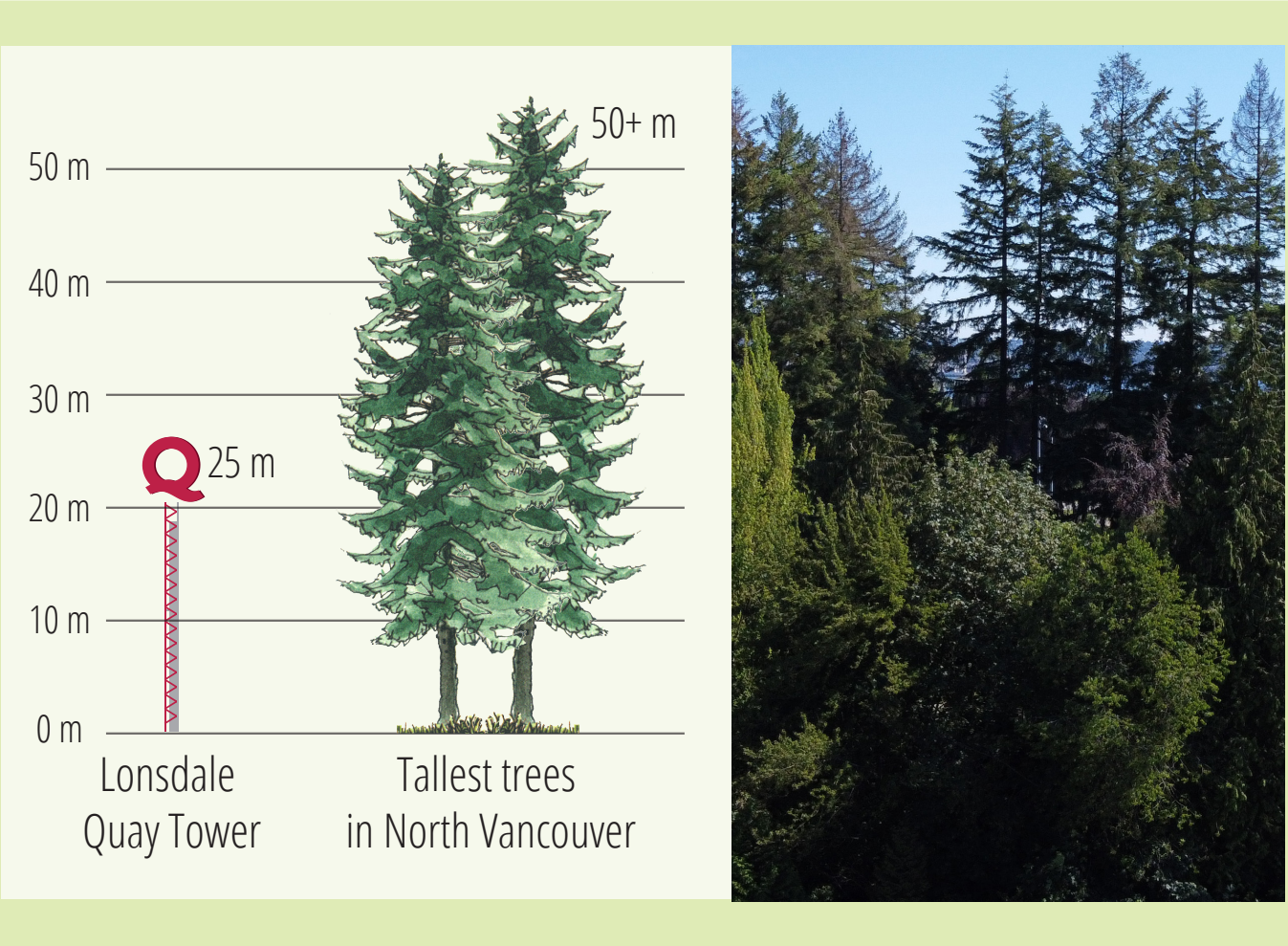
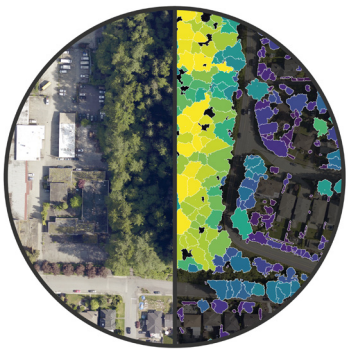
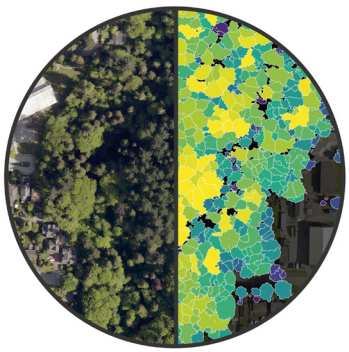



*Figure 16. The City's tallest trees are twice as high as the Lonsdale Quay tower*

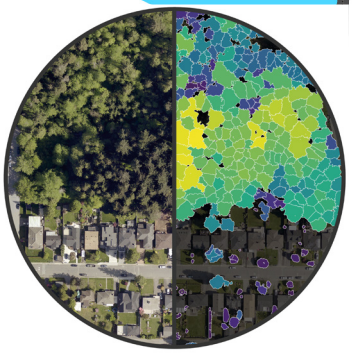
The map below provides information on the height of trees across the City. The smaller maps highlight three locations with the tallest trees; MacKay Greenbelt, Mission Creek and Loutet Park.

1. MacKay Greenbelt



2. Mission Creek



3. Loutet Park

*Figure 17. Map of tree heights derived from the 2021 LiDAR data.*

## CITY-WIDE URBAN FOREST STRUCTURE

Using segmentation analysis, it was found that there are at least 55,027 trees in the City, which together provide 240 hectares of canopy cover. However, this method does not include trees hidden beneath larger trees, and underestimates the total number of trees in the City. The true number of trees in North Vancouver may be two or three times higher than the estimated count.

Canopy segmentation is useful because it allows the urban forest to be described by height and canopy area per tree, which provides information about forest structure. Figure 18 illustrates this relationship for the City-wide urban forest. The vertical bars represent the tree count and are read on the left axis, while the line represents the canopy area and is read on the right axis. The tree count has been grouped into 10-metre height classes along the horizontal axis.

The chart reveals that the majority of the City's urban forest consists of small trees that are less than 10 meters in height. These smaller trees, which number about 28,500 or just over half of the City's trees, contribute only one-fifth of the total canopy cover. However, trees that are 30 to 40 meters tall, despite being fewer in number (5,500), provide approximately the same amount of canopy cover as the 28,500 smaller trees.

This highlights the importance of large, mature trees, as their larger canopies provide significantly greater benefits.

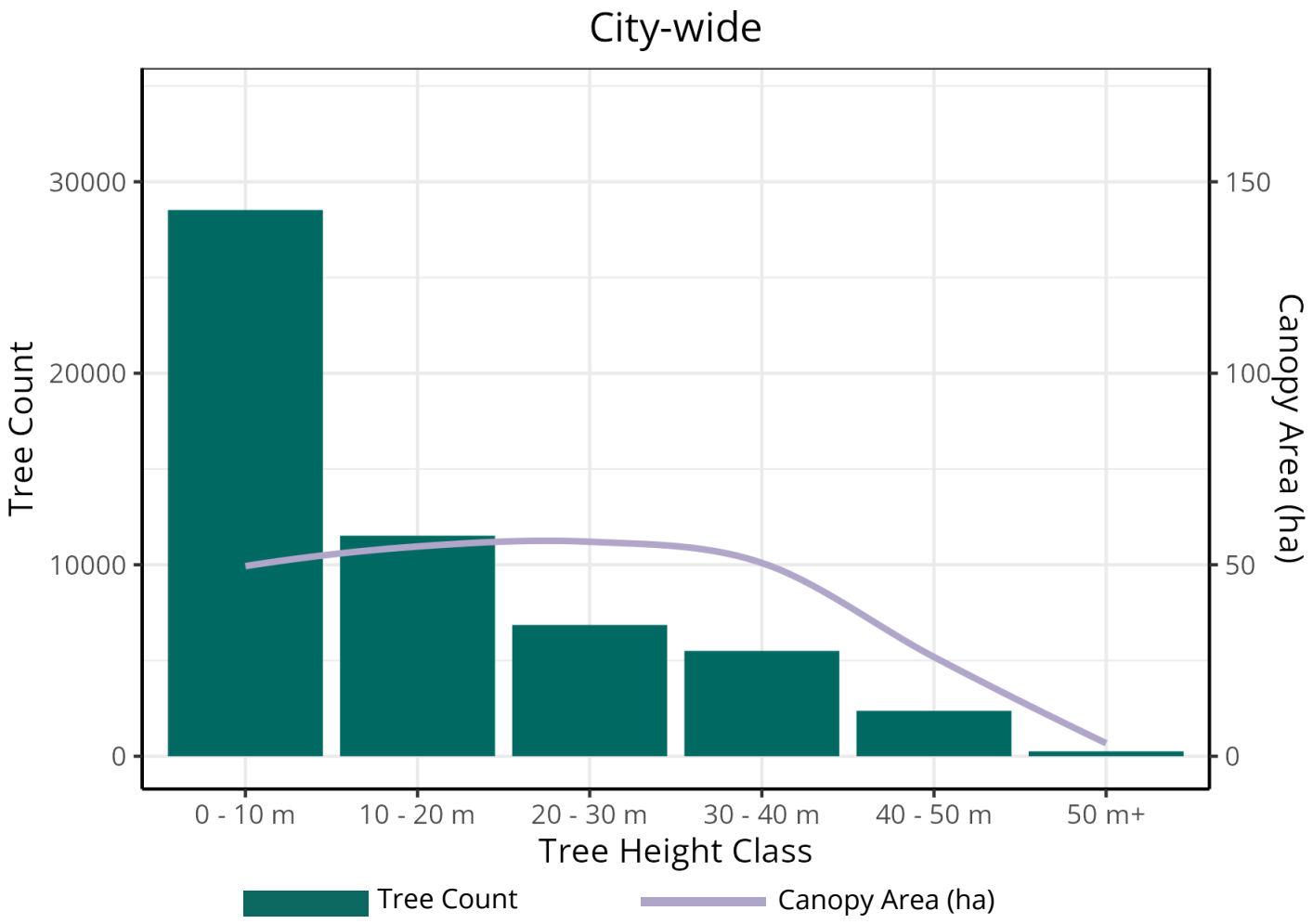



*Figure 18. City-wide tree count and canopy area by 10-metre height class.*

## NEIGHBOURHOOD URBAN FOREST STRUCTURE

The relationship between tree count, canopy area, and tree height can be analyzed for each of the neighbourhoods in the City to understand which areas rely on small or young trees for their canopy cover and which areas have a higher number of large, mature trees.

For example, Cedar Village (shown in Figure 19, first panel) has a high percentage of large trees between 20 and 40 m in height, making up 62% of the total tree count and providing 71% of the overall tree canopy. This neighbourhood has a high percentage of native conifers and deciduous trees, and it has the highest canopy cover (53%) in the City. The distribution of tree sizes suggests the forest is mature.

On the other hand, Central Lonsdale (shown in Figure 19 second panel) has mainly small trees less than 10 m in height, which make up 66% of the tree count and provide 37% of the neighbourhood's canopy cover. The neighbourhood also has trees between 10 - 20 m tall, which make up 25% of the tree count and provide 35% of the canopy cover. Despite only accounting for 9% of the tree count, trees between 20 - 40 m tall still provide 27% of the neighbourhood's tree canopy. The distribution of tree sizes suggests Central Lonsdale's forest is young, and still growing.

The charts in Figure 19 and Figure 20 provide the breakdown of tree count, canopy area, and height class for each neighbourhood in the City. They show that some neighbourhoods have a higher number of large, mature trees and associated canopy cover, which are rare and valuable for their outsized contributions to urban forest benefits. Retaining large trees is the most effective way to maintain tree canopy cover.

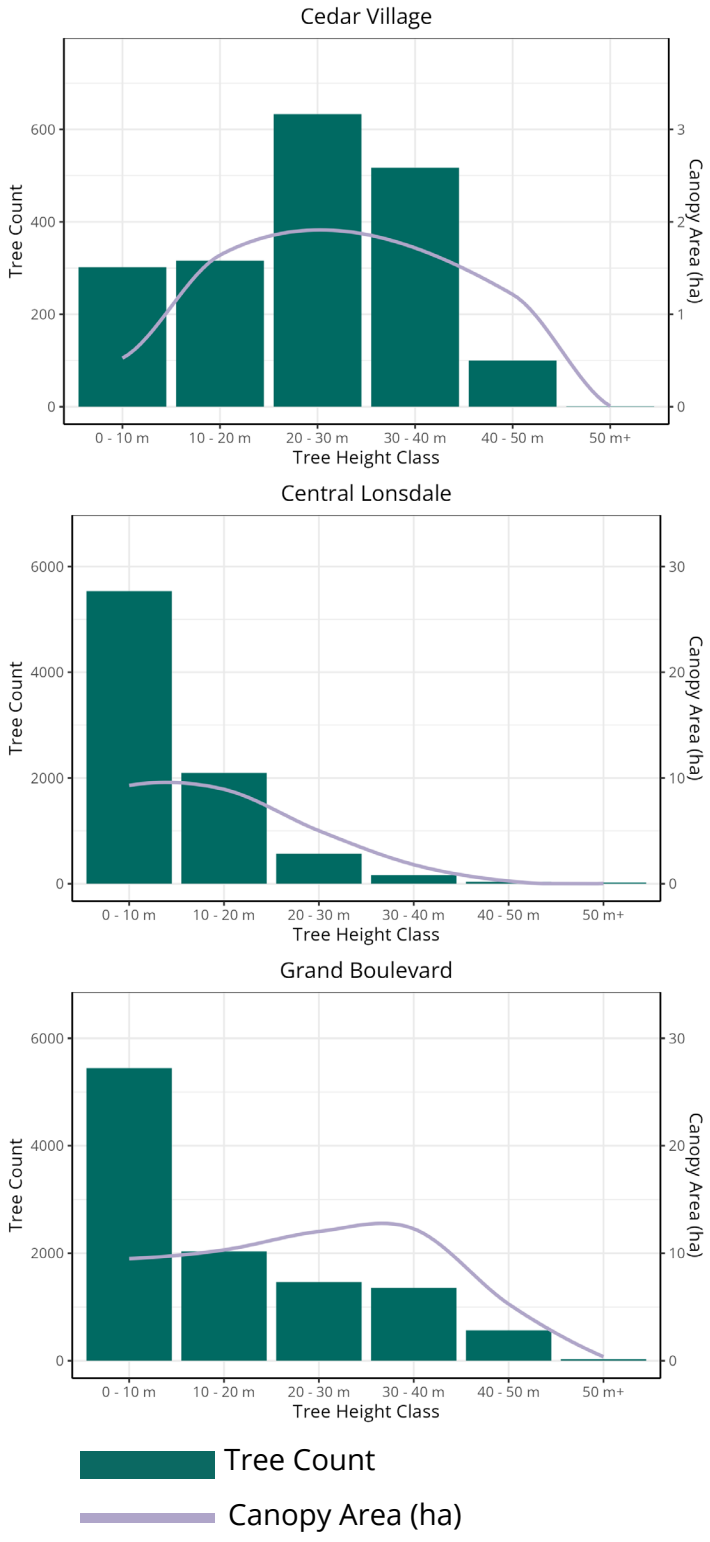



*Figure 19. Tree count and canopy area by height class in Cedar Village, Central Lonsdale, and Grand Boulevard.*

