CITY OF NEW WESTMINSTER

TREE PLANTING MASTER PLAN 2020 - 2030



NEW WESTMINSTER



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- **Mayor's Taskforce on Riverfront and Public Realm** (2019)
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- **Parks & Recreation Department**
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2019 CORPORATE VISION...

We will be a livable, walkable, prosperous City, strong in tradition, providing the best facilities, services, and programs for our citizens, delivered in a customer focused, accessible manner.

2041 OFFICIAL COMMUNITY PLAN VISION...

New Westminster is a healthy, inclusive and thriving community where people feel connected with each other. This sustainable city showcases a spectacular natural environment, public spaces and unique neighbourhoods that are well-integrated and accessible. Superior urban design integrates its distinctive character, heritage assets and cultural identity. Growth and development provide a variety of services and employment opportunities that contribute to a high quality of life for all.

2035 URBAN FOREST VISION...

New Westminster's urban forest is a beautiful and beloved public resource, providing refuge, education and recreation within the City. Urban trees are carefully planted, protected and maintained to enhance habitat, clean the air, capture carbon, manage stormwater and maximize benefits to our City's environmental health and quality of life.

Great planning and management supports an urban experience of diverse, colourful and comfortable, well-treed streets and boulevards that connect with neighbourhood parks, natural areas and the waterfront.



1 Introduction

A 10 year plan for street tree planting

The City of New Westminster's **Urban Forest Management Strategy** (2016) provides the strategic framework to achieve the goal of increasing tree canopy cover to 27% by 2035.

As part of implementing the strategy, the City plans to plant 500 trees per year. This planting effort will involve planting on public land — in streets, parks and natural areas — and on private land. This Tree Planting Master Plan (the Master Plan) will guide the City's tree planting program in streets over a 10 year period. It is a roadmap for how tree planting will contribute to the implementation of the **Urban Forest Management Strategy** and the canopy goal.

The Master Plan will:

- Establish principles to guide tree planting decisions based on existing City strategies and plans.
- Prioritize parts of the City for tree planting based on tree deficits and vulnerable populations.
- Provide planting design guidelines to achieve canopy outcomes and avoid or minimize conflicts with utilities, views and other constraints.
- Provide area specific implementation plans for the next 10 years of tree planting.

As the Master Plan implementation proceeds through the annual planting program, it will be imperative that each planting location is reviewed in the field to identify potential conflicts. In some locations, field review may result in a decision to prioritize essential civil infrastructure and find an alternative location for tree planting. In other locations, planting trees may require additional capital and operating budget investment to enable trees and other infrastructure to coexist. This flexibility is required to ensure that the City can deliver and maintain utility services to residents and businesses in a cost effective manner.

1.1 How to use this document

The Master Plan guides what, where and when trees should be planted in New Westminster. Staff, consultants, developers and the public can use this plan to understand the City's vision and priorities for growing the urban forest over the next 10 years.

This Master Plan will ultimately consist of 5 sections:

Section 1. Introduction

Section 2. Guiding Principles

Section 3. Tree Planting Priorities

Section 4. Planting Guidance

Section 5. Street Tree Planting Area Plans

1.2 Policy context

New Westminster's **Official Community Plan** (OCP, Bylaw 7925, 2017) includes goals that speak to the quality of the public realm, environment and natural areas of the City, as well as the provision of reliable and innovative services to the community. It is an action of the OCP to implement the **Urban Forest Management Strategy**.

The **Urban Forest Management Strategy** establishes targets and priority actions to enhance trees in the public realm including:

Targets:

- Increase canopy cover to 27% city-wide.
- By 2035, 100% of managed tree species are suitable for local climate and site water conditions.

Actions:

- Develop neighbourhood planting strategies to address succession, planting constraints and opportunities.
- Create opportunities to establish more trees in the urban environment and improve plantable space as part of the infrastructure renewal process.
- Ensure that new plantings in streets and parks (excluding areas managed as native forest) target no more than 10% of any species, 20% of any genus and 30% of any family at both the Citywide and neighbourhood levels.
- Spatially define the areas across the City where the use of native vegetation is to be prioritized and promote naturescaping.



Several other City plans and initiatives are also relevant to developing this Master Plan:

- By resolution, Council recognizes that climate change constitutes an emergency for the City of New Westminster and resolve that new actions be considered to help the City's targets and increase ambition for actions under the **Environmental Strategy & Action Plan**.
- The **Environmental Strategy & Action Plan** (2018) includes strategies to:
  - Increase the size and health of the city's urban forest cover.
  - Increase the diversity of vegetation species in the city.
- **Envision 2032** (2013), the City's sustainability framework, promotes the integration of natural features into urban design to create:
  - Healthy built environments.
  - Traditional street design, with wide sidewalks, tree-lined boulevards and pedestrian-oriented street lighting that protects the night sky, continues throughout the City as it grows, contributing to the ambiance and historical feel of neighbourhoods.
  - An urban oasis, with a rich tree canopy throughout the City that provides for attractive streets, growing food and a range of environmental services, including cleaner air, shading in summer and habitat, such as for song birds.
  - A comprehensive network of green spaces and corridors has brought nature, habitat and usable common spaces into all areas of the City, including buildings and sites.
  - Green infrastructure is being utilized to reduce stormwater impacts and to recreate the original hydrology of the area to the extent possible.
  - New Westminster's amenities, including parks, trails, recreation facilities, historic Downtown and neighbourhoods with character make the City a desirable place to work and do business.

- The **Community Poverty Strategy** (2016) includes an action to ensure that the City provides adequate trees in low-income and multi-family rental housing areas and neighbourhoods.
- The **Integrated Stormwater Management Plan and Best Management Practices Toolkit** (2017) includes strategies and practices to:
  - Manage stormwater to renew urban forests.
  - Apply absorbent landscapes, infiltration swales, rain gardens pervious paving and tree well structures to capture and clean stormwater.
- The **Ecological Inventory for New Westminster** (2015) identifies the natural assets and features that are significant functional components of the City's ecological network.
- The **Corporate Strategy** (2019) states we will be a livable, walkable, prosperous City, strong in tradition, providing the best facilities, services, and programs for our citizens, delivered in a customer focused, accessible manner.
- The **New Westminster Age-Friendly Community Strategy** (2017) includes action for the City to explore the development of parklets, incorporating accessible seating and landscaping in high pedestrian traffic areas to provide places of refuge and relaxation.
- **Master Transportation Plan** (2014) policies and actions include enhancing pedestrian comfort by providing boulevards, where feasible, with street trees to provide separation between vehicles and pedestrians and the creation of Green Streets, greenways and Great Streets.

These City plans and initiatives are the foundation of the principles and priorities for planting outlined in the following sections.



In 2009, a heatwave caused a spike in emergency room visits and more than 100 excess deaths — most of these were in New Westminster and the Downtown Eastside[1]. Temperatures in cities increase with decreasing tree canopy and increasing imperviousness, creating urban heat islands that increase the risk of heat related illness and death during heat waves. Research has shown that city blocks with more than 40% canopy cover show the greatest daytime cooling benefit on hot days[2]. For cooling at night, reducing the extent of impervious surfaces has a more significant effect. This research supports the use of tree cover as a climate adaptation strategy for mitigating daytime heat.

1 Kosatsky T, Henderson SB, Pollock SL (2012) Shifts in mortality during a hot weather event in Vancouver, British Columbia: rapid assessment with case-only analysis. Am J Public Health 102(12):2367–2371

2 Ziter, C.D.; Pedersen, E.J., Kucharik, C.J.; Turner, M.G. 2019. Scale-dependent interactions between tree canopy cover and impervious surfaces reduce daytime urban heat during summer. Proceedings of the National Academy of Sciences of the United States of America, 116(15) 7575-7580.

2 Guiding Principles

Principles for tree planting design and implementation

The following principles guide decisions on what, where and when trees should be planted in New Westminster's streets:

1. Select the right tree for the right place, balancing competing requirements between below and above ground utility infrastructure and green infrastructure.
2. Prioritize the quality of tree health and canopy outcomes over the quantity of trees planted.
3. Enhance natural habitat areas, biodiversity and connectivity.
4. Mitigate and adapt to climate change by increasing urban forest resilience and by leveraging its capacity to intercept stormwater, sequester carbon and cool urban areas.
5. Provide reliable, effective and efficient service.
6. Collaborate with stakeholders to identify and mitigate conflicts with infrastructure and community values.
7. Distribute canopy cover, and the associated ecosystem services, equitably across the population.
8. Protect New Westminster's unique cultural identities and its heritage.
9. Enhance the beauty, diversity and uniqueness of neighbourhoods.
10. Contribute to New Westminster's attractiveness as a place to live, learn, shop, work, and invest.
11. Enhance pedestrian comfort, accessibility, community health and safety.
12. Apply best management practices and innovation.



3 Tree Planting Priorities

Prioritizing where street trees should be planted

3.1 Factors for prioritization

Prioritizing where and when to plant trees is driven both by the urban forest strategy target to increase canopy cover and principles related to distributing ecosystem services equitably and adapting to climate change. To make connections between these drivers at the city block scale, several metrics were used:

1. **Land use:** Streets adjacent to denser land uses including multi-family and mixed-use were prioritized.

   Why? More people live in high density blocks and have less space for private trees and yards, therefore it is important for the public realm to provide the trees and greenspace in these areas.
2. **Street trees:** Streets with lower numbers of street trees were prioritized.

   Why? Areas without street trees are the focus of street tree planting.
3. **Seniors:** Streets adjacent to blocks where a high concentration of seniors reside were prioritized.

   Why? People over 65 are vulnerable to heat related illness and increasing canopy cover above 40% significantly lowers temperatures at the city block scale on hot days.
4. **Canopy cover:** Streets adjacent to blocks with low canopy cover (on public and private property) were prioritized

   Why? Areas with low canopy cover, if they also have few street trees, are locations in need of more planting to mitigate heat and contribute to the city-wide 27% canopy cover target.
5. **Impervious cover**: Streets adjacent to blocks with high impervious cover (on public and private property) were prioritized.

   Why? Air temperature and runoff increases with impervious cover so areas with high impervious cover are most in need of cooling and rainwater interception by tree canopy.

The following sections show the results for each of these metrics by city block and full page maps are provided in Appendix 1.

Land use

Blocks with multi-family, mixed and civic land use are a high priority for planting, followed by single-family then commercial and industrial land uses defined in the Official Community Plan.



Street trees

Blocks with the least street trees per 100m of block perimeter* are a high priority for planting because they are underserved.

The City of New Westminster's blocks have an average of 1 tree per 100m, and the highest density is 7 trees per 100m. In comparison, the City of Vancouver's blocks average 6 street trees per 100m while the City of Richmond streets average 3 trees per 100m.

*The block perimeter is the total length around the block delineated by surrounding streets and laneways.



The block of Edinburgh Street and 8th Avenue between 18th and 19th has 5 street trees per 100 m of perimeter.



This City block between Richmond, Simpson, Alberta and E Columbia streets has less than 1 street tree per 100 m of perimeter.



Seniors

Blocks with the highest concentration of people over 65 are a high priority for planting due to that population's vulnerability to heat.

This map reports the concentration of people over 65 years of age averaged from the 2016 census data.



Canopy cover

Blocks with the lowest canopy cover on public and private land are a high priority for planting. Canopy cover is used in combination with street tree density to identify blocks that have both a low number of street trees and a low canopy.

