URBAN FOREST STRATEGY: 2020 - 2045

Parks, Recreation & Culture

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ABBOTSFORD

Acknowledgments

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This is the City of Abbotsford's first Urban Forest Strategy. The vision and goals summarized below reflect our community's aspirations for the management of Abbotsford's forest resource over the next 25 years.

2045 VISION FOR THE URBAN FOREST

Abbotsford's vibrant urban forest celebrates our city's beauty, identity and environment. The city's forests are connected by a network of rural forests, parks, treed yards and tree-lined streets that deliver nature into every neighbourhood and into the heart of our thriving City Centre. Abbotsford's healthy, well-managed urban forest shows our commitment to sustaining our natural heritage and to our community's green, prosperous and healthy future.

Goals for Abbotsford's Urban Forest:

Goal 1 - PLAN
for a connected green network of trees and natural assets

- Maintain city-wide canopy cover at 40% by 2045 (excluding agricultural land)
- Develop a City tree policy
- Develop a biodiversity strategy

Goal 2 - PRESERVE
trees strategically on public and private land

- Strengthen tree protection and replacement on all private land
- Protect significant stands of trees
- Improve planting sites construction standards for streetscape and development

Goal 3 - MANAGE
public trees so they are healthy and safe

- Establish levels of services for urban forest management and integrate trees into the asset management system
- Update the inventory of specimen trees and natural stands
- Develop a tree risk management policy

Goal 4 - GROW
the urban forest equitably

- Increase City tree planting in areas with low canopy cover
- Identify areas of the City and types of development where new opportunities and strategies for tree retention and planting could apply
- Require more tree retention or replacement across all types of development

Goal 5 - PARTNER
broadly to foster urban forest stewardship

- Develop and implement a communications and stewardship plan
- Partner broadly on Urban Forest Strategy implementation
- Explore ways to provide grants and to encourage tree planting and tree care on private land

TABLE OF CONTENTS

1. INTRODUCTION

What is the Urban Forest?

The urban forest includes every tree in Abbotsford along with the vegetation, soils and natural processes associated with individual trees and forests across our urban and rural landscapes.

The City of Abbotsford is a mosaic of natural and planted trees across urban and rural landscapes. Among the farms and houses stand descendants of the tall timbers that once blanketed the landscape. In addition to native forest stands, new tree species have been planted in the region over the last century. Together, the mosaic of trees and diversity in rural and urban landscapes form Abbotsford's rich and complex urban forest.

The urban forest is a central part of the city's green infrastructure. Green infrastructure is defined as a network of natural assets delivering services including stormwater filtration, air pollution removal, carbon sequestration, biodiversity and beautification throughout the city. Abbotsford is impacted by significant change including development and a changing climate, which present both challenges and opportunities for the urban forest.

The urban forest includes all of the trees in Abbotsford, along with the vegetation, soils and natural processes associated with individual trees and forests in our urban and rural landscapes.

Purpose of the Strategy

The Urban Forest Strategy outlines how the City plans to manage the urban forest for next 25 years. The Strategy describes the extent and condition of Abbotsford's urban forest today and anticipates the opportunities and challenges that lie ahead. The strategic vision, goals and actions will guide implementation of the Strategy in the coming decade.

Abbotsford's Urban Forest Strategy includes 8 sections:

1 Introduction

Introduces the Urban Forest Strategy and describes the planning process.

2 Value of the Urban Forest

Describes ways the urban forest is valued by ecosystem services, asset appraisal and the community.

3 Urban Forest History

Provides the background on Abbotsford's urban forest legacy.

4 Benchmarks and Trends

Describes the current state of the urban forest (where, what, and how much we have), how the urban forest could change in the future.

5 Existing Approaches

Reviews the policy and programs that define and shape urban forest management in Abbotsford.

6 Priorities for Management

Defines the key issues facing Abbotsford's urban forest management program and explores priority actions.

7 Vision, Goals and Actions

Defines goals for the urban forest program and the specific steps to achieve the urban forest vision.

8 Tracking Progress

Describes the key performance indicators and targets to measure implementation success.

The Planning Process

The Urban Forest Strategy is the culmination of a multi-stage effort by the City, community, and other stakeholders. The Urban Forest Strategy is the product of a 4 stage planning process:

Stage 1 reviewed the City's current management program and identified strengths and needs that were summarized in a Key Findings Report.

Stage 2 measured the status and trends of Abbotsford's urban forest. Community engagement at this stage helped to identify urban forest values and community preferences. A Stage 2 report captured the outcomes of engagement and benchmarks and trends, and proposed principles and key moves to incorporate into the Strategy.

Stage 3 produced the draft Urban Forest Strategy, with input from Council and public feedback.

Stage 4 involves adoption of the final Strategy and subsequent implementation.

The planning process for the Urban Forest Strategy

2045 URBAN FOREST VISION

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2. THE VALUE OF THE URBAN FOREST

Section two describes some of the ways in which urban trees and forests provide value to our community and other living organisms. The beneficial services provided by urban trees and nature are called 'ecosystem services' and are commonly placed in four groups shown at right.

Abbotsford's urban forest is highly valued by the community, particularly for providing clean air and water, providing shade and beautifying the city. Decades of research have demonstrated how ecosystem services benefit human health and wellbeing[1]. For example, a study of neighborhood greenspace and health in Toronto found that having 10 more trees in a city block results in residents feeling seven years younger [1]. In terms of health perception, the study found that this is comparable to an increase of annual personal income of $10,000 [1].

Exposure to nature reduces stress and anxiety and improves focus and productivity [2,3]. Access to nature or even views of nature has also been found to improve recovery times in hospital patients [4]. Nearby parks and natural areas increase the likelihood of people achieving recommended levels of physical activities [5]. Shoppers will spend more time and money in commercial areas with high quality tree canopy [6].

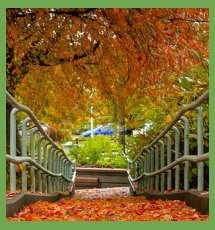
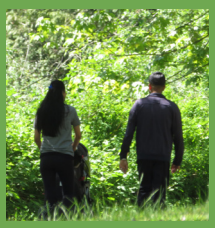
Research into the benefits of urban forests has grown alongside municipal interest in managing forests as natural assets. Natural assets are resources in the natural world that support the delivery of municipal services, such as treed riparian areas filtering, absorbing and transporting stormwater [7]. By placing monetary value on the replacement costs and services provided by natural assets, they can be included in municipal asset management systems to guide annual operational and capital budget investments [8].

Urban forest canopy and tree inventory data can be used to estimate the value of ecosystem services. The United States Department of Agriculture (USDA) has developed i-Tree Canopy and i-Tree Eco which use canopy and inventory data to estimate dollar values for air pollution removal, carbon sequestration, carbon storage and building energy savings [9,10].

1 The website Green Cities: Good Health is a comprehensive resource for information on research about the benefits or urban forestry and urban greening.

ECOSYSTEM SERVICES

CULTURAL


Services that contribute to quality of life and relate to how people value the urban forest including beautification, mental health and healing, sense of place, spirituality and recreation and tourism.

PROVISIONING



Services that provide forest products including timber, food, traditional medicine, fresh water and firewood.

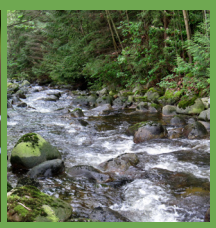
REGULATING



Services that regulate climate and ecosystem processes including pollination, air and water filtration, flood control, erosion prevention, stormwater capture and cooling.

SUPPORTING





Services that underlie all others and enable natural processes to maintain the conditions to support life including photosynthesis, creating soils, holding genetic diversity and providing habitat for species.

City-wide ecosystem services values from Abbotsford's urban forest were estimated using i-Tree Canopy[2]. The economic value of carbon storage is estimated at $119 million, with an additional $4 million of carbon being sequestered yearly. The value of air pollution removal is estimated at $438 thousand per year and avoided runoff at $409 thousand per year.

The replacement value of the City's 11,000 inventoried trees was estimated at nearly 6 million dollars using i-Tree Eco. The inventory represents only a fraction of the City's public trees because many more uninventoried trees are found in forests on City managed lands.