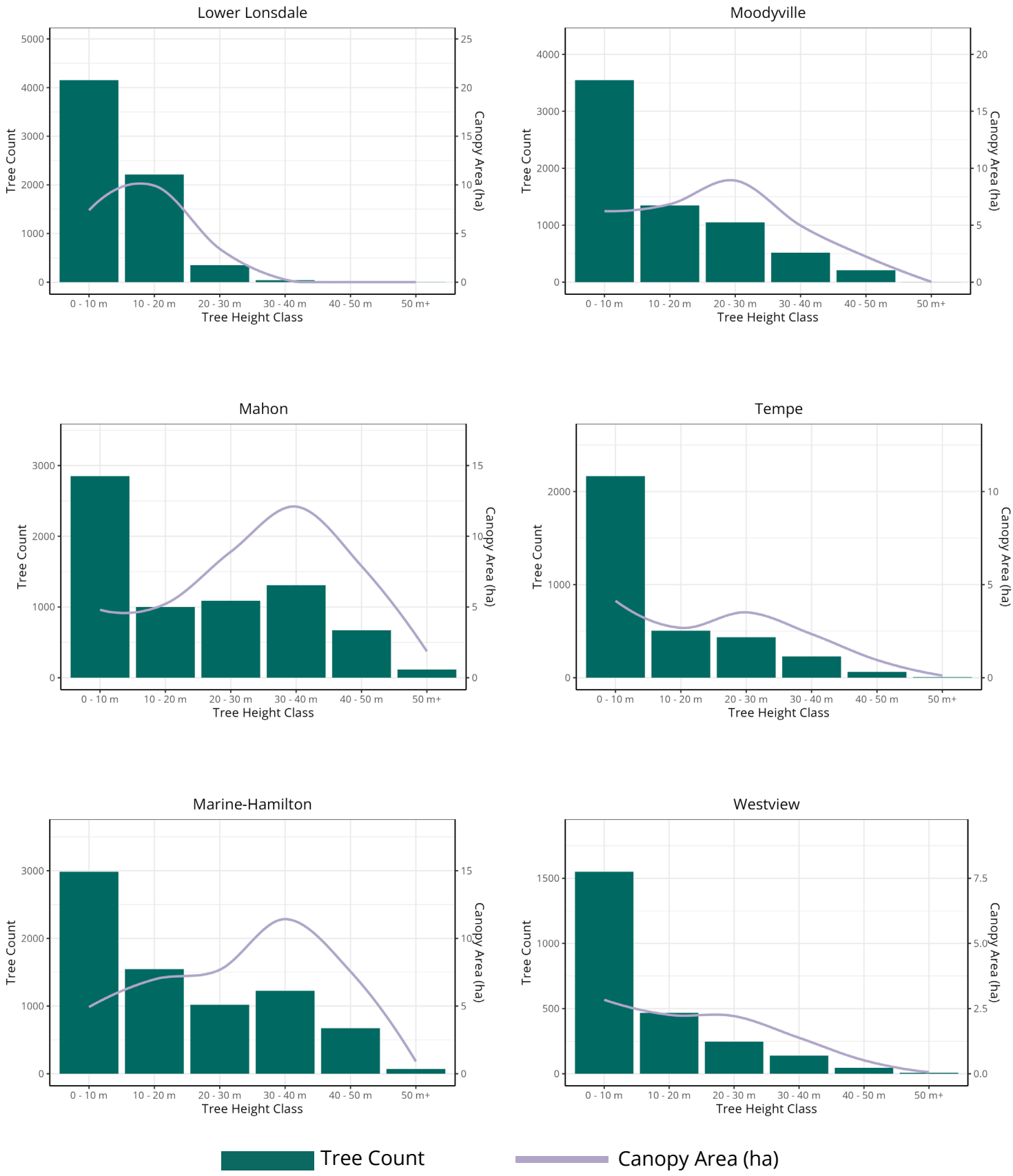



*Figure 20. Tree count and canopy area by height class in (clockwise from top left) Lower Lonsdale, Moodyville, Tempe, Westview, Marine-Hamilton, and Mahon.*

## CITY-WIDE CANOPY VOLUME

Canopy volume can also be estimated from segmented canopy cover. To estimate the canopy volume, a simplified formula was used assuming a conical shape of the trees. The resulting estimates were grouped into the same height classes as the tree canopy area data to determine which trees contribute the most to the overall canopy volume.

The urban forest in the City has an estimated canopy volume of over 40 million cubic metres. Figure 20 shows the tree count and canopy volume for each 10-metre height class. Larger trees in the urban forest provide a much greater amount of canopy volume than smaller trees. Despite making up more than half of the tree count, trees under 10 m tall contribute only 6% to the overall canopy volume. In contrast, trees between 30-40 m tall, which make up only 10% of the inventory, provide 32% of the total canopy volume, which is 3.2 times their share of the tree inventory.

Volume of canopy will be used as an indicator of mature tree retention and the success of implementing the recommendations from the urban forest report.

*Table 1. Ratio of proportional tree count (%) to canopy volume (%) by height class.*

| Height Class | Ratio of Tree Count to Canopy Volume |
|---|---|
| *0 - 10m* | *0.1* |
| *10 - 20m* | *0.7* |
| *20 - 30m* | *2.0* |
| *30 - 40m* | *3.2* |
| *40 - 50m* | *4.8* |
| *50m+* | *7.0* |

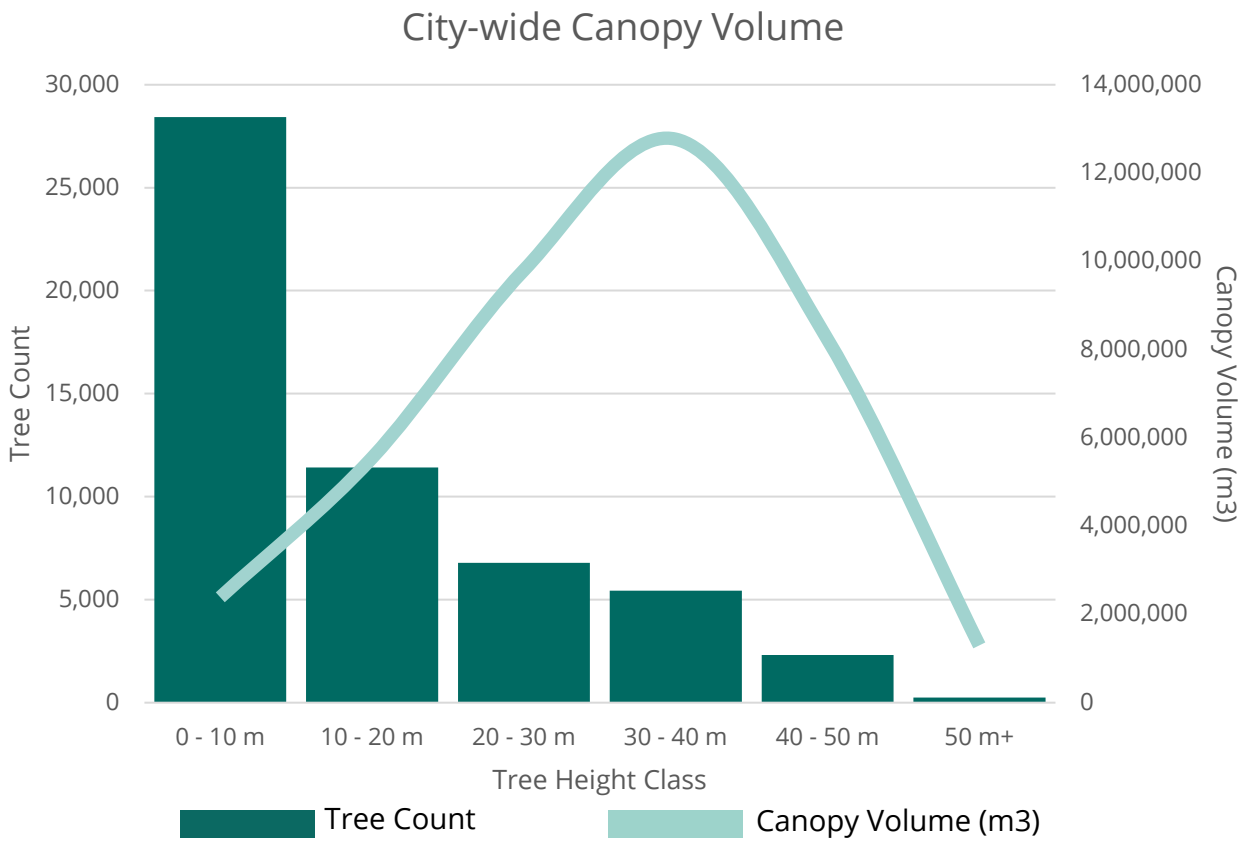



*Figure 21. City-wide tree count and estimated canopy volume by 10-m height classes.*

## 2.5. ECOSYSTEM SERVICES

As trees grow, they become more valuable and generate higher ecosystem service benefits, such as air pollution removal and stormwater interception. The "large tree argument" states that large-stature trees deliver many times the benefits of a small-stature tree during their lifetimes[28]. Therefore, planting and retaining large-stature trees is a way to maximize the ecosystem services provided by the urban forest.

The United States Department of Agriculture's i-Tree suite was used to assess the ecosystem services of the City's urban forest and inventoried street trees. However, these assessments can only estimate some of the many ecosystem service values provided by trees. The value of the City's trees also includes hard-to-quantify benefits related to recreation, improved mental health, biodiversity and habitat value, cultural meaning, and other ecosystem services.

According to the i-Tree Canopy assessment, trees in the City store $4.4 million in carbon and provide annual ecosystem services for sequestration, stormwater interception, and air pollution removal valued at $406 thousand. The i-Tree Eco assessment of the City's tree inventory estimated that the 8,266 trees store $165 thousand in carbon, provide ecosystem services partially valued at $52 thousand, and have a structural replacement value of approximately $14.8 million - that is the cost of having to replace a tree with a similar tree.

Although tree valuation methods are not perfect, they help demonstrate that the urban forest is composed of assets that perform valuable ecosystem services to support the City's overall quality of life.

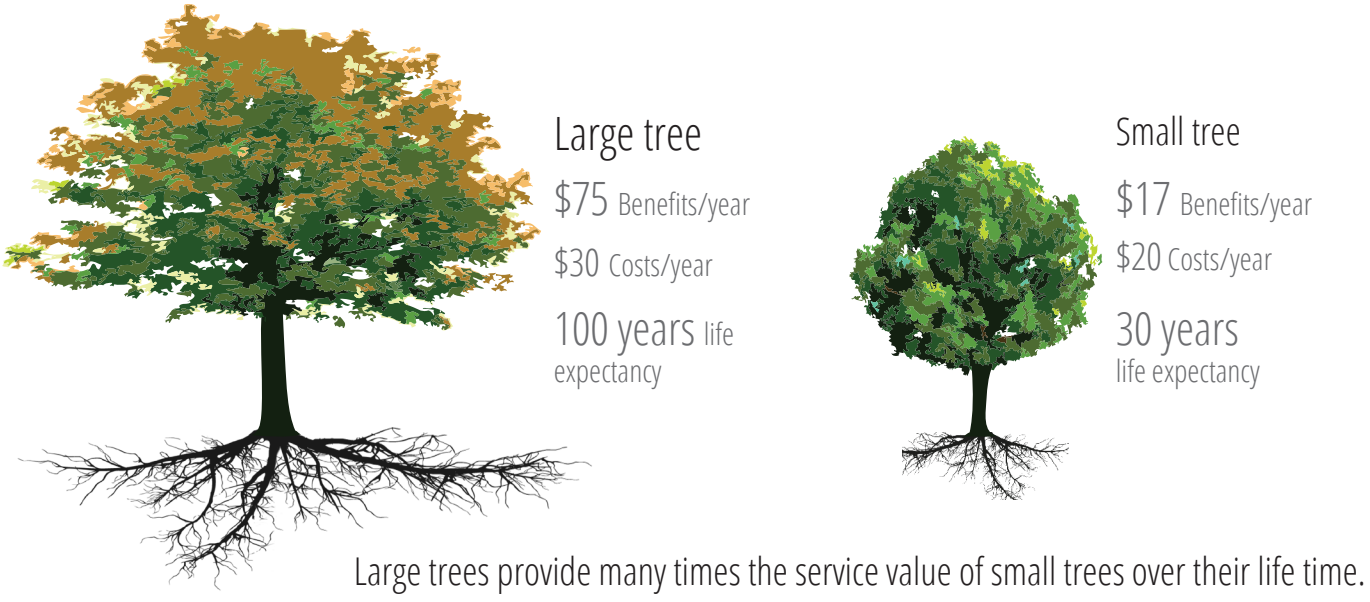



*Figure 22. Large trees provide several times the benefits of small trees.*

**Note:** the i-Tree Eco values for street trees are expected to be an underestimate because the inventory did not contain diameter measurements for every tree. Benefits are based on estimated diameters using an allometric equation based on tree height, yielding a maximum diameter of 74 cm. The structural replacement value is based on a replacement cost of $750 per tree (planting and establishment costs), and i-Tree's fitted values relating tree measures to the valuation procedures of the Council of Tree and Landscape Appraisers.


The City’s street trees have a replacement value estimated at $14.8 milllion.

*Table 2. Results of City-wide i-Tree Canopy assessment of City-wide canopy.*

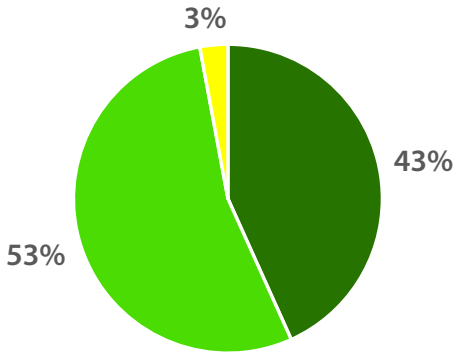
| Ecosystem Service | Service Estimates | Dollar Value |
|---|---|---|
| **Carbon & Stormwater** | | |
| C Sequestered annually in trees (t) | 620 | $148,700 |
| C stored in trees (t) | 18,460 | $4,430,300 |
| Avoided runoff annually (L) | 2,116,238 | $6,700 |
| **Air Quality** | | |
| CO removed annually (kg) | 214 | $400 |
| $NO_2$ removed annually (kg) | 1,700 | $800 |
| $O_3$ removed annually (kg) | 10,384 | $43,800 |
| PM10 annually (kg) | 3,567 | $32,800 |
| PM2.5 annually (kg) | 805 | $173,300 |
| $SO_2$ annually (kg) | 610 | $100 |
| Total air pollution removed annually (kg) | 17,280 | $251,200 |
| | **Total Annual Service Value** | **$406,600** |
| | **Total Non-repeating Service Value (carbon stored)** | **$4,430,300** |

*Table 3. Results from the i-Tree Eco assessment of the City tree inventory.*

| Ecosystem Service | Service Estimates | Dollar Value |
|---|---|---|
| **Carbon & Stormwater** | | |
| C Sequestered annually in trees (t) | 71 | $4,607 |
| C stored in trees (t) | 2,538 | $164,995 |
| Avoided runoff (L) | 6,716,000 | $15,613 |
| **Air Quality** | | |
| CO removed annually (kg) | 5.8 | Negligible |
| $NO_2$ removed annually (kg) | 337.1 | $970 |
| $O_3$ removed annually (kg) | 762.1 | $14,685 |
| PM10 annually (kg) | --- | --- |
| PM2.5 annually (kg) | 24.1 | $16,154 |
| $SO_2$ annually (kg) | 161.7 | $169 |
| Total air pollution removed annually (kg) | 1,290.8 | $31,978 |
| | **Total Annual Service Value** | **$52,198** |
| | **Total Non-repeating Service Value (carbon stored)** | **$164,995** |
| | **Total Structural Replacement Value** | **$14,800,000** |

## 2.6. NATURAL AND SEMI-NATURAL FORESTS

As documented by the City's Biodiversity and Natural Areas Report, 53% of the forested land in the City is made up of young forest, 80 years old or less. Young forests are characterized by dense and uniform canopies which limit diversity in understory vegetation. Mature forests make up 43% of forested land, and have more complex canopies that supports higher levels of biodiversity. There are no remaining old growth stands (older than 140 years). However, mature forests have the potential to develop old growth characteristics as they age.