Using both measures means that blocks with few street trees and low canopy cover are a higher priority than blocks with few street trees but high canopy cover due to adjacent parks or gardens.



Impervious ground cover

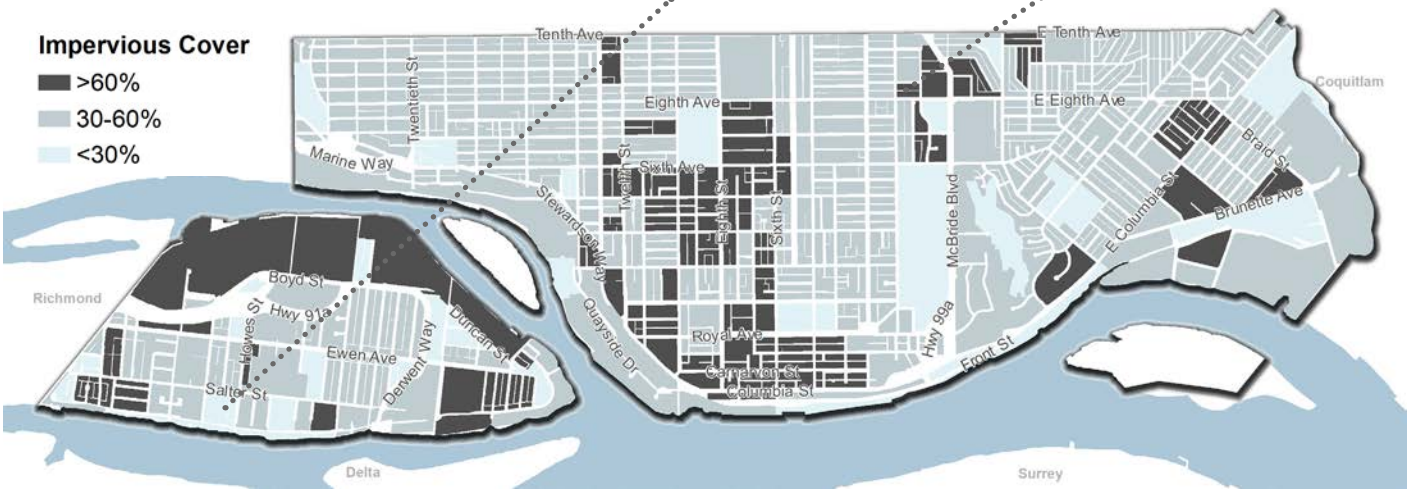
Blocks with high impervious ground cover are a high priority for planting because they are likely to be hot spots in the city. However, planting in these locations is likely to be more difficult because of the extent of hardscape and hot, dry conditions.



This City block between Salter, and Jardine streets and South Dyke road has 27% impervious cover.



This City block between Ovens and 8th Avenue and 1st and Colborne Street has 84% impervious cover.



3.2 Planting priorities

The planting prioritization factors were combined to assign low, moderate and high priority for planting.

Blocks with a high priority have

- Less than 3 street trees per 100 m
- Less than 30% canopy cover combined with either a high density of seniors or a high proportion of impervious surfaces.
- Any land use except industrial.

Blocks with a medium priority have

- Up to 5 street trees per 100 m and any land use.
- Up to 50% canopy cover combined with either a moderate density of seniors or a high proportion of impervious surfaces.

Streets with the low priority have

- Up to 7 street trees per 100 m and any land use.
- Up to 95% canopy cover combined with a low to moderate density of seniors or a low to high proportion of impervious surface.

The planting priority informs the schedule assigned to street and park planting, and where private land planting will be encouraged.

To derive planting schedules for public land, these priorities are combined with:

- Where planting opportunities are located based on:
  - Vacant sites.
  - Replacement tree requests.
- Operational ease of planting.

Those locations that are highest priority and have opportunities that appear to be unconstrained for immediate planting are scheduled for the first 3 years. Great Streets and future development areas are not prioritized because the time-frame for their redesign is not set; however, this Master Plan can inform tree planting outcomes as opportunities arise. Locations with no opportunities and no future development are not expected to be planted in the time-frame of this master plan.



4 Planting Guidance

Determining what should be planted where

Planting design context changes depending on the street, block and neighbourhood character and constraints such as underground services, boulevard width, bike lanes and so on.

This section provides guidance on how to design plantings to meet the intent of the guiding principles of the Master Plan while incorporating locations that consider specific context for choosing where and what to plant.

Guiding principles refresher:

1. Select the right tree for the right place, balancing competing requirements between below and above ground utility infrastructure and green infrastructure.
2. Prioritize the quality of tree health and canopy outcomes over the quantity of trees planted.
3. Enhance natural habitat areas, biodiversity and connectivity.
4. Mitigate and adapt to climate change by increasing urban forest resilience and by leveraging its capacity to intercept stormwater, sequester carbon and cool urban areas.
5. Provide reliable, effective and efficient service.
6. Collaborate with stakeholders to identify and mitigate conflicts with infrastructure and community values.
7. Distribute canopy cover, and the associated ecosystem services, equitably across the population.
8. Protect New Westminster's unique cultural and historic identities.
9. Enhance the diversity and uniqueness of neighbourhoods.
10. Contribute to New Westminster's attractiveness as a place to live, learn, shop, work, and invest.
11. Enhance pedestrian comfort, accessibility, community health and safety.
12. Apply best management practices and innovation.



4.1 General planting guidance for all locations

Stakeholder and community engagement

Successful implementation of the Tree Planting Master Plan will require a coordinated effort between City Departments as well as targeted stewardship initiatives across the community.

Interdepartmental Engagement

Prior to implementing the annual planting program, Parks & Recreation will:

1. Request available utility and one-call drawings for the streetscape.
2. Meet with City Departments to review proposed planting locations within the context of existing and future infrastructure.
3. Mark planting locations on site and review them in the field with relevant City Departments prior to planting.

Stakeholder and Community engagement

Parks & Recreation will develop a community engagement program as part of the implementation of the Master Plan that may include:

- Sharing the Master Plan and annual planting schedule on the City's website.
- Informing residents when boulevard trees are being planted and providing watering information.
- Encouraging residents to adopt a boulevard tree.
- Holding public engagement events and tree sales.
- Working together with the School District and students to engage them in urban forest data collection and tree planting.
- Working together with local First Nations and the urban aboriginal community to identify culturally appropriate ways to:
  - Use urban forestry to support reconciliation.
  - Enhance or restore cultural values connected to treed landscapes.
  - Adapt the urban forest to climate change .
- Working together with diverse community members to improve planting design and tree selection to reflect diverse values.



Planting site selection and preparation

All tree planting sites on public land should conform to the utility setbacks defined in the City of New Westminster Design Criteria (as amended) or as determined through a City design process. Refer to the **New Westminster Urban Forest Strategy - Technical Guidebook** (as amended) for specifications and details regarding soils and site preparation. On private land, owners can select their own planting locations; however, it is recommended that trees be setback from underground services and building foundations. The following guidance summarizes best practices for planting site preparation on public land:

- **Maximize soil volume:** While more soil is generally better, a minimum volume of 0.3 m^3 soil per unit area of projected crown area (m^2) is preferred. However, site specific exceptions may be made by the City. To increase root zone volume, suspended pavement, structural soils or soil cells may be required.
- **Maximize permeable surfaces:** Maximize the area of permeable surface surrounding trees with larger tree pits or permeable paving solutions.
- **Rehabilitate soils:** In compacted areas or locations where trees have repeatedly failed, rebuild soil profiles before planting as described in Layman et al.[1]. Minimize soil texture interfaces that disrupt water flow.
- **Reduce water loss and minimize competition:** Apply mulch to the root zone of trees to reduce water loss in the soil through evaporation.
- **Water efficiently:** Spring, summer and fall supplemental watering in dry periods will support a good annual growth increment. Water bags, water pods, water wells, or drip irrigation systems are efficient methods to ensure water is applied slowly and can infiltrate the soil.
- **Seek opportunities for passive water harvesting:** Plant trees in areas that naturally receive runoff but are not waterlogged. Integrate absorbent landscapes such as bioswales, berms, raingardens, French drains, bioretention tree pits, permeable hardscapes, and infiltration trenches in street designs to redirect stormwater runoff.

Species selection

As a general rule, select the largest tree suitable for the site to maximize the benefits produced.

- **Select for genus and genetic diversity:** Aim to have no more than 20 per cent of any single genus at the neighbourhood scale (excluding native trees). This objective may be adjusted within the limits of retaining existing healthy trees and planting a new urban forest with a high likelihood of success. Prefer trees grown from seed rather than clones or clonal root stock.
- **Select for age and size diversity over time:** In general, species should be long-lived. No more than 10 per cent of trees should be over-mature. Spread planting out over time to achieve a range of size and age classes.
- **Species selection context will vary between parks, streets and yards but should generally consider:**
  - The services the tree is being planted to provide (e.g., shade, aesthetics, habitat etc.).
  - The soil volume available.
  - Hardiness or tolerance of site microclimate conditions and future climate.
  - Potential to support biodiversity connectivity (avoid invasive species).
  - Proximity to utilities, lighting, structures or other infrastructure that could be in conflict.

1 Layman, R., Day, S., Mitchell, D., Chen, Y., Harris, J., & W.Daniels. (2016). Below ground matters: urban soil rehabilitation increases tree canopy and speeds establishment. Urban Forestry & Urban Greening, 16, 25-35. Retrieved from http://www.landrehab.org/UserFiles/DataItems/614F59537565 51764456673D/Layman_et per cent20al_2016.pdf

Planting stock, installation and young tree care

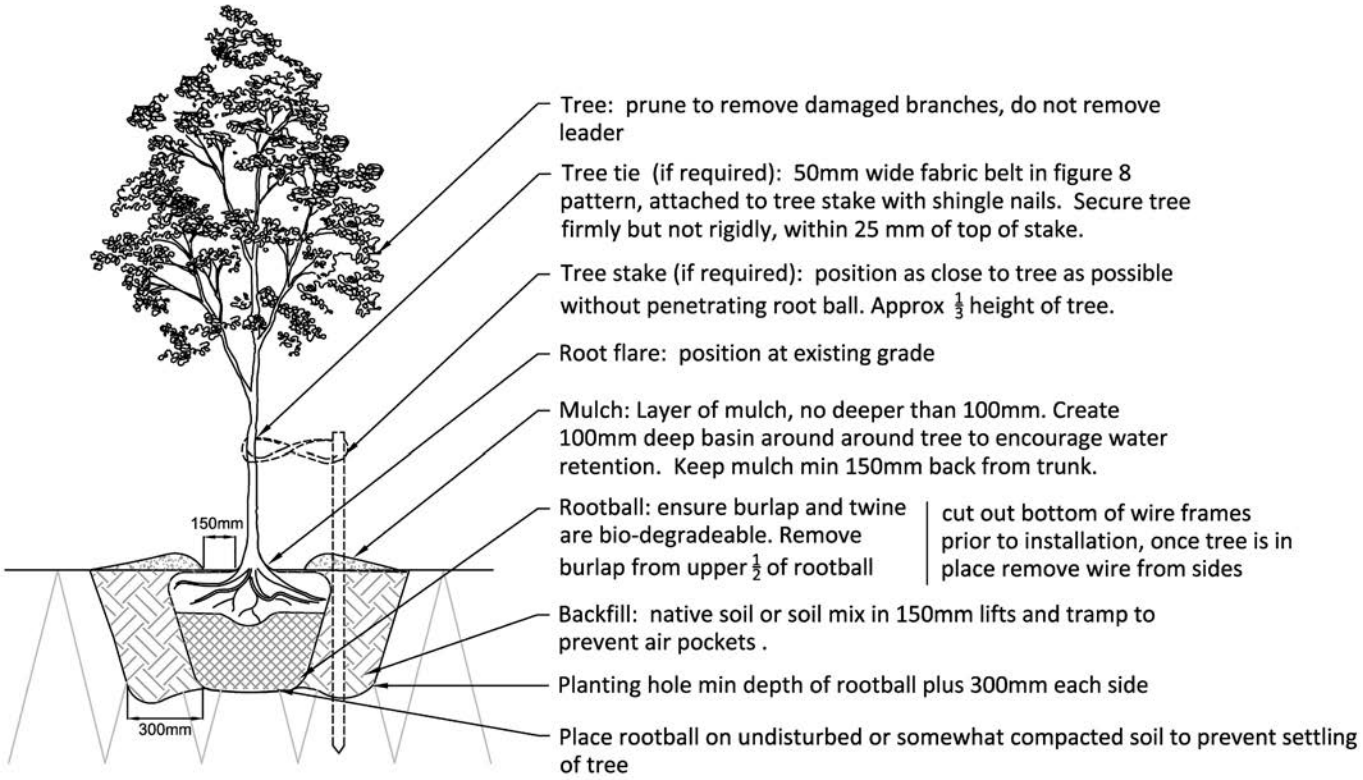
To ensure that trees planted into City or private landscape will be viable and long-lived in the landscape, it is critical that trees be of good quality and receive proper care to support their establishment. Refer to the **New Westminster Urban Forest Strategy - Technical Guidebook** (as amended) for specifications and details regarding stock selection and planting.