2 USDA i-Tree Canopy 2021 values

Ecosystem Service	Amount per m² of canopy	$ per ha of canopy
Carbon sequestered	.258 kg/yr	$473.43
Carbon stored	7.685 kg	$14,101.61
Avoided runoff	1.637 L/yr	$48.29
PM2.5 removed	0.335 g/yr	$37.47
PM10 removed	1.485 g/yr	$6.36
Carbon monoxide removed	0.089 g/yr	$0.06
Nitrogen dioxide removed	0.799 g/yr	$0.11
Ozone removed	5.618 g/yr	$7.72
Sulfer dioxide removed	0.304 g/yr	$0.02

City-wide (including ALR) Ecosystem Services

estimated using 2021 i-Tree Canopy values for urban and rural areas in Abbotsford

651 kilotonnes of carbon
stored in the urban forest

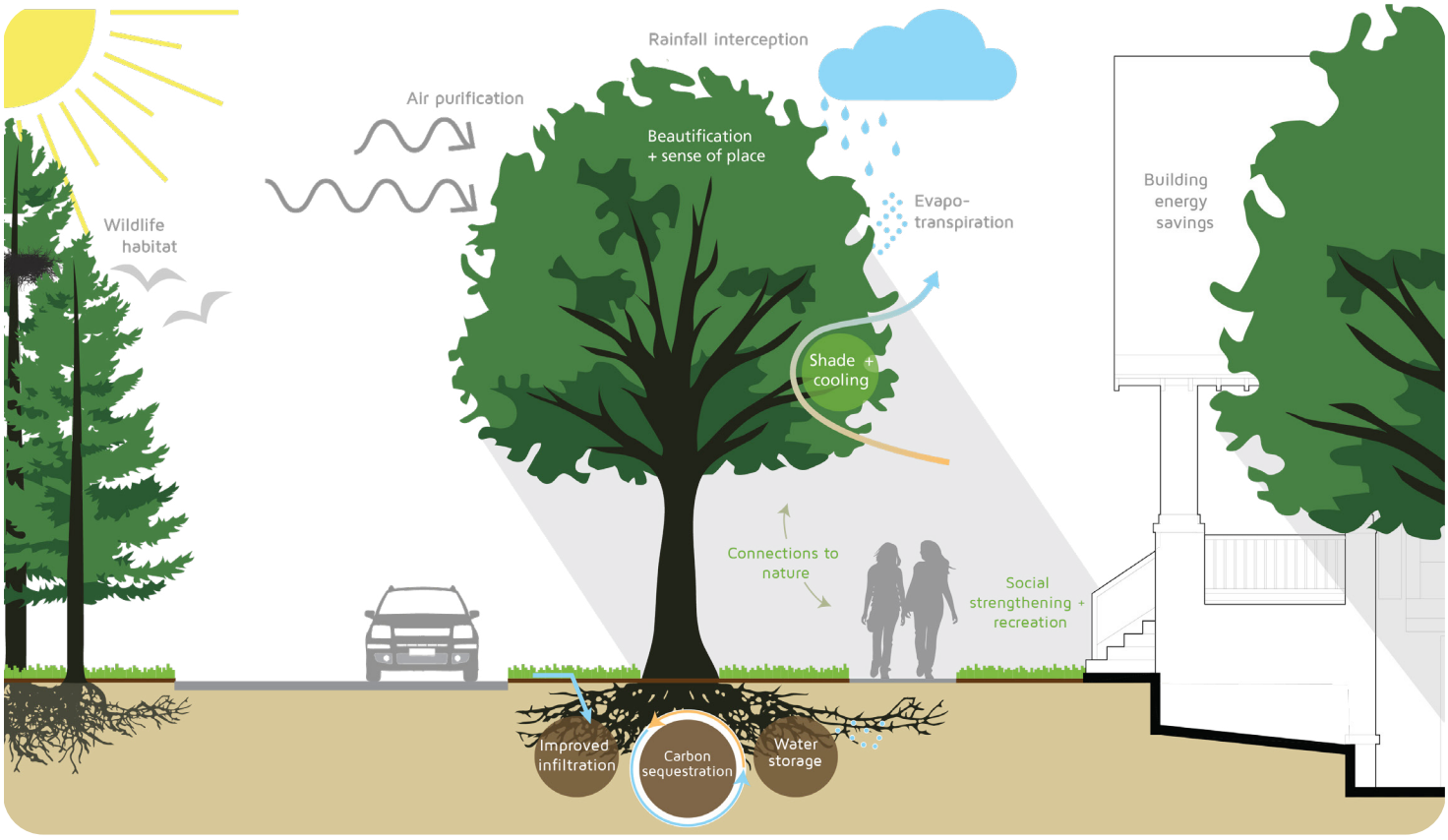
+

22 kilotonnes of carbon
sequestered annually

779 tonnes of pollutants
removed from the air annually

139 megaliters of avoided runoff kept from the storm system annually

Abbotsford's urban forest keeps 55 Olympic-sized swimming pools of water out of the storm system each year



The urban forest provides many important services to our community.

3. URBAN FOREST HISTORY

Since time immemorial, the Stó:lo people have lived on the lands now known as Abbotsford. The Fraser River, its tributaries and fertile lands remain essential to the Stó:lo way of life despite alteration. Places of significance to the Stó:lo persist throughout S'ólh Téméxw (Stó:lo territory), which includes Abbotsford [11].

In the 1850s, British colonists claimed the land within Abbotsford. The Canadian Pacific Railway was granted right-of-way from Mission to the American border and in the 1890s, a townsite and subdivision plan was filed. By the early 1900s, five rail companies ran through the area and accessed the Fraser River, which expanded commercial and residential settlement.

Historic disturbance for farming, logging, mining and urban development has changed Abbotsford's native forests, which would have supported older forests of native conifers in upland areas and a mix of floodplain forest dominated by red alder and black cottonwood along lowland waterways. Dense forests were logged and milled at the site now known as Mill Lake from the early 1900s. At one point, the Abbotsford Lumber Company was the third largest forestry employer in British Columbia [12].

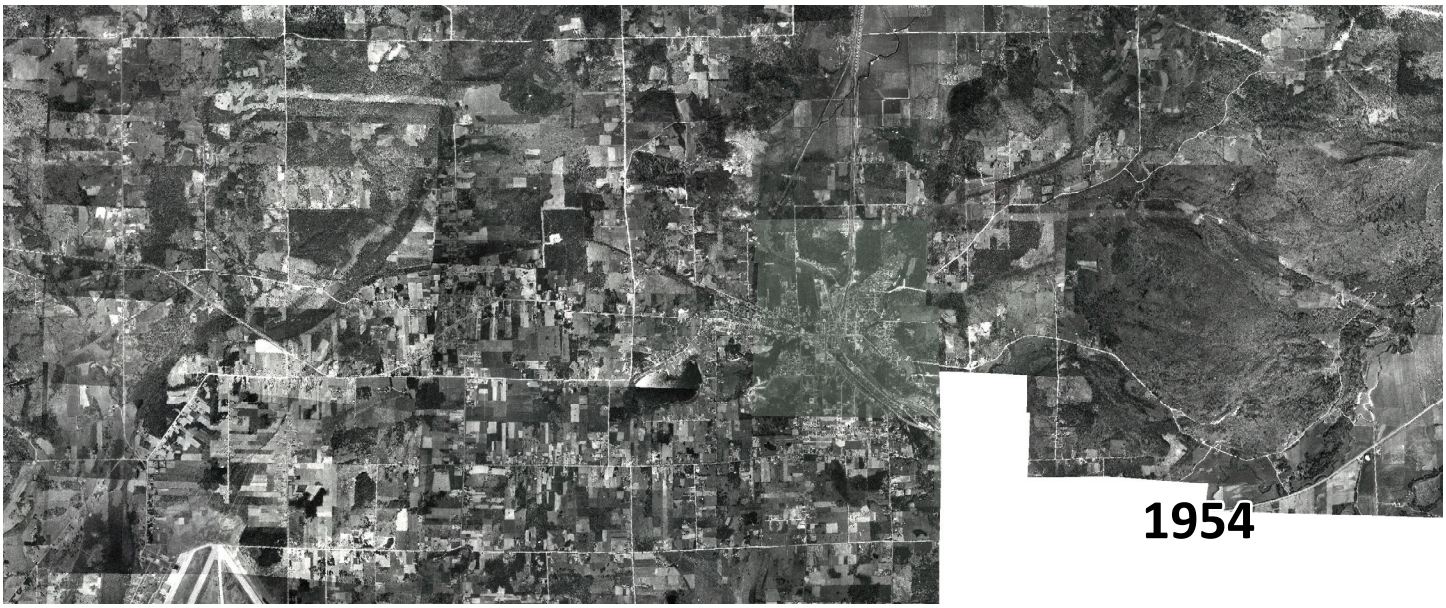
Flooding was a persistent issue in the spring, with the Fraser River and Sumas Lake flooding annually. This was often followed by a summer drought. The need for irrigation and flood protection led to dyking and eventually, the draining of Sumas Lake, which became settled as farmland [13]. Farming outpaced forestry and became the area's main industry. The mill closed in the 1930s, by which time, most forest in the area had been logged and sold off as farmland [12].

The Village of Abbotsford and the District of Sumas amalgamated in 1972 to become the District of Abbotsford. In 1995, the District of Abbotsford in turn, amalgamated with the District of Matsqui and became the City of Abbotsford we know today. Forest harvesting and agriculture were the drivers of land use changes in Abbotsford from 1900 to 1970. In the 50 years since, urban development has driven changes as Abbotsford's population has grown from a very small community to more than 153,000 people today [14].