*Proportion of forest by type*


*Figure 23. Natural and semi-natural forests*

LiDAR is able to detect differences in canopy density that can be interpreted as dead or dying overstorey trees. Dead trees have been detected in natural areas across several City parks. Specifically, over 100 dead and dying trees were detected in forested stands in Greenwood Park, Loutet Park, and Kealy Woods Park (Figure 21). The findings are consistent with observations of decline in native trees, like western hemlock and western redcedar, as a result of climate change and compounding forest health issues.

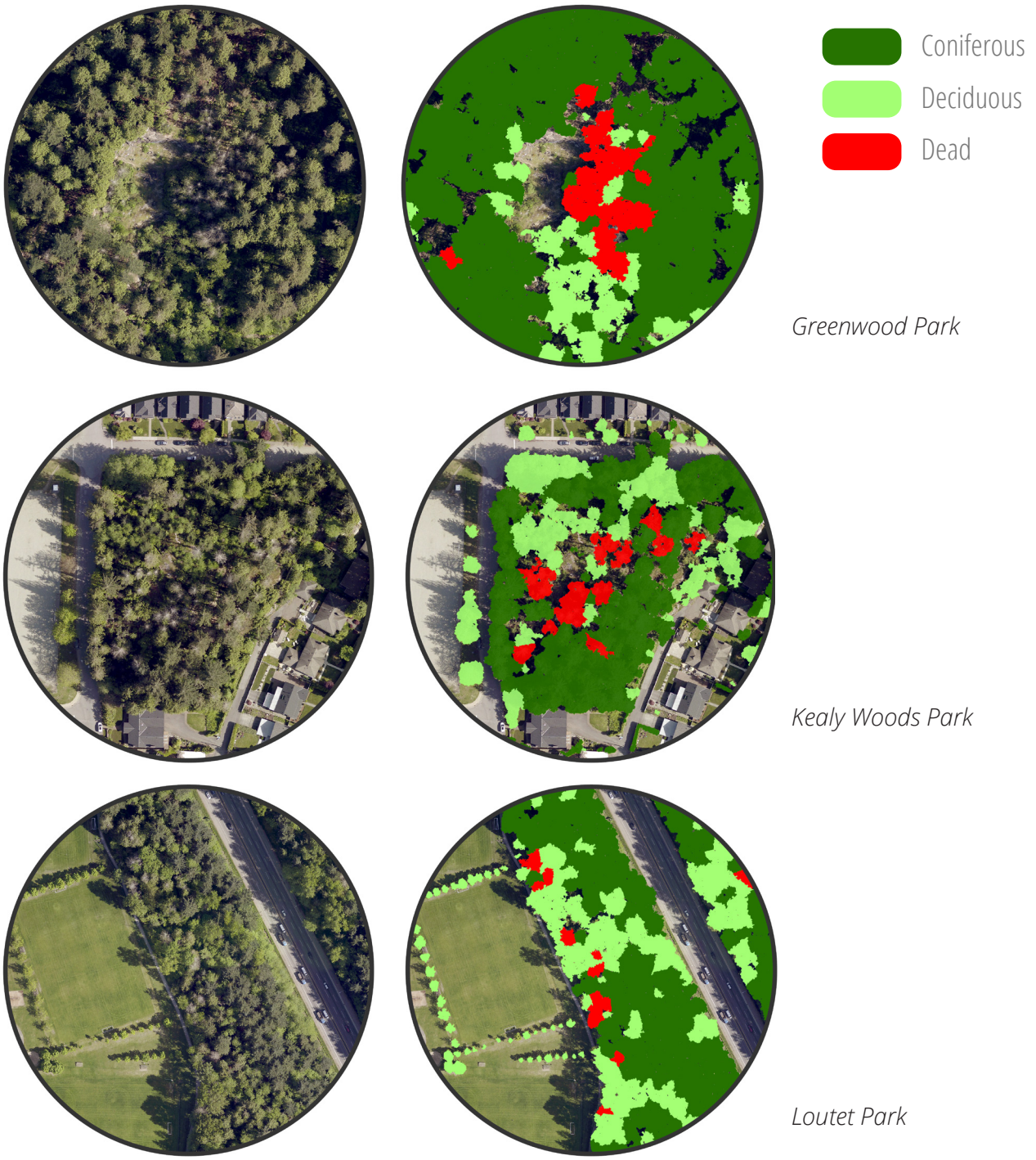



*Figure 24. Examples of tree losses and health issues in Greenwood Park, Kealy Woods Park, and Loutet Park.*

## 2.7. TREE INVENTORY

The tree inventory of the City of North Vancouver covers almost 9,809 records and contains information on approximately 8,300 street trees, including their species, genus, and location. It also includes details about wildlife trees, eagle nest trees, trees inspected, and dead trees. Although most of the trees in the inventory are planted on streets, it also covers some trees in City parks.

Figure 25 illustrates the distribution of street trees across the City's census dissemination blocks, with an average of just over 3 trees per 100 meters of perimeter. Some blocks have as many as 15 trees per 100 meters, while other areas, such as parts of Moodyville, Grand Boulevard, and Westview, have fewer street trees compared to Central Lonsdale and Lower Lonsdale, which have the highest density of street trees.

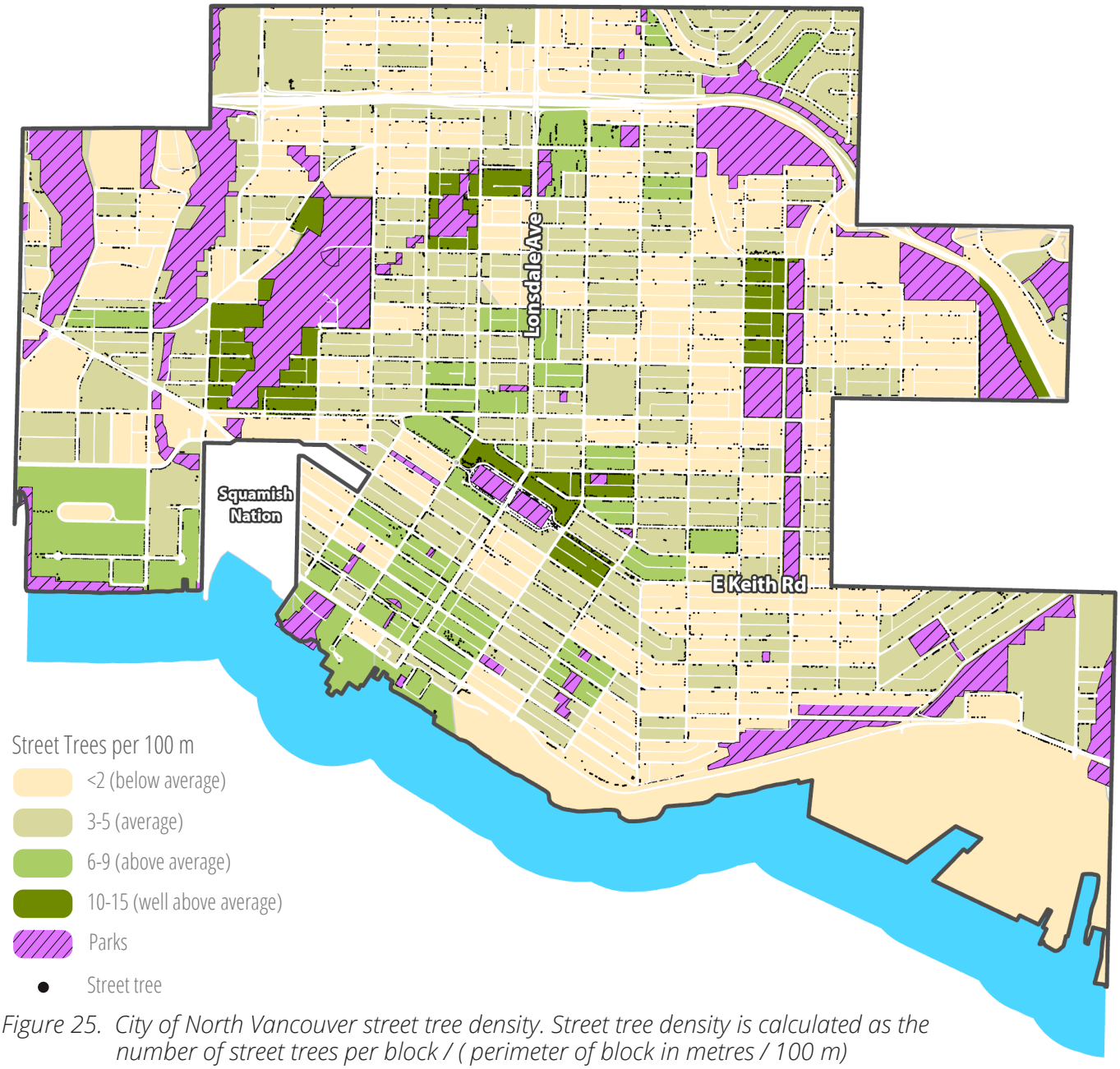



*Figure 25. City of North Vancouver street tree density. Street tree density is calculated as the number of street trees per block / ( perimeter of block in metres / 100 m)*

## SPECIES DIVERSITY IN THE INVENTORY

Having a diverse urban forest can enhance its resilience against pests and diseases that may target specific tree species. In the City's tree inventory, maples comprise the most common genus (18%), followed by cherry trees (10%), oaks (6%), and cedars (4%) (Figure 26). Best practices for managing urban forests suggest that no more than 5% of a tree inventory should belong to a single species, 10% to a genus, and 15% to a family [29]. Diversity can also aid in climate adaptation since climate risks to trees, such as storm damage, changed pest dynamics, and hotter, drier weather, are also influenced by tree genetics.

Street trees are particularly vulnerable to climate impacts since they are planted in challenging locations with limited soil volumes (and less moisture during dry periods), compacted soils, increased pollution, extreme temperatures, and a higher risk of physical impact or clearance pruning for traffic. While it may be tempting to rely on familiar species for street planting, climate change and other pressures make diversification a critical goal to decrease urban forest vulnerability.

The City's tree inventory was compared with species suitability rankings prepared by Metro Vancouver for its Urban Forest Climate Adaptation Framework[30]. Of the City's tree inventory, 71% are considered suitable or very suitable for future climate, while 29% are considered marginal. Trees that are rated as marginal are likely to be limited to moist planting sites in the future. The top five "marginal"-rated species in the City's tree inventory are western redcedar (5%), Japanese maple (3%), and magnolia (2%), European beech (2%) and western hemlock (2%).

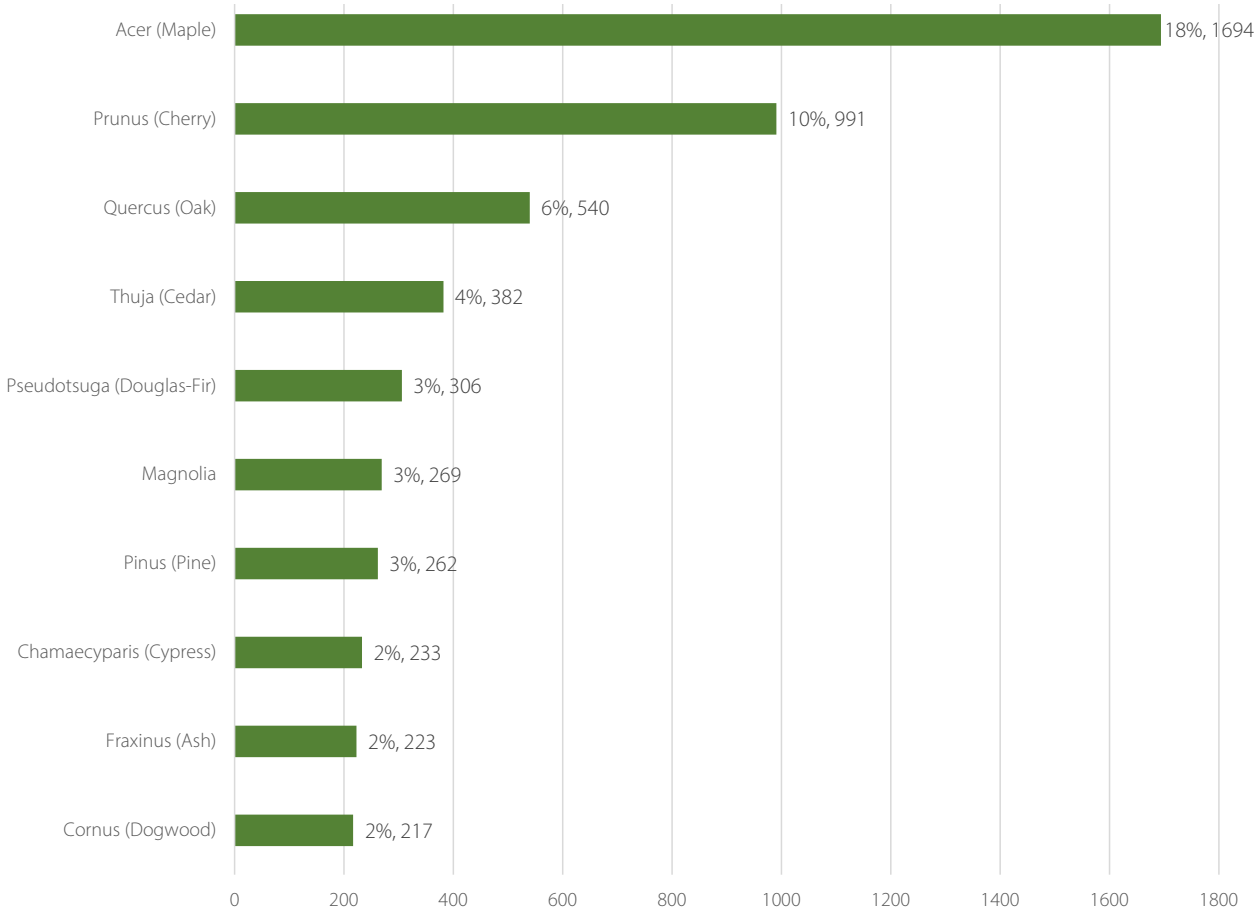



*Figure 26. 10 most common tree genera in the City inventory in 2022 showing the proportion (%) and count of each genus*

## 2.8. PRIORITY AREAS TO INCREASE TREE CANOPY

Strategic management of the urban forest needs to ensure benefits are provided to areas where they are most needed, given the connection between the urban forest and physical and mental health. Under a warmer climate, the impact of urban forest cover on reducing human vulnerability to heat can be significant. In British Columbia, research has found a correlation between low neighbourhood greenness and deaths during the record-breaking June 2021 heatwave[31].