For trees planted on City property, all nursery-grown plants are to be specified according to the Canadian Nursery Landscape Association Canadian Standards for Nursery Stock current edition and Canadian Landscape Standard, current edition. In general, trees should be:

- On a single leader, with the lowest branch being at least 1 m high on the stem.
- Of 6 cm caliper or greater if deciduous.
- Of 2.5 metres height or greater if coniferous
- Free of pest and disease, invasive weeds, injury, or other defects and girdling roots.

Trees should be planted between October and April. A diagram illustrating proper tree planting practices is shown below.

Young trees require watering during the summer. In most cases, trees need to be watered approximately weekly for up to 6 months in the first 3 years after planting. The frequency and duration of watering varies with drought conditions. Some trees may need supplemental watering beyond the first 3 years. A tree in need of watering will generally show signs of wilting leaves, a sparse canopy or early leaf drop. The soil around a tree should be moist but not wet.

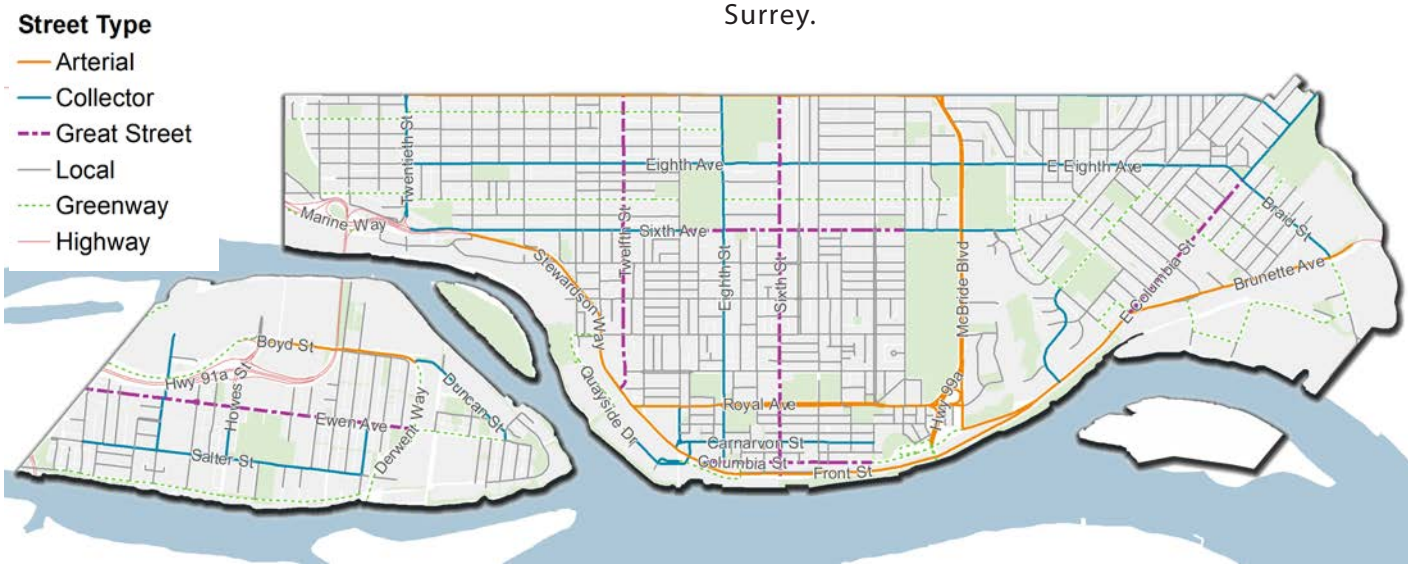


Notes:
1. Protect tree from damage during transportation.
2. Tree staking may be required in windy locations

4.2 Planting design guidance for street tree planting

Four key street types have been identified for tree planting purposes. These are Arterial, Collector, Local and Greenway streets. Highways are shown but are not managed by the City and therefore, no guidance is provided for them.

The most common type of streets are Local, providing access to residents' homes. Collector streets contain mixtures of residential and commercial land uses and provide access between neighbourhoods and to Arterial streets. Arterial streets provide access through New Westminster and to bordering cities of Burnaby, Coquitlam and Surrey.



Arterial Street - McBride Boulevard



Collector Street - Sixth Street



Local Street - Star Crescent



Greenway - Ewen Avenue



General guidance for species selection and planting locations in streets

- Use species selection to:
  - Maximize benefits for climate adaptation and biodiversity and minimize risks of wind breakage, pests and disease and infrastructure conflict.
  - Provide year round interest and visual cues for moving between different land uses (i.e., between residential, commercial, Great Street, park or school).
  - Strengthen the character of different locations by creating features of seasonal interest, visual diversity or uniformity as appropriate.
  - Vary species by block or, where planting character is already mixed, continue to mix species.
  - Favour deciduous species except when boulevards are as wide as mature canopy width and avoid planting conifers where they will shade buildings or streets in winter.
  - When winter shading and planting space is not limiting, plant evergreens for habitat, stormwater interception, screens and on the northern and eastern streets bordering parks as wind breaks.
  - Provide occasional fruiting trees where the community is requesting them provided that the boulevard width is adequate to prevent fruit fall on sidewalks or parking.
  - Maintain significant views by planting trees between properties and selecting sparser canopy trees on east-west streets.
- Select and place trees according to setbacks and clearance needed for underground and overhead utilities, lighting and constraints, and the soil volume available.
- Where overhead powerlines limit space, prioritize planting: 1) large canopy trees on 1 side of the street then, 2) medium canopy trees on 1 side of the street then 3) small canopy trees on the powerline side.
- Where sidewalks are adjacent to parks, plant a double row of tall, spreading canopy trees when space allows.
- Planting style should be linear and uniform where there are opportunities to create a tree avenue. Elsewhere, planting style should echo the character of the adjacent landscaping.
- Where building setbacks are close to the property line or boulevards are narrow, move tree planting into the parking lane bumpouts if feasible or select small or upright trees.
- Where planting strips are absent, plant trees on the public boulevard adjacent to private land if present.
- Where there are no public boulevard planting areas, encourage landowners to contribute to the urban forest by planting trees on private property that will contribute to the streetscape.
- Where there are unique planting locations, plant single or small groups of interesting trees as landmarks.
- Where there are views or heritage values, ensure tree placement is sensitive to maintaining view corridors and sight lines to heritage features.
- As redevelopment occurs, create boulevard or median planting sites for medium and large trees whenever possible.

Arterial

Arterial streets in New Westminster accommodate large volumes of trucks, vehicles and buses and predominantly serve vehicular, cyclist and pedestrian transportation. Arterials typically have long block lengths, limited access points and few residential driveways. All arterials are truck routes, 40% are bike routes and 30% are bus routes.

Arterial guidance:

- Target canopy cover of 20-40% subject to other site constraints and create canopy gaps to allow wind to disperse pollution out and up.

Arterial Street - McBride Boulevard



Collector

Description: Collector streets are generally 2 to 4 lane with sidewalks on both sides. Boulevards may not be present and most collectors have overhead powerlines on 1 side and street lighting on both sides. Pedestrian and cyclist volumes can be high, and parallel parking is often provided beside the curb. Collectors travel through both low density residential areas and dense, highly urbanized areas including downtown. Some collectors are designated Great Streets, which are destination streets that provide an enhanced pedestrian experience and typically have a clutter of signs, awnings and street furniture requiring detailed design for planting these areas. In New Westminster, 70% of collector streets are bus routes, 30% are bike routes and 15% are truck routes.

Collector guidance:

- Target canopy cover of 40-80% except on Great Streets target 20-40%, subject to other site constraints.

Collector Street - Sixth Street



Local

Description: Local streets are generally 1 or 2 travel lanes with parking on both sides and sidewalks on 1 or 2 sides. Boulevard planting strips or a private-side boulevards are often present. Most local roads have overhead powerlines on 1 side except in new neighbourhoods where they have been undergrounded. Private yards sometimes provide canopy over the sidewalks precluding street tree planting. In New Westminster, 25% of local roads are bike routes and 7% are bus routes.

Local guidance:

- Target canopy cover of 40-80% subject to other site constraints.

Local Street - Star Crescent



Greenways

Description: Greenways are streets that provide cycling and pedestrian routes across the City connecting neighbourhoods and major parks. They are mostly local streets (56%), although they include some collector (27%) and arterial streets (14%). Many greenways have overhead powerlines on 1 side or power underground.

Greenway guidance:

- Target canopy cover of 40-80% except on arterials 20-40%, subject to other site constraints.
- Use species selection to create planting character that is mixed in terms of species and structure (understory to overstory) to support pollinator and bird habitat.

Greenway - Ewen Avenue



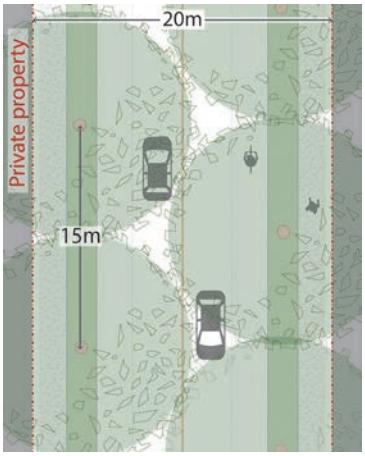
Maximizing tree canopy cover in streets efficiently

Maximizing canopy cover in streets on public and private properties to help meet New Westminster's 27% canopy cover target is a key driver for this Master Plan.