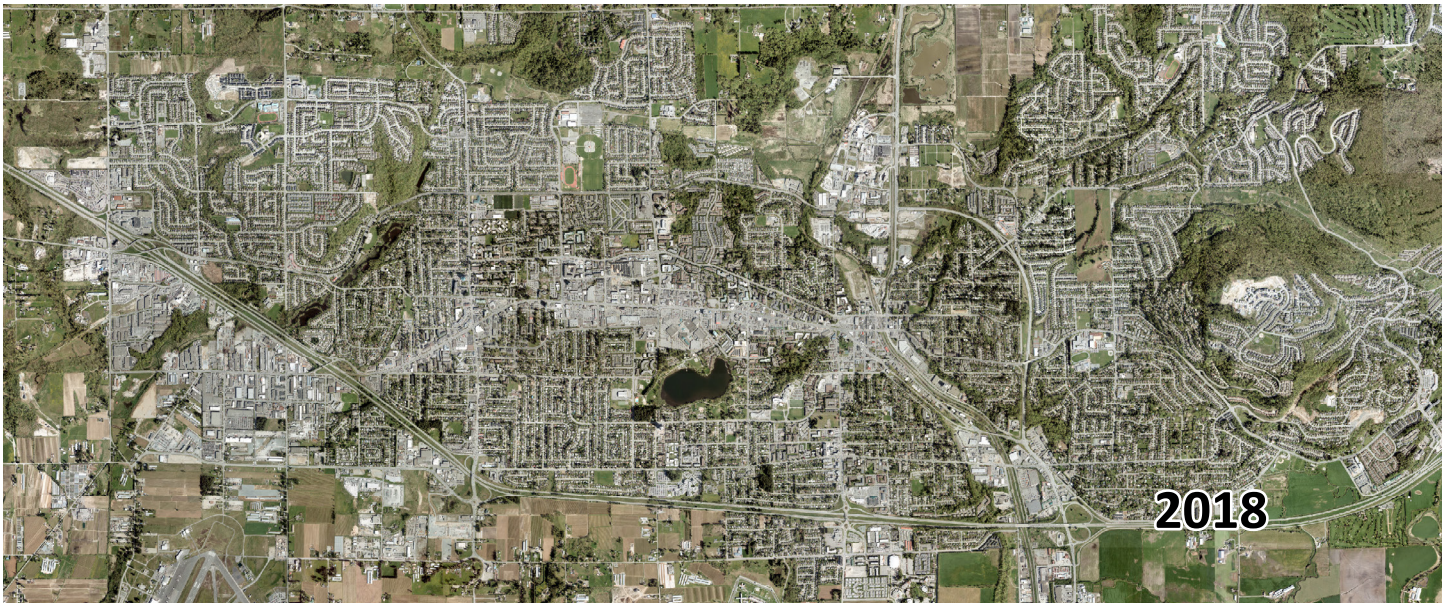
Circa 1905. Essendene Ave looking towards Montrose Ave. City of Vancouver Archives.

2021. Essendene Ave looking towards Montrose Ave.

Circa 1920. View of Old Yale Road. City of Vancouver Archives.


1954


1994


2018

4. BENCHMARKS AND TRENDS

This section describes the present state of the urban forest in terms of its distribution, extent, health and structure, its soils and ecosystems, character and management. Trends describe expected urban forest change based on prior observations.

Measuring Tree Canopy

Tree canopy is a common metric used to measure the extent of the urban forest. It describes the amount of land surface covered by tree canopy when looking from above.

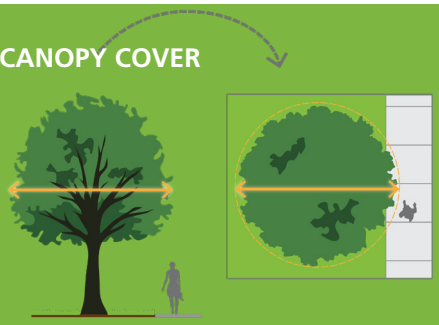
Many jurisdictions measure canopy cover over time to assess how their urban forest is changing. However, there is no established minimum canopy cover recommendation for municipalities. The amount of canopy cover in a city is the result of local conditions and constraints such as climate, geography, land use and the density of buildings and infrastructure.

As a result, optimal canopy cover may vary by community based on local context and priorities. Local values and priorities inform the setting of an optimal canopy cover target for Abbotsford.

To develop this Strategy, canopy cover was re-measured using Light Detection and Ranging (LiDAR) data from 2017. LiDAR data is collected from a plane which sends lasers towards the ground. The laser beams are reflected by the surfaces they encounter to provide a highly accurate picture of the surface including the ground, vegetation, buildings and other infrastructure. LiDAR data can be used to create a very accurate model of tree canopy.

The United States Department of Agriculture's i-Tree Canopy tool was also used to validate the LiDAR estimates and to estimate the change in canopy cover since 1994 in the city. The tool estimates canopy cover using aerial imagery.

ABOUT CANOPY COVER



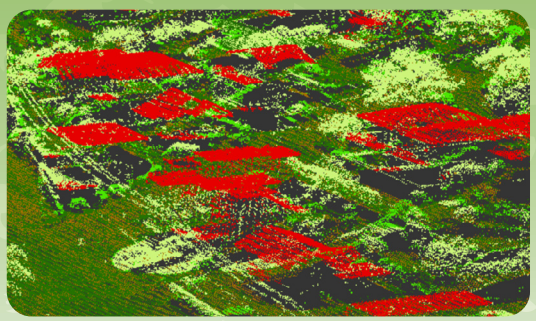
Tree canopy is the layer of tree leaves and branches covering the ground when looking from above.

WHAT DOES CANOPY COVER LOOK LIKE?

5% canopy

20% canopy

80% canopy



LiDAR data is a 3D point cloud from which features such as tree canopy and buildings can be extracted.

Abbotsford's City-wide Canopy Cover

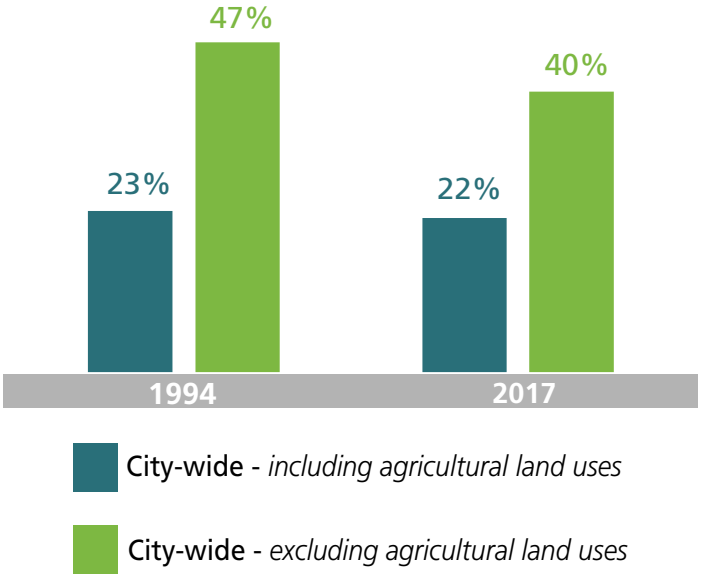
Canopy cover was measured city-wide with and without land in agricultural use for 1994 and 2017. **In 2017,the LiDAR analysis estimated:**

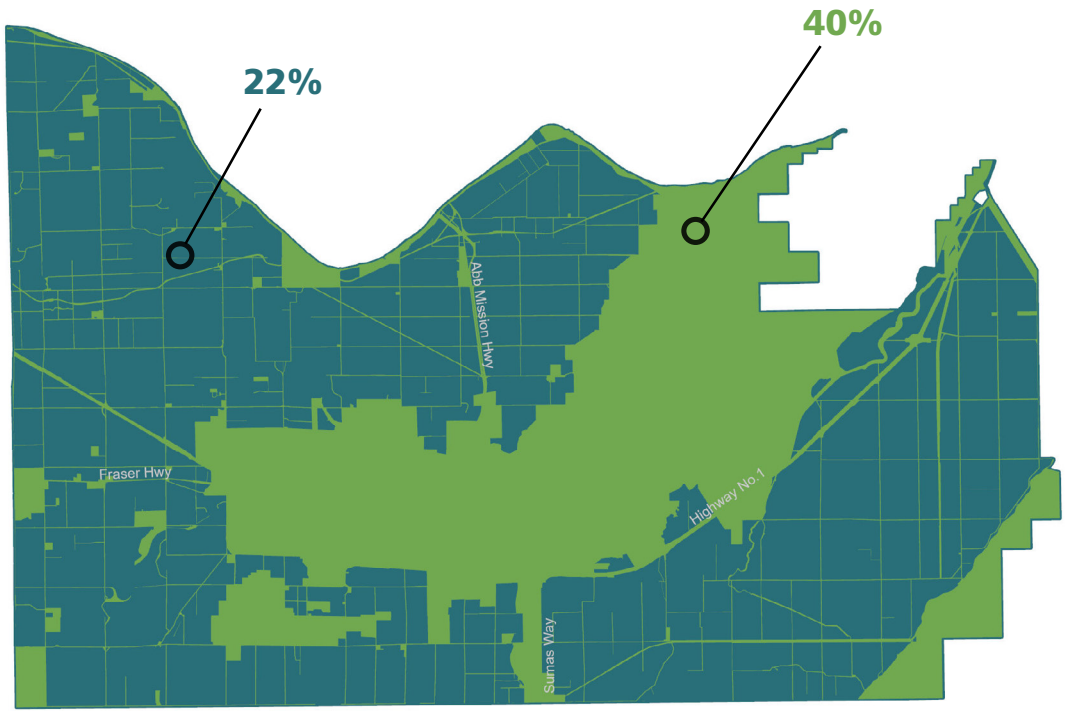
- Abbotsford's **city-wide canopy cover, including agricultural land,** was **22%**. This represents 8,473 hectares of canopy within the municipal boundary.
- Abbotsford's **city-wide canopy cover, excluding agricultural land**, was **40%**.