To identify areas vulnerable to heat in the City, temperature data and population density were compared with the City's canopy cover.

Figure 27 shows population density for each block, and that some higher density areas have very low canopy cover. Population density was calculated using 2021 Census data.

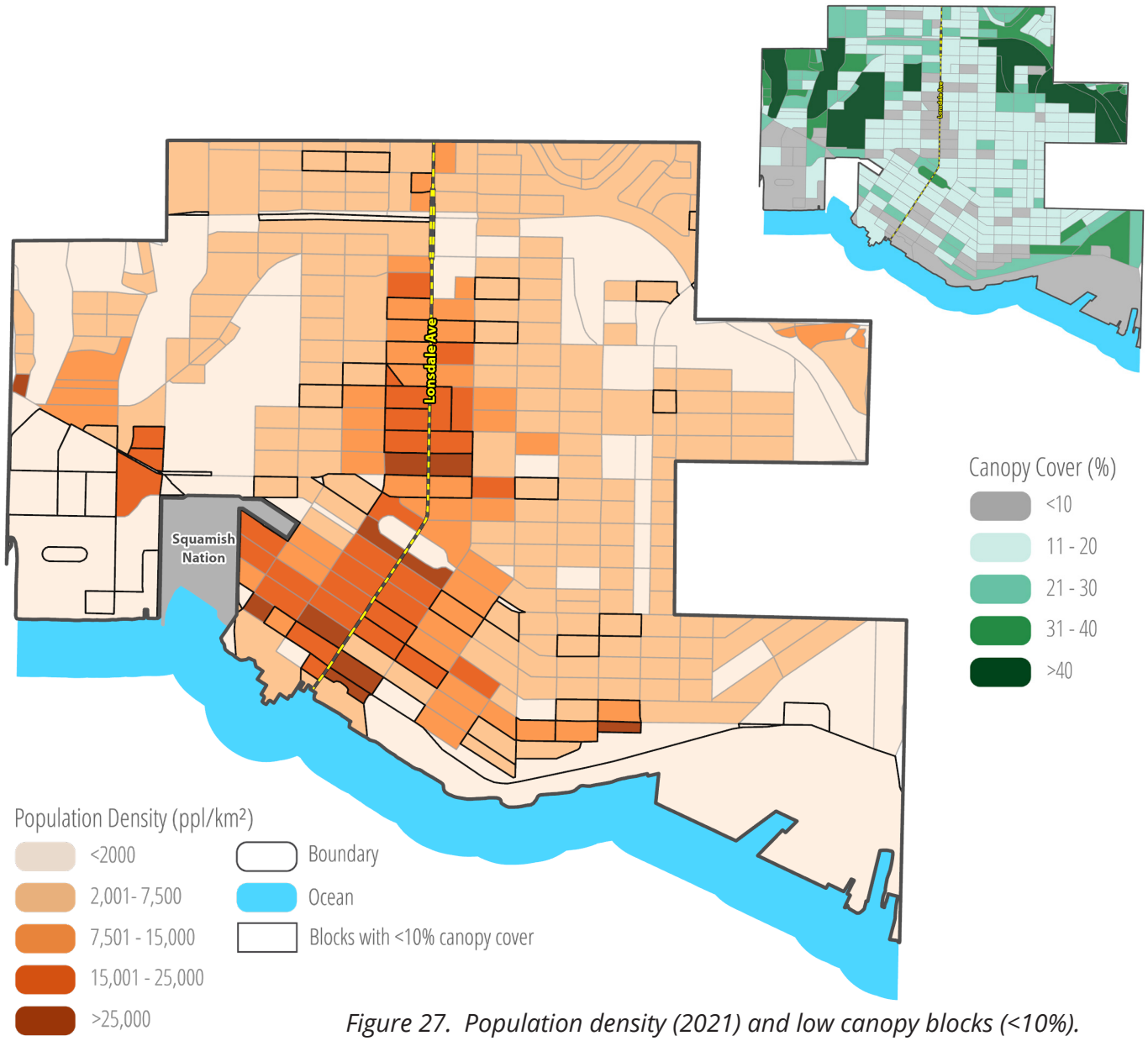



*Figure 27. Population density (2021) and low canopy blocks (<10%).*

Temperature data was derived from a satellite image taken on June 30, 2021, at 7 pm, near the end of that year's unprecedented heatwave. Figure 28 shows land surface temperature and low tree canopy blocks. There is a general trend of increasing land surface temperature with lower tree canopy, except near the ocean or riparian areas.

The hottest blocks in Central and Lower Lonsdale and near Capilano Mall were over seven degrees warmer than residential areas in Mahon, Cedar Village, and upper Marine-Hamilton on the evening of June 30, 2021. Expanding and conserving the urban forest in these areas can help reduce the risk from extreme heat events to area residents, particularly those who live in older accommodations or without cooling. The Urban Forest Plan will explore priorities around increasing tree canopy and work with the community to develop recommendations to address risks to human health and well-being through greening.

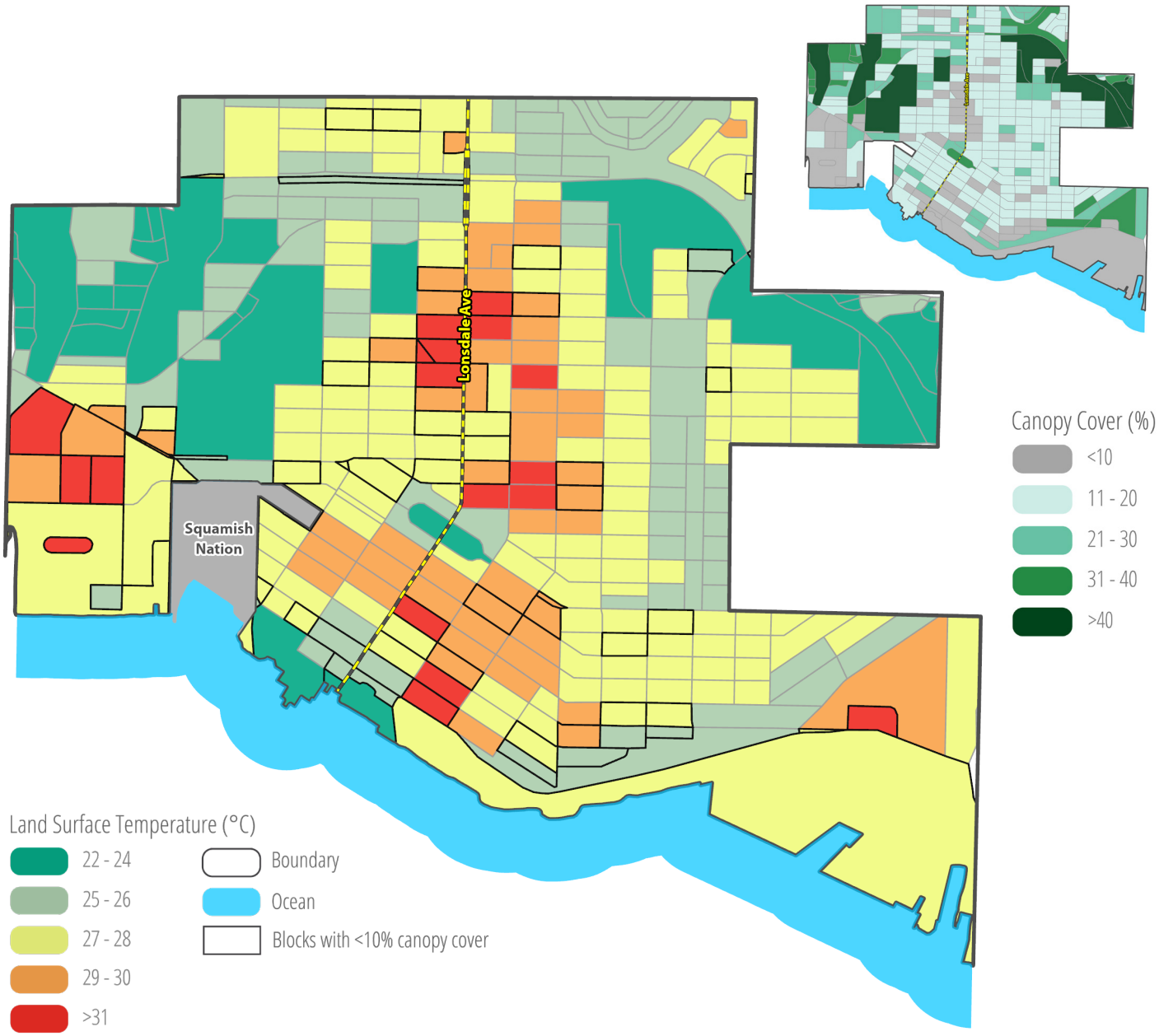



*Figure 28. Land surface temperature from June 30, 2021 (7pm) and low canopy blocks (<10%).*

# 3. OPPORTUNITIES AND CHALLENGES

## CLIMATE CHANGE AND EXTREME WEATHER

Trees are already suffering the impacts of climate change, with widespread tree mortality observed across the Lower Mainland. Adapting the urban forest will require planting climate adapted genetic stock of native species, planting a greater diversity of urban species, and providing trees with growing conditions to support their health and resilience.

Projected changes for the region by the 2050s indicate trees will face substantially hotter average and maximum annual temperatures, changed rainfall patterns with extended summer droughts, reduced snowpack and earlier runoff, and the potential for more variable extreme weather including windstorms, heat waves and heavy precipitation[32].

Longer growing seasons are good for growing trees in theory but also encourage new plant and insect pests and may push existing trees past their drought tolerance [33][34][35][36]. Because of these issues, climate conditions will have significant impacts on the survival and composition of our forests.

Effects tied to shifting climate can be seen today: urban trees in boulevards and parking lots are struggling with heat and evaporation, while in natural areas western redcedar are disappearing from places they formerly grew[37]. Although the impacts of climate are influenced by tree genetics, planting site quality will be a major factor in mortality and decline. Trees exposed to the hottest paved environments, the worst soils, or isolated planting volumes already face additional stressors on growth and development[38]. Supporting the urban forest as an adaptation tool requires selecting climate-resilient species for planting and giving them more or better space to grow[39].

### By the 2050s:

**Warmer temperatures:** almost twice as many days over 25°C will expose vulnerable people to more extreme heat.

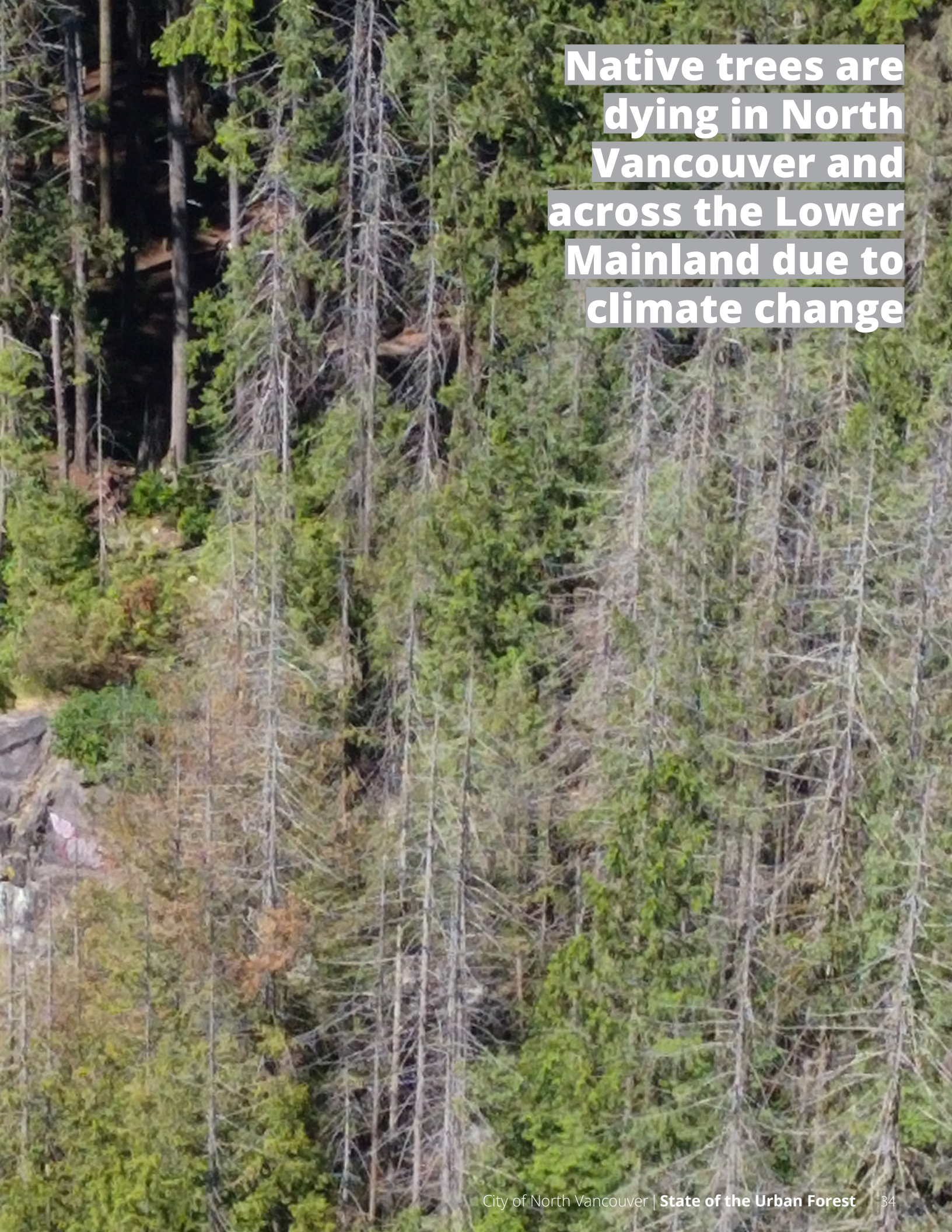
**Drier summers:** longer summer dry spells causes declining forest health and species shifts.

**More precipitation in fall and winter:** more rain in fall and winter will increase flooding.

**Decreased snowpack and meltwater:** 62% less snowpack will result in drier forests by mid-summer.

**Longer growing season:** growing seasons will reach almost 340 days per year, allowing new plants and pests to live here.

**More extreme rainfall events:** Heavier rainfalls are expected to occur, causing storm damage.



# Native trees are dying in North Vancouver and across the Lower Mainland due to climate change

## URBANIZATION AND DEVELOPMENT

As the City grows, more impermeable surfaces are created to accommodate more housing, utilities, bike lanes and the other amenities of a busy and vibrant public realm. This densification can mean that trees on private land get removed to make room for housing, and new trees get added in boulevards. The increase in hard surfaces also creates challenging conditions for trees, such as hotter temperatures and reduced soil volume[40][41].

Above and below ground utilities can be an obstacle to tree planting. Above ground electrical wires limit species selection and trees require frequent pruning if they grow too close to the wires. Development presents opportunities to place connections underground, allowing trees to grow. However, conflicts can also arise with underground utilities, when tree roots damage pipes, or when utility replacement cuts tree roots. Improving construction and design standards for the belowground environment is a key challenge for the Urban Forest Plan.

Development can also be an opportunity to expand the urban forest. It pays for tree planting and often leads to investments in retrofitting streets for tree growth. Redevelopment can introduce trees to low tree canopy areas, and support urban forest goals. The Urban Forest Plan will harness opportunities to improve tree canopy with development.