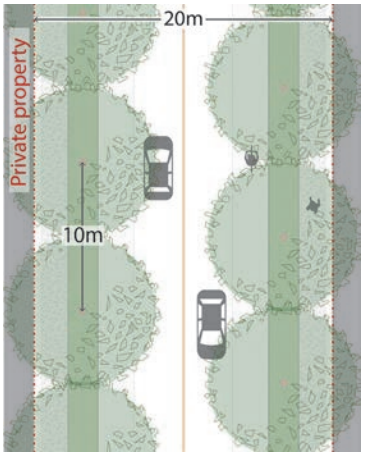
Where space permits it is more efficient to plant fewer, large tree species than many small tree species. One large tree that reaches maturity provides significantly more canopy cover and ecosystem services than a small tree. The illustrations below show how a street planted with large, medium and small trees compares in terms of the number of trees that can potentially fit and the canopy cover outcome. In reality, it is rarely possible to achieve continuous street tree planting due to other critical infrastructure, making it more of an imperative to plant fewer trees but larger tree species.

In this streetscape example...

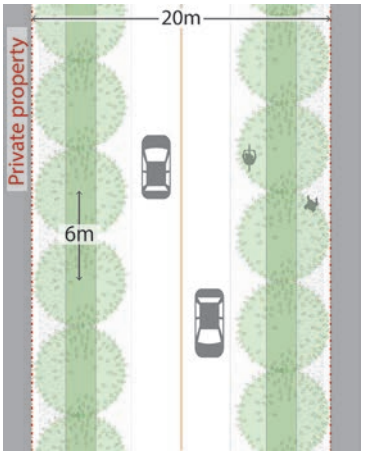
...5 large trees provide more than 80% canopy cover



...7 medium trees provide ~40% canopy cover



...11 small trees provide ~20% canopy cover



It is more efficient to meet canopy cover targets with fewer large trees than many small trees.

Large and medium trees allow for vehicle clearance and create more room-like streetscapes with attractive, overarching canopies that enhance pedestrian comfort. However, for a medium or large tree to be the right tree, it must have the above and below ground space to grow.













These Google Streetview Images show what different canopy cover percentages look like at street level

5 Street Tree Planting Area Plans

Plans showing what, when and where street trees will be planted across the city

For tree planning purposes, the City is divided into four Planting Areas that are roughly equal in size and include coherent neighbourhoods with similar character. For each Planting Area, context is provided in terms of its physical setting, existing street tree character and species palette, and typical constraints. Each street that contains planting opportunities is either scheduled for planting over the next 10 years or noted as being slated for future development. Future development areas will be subject to a separate tree planning process but planting design and species selection should be informed by the guidance in this Street Tree Master Plan.

For streets scheduled to be planted in the next 10 years, planting design should be informed by guidance provided in Section 4. This Master Plan provides a species recommendation for streets to be planted in the next 3 years but does not specify species beyond that time-frame to enable flexibility to respond to new information such as emerging pest and disease threats, species performance, new City strategic objectives, new development plans and so on.

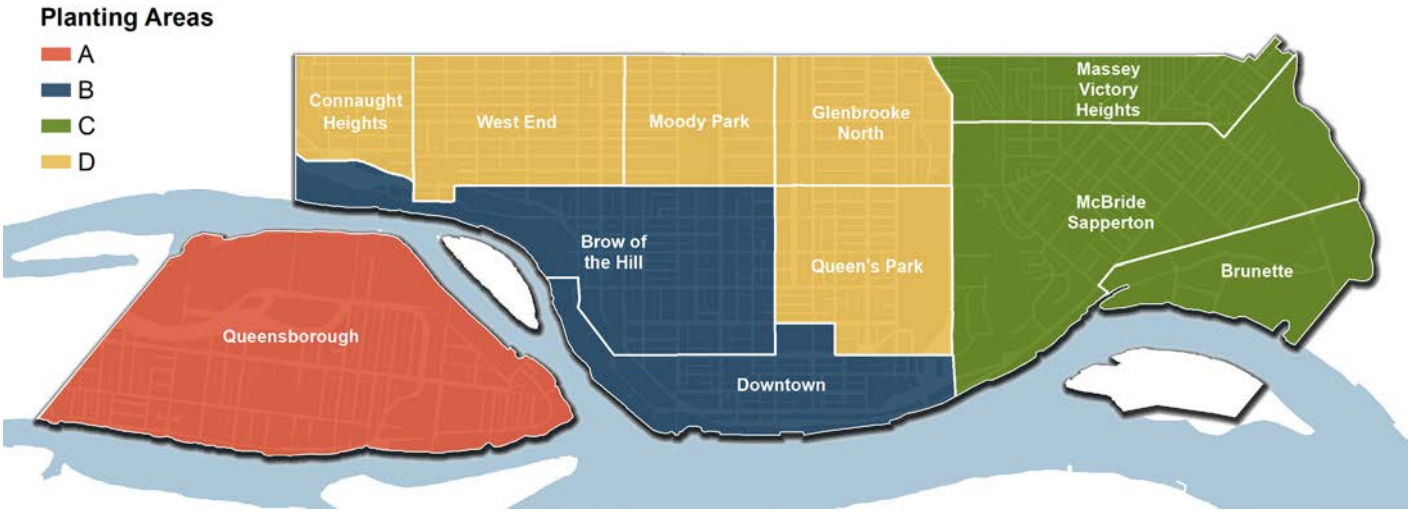
The Planting Areas are:

Planting Area A - Queensborough

Planting Area B - Brow of the Hill, Downtown

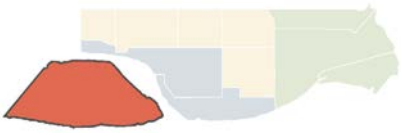
Planting Area C - Massey Victory Heights, McBride Sapperton, Brunette

Planting Area D - Connaught heights, West End, Moody Park, Glenbrooke North, Queens Park



5.1 Planting Area A - Queensborough

2016 Canopy Cover ~6%



Physical Context: Queensborough's flat, floodplain topography and its geographical separation from the rest of the city create a unique planting context. The water table is high and many older streets still have open ditch drainages. Roughly 50% of Queensborough's land use is single-family homes but newer homes have high building lot coverage. Multi-family development is also increasing. The remaining land uses are predominantly industrial and commercial. The density of residential development, commercial and industrial land uses mean that Queensborough's urban forest canopy will be largely confined to public streets and parks.

Street Tree Character: Despite housing development beginning in the 1930s, street tree planting was not typical and few trees appear to have been planted on private land. Queensborough's planting character in streets is more a function of trees planted with development in the last 10 to 20 years as roadside ditches have been enclosed and boulevards have been constructed.

While mature street trees are rare, mature cottonwood trees line the roadways adjacent to the Fraser River and some of the larger land parcels.

Typical Constraints:

Constraints typical of Planting Area A include:

- Open ditches.
- Overhead powerlines.
- Sight lines for arterial roads, highways and commercial areas.
- Narrow, poorly defined or absent boulevards.
- High impermeability and poor soil quality.

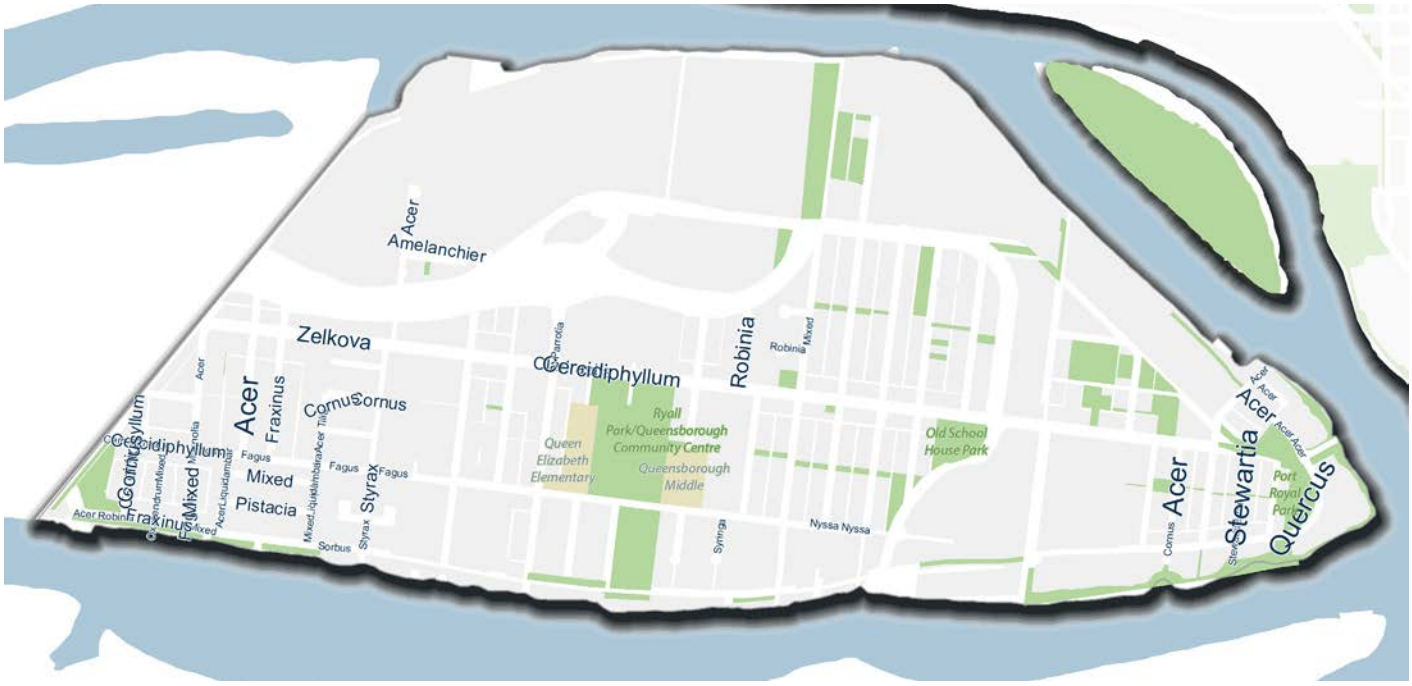


Queensborough includes newer streets such as the Ewen Avenue greenway (top) or Brooke Street (centre left) with regular street tree planting as well as streets such as Boyd Avenue (centre right) which still have ditches and often few street trees. Star Crescent (bottom) is an example of a more established streetscape planted with a high diversity of species and structure.

Parks & Recreation will need to work closely with other City departments to coordinate both the timing and placement of tree planting to minimize the likelihood that new trees will conflict with development plans or streetscape upgrades.