When agricultural land use is excluded, city-wide canopy cover has declined significantly from 47% to 40% between 1994 and 2017.

Abbotsford's canopy cover (excluding agricultural land) was estimated at 40% in 2017

Percent canopy cover: Change from 1994 to 2017



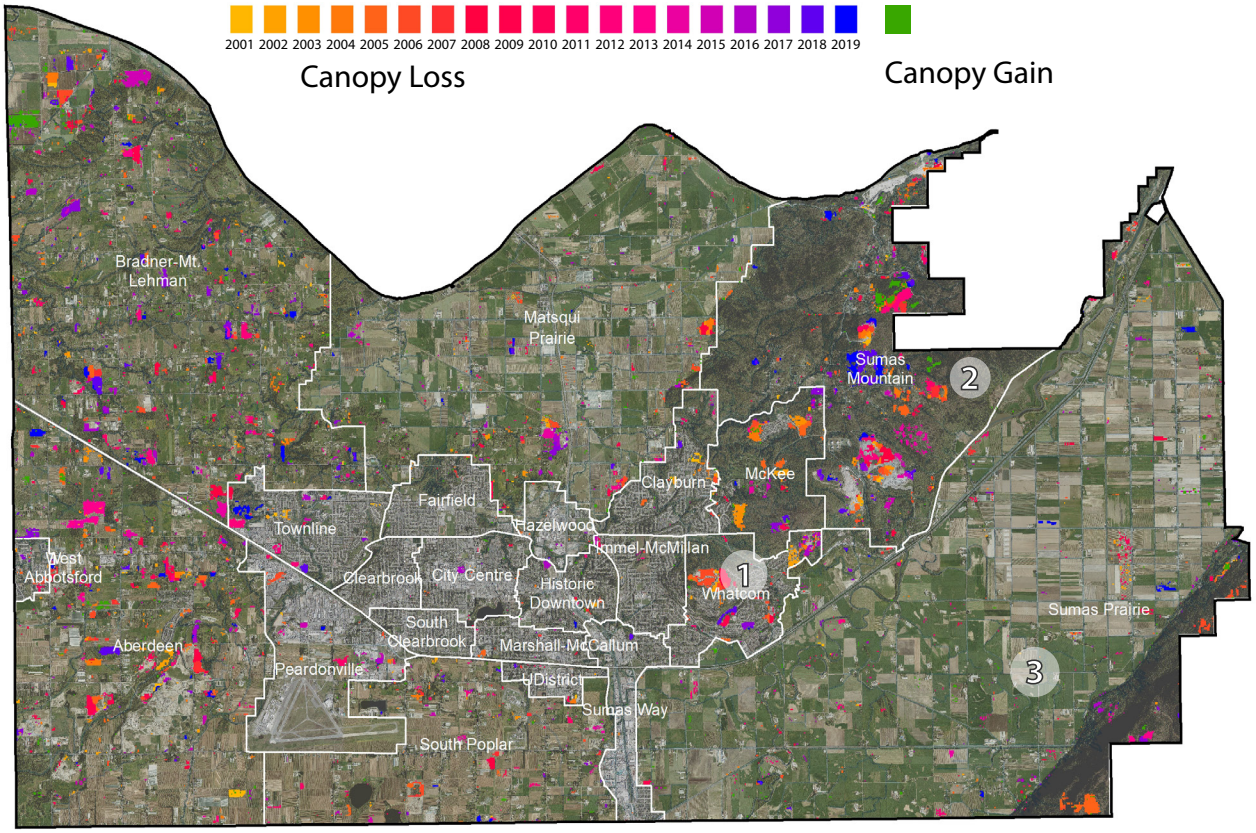


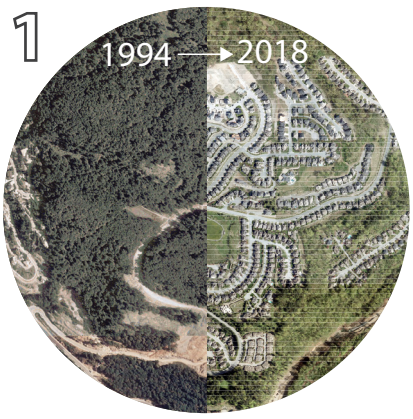
City-wide land with agricultural land uses included (BLUE) and without agricultural land uses (GREEN)

Where Canopy Cover has Changed

Changes in global forest cover have been tracked by the University of Maryland since 2000 [16]. The satellite data does not detect individual trees but shows large-scale forest cover change. Several examples of the changes observed between 1994 and 2018 are shown below.

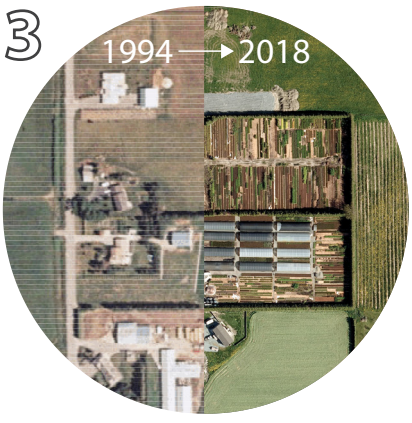
Large-scale canopy loss identified in Abbotsford is typically related to forest land being developed into residential neighbourhoods, or clearing for forestry, mining and agriculture. Clearing for residential development is visible in Whatcom and McKee. Canopy loss from forestry and mining activities are evident on Sumas Mountain, as are some areas of canopy gain with reforestation. Within the agricultural lands, canopy loss is visible for both farming and development. In a few areas, taller crops show as canopy losses on agricultural lands. Canopy gain is also visible on some agricultural lands.