## URBAN FOREST PROGRAM CAPACITY

Program capacity refers to the resources, including staff and budgets, available to manage and expand the urban forest. Challenges, such as climate change and increased demand for urban forest services as the City grows, impact the capacity of urban forest program to meet demand. To address these challenges and maintain a sustainable urban forest program, it may be necessary to add program capacity through training, staff, equipment, and funding. This can be achieved through a combination of resources such as fees for service, tax revenue, grants from higher governments, donations, cost-sharing, and development contributions, among others.

## ASSET MANAGEMENT

Adopting a formal asset management approach for trees and green infrastructure can lead to more sustainable management. Trees provide valuable ecosystem services that increase as trees grow. When managing trees as assets, their entire lifecycle is taken into account, recognizing that smaller trees offer fewer benefits than larger ones[42], and that unhealthy trees may require additional management costs that outweigh their benefits. Asset management encourages urban foresters to consider the most effective methods for maximizing each tree's potential service life while minimizing the negative impacts, such as risk of failure or wildfire.

## BIODIVERSITY

Biodiversity encompasses the variety of genes, life forms, and ecosystems present on Earth, and it plays a crucial role in supporting the many essential ecosystem services provided by urban forests[43]. Trees, in particular, are critical to maintaining high levels of biodiversity as they provide structural support and diverse habitats for many organisms. Wildlife and ecosystems benefit from the same urban forest ecosystem services as humans, such as clean air and water, shade, and forage.

The City's Biodiversity and Natural Areas Report describes how biodiversity is threatened by urbanization, climate change impacts, and invasive plants and animals in the City. These risks also impact how the Urban Forest Plan will consider diversity and resilience in the urban forest without threatening native ecosystems or functions.

One significant risk to the City's biodiversity is habitat fragmentation. Smaller habitats are more vulnerable to invasive species and disruptive edge effects such as urban pollution, light, and noise. They feature fewer habitat niches to support diversity and are less resilient to disturbance or climate-driven impacts like a major storm. The City's land base is one of the most urbanized in British Columbia, and urban trees can maintain or rebuild connections between isolated patches of habitat[44], such as important forest fragments in the City's remaining natural and riparian areas. Biodiversity in the City also builds connections between people and the environment.

## FOREST HEALTH AND MASS MORTALITY

Forest health management is about reducing the risk of premature mortality in the urban forest, a principle of good asset management. Forest health management tends to focus on living insects, fungi, and other pathogens as forms of tree disease, but it also encompasses non-living factors like soil chemistry, pollution, and climate impacts like drought.

Forest health factors can pose a risk to the urban forest when they have the potential to kill many trees. A recent example of mass mortality in the City is from the western hemlock looper outbreak. The looper feeds aggressively on the needles of western hemlocks and sometimes Douglas-fir, resulting in large patches of brown, sick-looking trees. Combined with the impacts of drought, looper damage caused significant tree mortality from the recent outbreak. The City has had to devote specific funding to prioritizing response to hemlock looper moth, including hazard tree removals and future restoration efforts. Climate change is likely to exacerbate the frequency and severity of insect outbreaks.

As climate change progresses, the risk of wildfire increases in natural areas because forest health issues create additional dead wood or vegetation which acts as fuel during increasingly favourable hot and dry conditions. The City is investing in FireSmart treatments in natural areas to help manage this risk and reduce the likelihood of fire breaking out in parks.

# 4. MUNICIPAL URBAN FOREST PROGRAM

City management of the urban forest is shared between Engineering, Parks & Environment and Planning & Development departments. Within the Engineering, Parks & Environment Department, the Parks & Environment division is responsible for the maintenance of parks, trails and greenways as well as community stewardship and environmental programs. The Engineering division is responsible for tree planting maintenance and operations. The Planning & Development Department regulates tree removal on private property by managing tree permit applications (Tree Bylaw and Streamside Development Permit Areas) and regulates planting and landscaping requirements with development.

## 4.1. STAFFING AND ACTIVITIES

Most City tree planting and maintenance is managed by the Engineering, Parks & Environment Department. The core urban forestry team is comprised of one urban forest supervisor, a full-time arborist, 5 full-time support staff (tree workers, laborers) and 1 auxiliary staff. Staff responsibilities include:

- Responding to service requests about City trees
- Planting site preparation and tree planting
- Young tree care (pruning, mulching, watering, fertilizing)
- Inspecting City and protected trees
- Removing City trees and stump grinding
- Storm response and emergency tree pruning
- Supporting stewardship programs in parks and natural areas
- Managing contractors
- Public communication and education

In 2021, there were over 500 tree related service requests. Currently, urban forest maintenance and tree risk management incorporate reactive (request-driven) and proactive elements. Urban forestry workers include ISA TRAQ certified arborists who assess City trees when a problem is reported and conduct inspections to update the tree inventory.

## TREE PLANTING

The City plants trees in streets and parks, using both capital and operational budgets, through several programs:

- Living City Program focuses on planting trees in boulevards, particularly in areas with low numbers of street trees currently.
- Replacement tree planting occurs when City-owned trees are removed due to decline, hazard, or other circumstances. This program includes replacement tree planting by others, such as developers who have been approved to remove City trees as part of a development proposal.
- Development contributes trees through payments to the City to plant trees in boulevards as well as directly planting boulevards on large projects.
- Donations specifically to support tree planting are collected by the City from members of the public.
- Park tree plantings add new and replacement trees in City parks. Natural areas plantings using smaller stock sizes also occur.
- Capital projects, such as park improvements, can be associated with planting.

On average, the City plants approximately 170 caliper-sized trees each year, of which 30 are replacement trees and 140 are new trees. Planting in natural areas provides an additional 500 or more trees each year with smaller stock sizes. Additional trees are planted on City streets each year as part of larger developments.

## YOUNG TREE CARE

Young tree care consists of watering to establishment (typically 3-5 years) and some young tree pruning, along with mulching, weeding of tree wells, and fertilization. Young tree care is crucial to supporting the healthy establishment of trees so that they can grow to become valuable, long-lived assets.

### KEY FINDINGS

**5 full-time staff and 1 auxiliary staff care for the City's urban forest.**

**500 service requests related to City trees in 2021.**

**$627,500 operational budget in 2021 for urban forestry**

**$174,000 for natural areas operations and promoting park stewardship.**

**$210,000 for planting, young tree care, and establishment.**

**About 135 caliper-sized trees planted by the City each year. In 2021, 30 were replacements and 100+ were new trees. Development contributed an additional 145 trees in 2021, of which 35 were directly planted by City crews.**

**500+ native trees planted each year in natural areas (smaller stock sizes)**

### RISK INSPECTION AND MAINTENANCE

The City's approach to ongoing tree care is both request-driven, relying on reports of tree issues from the public or other parties, and proactive with scheduled inspections and maintenance for some trees. Trees scheduled for maintenance are often the subject of previous service requests, but did not meet the criteria for removal in the Tree Policy. Regular inspection and maintenance of City trees also occurs along main roads to reduce conflicts with vehicles.

### MANAGING FOREST HEALTH AND WILDFIRE

In recent years, the City has been impacted by forest health issues like western hemlock looper moth and drought dieback in western redcedar and other species. Climate impacts are putting stress on native trees while increasing the potential for more intense fires. To respond to these issues, the City is managing dead fuels in parks, assessing the extent of damage from looper moth and appropriate next steps.

## 4.2. OPERATIONAL BUDGET

The operational budget spent by urban forestry was $627,500 in 2021 for core tasks like tree pruning and responding to public service requests, inspections, and removals. Natural areas operations and park stewardship programming required $174,000. Tree planting and young tree maintenance (including watering) required $210,000, including caring for plantings undertaken with separate capital funds from the Living City program. In 2021, an additional $150,000 in annual budget was allocated to the City's response to the hemlock looper moth with funds being used to inventory damages, inform and educate the public about the problem, examine treatment options, prioritize and schedule hazard tree removals and formulate a tree planting restoration plan. Western hemlock looper is a native insect that has outbreaks every 10 to 20 years[45], so the cost of response will diminish again until the next outbreak.

# 5. URBAN FOREST POLICY CONTEXT

The City's urban forest is shaped by many laws, bylaws, policies, and plans (Figure 29). The regulatory framework affecting the urban forest can be divided into four categories:

- **Enabling legislation** is the provincial law that provides the City with the authority to manage trees. Other federal and provincial laws may set legal requirements regarding trees and forests that must be met by city bylaws or programs as well as private citizens.
- **Guiding Policy and Plans** are City policies that establish Council's strategic priorities and vision for the urban forest.
- **Bylaws and Guidelines** are the tools the City uses to affect its urban forest management program, including setting standards for zoning, land use, and development, City trees, and regulating trees on private land.
- **Associated Plans and Strategies** address issues like transportation, stormwater/drainage, housing, and climate that have alignment with urban forestry.


*Figure 29. Policies affecting urban forest management in the City.*

## 5.1. ENABLING LEGISLATION

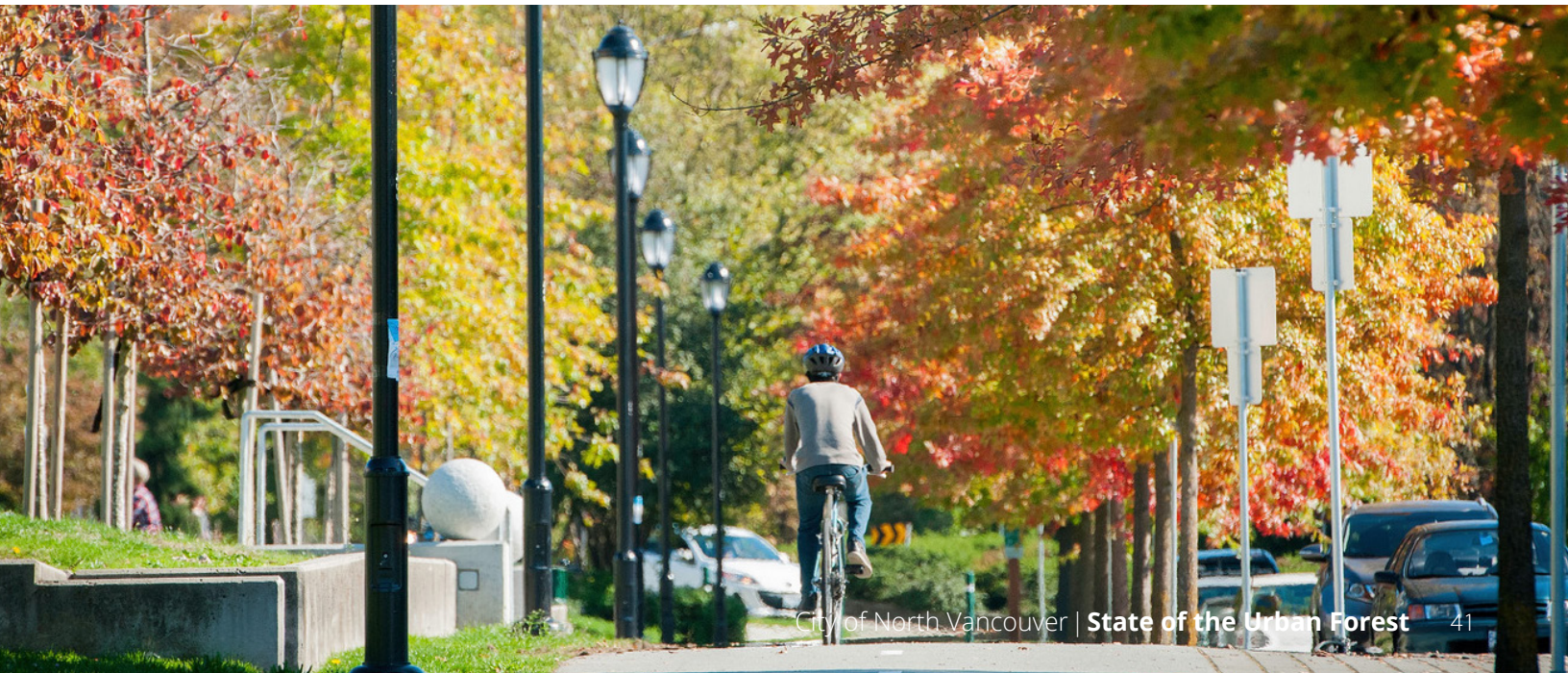
The City's authorities and obligations come from two pieces of provincial legislation, the Local Government Act and the Community Charter. The Community Charter establishes broad powers of the municipality, including the ability to regulate trees and vegetation. The Charter also dictates how the government is run by setting standards for making bylaws, public accountability, and financial planning. The Local Government Act plays its role in urban forest management by establishing standards for planning and development in the City. Under the Local Government Act, the City of North Vancouver must adopt an Official Community Plan (OCP) which identifies where land uses and economic activities will occur. Within the OCP, the City can also make policy statements regarding its other program areas, such as parks and recreation. The Local Government Act also enables the City to define Development Permit Areas (DPA) in its OCP or Zoning Bylaw, where additional guidelines regarding trees may apply. Bylaws and guidelines adopted by Council must be consistent with the OCP.

Other federal and provincial legislation create legal requirements for habitat, wildlife, water, and other values influencing urban forest management. Among these are the federal Species at Risk Act and Migratory Birds Convention Act, and the provincial Riparian Areas Protection Act, Water Sustainability Act, and Wildlife Act.

## 5.2. GUIDING POLICIES AND PLANS

The Official Community Plan is the City's key document detailing its long-term vision centered around livability, diversity, and climate resilience. The OCP recognizes the importance of the urban forest and establishes objectives to acquire new parkland, enhance biodiversity and ecological health, protect riparian and wetland areas, undertake habitat restoration projects, improve walkability and increase the ratio of permeable green space to impermeable surface during redevelopment.

The Council Strategic Plan outlines a priority to turn the City into the "healthiest small city in the world". The 4-year plan proposes the development of a Climate and Environment Strategy and supports the expansion of the urban tree canopy and enhancing habitat to bolster ecosystem services.



## 5.3. BYLAWS AND POLICIES

Bylaws are the implementation tools that staff use to ensure the City's vision for the urban forest is being achieved. Bylaws are statutes adopted by Council. Several bylaws are used to directly manage the urban forest in the City:

- Tree Bylaw (regulates tree removal on private land)
- Policy for the Management of Trees on City Property (regulates trees on City land)
- Subdivision and Development Control Bylaw
- Zoning Bylaw
- Street and Traffic Bylaw
- Parks Regulation Bylaw

### TREE BYLAW

**Purpose:** The City's Tree Bylaw (2022) assigns protected status to trees and regulates the removal of trees on private land. Any tree having a diameter of 20 cm or more requires a tree permit for removal, damage, or cutting. A permit is not required for trees smaller than 20 cm in diameter, trees on highways, or on land in zones RS-1, RS-2, RS-4B, RT-1 or RT-2 (single-family and duplexes). No permit is required for the pruning of trees in line with International Society of Arboriculture best practices or for emergency removals to mitigate imminent danger to persons or property.

**Details:** All tree cutting or removal permits require an arborist report and retained trees to be protected during construction. Three replacement trees must be planted for each tree removed. Trees being removed because they are dead, dying, or hazardous only require one replacement tree, except in the Streamside Protection and Enhancement Development Permit Area (Zoning Bylaw) where tree replacement numbers are based on tree diameter (varies 2-8 trees) using BC Ministry of Environment criteria. The bylaw allows cash-in-lieu of planting to be paid to the City if a Certified Arborist verifies that the parcel from which trees are being cut cannot accommodate the replacements. The cash-in-lieu contribution is $750 per tree. Cash-in-lieu can be used by the City to support tree planting on public land, including in streets.