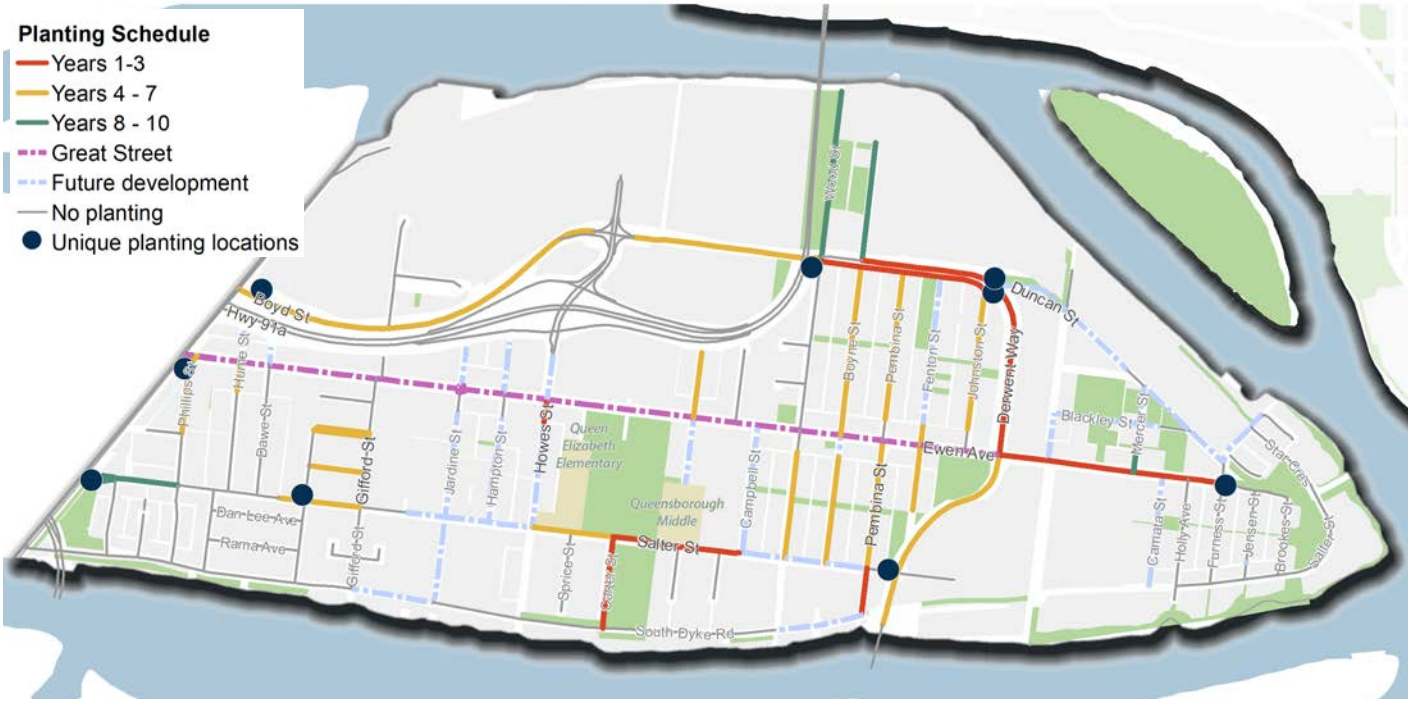
Existing species character

The street trees planted in Planting Area A are quite diverse. Plantings include species of Acer (maple), Robinia, Quercus (oak), Zelkova, Fraxinus (ash) and many others. However, Acer comprises 17% of the poulation (3 times more than any other tree). Numerous streets have few or no street trees.



Planting scheduled in the next 10 years

A total of 17 streets and 9 unique planting locations are scheduled for planting in the next 10 years. The length of these streets totals almost 9 km. See the table on the following page for proposed species selections in streets to be planted in years 1 to 3.



Locations to be planted in years 1 to 3

Approximately 2 km of road have been identified for planting in the first 3 years and species recommendations are included for each street in the table below. Howes Street is partly under development and therefore the selected species should align with what is already proposed for the development adjacent. Nine unique planting locations have been identified. These spaces present opportunities to create surprising plantings that could become local landmarks, such as species with unusual form, cultural significance, seasonal changes or fruiting trees.

Street	Type - Key Benefits	Priority	Length	Species proposed
Boyd Street (north side only)	Arterial - biodiversity, carbon, stormwater	High	350 m	Pseudotsuga menziesii Quercus garryana
Boyd Street (same named street adjacent to arterial)	Local - screen, pollinators	High	430 m	Eriobotrya japonica Pinus mugo Arbutus unedo
Carter Street (park side only)	Local - shade, biodiversity, carbon	High	230 m	Metasequoia glyptostroboides Quercus bicolor
Ewen Avenue (south side only)	Greenway/ Great Street - shade, pollinators	High	560 m	Gymnocaldus dioicus Quercus frainetto Eucommia ulmoides
Derwent Way	Greenway - biodiversity, stormwater	High	420 m	Pseudotsuga menziesii Quercus garryana
Salter Street (south side only)	Collector - shade, carbon	High	325 m	Quercus coccinea Zelkova serrata
Howes Street	Collector	High	55 m	Consistent with developer planting
Pembina Street (west side only)	Local - shade, carbon	High	120 m	Corylus colurna
Unique planting locations	Bump outs or small public land areas - surprise and delight	High	9 locations	Various

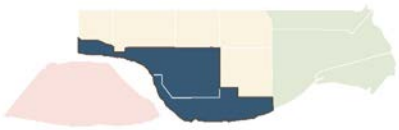
The planting locations identified above may be subject to change during the detailed interdepartmental site review and ground truthing process.

Locations to be planted in years 4 to 10

Of the remaining streets, 5.5 km are in moderate priority and 1 km are in low priority. These locations are either in areas where front yards extend into public land and consultation is required, or are in industrial areas where few people walk or reside. Species for these locations will be selected closer to the scheduled time to accommodate consultation outcomes and unanticipated changes. Acer should be avoided given its high representation.

5.2 Planting Area B - Downtown and Brow of the Hill

2016 Canopy Cover ~ 10%



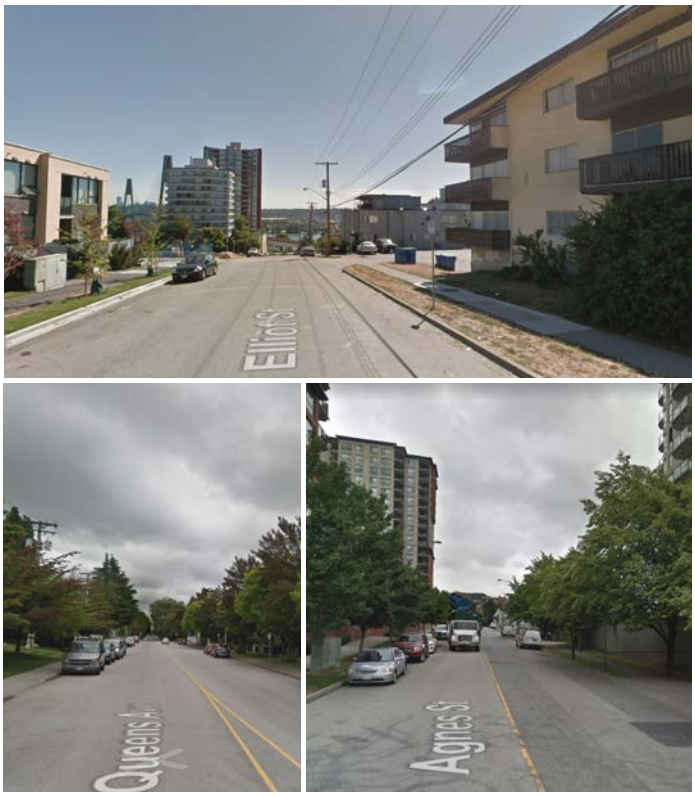
Physical Context: Downtown and Brow of the Hill stretch upwards from the Fraser River to the "brow", the highest part of a hill where the ground begins to flatten out. The upward slope is relatively steep and south-facing. There are river views along certain streets. These are some of the oldest neighbourhoods in the city and contain numerous heritage buildings. This area is also the highest density and least permeable in the city. A large proportion of land use is multi-family or commercial and there is the potential for infill development in much of the area that is single family. The current and future density of these land uses mean that Downtown's urban forest canopy will be largely confined to public streets and parks when the area is fully developed. Planting conditions and soil moisture will be challenging due to high impermeability and warm, south-facing slopes. However, intact old soils are likely to exist in streets developed pre-1960s (pre-grading and soil removal) and planting into these soils is likely to support good tree growth.

Street Tree Character: Street tree density is fairly low in most of the planting area. Ninth Street is one of the few streets that has continuous street tree planting. Early tree planting appears to have been concentrated in parks and gardens despite the presence of boulevards in numerous streets. Large, mature trees are present in Victorian style parks including Tipperary Park (est. 1908) and Albert Crescent Park (est. 1876).

Typical Constraints:

Constraints typical of Planting Area B include:

- Driveways.
- Overhead powerlines.



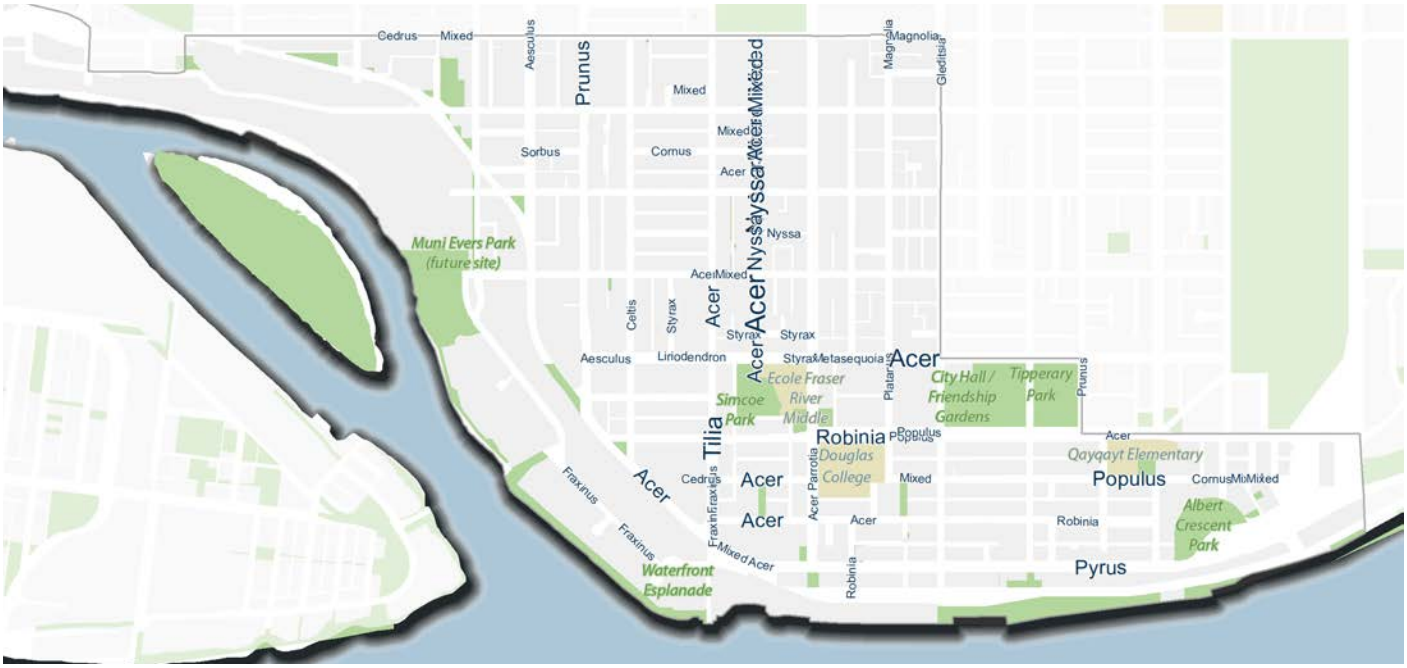
Planting Area B includes streets such as Elliot Street (top) downtown that have a mixed of recently planted boulevards and boulevards with above and underground utilities and no tree planting. The Planting Area also has treed streets such as Queens Avenue (bottom left) in Brow of the Hill with diverse planting or on Agnes Street (bottom right) downtown with regular plantings.

- Sight lines for arterial roads, highways and commercial areas.
- Views.
- Building awnings, street furniture, transit stops.
- Zero building set-backs and underground parkades.
- Narrow, poorly defined or absent boulevards.
- High impermeability and low soil quality, particularly in Downtown.