Residential development in Whatcom

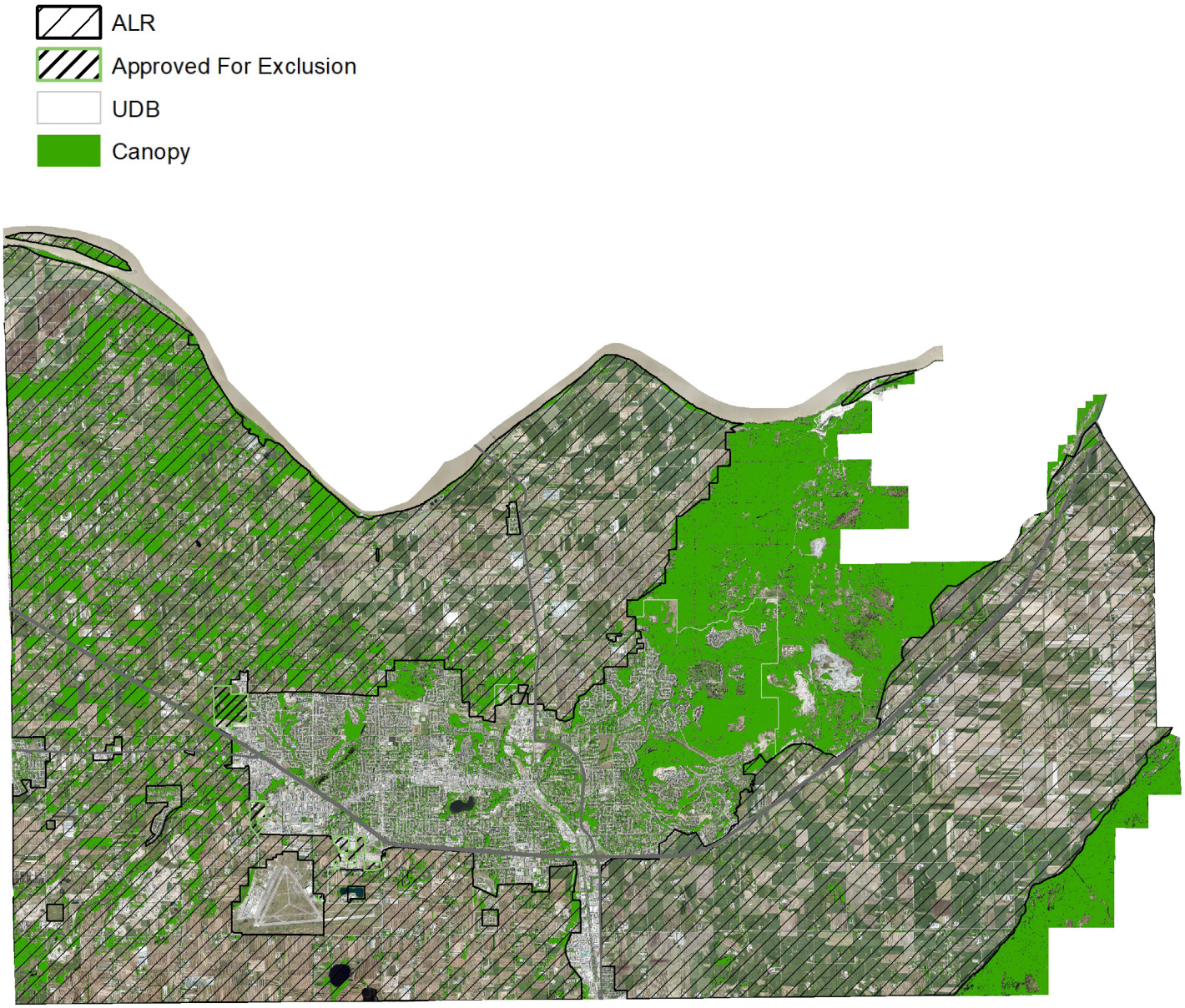
Forest regeneration on Sumas Mountain



Farm vegetation buffer

Abbotsford's Tree Canopy Mapped

The map below shows canopy cover distribution derived from the 2017 LiDAR data. The largest areas of continuous canopy cover were found on Sumas Mountain and Vedder Mountain. Other significant areas of connected tree canopy were identified along riparian corridors throughout the western portion of the city and particularly within the Agricultural Land Reserve.

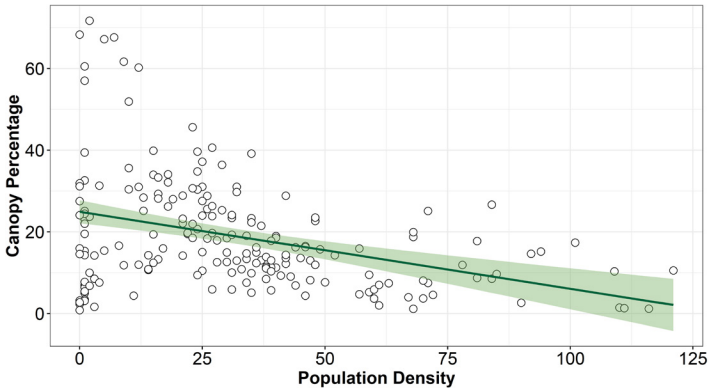


Canopy cover polygons mapped with the Agricultural Land Reserve (ALR) and Urban Development Boundary (UDB)

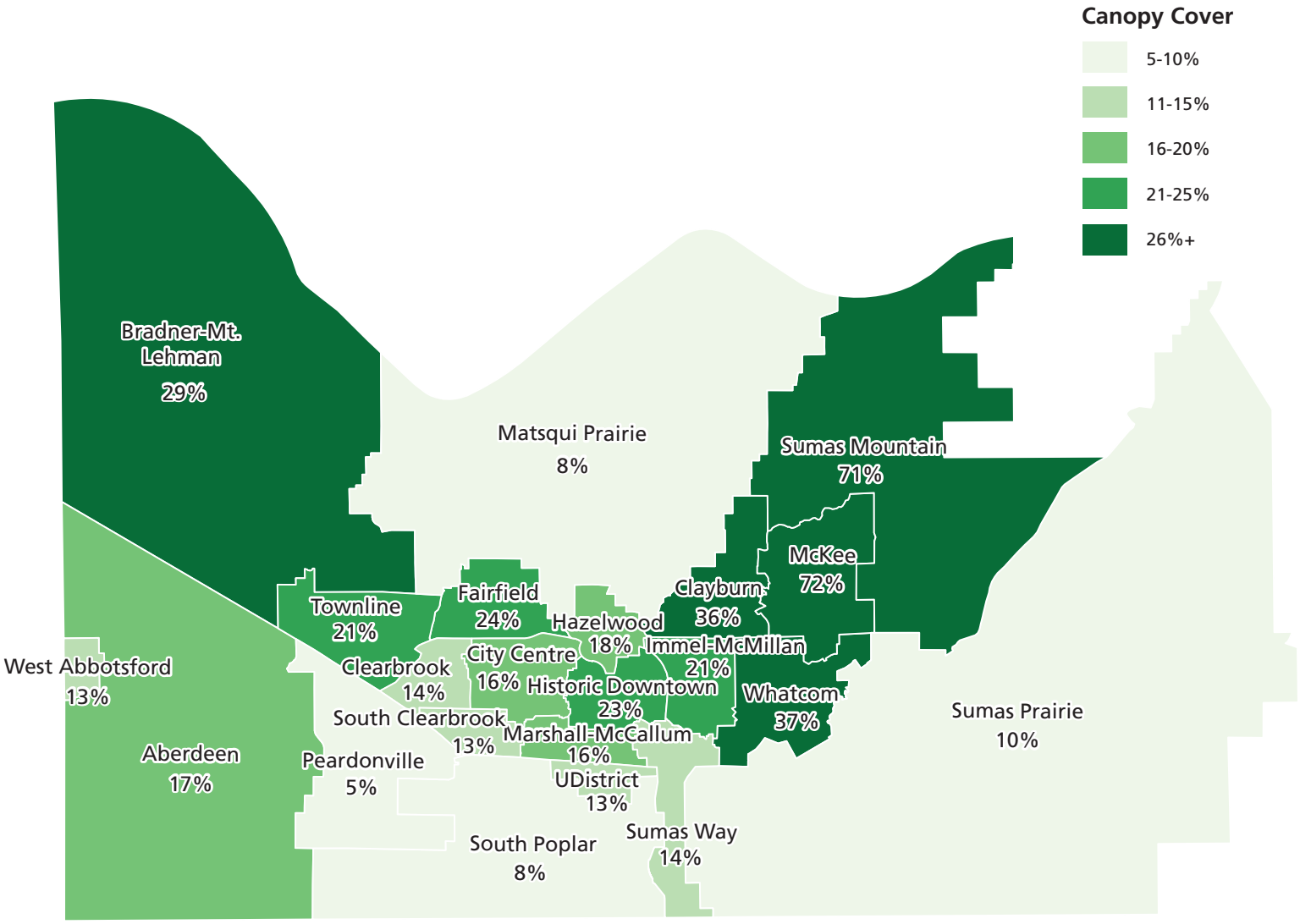
Canopy Cover by Neighbourhood

As in most cities, canopy cover is not evenly distributed among Abbotsford's neighbourhoods. Each neighbourhood has different land uses, lot sizes and density which support different levels of canopy cover. Abbotsford's neighbourhoods range in canopy cover from 5% in Peardonville (airport and industrial), to 72% in McKee (undeveloped forest land).

In Abbotsford, canopy cover tends to decrease with increasing population density, which suggests that ecosystem services from the urban forest are not distributed equitably among Abbotsford's residents or neighbourhoods.



Graph showing the trend line for decreasing canopy with increasing population density in Abbotsford



Canopy cover percent by neighbourhood

Canopy Cover by Land Use and Ownership

Canopy cover varies by type of land use across Abbotsford. The table below reports canopy cover by public land uses, private land uses and city-wide summary areas.

Land use largely determines the space and suitability of land for supporting trees and forests, for example:

- Lands under agricultural use have relatively low canopy cover because they are actively farmed.
- Parks have relatively high canopy cover because substantial areas of native forest are protected in Abbotsford's parks.
- Urban residential land uses have moderate canopy cover because they support relatively high development density.

Canopy cover tends to decrease with increasing development density and impermeable cover. Low canopy cover is also associated with open space uses such as farming or sports fields.