The City also requires each replacement tree be maintained by the permit applicant for two years, and takes a security deposit of $975 per replacement tree as well as an inspection fee to provide for the acceptance of the tree at the end of the maintenance period. Finally, protected trees that are removed to accommodate development are subject to an ecological compensation fee of $1500 per tree, which can be offset by $750 for each additional replacement tree planted on the site. This acts as an incentive to encourage the addition of trees on site and reduce cash-in-lieu payments. Cities without incentives to promote

on-site tree retention and replacement often experience a transfer of the urban forest from private to public land.

## TREE POLICY

**Purpose:** The 2011 Policy for the Management of Trees on City Property (Tree Policy) shapes the management and care of trees on City property by the Engineering, Parks and Environment Department. The Tree Policy outlines the objective to ensure the long-term sustainability of public urban forest assets through prioritizing the preservation of existing City trees wherever conditions permit.

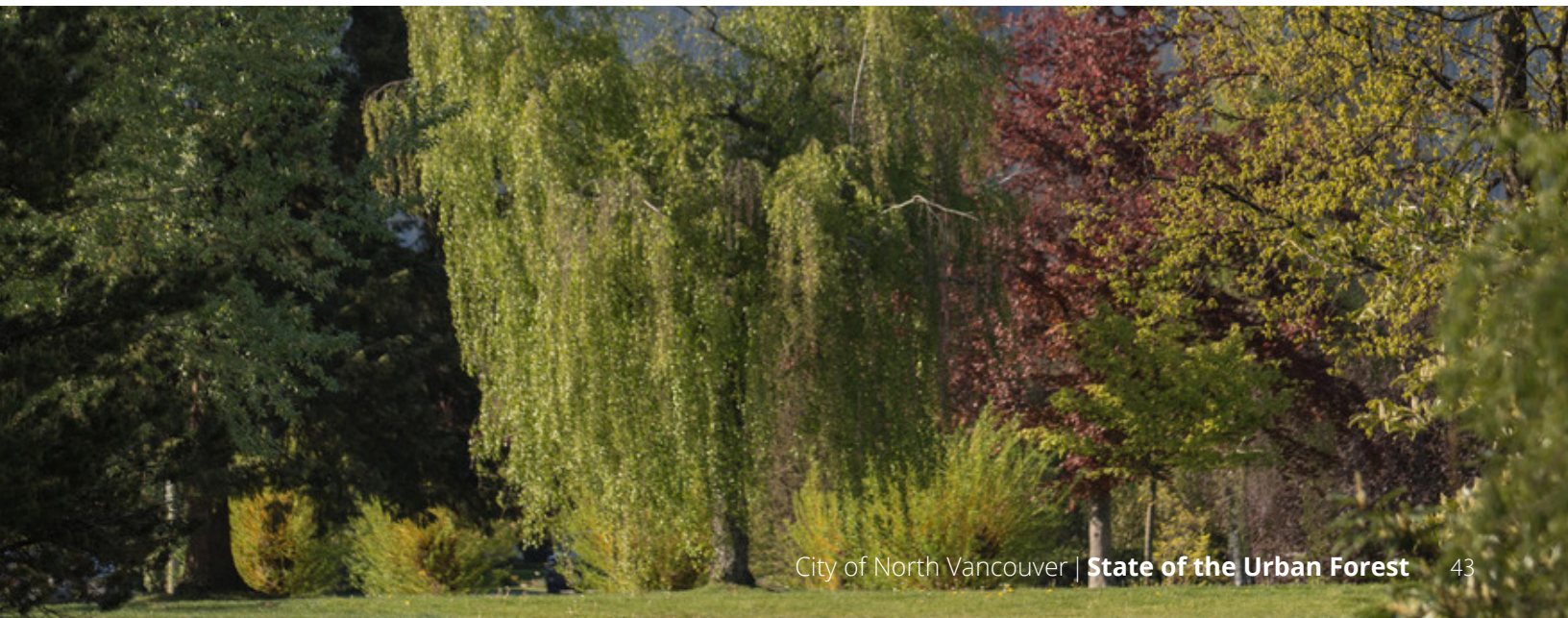
**Details:** The Policy specifies the requirements for protection and care of public trees, including maintenance in such a manner as to promote general good health, and to not endanger, interfere, or otherwise conflict with requirements of safe public use of an area. Under the Tree Policy any public tree that poses a hazard to public safety due to its habit, growth, age, condition or disease shall be maintained by the City to mitigate the issue. The Policy describes tree removal criteria that are used to evaluate requests to remove City trees and the public tree cutting permit application process, along with replacement tree planting criteria including the quantity and quality standards for replacement trees and planting installation specifications.

## ZONING BYLAW

**Purpose:** The Zoning Bylaw (1995) plays an important role in creating the physical space for trees. The Zoning Bylaw establishes minimum standards for lot coverage, landscaped areas and building setbacks as part of development activity. These three factors are key determinants with respect to the protection of the urban forest and planting new trees because they determine how much growing space is available in post-development settings.

**Details:** While zoning bylaws can directly regulate vegetation, such as the number of trees required on each private parcel, setback variances to accommodate trees, or consolidation of lot coverage to proactively conserve planting space, no provision in the City's bylaw does so. As cities densify to meet housing and sustainability goals, underground structures (like parkades) regularly come into conflict with trees on private and adjoining public lands. Underground structures in the City can be sited on any portion of a lot, with minor exceptions on prominent thoroughfares.

Enabled by the Zoning Bylaw, the Streamside Protection and Enhancement Development Permit Area protects land and vegetation within 15 metres of a watercourse and 10 metres from a ravine bank. Within this area, a permit is required for any work that could damage trees of any size or require their removal. These rules restrict tree removal in riparian areas, which are important habitat and biodiversity corridors in the City providing critical ecosystem services.



## SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

**Purpose:** The Subdivision and Development Control Bylaw provides servicing requirements for subdivision and developement of land, including public street trees. In the City, street trees are planted by both the City and developers as well as through City programs like the Living City Tree Planting Program. Trees in the public boulevard are a requirement of all new developments in order to enhance the City's urban forest.

**Details:** The City has discretion to approve the species location, spacing, and other design aspects of boulevard tree installation, to account for the variety of boulevard widths and character.

The City determines the required width of new boulevards in consideration of existing infrastructure, trees, and intended street character. 1.5 m in width is generally used as the minimum acceptable standard for new development. The City has pursued wider boulevards in many locations to improve the available planting space and support green infrastructure projects.

Planting sites in street boulevards must meet the City's published Engineering Standard Drawings. Standards were updated in 2022 to include new tree planting details for coniferous and deciduous species, tree protection, and tree planting in streets with soil cells/structural soils. These updated details contain minimum soil volumes by mature tree size, including a requirement for no less than 25 $m^3$ per large tree in linked (combined) soil volumes. Planting on City property must also follow the Policy for the Management of Trees on City Property.

## OTHER BYLAWS

The Parks Regulation Bylaw (1996) states no park tree can be removed, pruned, or damaged without authorization from the Manager of Parks & Environment. The Street and Traffic Bylaw (1991) bans unauthorized tree removal from boulevards.

## 5.4. ASSOCIATED PLANS AND STRATEGIES

Several City plans and strategies have relevance for urban forest management:

### CLIMATE AND ENVIRONMENT STRATEGY

In the draft Climate and Environment Strategy, protecting and expanding urban forests is a pivotal direction in the pathway, "Less Grey, More Green". This pathway includes objectives for protecting existing natural areas as well as supporting climate change adaptation and resilience. This Strategy will promote tree retention and healthy urban forest growth as part of the City's climate change response, and explore opportunities to implement green infrastructure.

### BIODIVERSITY AND NATURAL AREAS REPORT

The Biodiversity and Natural Areas Report (2023) is focused on protecting, connecting, and restoring natural areas, including forests, in the City. The report includes ecological inventory and habitat mapping, identifying the City's green infrastructure network, and implementation recommendations. The Urban Forest Plan will be consistent with the Biodiversity and Natural Areas Report.

### MOBILITY STRATEGY

The Mobility Strategy (2022) presents a vision and pathway of a healthier City and transportation system. The Strategy connects a "people first" philosophy with an implementation plan to make the City safer and more attractive for people who use active and public transportation. Recognition of the role of street trees in supporting safe, comfortable walking, biking, and rolling is incorporated throughout the plan, including an action to achieve a double row of trees (along streets) in underserved areas.

### PARKS MASTER PLAN

The Parks Master Plan (2010) guides the planning of natural areas and community and neighbourhood parks in the City. It provides direction for design, protection, acquisition, and amenities provided by each park. Creating the plan involved extensive public engagement. When asked to identify the best ways to "create an identifiable character for the community", protecting the natural environment and including more trees and landscaping in public places were the top responses.

### URBAN FOREST MANAGEMENT PLAN

The Urban Forest Management Plan – Technical Report (2007) details the natural condition of forests in the City's 14 natural area parks. The plan identifies management concerns for the health of the forest and provides strategies tailored to each area to maintain ecological integrity, health, and vigour.

### STREET TREE MASTER PLAN

The Street Tree Master Plan (2004) sets out a plan to maintain and increase the City's inventory of several thousand street trees. The plan includes a street tree inventory, an implementation strategy, and detailed street tree plans and guidelines. The plan focuses on planting of long-lived large trees clear of utility conflicts, ensuring diversity in species and age, having a balance of native and ornamental species, and creating a maintenance program for tree pruning and disease control. The report also presents the findings of an urban forestry municipal comparison with seven cities, a street tree ecosystem benefits analysis, and tree planting and maintenance standards and specifications.

### INVASIVE PLANT MANAGEMENT STRATEGY

The Invasive Plant Management Strategy (2013) was developed to provide the City with a coordinated approach to managing invasive plant species. The Strategy has five main goals and objectives: Outreach and Education, Control Implementation, Stakeholder Coordination, Assessment and Restoration, and Policy and Adaptive Management. Effective invasive species management requires education and outreach for increasing public awareness and knowledge.

In 2020, the current abundance and distribution of invasive plant species on City property was updated.

### INTEGRATED STORMWATER MANAGEMENT PLAN

The Integrated Stormwater Management Plan (2016) documents water flow throughout the City, both in natural streams and in engineered infrastructure. It provides long-term planning goals and objectives to improve water quality and reduce the impacts of storm surges. This plan encourages the use of green infrastructure, which are more naturally designed systems, to capture and slow stormwater flow. Examples of green infrastructure include bioswales, green roofs, pervious surfaces, and systems to capture and reuse grey water. Many of these solutions can be paired with tree planting to enhance urban forest value.

### INTEGRATED PEST MANAGEMENT POLICY

The Integrated Pest Management Policy (1995) was created in response to citizen concerns surrounding pesticide applications as well as human and environmental health. This policy sets out the precautionary principle for the application of cosmetic synthetic pesticides on public lands as well as an Integrated Pest Management Program.

### STREAMSIDE PROTECTION AND ENHANCEMENT DEVELOPMENT PERMIT GUIDELINES

The Streamside Protection and Enhancement Development Permit Guidelines (2006) aim to protect fish, streams, and the setbacks adjacent to streams known as riparian areas. It was developed to ensure development meets or exceeds the provincial Riparian Areas Protection Regulation (RAPR). The DPA policy provides the requirements of protecting riparian areas and a mechanism for the City to approve developments near riparian areas. This DPA process is triggered for any construction of a building, increase in impervious surface or landscape changes within 15 meters of the top of bank of a stream (10 m if the stream is in a wide ravine). Developments are allowed but must have no net loss of riparian habitat and must be located as far away from the stream as possible.

### POLICY GAPS TO CONSIDER IN THE URBAN FOREST PLAN

To develop the Urban Forest Plan, gaps in the existing regulatory environment for trees will be explored to identify where the City could adopt or amend policy to secure improved outcomes for the urban forest. Some trees in the City of North Vancouver are more protected than others and some bylaws and policies that address urban forest management standards need to be updated to reflect best practices and current environmental conditions. These gaps reflect the City's ongoing development of a vision for its urban forest, and the changing environmental and development context of the City.

To secure a resilient urban forest, the City needs to adopt a citywide canopy cover target. With new geospatial information on the City's trees, the City can begin to set, measure, and monitor related goals for tree loss and replacement by land use or neighbourhood, more effectively schedule maintenance of public trees, and review tree protection performance. Incorporating City trees into asset management policy will be an important step in formalizing natural asset management.

With clearly established goals for canopy cover, the City can begin to address gaps in tree protection and update development policy to refine and improve soil and landscaping requirements. On public land, policies and standards can be updated to harmonize tree protection standards between public and private land, provide clarity on accomodating trees with utilities, and update best management practices for planting and maintenance. Policy gaps will be addressed through recommendations in the Urban Forest Plan.

## 5.5. BEST PRACTICES AND STANDARDS

Urban forestry and arboriculture are widespread occupations with national and international professional associations as well as a healthy community of academic researchers. The visibility of the profession and urban forest issues have generated several third-party standards and best practice guides that urban forest managers can reference when developing their policy documents and programs. City policies and procedures already refer to several of these sources (Table 4).

*Table 4. Select best practice standards used in urban forestry.*

| Publisher | Standard | Description | Implementation in the City |
|---|---|---|---|
| **International Society of Arboriculture (ISA)** | Best Management Prctices | The ISA publishes best management practices on many subjects in tree care, maintenance, and urban forestry applications. Certified arborists are encouraged by the ISA to follow all applicable best management practices. | The City references ISA Best Management Practices in its **Tree Bylaw**: pruning private trees is allowed without a permit if it respects these best management practices. |
| **American National Standards Institute** | Z133, A300 | The American National Standards Institute releases accepted industry standards for safety in arboriculture operations (Z133) and tree care (A300). | The City references ANSI A300 standards in its **Tree Bylaw** and City **Tree Policy**. |
| **Council of Tree and Landscape Appraisers** | The Guide for Plant Appraisal | The Guide, now in its 10th edition, presents a widely used protocol for tree appraisal. | The City has used the Guide to establish compensatory values for its public trees in policies, for example, the **Street Tree Master Plan** (2004) and **Parks Bylaw**, 1996 No. 6611. |
| **Canadian Nursery Landscape Association** | Canadian Landscape Standard, Canadian Nursery Stock Standard | The Association publishes standards in common use for landscape construction and nursery stock. | Landscape material installed on City property and through development agreements must meet the standard, referenced in the City's **Tree Policy**. |
| **Sustainable Forestry Initiative** | Urban and Community Forest Sustainability Standard (draft) | The Sustainable Forestry Initiative (SFI) is preparing a certification standard for urban forest management programs. Draft versions define 16 objectives for a sustainable urban forest program, accompanied by five guiding principles. | Standard is in draft and no city has yet certified its program. |
| **Metro Vancouver** | Urban Forest Climate Adaptation Initiative | Metro Vancouver has prepared a Tree Species Selection Tool, and Design Guidebook prepared a three-part practical guide to prepare the urban forest for projected climate change impacts. | Used to guide the species selection process during City planting programs. |

## 5.6. PEER CITY COMPARISON

Comparing urban forest programs across Lower Mainland municipalities provides insights into relative levels of investment in urban forestry in the region. Table 5 compares information on the budgets and activities of five peer cities. Peer cities have been selected to show a range of contexts that exist in the region. Some communities, like Vancouver and the City of North Vancouver are more urban, while others have large natural areas that contribute significant canopy area. These contexts change the level of investment needed in tree inventory, planting, tree care, risk assessment, and tree protection.