Parks & Recreation will need to work closely with other City departments to coordinate both the timing and placement of tree planting to minimize the likelihood that new trees will conflict with development plans or streetscape upgrades.

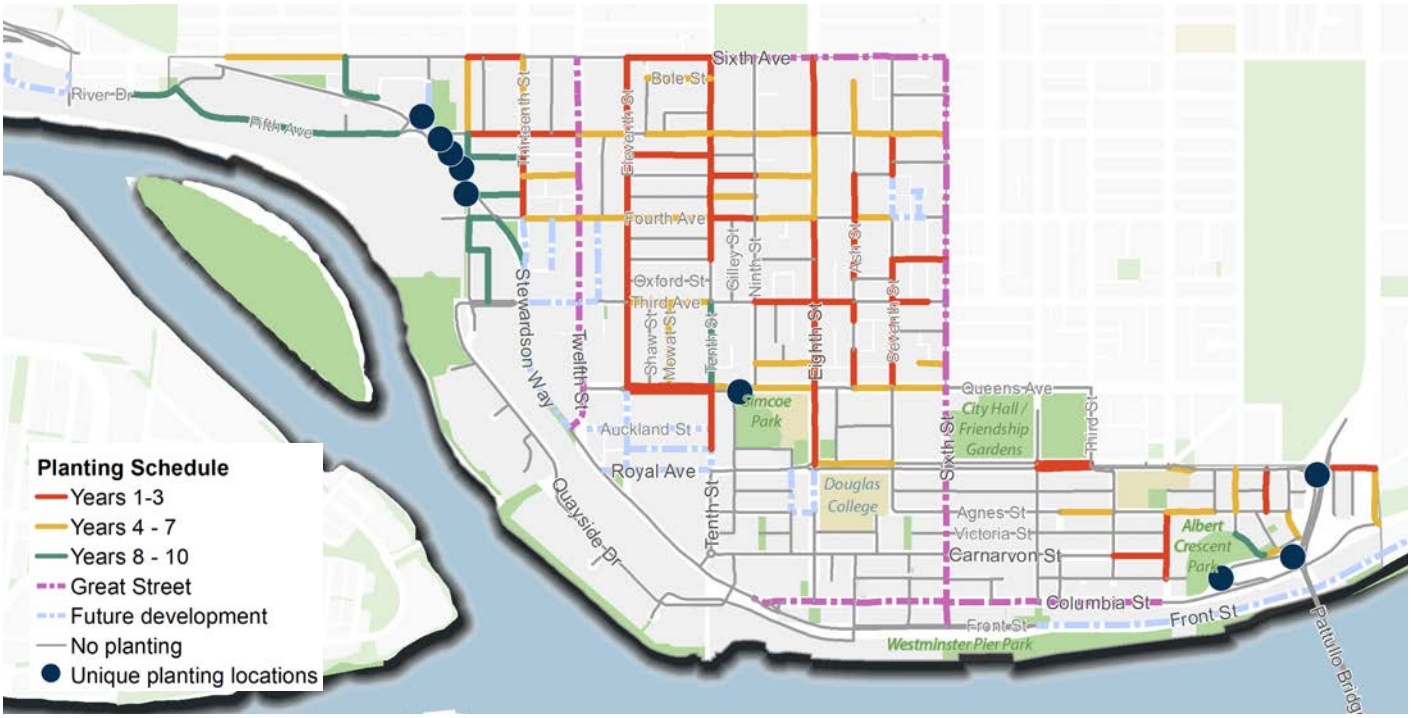
Existing species character

The street trees planted in Planting Area B are diverse other than Acer (maple), which makes up 24% of the population, followed by Cornus (dogwood) at 9%. Other species planted in the area include Fraxinus (ash), Magnolia, Syrax, Robinia, Aesculus (horsechestnut) and Quercus (oak) among others.



Planting scheduled in the next 10 years

A total of 38 streets and 9 unique planting locations are scheduled for planting in the next 10 years. The length of these streets totals almost 14 km. See the table on the following page for proposed species selections in streets to be planted in years 1 to 3.



Locations to be planted in years 1 to 3

Approximately 6 km of streets have been identified for planting in the first 3 years and species recommendations are included for each street in the table below. Nine unique planting locations have been identified. These spaces present opportunities to create surprising plantings that could become local landmarks, such as species with unusual form, cultural significance, seasonal changes or fruiting trees.

Street	Type - Key Benefits	Priority	Length	Species Proposed
Sixth Avenue (north side only)	Collector - pollinators	High	220 m	Gleditsia triacanthos
Fifth Avenue (north side only)	Local- pollinators	High	290 m	xChitalpa tashkentensis Cercis siliquastrum
Thirteenth Street (powerlines north side)	Local - shade, pollinators	High	210 m	Cercidiphyllum japonicum (S) Pistacia chinensis (N)
Fourth Avenue	Local - pollinators	High	115 m	Acer tataricum
Eleventh Street (powerlines north side)	Local - shade, carbon, pollinators	High	875 m	Nothofagus antarctica (S) Quercus frainetto (S) Zelkova serrata (S) xChitalpa tashkentensis (N) Cercis siliquastrum (N) Koelreuteria paniculata (N)
Tenth Street	Local - shade, pollinators	High	850 m	Cladrastris kentukea Acer tataricum Koelreuteria paniculata Malus x zumi Cornus florida
Napanee Street (south side only)	Local - pollinators and stormwater	High	90 m	Magnolia grandiflora
St. Andrews Street	Local - shade, carbon	High	115 m	Parottia persica
Third Avenue (powerlines south side)	Local - pollinators	High	260 m	Lagerstroemia indica (trial S) Albizia julibrissin (N/S)
Queens Avenue (median only)	Local - shade, carbon	High	220 m	Ostrya virginiana
Eighth Street (powerlines east side)	Collector - shade, carbon, pollinators	High	850 m	Cercis chinensis (E) Cercis siliiquastrum (E) Davidia involucrata (E) Parottia persica (W) Zelkova serrata (W) Quercus macrocarpa (W)
Ash Street (powerlines east side)	Local - shade, carbon, pollinators	High	420 m	Pistacia chinensis (E) Quercus coccinea (W)
Seventh Street (powerlines west side)	Local - shade, carbon, pollinators	High	445 m	xChitalpa tashkentensis (W) Oxydendron arboreum (E) Tilia tomentosa (E)

Street	Type - Key Benefits	Priority	Length	Species Proposed
Blackford Street	Local - shade, carbon	High	40 m	Fraxinus ornus
Royal Avenue (south side only)	Arterial - shade, carbon	High	100 m	Parrotia persica
Carnarvon Street	Collector - pollinators	High	135 m	Gleditsia triacanthos
Elliot Street (west side only)	Local - pollinators	High	175 m	Cercis siliquastrum
Coburg Street (powerlines east side)	Local - shade, carbon, pollinators	High	110 m	Pistacia chinensis (E) Fraxinus ornus (W)
Unique planting locations	Bump outs or small public land areas - surprise and delight	High	9 locations	Various

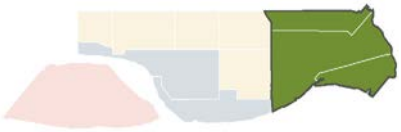
The planting locations identified above may be subject to change during the detailed interdepartmental site review and ground truthing process.

Locations to be planted in years 4 to 10

Of the remaining streets, 5 km are in moderate priority and 2 km are in low priority. These locations are either in areas where front yards extend into public land and consultation is required, or are in industrial areas where few people walk or reside. Species for these locations will be selected closer to the scheduled time to accommodate consultation outcomes and unanticipated changes. Acer should generally be avoided given its high representation.

5.3 Planting Area C - Massey Victory Heights, McBride Sapperton, Brunette

2016 canopy cover ~ 19%



Physical Context: This planting area encompasses three neighbourhoods comprising the eastern third of the City. McBride Sapperton and Brunette extend from the Fraser River upslope to the height of land. Massey Victory Heights sits on the height of land. There are river and mountain views along certain streets. The McBride Sapperton neighbourhood established shortly after settlement and was initially used for industry and military purposes. The Fraser and Brunette Rivers were important to industry for transportation and water sources.

The Massey Victory Heights subdivision mostly developed after the 1940s. Today, predominant land uses in this area are single-family except east of McBride Blvd, which is largely multi-family and Brunette, which is predominantly industrial. Some commercial and multifamily development is concentrated along East Columbia Street. Many residential streets, particularly in Massey Victory Heights, have rear laneway access resulting in unbroken frontages with continuous sidewalks. Boulevards are sometimes present but more often the public boulevard is attached to front yards. The high permeability, low density and limited planned land use changes in Sapperton and Massey-Victory Heights should support growth in tree canopy on both private and public land. Brunette will not provide significant street tree planting opportunities due to its industrial uses.

Street Tree Character: Despite the area's high canopy cover relative to Areas A and B, street tree density is low in Massey Victory Heights and nul in Brunette. Parks and private land contribute significantly to the urban forest, particularly Hume Park (1912) and Glenbrook Ravine (1980). Most street trees in this area are located in Sapperton



Planting Area C has a number of street trees planted on the right-of-way along the private property such as on Richmond Street (top) in McBride Sapperton. On other streets such as Eighth Avenue (bottom left), tree canopy is mostly contributed by private trees. Capilano Drive (bottom right) in Brunette shows an example of diverse planting along a greenway street.

and are fairly mixed in both age and species due to the contribution of front yard plantings. Fader Street has a continuous planting of cherry trees that was highlighted in the neighbourhood's historical context. Numerous large, mature trees are scattered through the McBride-Sapperton and Massey Victory Heights neighbourhoods.

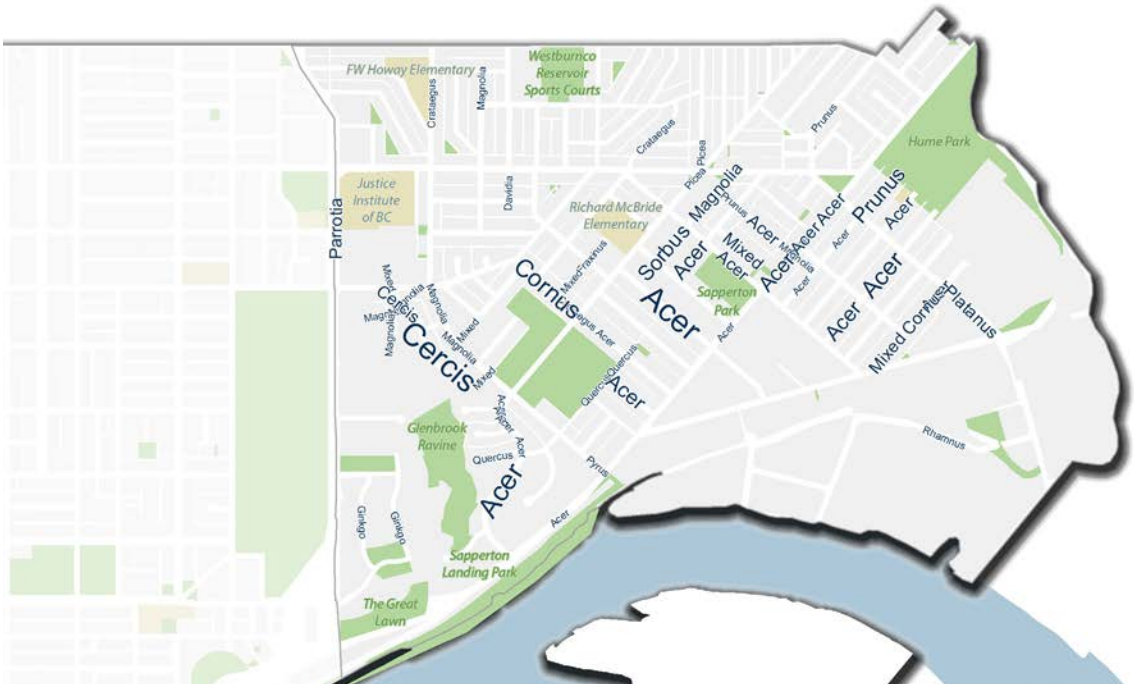
Typical Constraints:

Constraints typical of Planting Area C include:

- Overhead powerlines.
- Sight lines for arterial roads and commercial areas.
- Views.
- Public boulevard encroachment.