Ownership of Abbotsford's Tree Canopy

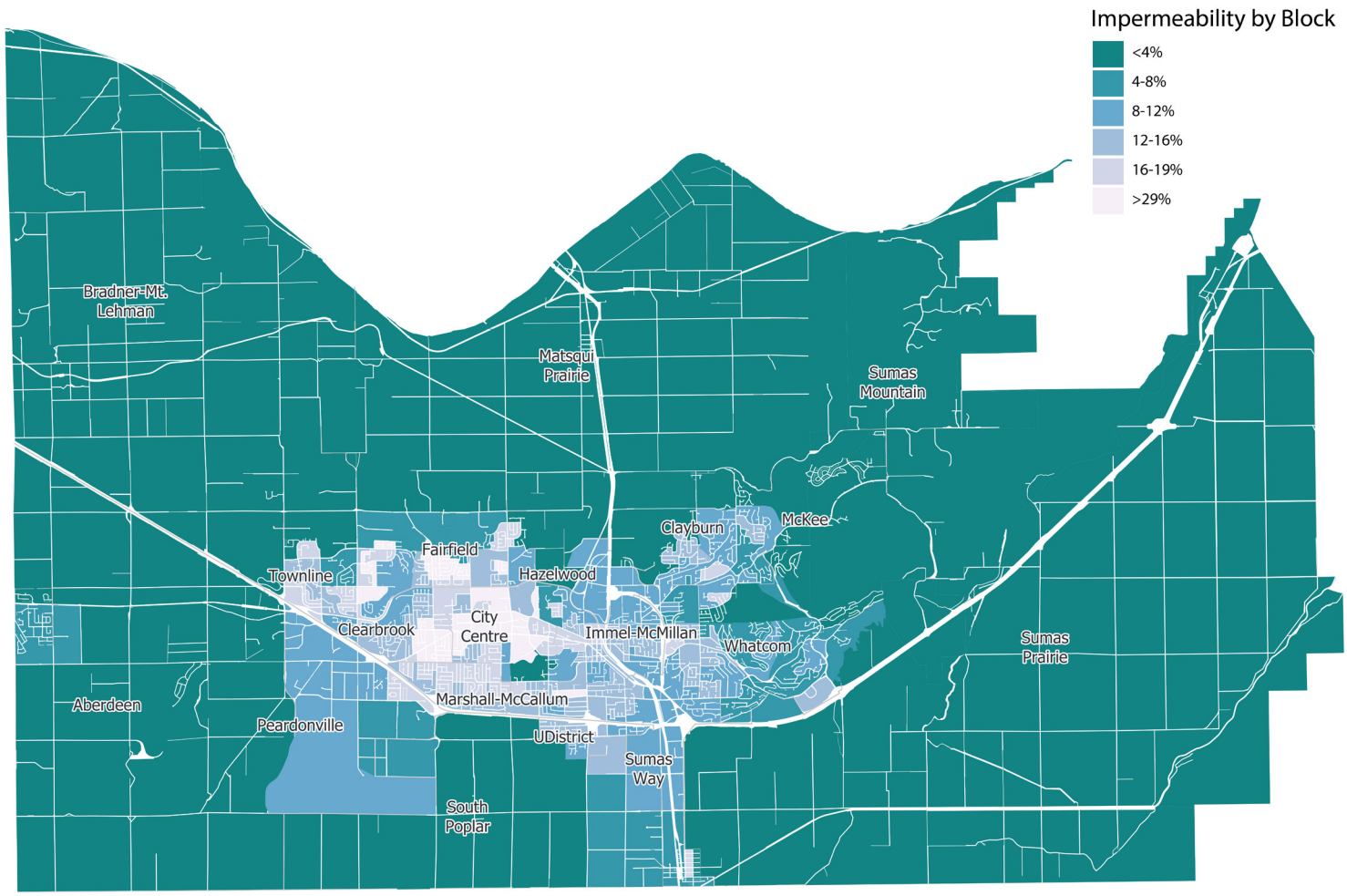
Abbotsford's 2017 tree canopy was 85% private (non-City owned) and 15% City managed (road allowances, parks and other City managed properties). The results are relatively consistent with the distribution of land ownership, with 87% of land private/non-City owned, and 13% of land under City management.

Land Use Type	Land Area (ha)	% Total Land Area	% Canopy Cover (2017)
PUBLIC LAND			
Public roadways	2,665 ha	7%	13%
Other City-Owned	1,253 ha	3%	18%
Parks	1,158 ha	3%	62%
PRIVATE LAND			
City Centre + Urban and Neighbourhood Centre	228 ha	1%	11%
Urban residential	2,593 ha	7%	27%
Suburban	157 ha	<1%	50%
Industrial	712 ha	2%	16%
Institutional	393 ha	<1%	18%
Commercial	157 ha	<1%	9%
Airport	9 ha	<1%	2%
Country, Open Space, Rural and other private land	4,457 ha	12%	74%
Agricultural	24,346 ha	64%	12%
CITY-WIDE SUMMARIES			
City-wide	38,128 ha	100%	22%
City-wide excl. agricultural land	13,782 ha	36%	40%
Urban Development Boundary	6,716 ha	18%	25%

Impermeability

The map below shows impermeability based on Metro Vancouver's 2014 Land Cover Classification data [15]. The Metro Vancouver dataset provides relative estimates of land cover across Abbotsford. Overall, Abbotsford has relatively small proportions of impermeable surface in terms of buildings and pavement due to large areas of land in agricultural use. However, impermeability is higher in the Urban Development Boundary and particularly in the City Centre neighbourhood.

The more impermeable an area, the less likely it is to support high canopy cover. Trees planted in hardscape areas tend to have less soil and water to support growth because growing space is restricted and rain runs off as stormwater rather than into the ground. Impermeable cover is a useful metric for understanding the constraints for planting new trees as well as limits to potential canopy cover. Impermeable areas require higher investment in planting sites, such as the use of soil cells and permeable paving, to support healthy trees. City Centre and surrounding high density areas will require investment in planting infrastructure to successfully increase canopy cover.



Impermeability by Block

Native Forests

Abbotsford is home to a variety of native forest ecosystems, most of which have been disturbed by historic logging, agriculture or urbanization at some point. As a result, most of the forest is young second growth or riparian stands.

Climate normals[3] show average yearly precipitation of 1,538 mm and an average yearly temperature of 10°C. Typically, winters are mild and summers are cool, though periods of drought are common in the summer. On average, only 10% of the annual rainfall occurs in the three months from June to August.

The Province of British Columbia has a system for classifying forest landscapes called the Biogeoclimatic Ecosystem Classification (BEC) system [17]. Abbotsford falls within two major BEC subzones, the Coastal Western Hemlock dry maritime (CWHdm) and Coastal Western Hemlock very dry maritime (CWHxm) of the BEC system.

These subzones represent forest communities on the inner coast of British Columbia where dry summers can create soil moisture deficits for trees, distinguishing these forests from similar but wetter forests on the outer coast or at higher elevations in the Coast Mountains.

The soils and topography vary from place to place, giving Abbotsford's natural urban forests their distinct character. Riparian stands are typically dominated by cottonwood or red alder where periodic flooding occurs and then transition into bigleaf maple. Second-growth mixed forest stands of bigleaf maple with components of red alder, paper birch, western redcedar and Douglas-fir are common across the city. Conifer dominated forest are less common but where present, western redcedar and Douglas-fir are the dominant species.

Protected Species

Protected flora and fauna known to occur within Abbotsford's urban forest[4] and the freshwater it protects include:

- Banded Cord-moss
- Band-tailed Pigeon
- Barn Owl
- Coast Giant Salamander
- Coastal Tailed Frog
- Common Nighthawk
- Dun Skipper
- Garry Oak
- Great Blue Heron
- Little Brown Myotis
- Mountain Beaver
- Nooksack Dace
- Northern Red-legged Frog
- Northern Rubber Boa
- Olive-sided Flycatcher
- Oregon Forestsnail
- Oregon Spotted Frog
- Pacific Water Shrew
- Painted Turtle
- Peregrine Falcon
- Phantom Orchid
- Roell's Brotherella
- Salish Sucker
- Tall Bugbane
- Townsend's Mole
- Trowbridge's Shrew
- Vancouver Island Beggarticks
- Western Screech Owl
- White Sturgeon

Sensitive Ecosystems

Abbotsford's Sensitive Ecosystem Inventory shows the city retains significant areas of ecologically valuable habitat totaling over 64 square kilometres or 17% of the city. In an urban landscape, ecosystems are usually modified by human activity to some degree but still provide significant ecological value. "Sensitive Ecosystems" include old forests and wetlands of significant area and low modification. "Modified Ecosystems" include young forests and agricultural fields, which still have ecological value despite their disturbed character [18].

Forested sensitive ecosystems occupy 3,480 hectares, and include:

- Old forest — Forests older than 250 years in age and having complex vertical structure;
- Mature forest — Forests that are 80-250 years in age with moderate structural complexity;
- Young forest — Forest stands of less than 80 years in age that may be less complex;
- Woodland — Open forests characterized by abundant light reaching the ground, found typically on dry, exposed sites.

Abbotsford's additional sensitive ecosystems include non-forested freshwater, seasonally flooded agricultural fields, old fields, wetlands and riparian ecosystems.