*Table 5. Municipal comparison of urban forestry programs*

| Description | North Vancouver (City) | Vancouver | North Vancouver (District) | Port Moody | Burnaby | Surrey |
|---|---|---|---|---|---|---|
| **Context** | | | | | | |
| Population (2021) | 58,120 | 662,248 | 88,168 | 33,535 | 249,125 | 568,322 |
| Density (people/km²) | 4,913 | 5,750 | 549 | 1,297 | 2,751 | 1,798 |
| Land area (km²) | 11.8 | 115.2 | 160.7 | 25.9 | 90.6 | 316.1 |
| **Assets and Resourcing** | | | | | | |
| Canopy cover within urban containment boundary | 20% (2021) | 23% (2018)<br>21% (2013) | 47% (2014) | 43% (2019) | 29% (2018) | 32% (2014) |
| Public tree population (inventoried street and park trees) | 9,800 | 147,000 | Unknown | 4,500 | 32,500 | 103,985 |
| Approximate annual operational urban forestry budget | $627,500 | $5,500,000 | ~$800,000 | $400,000 | $2,300,000 | $4,800,000 |
| Budget average per person | $10.80 | $8.31 | $9.07 | $11.93 | $9.23 | $8.45 |
| Budget average per km² | $53,178 | $47,743 | $4,978 | $15,444 | $25,386 | $15,185 |
| Urban forest staff (tree bylaw implementation + tree management) | 1 supervisor<br>1 FTE* arborist<br>2 FTE support (including 2 tree workers)<br>1 TFT* support staff | ~55 FTE | 4 FTE arborists (incl. 2 field arborists)<br>1 FTE support<br>1.5 FTE bylaw staff | 2 FTE arborists<br>2.25 FTE support | 1 Forestry Supervisor<br>2 FTE arboricultural foremen<br>2 FTE arborists<br>2 FTE tree care crews | ~11 FTE |
| Tree inventory | Yes | Yes | No | Yes | Yes | Yes |

FTE = full time equivalent, TFT = temporary full time

| Description | North Vancouver (City) | Vancouver | North Vancouver (District) | Port Moody | Burnaby | Surrey |
|---|---|---|---|---|---|---|
| **Planting** | | | | | | |
| Planting programs supporting residents to plant or support planting on City property (excludes replacement planting programs) | Living City Tree Planting Program<br><br>Park Stewardship Program<br><br>Natural Areas Restoration Planting | Branch Out (Pilot) | - | - | Tree4Free | Releaf planting program |
| Annual boulevard tree planting rate | ~100 street trees through Living City Tree Planting Program<br><br>30 replacement trees (2021)<br><br>+ 145 trees through development contributions | 1,500 street trees | Unknown | ~50 trees | Unknown | 4,475 |
| **Management** | | | | | | |
| Pruning | Reactive and some proactive | Reactive | Proactive street tree pruning (annually <10 years; every 3 years >10 years) | Reactive; contracted out | Reactive | Proactive |
| Risk management approach | Reactive and some proactive | Reactive | Proactive (3-year cycle) | Reactive except proactive along trails | Reactive | Proactive |
| Risk management policies/programs | Tree Policy | - | Dangerous Tree Bylaw | Tree Management Policy | - | Natural Areas Management Plan |
| Urban forest strategy or management plan | Yes (in progress) | Yes | No | Yes (in progress) | Yes (in progress) | Yes |
| **Protection** | | | | | | |
| Bylaw(s) for private tree protection | Yes | Yes | Yes | Yes | Yes | Yes |
| Protected tree size | 20 cm or greater DBH, except RS and RT zones | 20 cm or greater DBH | 75 cm or greater DBH | 10 cm or greater, ESAs and strata only | 20.3 cm or greater | 30 cm |

## KEY FINDINGS FROM THE PEER CITY COMPARISON

- The City's canopy cover is in the lower range of comparison municipalities, similar to Vancouver's. The City is a highly urbanized municipality, second only to Vancouver in population density. Vancouver was able to increase its canopy cover between 2013 and 2018 by 2%, with much of the increase attributable to the growth of existing trees.
- The City's operational budget for urban forestry ($627,500) carries a per capita cost of $10.80 — in the same range as comparison municipalities. Budgeting practices vary between cities, and budgets do not represent equivalent service levels.
- The City's Living City Street Tree Planting Program, replacement tree planting, and planting in parks (supported by both capital spending, donations, and — in the future — cash-in-lieu payments) improve canopy cover, in addition to developer planted trees.
- The City's tree maintenance and risk management combines reactive (request-driven) approaches with some proactive, scheduled pruning (often trees previously reported through service requests). Cities with proactive maintenance approaches for at least some urban forest asset classes support better health and longevity and are better able to implement visual risk inspections.
- All comparison municipalities administer tree bylaws for the protection of public and private trees. The City's bylaw, like Port Moody's, does not apply to low density residential areas. A threshold diameter of 20cm for protected tree status is similar to most other bylaws in the region.

# 6. URBAN FOREST REPORT CARD

The urban forest report card assesses the City's current urban forest program based on the information compiled by the State of the Urban Forest Report. The approach used is a qualitative assessment of criteria and indicators for sustainable urban forest management, prepared by Leff [46] and adapted with other criteria to fit the City's context. A criteria is a particular outcome related to urban forest management, while indicators are descriptive statements that reflect poor, fair, good, and optimal performance relative to the criteria. To review the detailed criteria and indicator statements, see Appendix 1, where sources are provided.

The Urban Forest Plan will use the Urban Forest Report Card as a tool to guide recommendations, and to monitor progress towards achieving a sustainable urban forest program.

## KEY FINDINGS

The City's 2022 Urban Forest Report Card score is "Fair". An area of strength for the City is planning, where Council, staff, and community awareness have already supported the inclusion of trees in strategic plans. Areas for improvement include:

- Establishing canopy targets and building capacity for urban forest management to implement the future Urban Forest Plan.
- Expanding planting programs and improving standards guiding tree planting throughout the City.
- Documenting management standards and building up proactive tree risk and maintenance.
- Expanding partnerships with the community, institutions, and promoting stewardship by large landowners.

# Urban Forest Report Card

**2023** program grade (in colour)


| | Poor | Fair | Good | Optimal |
|---|---|---|---|---|
| **THEME: PLANNING** | | | | |
| Awareness of the urban forest as a community resource | ○ | ○ | ● | ○ |
| Relative tree canopy cover (not graded, target to be developed) | ○ | ○ | ○ | ○ |
| Clear and defensible urban forest canopy assessment and goals | ○ | ● | ○ | ○ |
| Interdepartmental and municipal agency cooperation in urban forest strategy implementation | ○ | ○ | ● | ○ |
| Municipality-wide urban forest management plan | ○ | ● | ○ | ○ |
| Municipal natural asset management | ○ | ● | ○ | ○ |
| Municipal biodiversity or green infrastructure strategy | ○ | ○ | ○ | ● |
| Municipal urban forestry program capacity | ○ | ● | ○ | ○ |
| Urban forest funding to implement a strategy | ○ | ● | ○ | ○ |
| **THEME: PLANTING** | | | | |
| City tree planting and replacement program design, planning and implementation | ○ | ○ | ● | ○ |
| Development requirements to plant trees on private land | ○ | ● | ○ | ○ |
| Streetscape and servicing specifications and standards for planting trees | ○ | ● | ○ | ○ |
| Equity in planting program delivery | ○ | ● | ○ | ○ |
| Forest restoration and native species planting | ○ | ● | ○ | ○ |
| Selection and procurement of stock in cooperation with nursery industry | ○ | ● | ○ | ○ |
| Ecosystem services targeted in tree planting projects and landscaping | ○ | ● | ○ | ○ |
| **THEME: MANAGING** | | | | |
| Tree Inventory | ○ | ● | ○ | ○ |
| Knowledge of trees on private property | ○ | ○ | ● | ○ |
| Natural areas inventory | ○ | ○ | ○ | ● |
| Age diversity (size class distribution) | ○ | ● | ○ | ○ |
| Species diversity | ○ | ● | ○ | ○ |
| Species suitability | ○ | ○ | ● | ○ |
| Publicly owned tree species condition | ○ | ● | ○ | ○ |
| Maintenance of intensively managed trees | ○ | ● | ○ | ○ |
| Emergency response planning | ○ | ● | ○ | ○ |
| Tree risk management | ○ | ● | ○ | ○ |
| Pest and Disease management | ○ | ○ | ● | ○ |
| Waste biomass utilization | ○ | ◐ | ○ | ○ |
| **THEME: PROTECTING** | | | | |
| Policy/regulations regulating the protection and replacement of private and City trees | ○ | ○ | ● | ○ |
| Policy/regulations for sensitive ecosystems, soils, or permeability through private development | ○ | ○ | ● | ○ |
| Internal protocols guide City tree or sensitive ecosystem protection | ○ | ○ | ● | ○ |
| Standards of tree protection/care observed during development or by arborists | ○ | ● | ○ | ○ |
| Cooperation with utilities on protection (and pruning) of City trees | ○ | ◐ | ○ | ○ |
| **THEME: PARTNERING** | | | | |
| Citizen involvement and neighbourhood action | ○ | ○ | ● | ○ |
| Involvement of large private land and institutional land holders | ● | ○ | ○ | ○ |
| Urban forest research | ○ | ● | ○ | ○ |
| Regional collaboration | ○ | ● | ○ | ○ |

# 7. NEXT STEPS

The Urban Forest Report Card and State of the Urban Forest Report provide a performance baseline that will inform recommendations and directions the Urban Forest Plan. Recommendations considered for the Urban Forest Plan will aim to shift the City's urban forest management program towards good and optimal indicator ratings.

Issues that will be addressed during development of the Urban Forest Plan include:

- Establishing a new canopy cover target (or sub-area targets) for the City, considering the role and needs of expanded tree planting, additional tree protection, or more incentives for retaining and planting trees on public and private property.
- Responding to forest health issues, particularly in natural areas, where native biodiversity is threatened by intersecting climate impacts, edge effects from development, and outbreaks of insect pests and disease, to ensure the City has the expertise to achieve resilience for native biodiversity.
- Expanding the application and understanding of best practices in the City's urban forest bylaws and policies to help present the urban forest as a connected ecosystem with significance to biodiversity, natural areas, infrastructure, capital planning, and development.
- Assessing the capacity of the City's urban forest program to achieve strategic goals, recognizing increasing demand for urban forest ecosystem services, the needs of vulnerable residents for urban forest benefits, intersections with the City's established priorities, and the growing threat of climate change and development related tree loss, so that the Urban Forest Plan can be implemented to maximize benefits and minimize risks.
- Identifying new opportunities to engage the public on urban forest issues and projects to build awareness of the urban forest's value and how community members can contribute to the urban forest through stewardship, tree retention, and other venues.

The public will have opportunities to provide feedback on the State of the Urban Forest Report and Urban Forest Plan development. Visit **https://letstalk.cnv.org/urbanforestplan** to review project information and engagement opportunities.

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# APPENDIX 1. CRITERIA AND INDICATORS FOR THE URBAN FOREST REPORT CARD

The criteria and indicators table is based on the following resources:

- Davey Institute / USDA Forest Service: The Sustainable Urban Forest a Step-by-Step Approach (2016). Available online at www.itreetools.org/resources/content/Sustainable_Urban_Forest_Guide_14Nov2016.pdf
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The Sustainable Forestry Initiative has released a draft of its upcoming certification standard for urban forests. Once adopted, this standard is expected to become widely adopted in North America and may be useful for future comparison or progress reporting:

- Sustainable Forestry Initiative: SFI Urban and Community Forest Sustainability Standard (2021). Available online at: https://www.forests.org/wp-content/uploads/SFI-Urban-and-Community-Forest-Sustainability-Standard-%E2%80%93-November-1-2021.pdf

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| **Theme: Planning** | | | | | |
| Awareness of the urban forest as a community resource | The urban forest is recognized as vital to the community's environmental, social, and economic well-being. | General ambivalence or negative attitudes about trees, which are perceived as neutral at best or as the source of problems. Actions harmful to trees may be taken deliberately. | Trees are widely acknowledged as providing environmental, social, and economic services but are not widely integrated in corporate strategies and policies. | Trees are widely acknowledged as providing environmental, social, and economic services and urban forest objectives are integrated into other corporate strategies and policies. | Urban forest recognized as vital to the community's environmental, social, and economic well-being. Widespread public and political support and advocacy for trees, resulting in strong policies and plans that advance the viability and sustainability of the entire urban forest. |
| Relative tree canopy cover*<br>*target subject to UFP review | Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighbourhood or land use. | The existing canopy cover for entire municipality is <50% of the desired canopy | The existing canopy is 50%-75% of desired | The existing canopy is >75%-100% of desired | The existing canopy is >75%-100% of desired - at the individual neighborhood level as well as overall municipality |
| Clear and defensible urban forest canopy assessment and goals | Urban forest policy and practice is driven by comprehensive goals municipality-wide and at the neighbourhood or land use scale informed by accurate, high-resolution assessments of existing and potential canopy cover. | No assessment or goals. | Low-resolution and/or point-based sampling of canopy cover using aerial photographs or satellite imagery – and limited or no goal setting.<br><br>(UFP will advance this indicator) | Complete, detailed, and spatially explicit, high-resolution Urban Tree Canopy (UTC) assessment based on enhanced data (such as LiDAR) – accompanied by comprehensive set of goals by land use and other parameters. | The City has a complete, detailed, and spatially explicit high-resolution Urban Tree Canopy (UTC) assessment accompanied by a comprehensive set of goals, all utilized effectively to drive urban forest policy and practice municipality-wide and at neighbourhood or smaller management level. |

* There is no grading for this assessment criteria as the City will develop a target through the UFP.