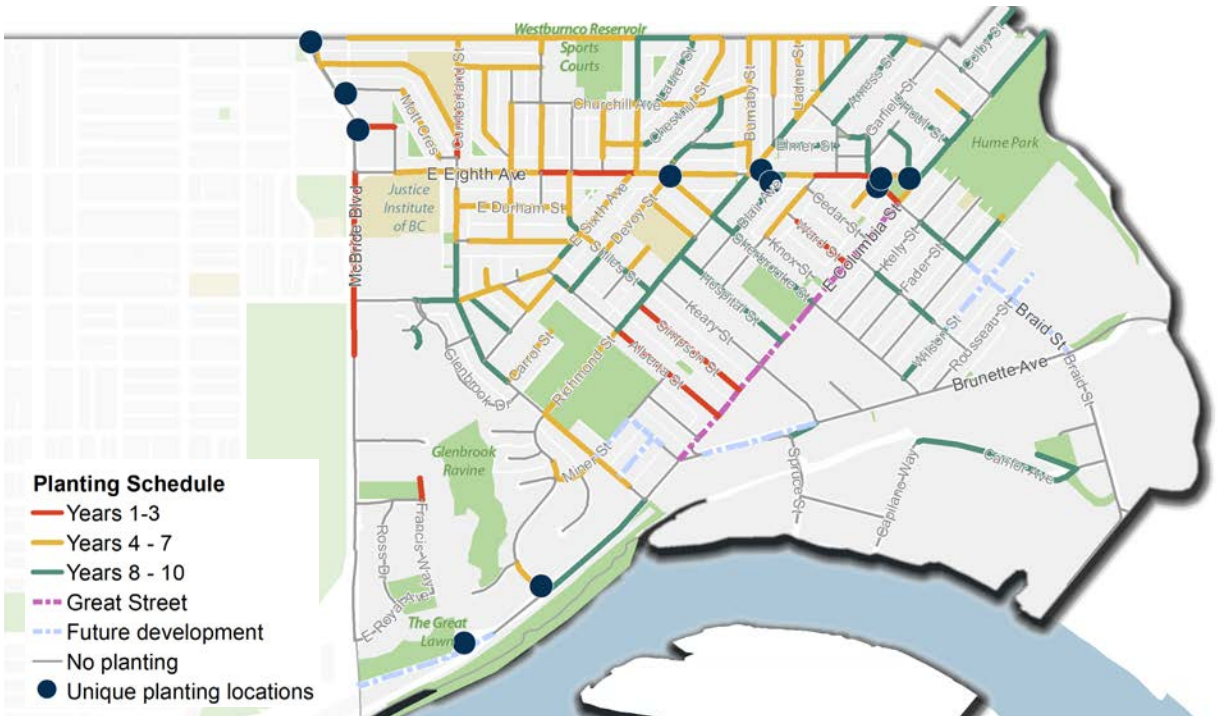
Existing species character

The street trees planted in Planting Area C are diverse other than Acer (maple), which makes up 32% of the population, followed by Magnolia at 9%. Other species planted in the area include Prunus (cherry), Cornus (dogwood), Ginkgo, Cercis (hackberry), Quercus (oak) and Sorbus (ash) among others.



Planting scheduled in the next 10 years

A total of 63 streets and 11 unique planting locations are scheduled for planting in the next 10 years. The length of these streets totals about 23 km. See the table on the following page for proposed species selections in streets to be planted in years 1 to 3.



Locations to be planted in years 1 to 3

Approximately 3 km of street have been identified for planting in the first 3 years and species recommendations are included for each street in the table below. Eleven unique planting locations have been identified. These spaces present opportunities to create surprising plantings that could become local landmarks, such as species with unusual form, cultural significance, seasonal changes or fruiting trees.

Street	Type - Key Benefits	Priority	Length	Species Proposed
Sangster Place (south side only)	Local - stormwater, carbon, pollinators	High	130 m	Abies concolor Prunus x yedoensis
McBride Boulevard (east side infill plant)	Arterial - pollinators	High	850 m	Prunus x yedoensis
Francis Way	Local - shade, carbon	High	70 m	Platanus x hispanica
Cumberland Street	Local - pollinators	High	290 m	Gleditsia triacanthos (W) Cercis canadensis (E)
East Eighth Avenue (south side only)	Collector - pollinators	High	465 m	Syringa pekinensis Chionanthus retusus
Alberta Street (powerlines north side)	Local - shade, carbon, pollinators	High	420 m	Nyssa sylvatica (S) Stewartia monodelpha (N)
Simpson Street (powerlines north side)	Local - shade, carbon, pollinators	High	415 m	Ostrya carpinifolia (S) xChitalpa tashkentensis (N)
Ward Street (north side only)	Local - pollinators	High	60 m	Prunus x yedoensis
Braid Street (park side only)	Collector - pollinators	High	130 m	Lagerstroemia indica (trial)
Unique planting locations	Bump outs or small public land areas	High	11 locations	Various

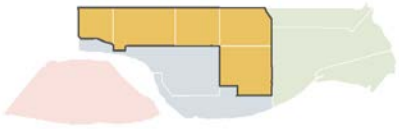
The planting locations identified above may be subject to change during the detailed interdepartmental site review and ground truthing process.

Locations to be planted in years 4 to 10

Of the remaining streets, 12 km are in moderate priority and 8 km are in low priority. These locations are either in areas where front yards extend into public land and consultation is required, or are in industrial areas where few people walk or reside. Species for these locations will be selected closer to the scheduled time to accommodate consultation outcomes and unanticipated changes. Acer should generally be avoided given its high representation.

5.4 Planting Area D - Connaught Heights, West End, Moody Park, Glenbrooke North & Queens Park

2016 Canopy Cover ~ 21%



Physical Context: This planting area encompasses five neighbourhoods comprising the central and north-western edge of the City. All neighbourhoods share a predominantly single family character except for sections of Twelfth Street, Sixth Street and Eighth Street, which have commercial and multi-family land uses. Queens Park contains significant heritage values with homes built in the 1860s onwards. Glenbrooke, Moody Park and the West End developed in the late 1800s and early 1900s. Connaught Heights predominantly developed in the 1930s. Connaught Heights and the West End value views sloping down south and west to the Fraser River.

Many residential streets have rear laneway access, which typically results in continuous boulevard frontages. In some locations planting strips are well defined by sidewalks, and in other areas the public boulevard is attached to front yards. The continuous nature of the frontages and the low density of these neighbourhoods provides large soil volumes for tree planting. These neighbourhoods also tend to have high permeability and likely contain some intact native soils given the age of development. Despite this area already high canopy cover relative to other parts of the city, it also has the capacity to support more given its low density and the quality of planting sites.

Street Tree Character: This area has the highest density of street trees relative to other neighourhoods. Most streets, or segments of them contain continuous street tree planting. Numerous large, mature trees are scattered through the neighbourhoods but particularly in Queens Park (both in the neighourhood and in the park itself).



Planting Area D generally has a higher tree canopy cover both from public and private trees. Streets such as Eight Avenue (top) in the West End have a diversity of planting of the boulevard. London Street (middle left) and Hamilton Street (bottom) show typical local streets with a diverse planted boulevard, while Osborne Avenue (middle right) shows a street dominated with plum trees.

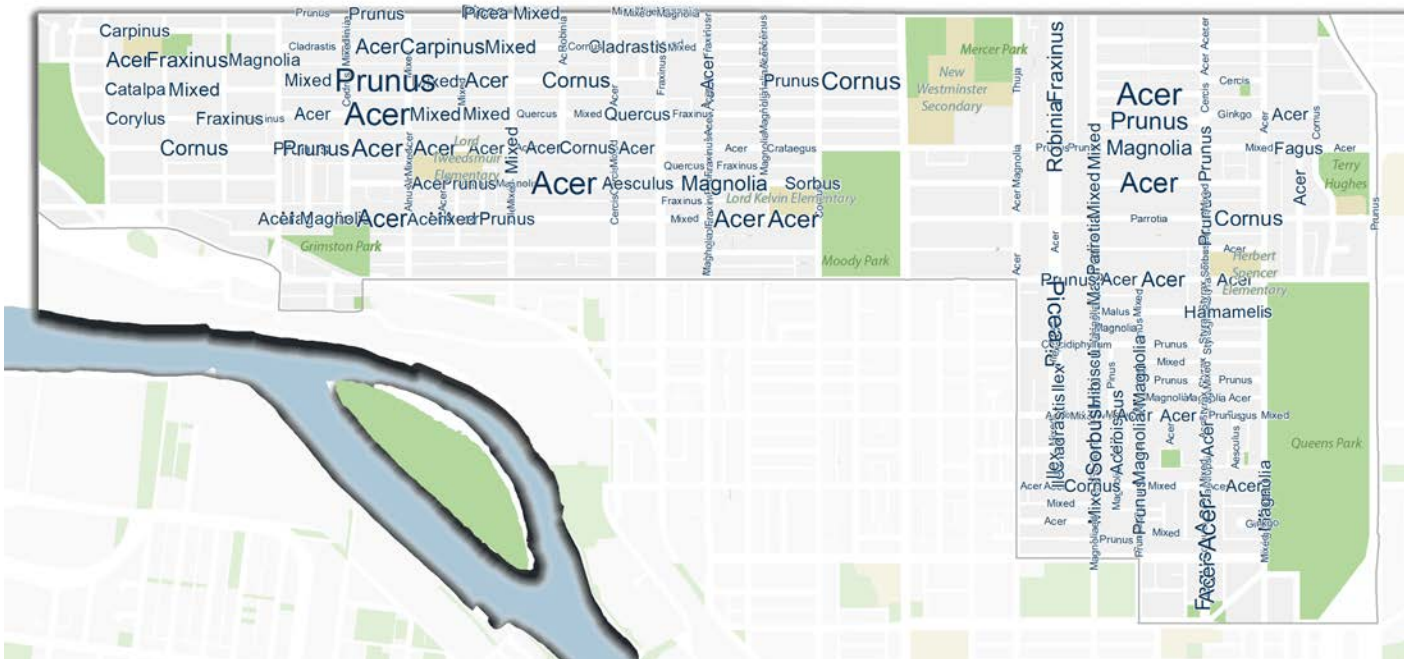
Typical Constraints:

Constraints typical of Planting Area D include:

- Overhead powerlines.
- Sight lines for arterial roads and commercial areas.
- Views.