3 Abbotsford weather station A 1981 - 2010
http://climate.weather.gc.ca/climate_normals/

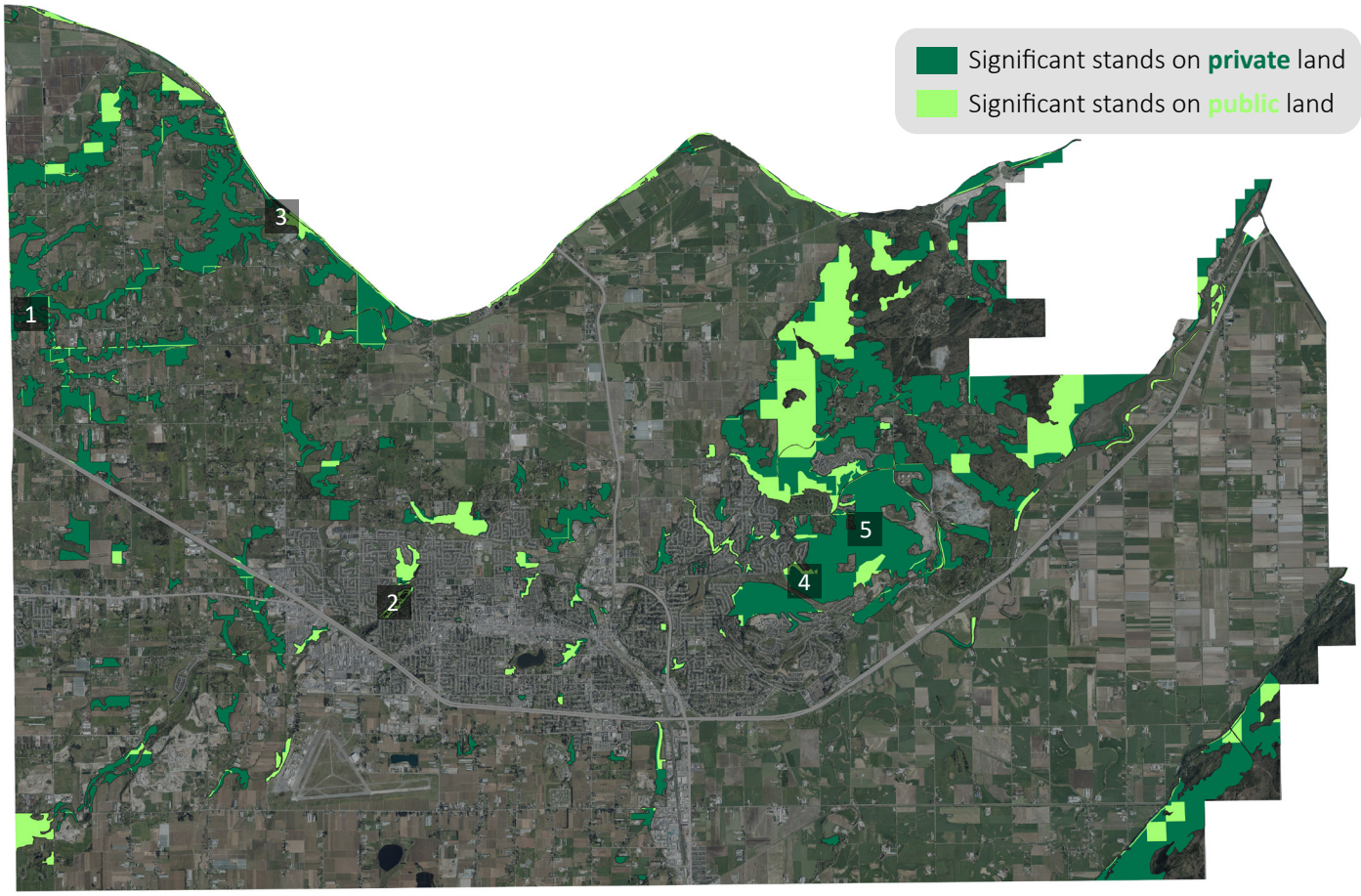
4 BC Species and Ecosystem Explorer https://a100.gov.bc.ca/pub/eswp/

Significant Stands

To better identify forest stands of high structural value, sensitive ecosystems and protected species locations have been overlaid with canopy height data. Several of these areas were then visited to confirm their classification. Where areas of tall trees intersect with identified sensitive ecosystem patches or rare BEC sites, we expect to find forests with the highest structural complexity and ecological value.

A total of 4,315 hectares of forest has been classified as 'significant stands' based on canopy overlapping with protected species, sensitive ecosystems or tall stands of trees. In total, 1,162 hectares (27%) of significant stands occur on City managed lands or in protected areas.

Most significant stands are located either in riparian corridors or on steep slopes that were not historically suitable for agriculture.



This riparian forest is dominated by bigleaf maple but includes several 55m tall remnant Douglas-fir of 150 - 190 cm diameter. The age estimate for this tree is 250-300 years old.

This stand is dominated by large, multi-stemmed bigleaf maples and tall, large diameter cottonwoods.

This upslope conifer forest stand is composed of healthy western red cedar and Douglas-fir trees with average diameters of 70 cm.

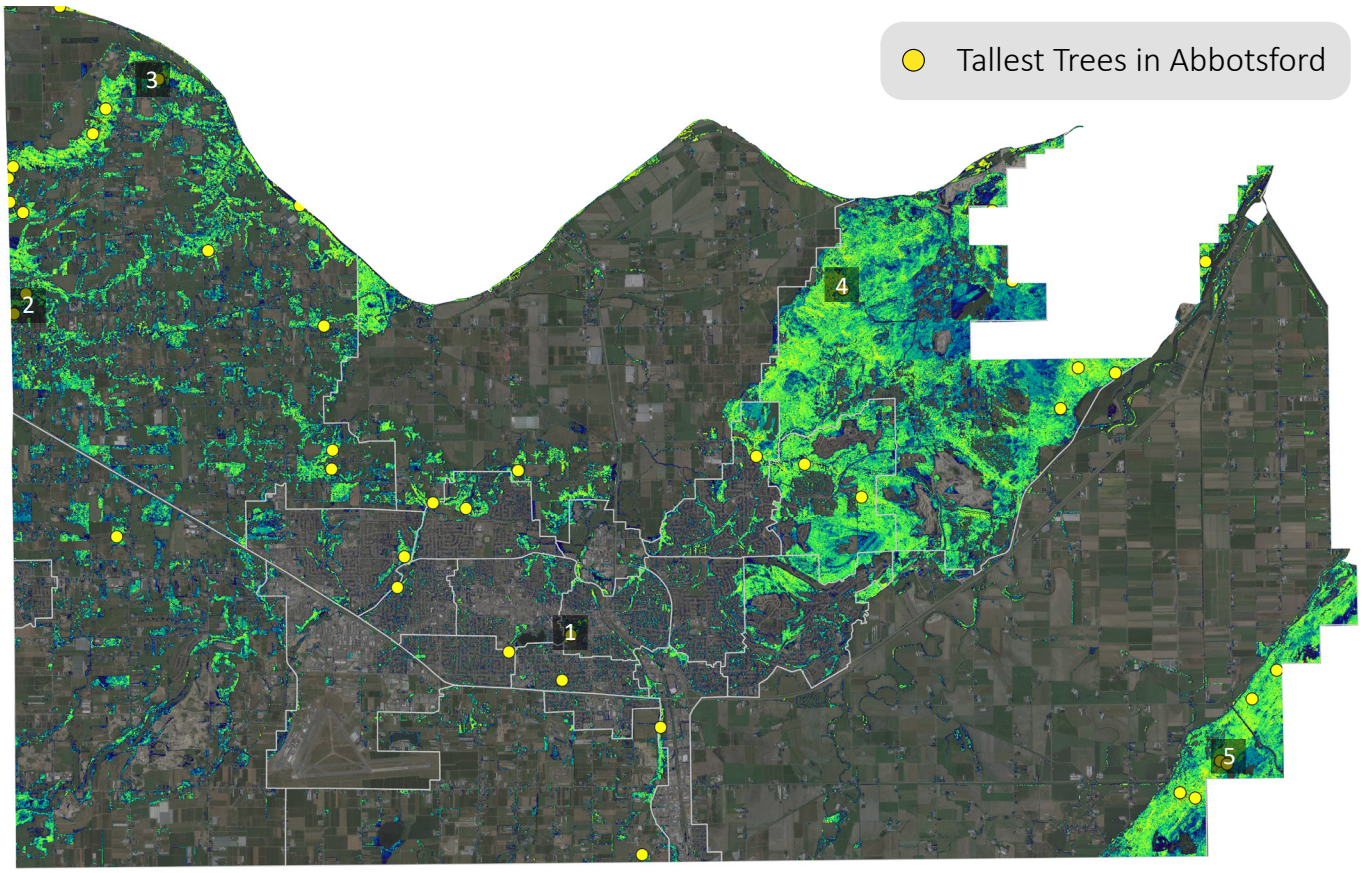
This stand, like much of the forest in this area, is composed of big leaf maples with components of red alder, paper birch and Douglas-fir.