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Interdepartmental and municipal agency cooperation on urban forest strategy implementation | Ensure all relevant municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities. | Little cooperation and conflicting among departments and/or agencies often leading to poor outcomes for trees. | Common goals but limited cooperation among departments and/or agencies and mixed outcomes for trees. | Municipal departments, affected agencies and urban forest managers recognize potential conflicts and reach out to each other on an informal but regular basis. | Formal interdepartmental working agreements or protocols for all projects that could impact municipal trees. |
| Municipality-wide urban forest management plan | Develop and implement a comprehensive urban forest management plan for public and private property. | No plan | Existing plan limited in scope and implementation<br>*existing UFP is from 2007 and applies to natural area parks | Recent comprehensive plan developed and implemented for publicly owned forest resources, including trees managed intensively (or individually) and those managed extensively, as a population (e.g., trees in natural areas) | Strategic, multi-tiered plan with built-in adaptive management mechanisms developed and implemented for public and private resources |
| Municipal natural asset management | Integrate green infrastructure assets into the municipal asset management system to support valuing and accounting for natural assets in the City's financial planning to build climate resilient infrastructure. | No recognition of value of natural or human-made elements that provide ecological and hydrological functions (green infrastructure) | Local government recognizes the value of green infrastructure but does not yet have information to include them in an asset management system. | Green infrastructure assets have been partially or fully inventoried and some assets are included in an asset management system, with the intent to ultimately capture all assets in the consolidated financial statements of the municipality. | Green infrastructure assets are inventoried and included in an asset management system and on the consolidated financial statement of the municipality. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Municipal-wide biodiversity or green network strategy | Acquire and restore publicly-owned natural areas in pursuit of meeting municipal-wide biodiversity and connectivity goals. | No or very limited planning and stewardship of natural areas. | Area specific management plans focused on management, restoration, and protection of natural areas. | Municipal-wide urban forest, parks or natural areas strategy guiding management, restoration, and protection of the existing natural areas network. | Biodiversity strategy or equivalent in effect to manage, restore and existing and acquire future natural areas network throughout the municipality. |
| Municipal urban forestry program capacity | Maintain sufficient well-trained personnel and equipment – whether in-house or through contracted or volunteer services – to implement municipality-wide urban forest management plan | Team severely limited by lack of personnel and/or access to adequate equipment. Unable to perform adequate maintenance, let alone implement new goals. | Team limited by lack of staff and/or access to adequate equipment to implement new goals. | Team able to implement many of the goals and objectives of the urban forest management plan. | Team able to implement all of the goals and objectives of the urban forest management plan. |
| Urban forest funding to implement a strategy | Maintain adequate funding to implement the Urban Forest Plan | Little or no dedicated funding. | Dedicated funding but insufficient to implement the Urban Forest Plan or maintain new assets as they are added to the inventory.<br>*pending UFP review | Dedicated funding sufficient to partially implement the Urban Forest Plan and maintain new assets as they are added to the inventory. | Sustained funding to fully implement the Urban Forest Plan and maintain new assets as they are added to the inventory. |
| **Theme: Planting** | | | | | |
| City tree planting and replacement program design, planning and implementation | Comprehensive and effective tree selection, planting and establishment program that is driven by canopy cover goals and other considerations according to the UFS. | Tree replacement and establishment is ad hoc. | Some tree planting and replacement occurs, but with limited overall municipality-wide planning and insufficient to meet replacement requirements. | Tree replacement and establishment is directed by needs derived from an opportunities assessment and species selection is guided by site conditions, tree health and climate adaptation considerations. | Tree planting and replacement is guided by strategic priorities and is planned out to make progress towards targets set for canopy cover, diversity, tree health and climate adaptation within the timeframe of the strategy. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Development requirements to plant trees on private land | Ensure that new trees are required in landscaping for new development or, where space is lacking, there is an equivalent contribution to tree planting in the public realm. | Landscaping requirements do not address trees on private land. | Developments are generally required to provide replacement but the outcomes are often in conflict with public trees and other infrastructure due to space limitations and not connected to meeting canopy cover targets. City-wide Tree Bylaw does implement replacement policy but not for all zones. | Developments are required to provide replacement trees or, where space is not adequate according to soil volume available, provide cash-in-lieu for equivalent tree planting on public land. The requirement is not connected to meeting canopy cover targets. | Developments are required to provide a minimum density of trees per unit measure or, where space is not adequate according to soil volume available, provide adequate cash-in-lieu for equivalent tree planting on public land. Planting density is determined based on meeting a municipal-wide canopy cover target. |
| Streetscape and servicing specifications and standards for planting trees | Ensure all publicly owned trees are planted into conditions that meet requirements for survival and maximize current and future tree benefits. | No or very few specifications and standards for growing sites. | Specifications and standards for growing sites exist but are inadequate to meet urban forest goals. | Specifications and standards exist and are adequate to meet urban forest goals but are not always achieved. | All trees planted are in sites with adequate soil quality and quantity, and with sufficient growing space to achieve their genetic potential and life expectancy, and thus provide maximum ecosystem services. |
| Equity in planting program delivery | Ensure that the benefits of urban forests are made available to all, especially to those in greatest need of tree benefits. | Tree planting and outreach are not determined equitably by canopy cover or need for benefits. | Planting and outreach includes attention to low canopy neighborhoods or areas. | Planting and outreach targets neighborhoods with low canopy and a high need for tree benefits. | Equitable planting and outreach at the neighbourhood level are guided by strong citizen engagement in identified low-canopy/ high-need areas. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Forest restoration and native species planting | Encourage the appreciation of climate suitable native vegetation by the community and ensure native species are widely planted to enhance native biodiversity and connectivity | Voluntary use of climate suitable native species on publicly and privately-owned lands. | The use of climate suitable native species is encouraged on a site-appropriate basis in public and private land development projects. | Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects but are not integrated across all policy or guided by a connectivity analysis. | Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects and through tree bylaw. |
| Selection and procurement of stock in cooperation with nursery industry | Diversity targets and climate adaptation/ mitigation objectives guide tree species selection and nurseries proactively grow stock based on municipal requirements. | Species selection is not guided by diversity targets or climate adaptation/ mitigation objectives. | Species selection is guided by diversity and climate adaptation/ mitigation but required stock is rarely available from nurseries and acceptable substitutes reduce diversity. | Species selection is guided by targets for diversity and climate adaptation/ mitigation and required stock or acceptable substitutes are usually available from nurseries. | Species selection is guided by targets for diversity and climate adaptation/mitigation and required stock is secured ahead of the planned planting year from contract or in-house nurseries. |
| Ecosystem services targeted in tree planting projects and landscaping | Incorporate ecosystem services objectives into public and private tree planting projects to improve urban tree health and resilience, carbon sequestration, stormwater management and cooling. | Ecosystem services not considered in planting projects or intentionally designed into vegetated landscapes | Ecosystem services, such as stormwater interception, occasionally incorporated into City or private land planting projects and landscape designs. | Guidelines in place for planting projects and landscape designs on public and private land to deliver specific ecosystem services. | Ecosystem services targets are defined for the urban forest and policy requires planting project and landscape designs on public and private land to contribute to meeting targets. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| **Theme: Managing** | | | | | |
| Tree inventory | A current and comprehensive inventory of intensively managed trees to guide management, including data such as age distribution, species mix, tree condition and risk assessment. | No inventory. | Partial inventory of publicly-owned trees in GIS. | Complete inventory of street trees and intensively managed park trees in GIS but inconsistently updated. | The municipal tree inventory is complete, is GIS-based, supported by mapping, and is continuously updated to record growth, work history and tree condition. |
| Knowledge of trees on private property | Understand the extent, location, and general condition of privately-owned trees. | No information about privately owned trees. | Aerial, point-based or low-resolution assessment of tree canopy on private property, capturing broad extent. | Detailed Urban Tree Canopy analysis of the urban forest on private land, including extent and location, integrated into a municipality-wide GIS system | The City has an i-Tree Eco analysis of private trees as well as detailed Urban Tree Canopy analysis of the entire urban forest integrated into a municipality-wide GIS system. |
| Natural areas inventory | A current and comprehensive inventory of sensitive and modified natural ecosystems and their quality mapped to Provincial standards to provide standardized ecological information to support decision-making. | No municipal inventory of natural areas. | Natural areas inventoried in GIS but not recently updated and attribute information not to a standard that can support decision-making. | Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making but not updated in the last 5 years. | Natural areas inventoried in GIS and with standard and complete attribute information to support decision-making and updated in the last 5 years. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| "Intensively" managed tree age diversity (size class distribution) | Provide for ideal age distribution for all "intensively" managed trees – municipality-wide as well as at neighbourhood level | Even-age distribution, or highly skewed toward a single age class (maturity stage) across entire population | Some uneven distribution, but most of the tree population falls into a single age class<br>*Size class distribution is based on estimates using LiDAR-derived tree heights. | Total tree population across municipality approaches an ideal age distribution of 40% juvenile, 30% semi-mature, 20% mature, and 10% senescent | Total population approaches that ideal distribution municipality-wide as well as at the neighborhood level |
| "Intensively" managed tree species diversity | Establish a genetically diverse population across the municipality as well as at the neighbourhood scale | Five or fewer species dominate the entire tree population across municipality | No single species represents more than 10% of the total tree population; no genus more than 20%, and no family more than 30% | No single species represents more than 5% of total tree population; no genus more than 10%; and no family more than 15% | At least as diverse as "Good" rating (5/10/15) municipality-wide - and at least as diverse as "fair" (10/20/30) at the neighborhood level |
| "Intensively" managed tree species climate suitability | Establish a planted tree population suited to the urban environment and adapted to the overall region | Fewer than 50% of planted trees are from species considered suitable for the area | >50%-75% of planted trees are from species suitable for the area | More than 75% of planted trees are suitable for the area. | Virtually all planted trees are suitable for the area |
| "Intensively" managed tree species condition | Current and detailed understanding of condition and risk potential of all publicly owned trees that are managed intensively (or individually) | Condition of urban forest is unknown | Sample-based tree inventory indicating tree condition and risk level | Complete tree inventory that includes detailed tree condition ratings | Complete tree inventory that is GIS-based and includes detailed tree condition as well as risk ratings |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Maintenance of intensively managed trees | Maintain all publicly owned intensively managed trees for optimal health and condition in order to extend longevity and maximize current and future benefits | Intensively managed trees are maintained on a request/reactive basis. | Intensively managed trees are maintained on a request/reactive basis. Limited systematic (block) pruning and/or immature trees are structurally pruned. | All intensively managed trees are systematically maintained on a cycle determined by workload and resource limitations. All immature trees are structurally pruned. | All mature intensively managed trees are maintained on an optimal pruning cycle. All immature trees are structurally pruned. |
| Emergency response planning | A response plan guides call-out procedures, resources available and the clean-up response for extreme weather and earthquake. | Response plan not documented or not current. | Response plan is documented and includes call-out procedures, roles and responsibilities but lacks details to prioritize hazards and clean-up. | Response plan includes call-out procedure, roles and responsibilities, and criteria for prioritizing tree hazards and removing debris is in place. | A comprehensive response plan is in place and a response drill occurs annually. |
| Tree risk management | Comprehensive tree risk management program fully implemented, according to ANSI A300 (Part 9) "Tree Risk Assessment" standards, and supporting industry best management practices. | No coordinated tree risk assessment or risk management program. Response is on a reactive basis only. | Some areas within the city are prioritized for risk assessment and management. Little annual budget is available to develop a more proactive inspection program. | Priority areas of the City are inspected on a regular schedule and operational standards and budgets are in place for responding to and managing tree risks within an appropriate timeframe. | A comprehensive risk management program is in place, with all public lands inspected on defined schedules and operational standards and budgets in place for responding to and managing tree risks within an appropriate timeframe. |
| Pest and Disease Management | An Integrated Pest Management (IPM) plan guides treatment responses to existing and potential pest, disease and invasive species threats to the urban forest. | No integrated pest management plan and no pest management. | No integrated pest management plan and reactive pest management. | An integrated pest management plan is in place and implemented. | A comprehensive pest management program is in place, with detection, communication, rapid response and IPM practiced. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Waste biomass utilization | A closed system diverts all urban wood and green waste through reuse and recycling. | Wood waste from the urban forest is not utilized. | Wood waste from the urban forest is utilized as mulch or biofuel. | Wood waste from the urban forest is utilized as mulch or biofuel and sometimes high value pieces are milled and stored for later use or sold on to local value-added industries. | Low value wood waste from the urban forest is utilized as mulch or biofuel and all high value pieces are milled and stored for later use or sold on to local value-added industries. |
| **Theme: Protecting** | | | | | |
| Policy or regulations regulating the protection and replacement of private and City trees | Secure the benefits derived from trees on public and private land by enforcement of municipality-wide policies and practices including tree protection. | No or very limited tree protection policy. | Policies in place to protect public trees and employ industry best management practice. | Policies in place to protect public and private trees with enforcement but lack integration with other municipal policy to enable effective tree retention. | Urban forest strategy and integrated municipal-wide policies that guide the protection of trees on public and private land, and ensure they are consistently applied and enforced. |
| Policy or regulations for conservation of sensitive ecosystems, soils, or permeability on private property through development | Secure the benefits derived from environmentally sensitive areas by enforcement of municipality-wide policies in pursuit of meeting biodiversity and connectivity goals. | No or very limited natural areas protection policy. | Policies in place to protect privately-owned natural areas without enforcement. | Development Permit Areas in place to protect privately-owned natural areas with enforcement but lack integration with other municipal policy to enable effective tree retention. | Biodiversity strategy or equivalent and integrated municipal-wide policies that guide privately-owned natural area protection and ensure they are consistently applied. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| Internal protocols guide City tree or sensitive ecosystem protection | Ensure all relevant municipal departments follow consistent tree or ecosystem protection protocols for capital design and construction activities. | No protocols guiding City tree or ecosystem protection for capital design and construction activities. | Informal and inconsistent processes followed for City tree or ecosystem protection for capital design and construction activities. | Established protocols for City tree or ecosystem protection for capital design and construction activities but outcomes are inconsistent or sometimes unachievable. | Established protocols for City tree or ecosystem protection for capital design and construction activities are consistently followed and outcomes are successful. |
| Standards of tree protection and tree care observed during development or by local arborists and tree care companies | Consulting arborists and tree care companies understand city-wide urban forest goals and objectives and adhere to high professional standards. | Limited understanding or support for tree protection requirements. | General understanding or support for tree protection requirements but large variation in the quality of information and services provided. | General understanding or support for tree protection requirements and generally consistent quality of information and services provided. | Advocacy for tree protection requirements, engagement with City staff on improving processes and standards, and generally consistent quality of information and services provided to high professional standards. |
| Cooperation with utilities on protection (and pruning) of City trees | All 3rd party utilities employ best management practices and cooperate with the City to advance goals and objectives related to urban forest issues and opportunities. | Utilities take actions impacting urban forest with no municipal coordination or consideration of the urban forest resource. | Utilities inconsistently employ best management practices, rarely recognizing potential municipal conflicts or reaching out to urban forest managers and vice versa. | Utilities employ best management practices, recognize potential municipal conflicts, and reach out to urban forest managers on an ad hoc basis – and vice versa. | Utilities employ best management practices, recognize potential municipal conflicts, and consistently reach out to urban forest managers and vice versa. |

| Assessment Criteria | Objective | Indicators for Urban Forestry Performance | | | |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | Optimal |
| **Theme: Partnering** | | | | | |
| Citizen involvement and neighbourhood action | Citizens and groups participate and collaborate at the neighbourhood level with the municipality and/or its partnering NGOs in urban forest management activities to advance municipality-wide plans | Little or no citizen involvement or neighborhood action. | Community groups are active and willing to partner in urban forest management, but involvement and opportunities are ad hoc. | Several active neighborhood groups engaged across the community, with actions coordinated or led by municipality and/or its partnering NGOs. | Proactive outreach and coordination efforts by the City and NGO partners result in widespread citizen involvement and collaboration among active neighbourhood groups engaged in urban forest management |
| Involvement of large private land and institutional land holders (e.g., schools) | Large private landholders to embrace and advance city-wide urban forest goals and objectives by implementing specific resource management plans. | Large private landholders are generally uninformed about urban forest issues and opportunities. | Landholders manage their tree resource but are not engaged in meeting municipality-wide urban forest goals. | Landholders develop comprehensive tree management plans (including funding strategies) that advance municipality-wide urban forest goals. | As described in "Good" rating, plus active community engagement and access to the property's forest resource. |
| Urban forest research | Research is active and ongoing towards improving our understanding of the urban forest resource, the benefits it produces, and the impacts of planning, policy, design and management initiatives. | No urban forest research. | Isolated academic research occurs in the municipality's urban forest. | The municipality supports and has input on academic research occurring in its urban forest and knowledge transfer occurs. | The urban forest is a living laboratory - in collaboration with public, private, NGO and academic institutions - integrating research and innovation into managing urban forest health, distribution, and abundance. |
| Regional collaboration | There is cooperation and interaction on urban forest plans among neighbouring municipalities within the region, and/or within regional agencies. | Municipalities have no interaction with each other or the broader region for planning or coordination on urban forestry. | Some neighboring municipalities and regional agencies share similar policies and plans related to trees and urban forest. | Some urban forest planning and cooperation across municipalities and regional agencies. | Widespread regional cooperation resulting in development and implementation of regional urban forest strategy. |