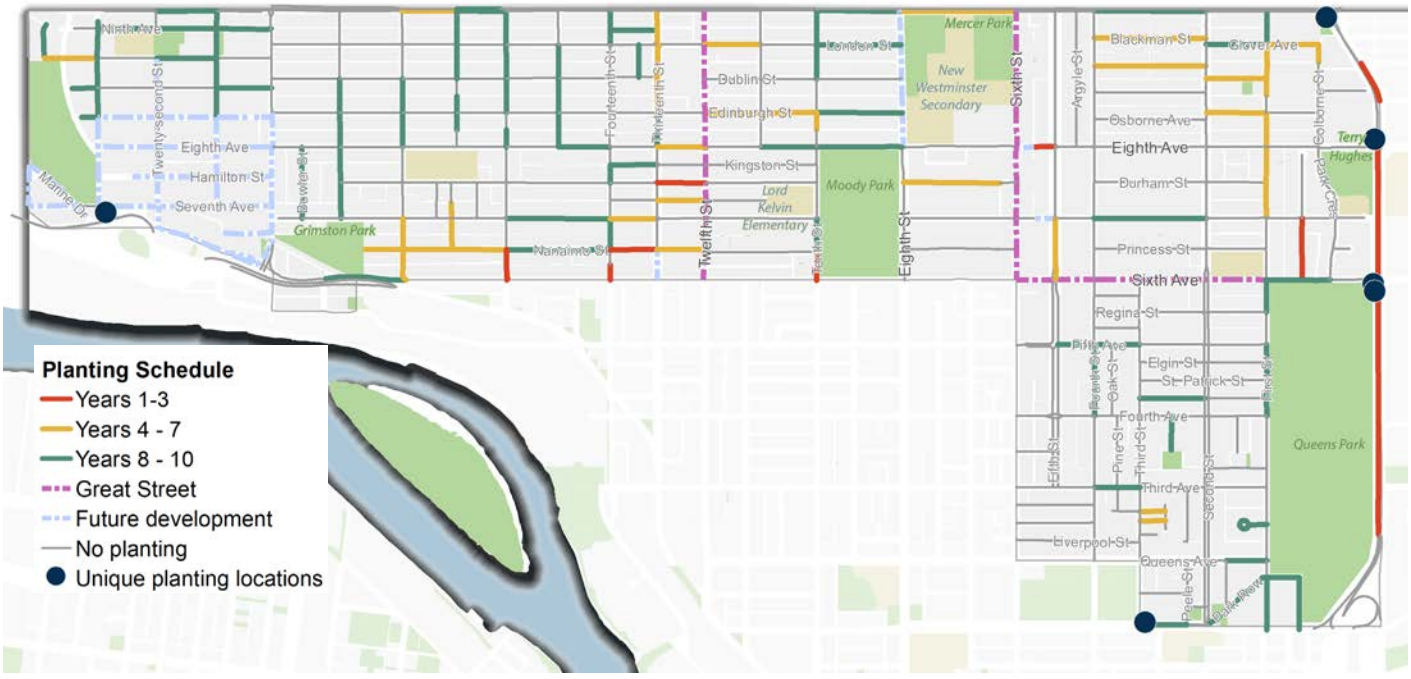
Existing species character

The street trees planted in Planting Area D are diverse other than Acer (maple), which makes up 23% of the population, followed by Magnolia and Prunus (cherry/plum) each at 10%. Other species planted in the area include Cornus (dogwood), Fraxinus (ash), Quercus (oak), Carpinus (hornbeam) and Sorbus (ash) among others.



Planting scheduled in the next 10 years

A total of 47 streets and 6 unique planting locations are scheduled for planting in the next 10 years. The length of these streets totals about 18 km. See the table on the following page for proposed species selections in streets to be planted in years 1 to 3.



Locations to be planted in years 1 to 3

Approximately 2 km of road have been identified for planting in the first 3 years and species recommendations are included for each street in the table below. Six unique planting locations have been identified. These spaces present opportunities to create surprising plantings that could become local landmarks, such as species with unusual form, cultural significance, seasonal changes or fruiting trees.

Street	Type - key benefits	Priority	Length	Species Proposed
Sixteenth Street	Local - shade, pollinators, carbon	High	95 m	Aesculus x carnea
Fourteenth Street (powerlines west side)	Local - shade, pollinators, carbon	High	45 m	Acer griseum (W) Parottia persica (E)
Nanaimo Street (north side only)	Local - pollinators	High	145 m	Styrax japonicus Malus x zumi
Hamilton Street (north side only)	Local - pollinators	High	150 m	Styrax japonicus Stewartia monodelpha
Tenth Street (east side only)	Local - shade, pollinators	High	85 m	Pistacia chinensis
Eighth Avenue (south side only)	Collector - pollinators	High	65 m	Prunus serrulata
Colborne Street	Local - shade, carbon	High	190 m	Parrotia persica
Sixth Avenue (north side only)	Collector - pollinators	High	365 m	Malus tschonoskii (trial) Syringa pekinensis
McBride Boulevard (west side only)	Arterial - shade, carbon, biodiversity	High	1,330 m	Ulmus americana Tilia tomentosa Quercus coccinea Sequoiadendron giganteum Pseudotsuga menziesii Pinus ponderosa
Unique planting locations	Bump outs or small public land areas	High	6 locations	Various

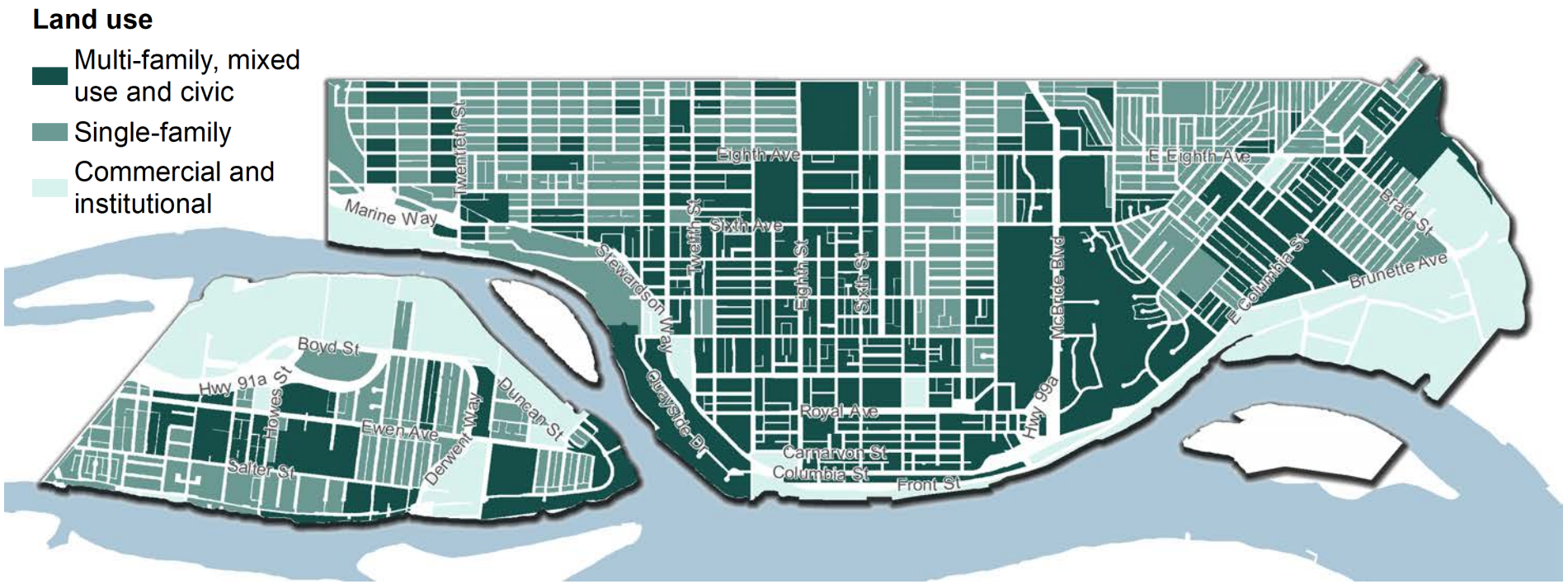
The planting locations identified above may be subject to change during the detailed interdepartmental site review and ground truthing process.

Locations to be planted in years 4 to 10

Of the remaining streets, 5 km are in moderate priority and 11 km are in low priority. These locations are typically in areas where front yards extend into public land and consultation is required. Species for these locations will be selected closer to the scheduled time to accommodate consultation outcomes and unanticipated changes. Acer should generally be avoided given its high representation.

Appendix 1 – Street Tree Planting Prioritization Maps

Land Use



Street Tree Density



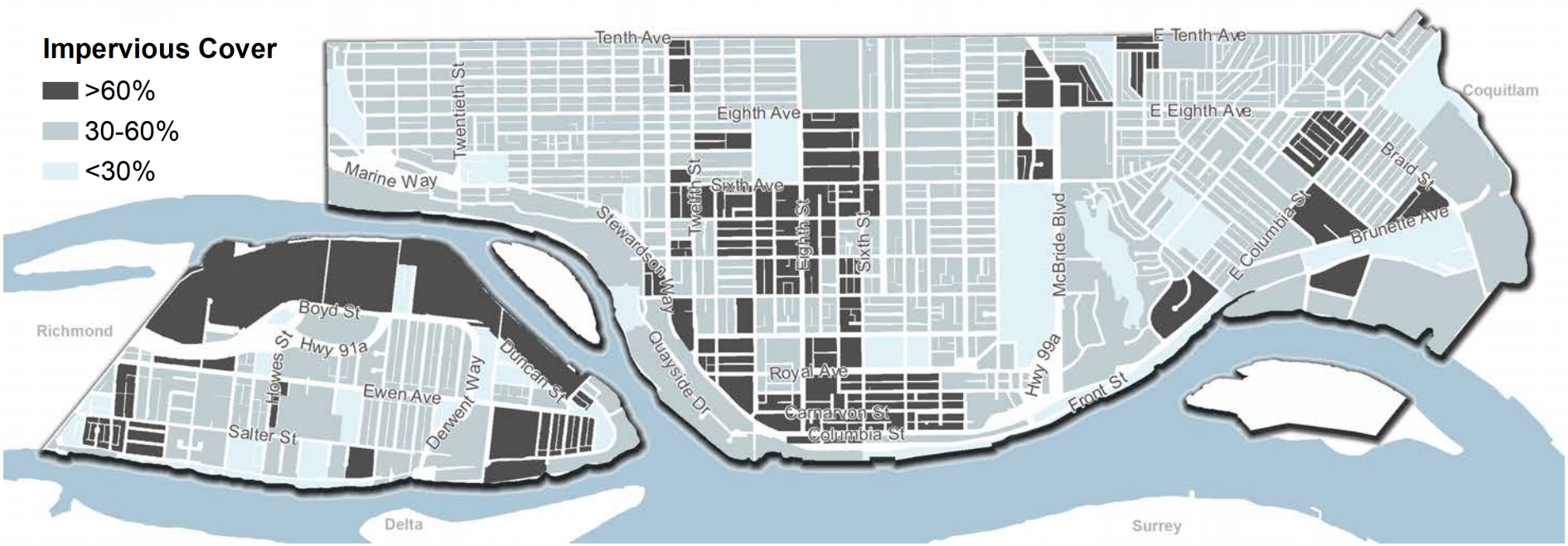
Senior Density



Canopy Cover



Impervious Ground Cover



Tree Planting Priority