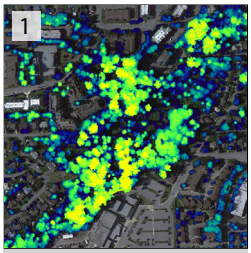
The same forest type as 4 but with some tall cottonwoods shown at the stand edge. Many of the birch and red alder are dead or dying and western red cedar is establishing in the understory.

Significant Stands of Trees

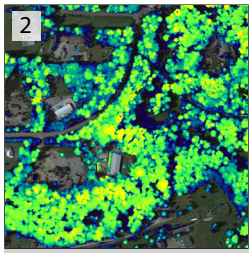
Tallest Trees

Canopy height data was processed from LiDAR captured in 2017 to map Abbotsford's tallest trees. Abbotsford's tallest trees are more than 60 metres in height — the equivalent of an 18-storey building. While Abbotsford's tallest trees are likely Douglas-fir, there are also impressive heights reached by black cottonwoods. The tallest trees are found in forest stands.

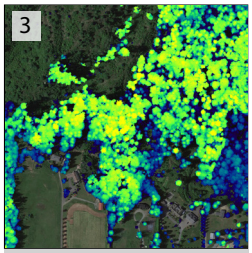




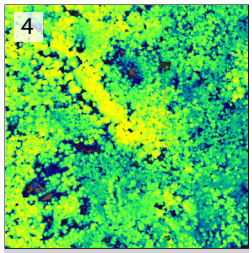
1. Ravine Park has the tallest tree in downtown which is 60m tall.



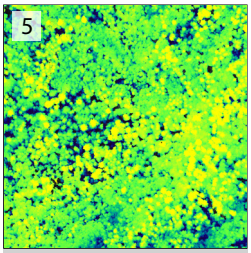
2. Riparian forests in agricultural areas contain many taller trees.



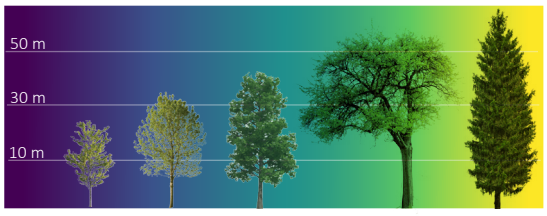
3. The ridge down to Glen Valley is a relatively continugous stretch of tall forest

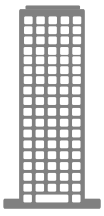


4. Sumas Mountain has the highest density of tall trees in Abbotsford



5. The steep sides of Vedder mountain are forested with tall trees





Abbotsford's tallest trees are more than 60 metres in height — the equivalent of an 18-storey building

Tallest Trees

Planted City Trees

Planted City trees include trees planted along road allowances, in parks or on other City-owned land. Planted trees are more intensively managed than natural forests because they are often near people and infrastructure. Typically, trees along streets or around buildings include a variety of non-native species that are well suited to urban growing environments. Use of native species as urban trees is limited because most do not perform well in urban environments due to challenges such as compaction, pollution, constrained growing space and branch breakage potential.

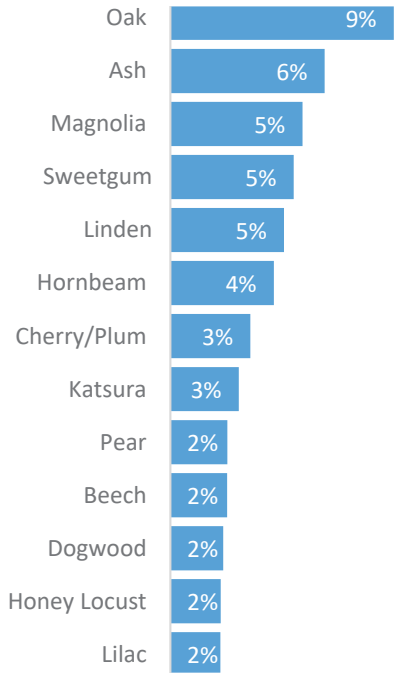
Inventory

The City of Abbotsford has an inventory for 11,019 of its urban trees. The total number of trees on City property, when including native forests, would number in the hundreds of thousands. The inventory is primarily made up of street trees (88% of the inventory), with a small proportion of planted park trees. To obtain a more complete picture of the City's planted tree population, the inventory will need to be expanded and updated over time.

Diversity

Planting a diverse urban forest is important for resilience [19]. The most recent guidance recommends 5-10-15 as a rule-of-thumb so that urban forest populations have no more than 5% of any one species, 10% of any genus and 15% of any family [20, 21]. The rule is meant to limit vulnerability in the urban forest population from pests and diseases that target specific species or genera of trees. However, it is also important the species planted in the urban forest perform well so diversification needs to be achieved with urban tree species that are proven performers in Abbotsford. The City has found nursery stock limits the species available for planting and that a diversity target of 10-15-25 is more realistic and acceptable for Abbotsford. Generalized diversity targets should not apply to natural forests because they could conflict with ecological objectives.

Abbotsford's tree inventory is composed of 26% maple genus followed by 9% oak. At the species level, red maple (*Acer rubrum*) is at 14%, and the next most abundant species are at 5%. The high proportion of maple in the tree inventory exceeds guidelines for urban forest diversity.



Fourteen genera make up 80% of Abbotsford's inventoried tree population.

Many of the trees in Abbotsford's inventory are young street trees like this linden.

Age, size and genetic diversity are also important for maintaining stability in urban forest populations over time. Urban trees tend to have shorter lifespans than those in natural forests [23], so maintaining a higher proportion of young trees in the population promotes stability by ensuring there are enough young trees to survive to maturity. Age diversity guidelines for urban forests suggest that 40% of an urban forest should have a diameter at breast height of less than 20 cm, 30% between 20-40 cm, 20% between 40-60 cm and 10% greater than 60 cm [22].

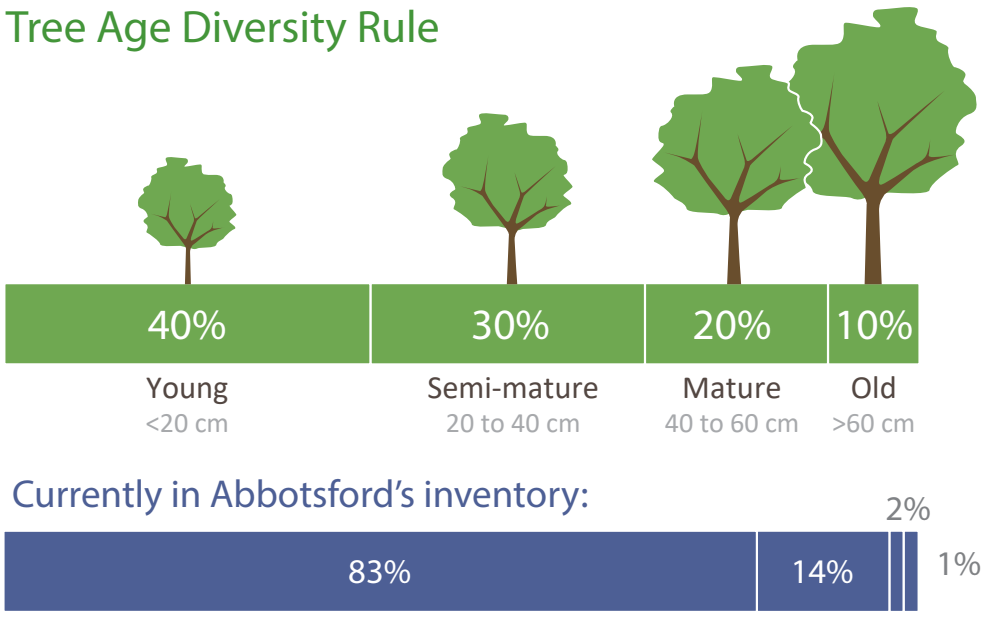
Abbotsford's inventoried tree population is heavily skewed to young trees, which reflects the more recent efforts to plant and inventory street trees. As Abbotsford's street trees mature, differentiation in size and age class will increase due to variation in size and life expectancy among species.

Condition

Condition is an indicator of the health and structure of trees. Trees in poor condition typically have a shorter life expectancy or require more maintenance therefore it is a priority to have most of the trees in the population in predominantly fair to excellent condition. Currently, the condition of inventoried City trees is largely unknown (87% have no condition rating). However, of those that were rated, less than 5% were in poor condition.

Private Trees

Private yards, rural and agricultural properties hold 85% of the Abbotsford's canopy cover. The City does not maintain an inventory of private trees. Based on the LiDAR canopy work, it is estimated that more than 600,000 trees are found on private land. Height data suggests that trees on private land are, on average, shorter than trees in City parks and roadways. This is may be due to the many small trees planted around homes and farm fields.



Abbotsford's inventoried tree population is heavily skewed to young trees.

Opportunities for Tree Planting

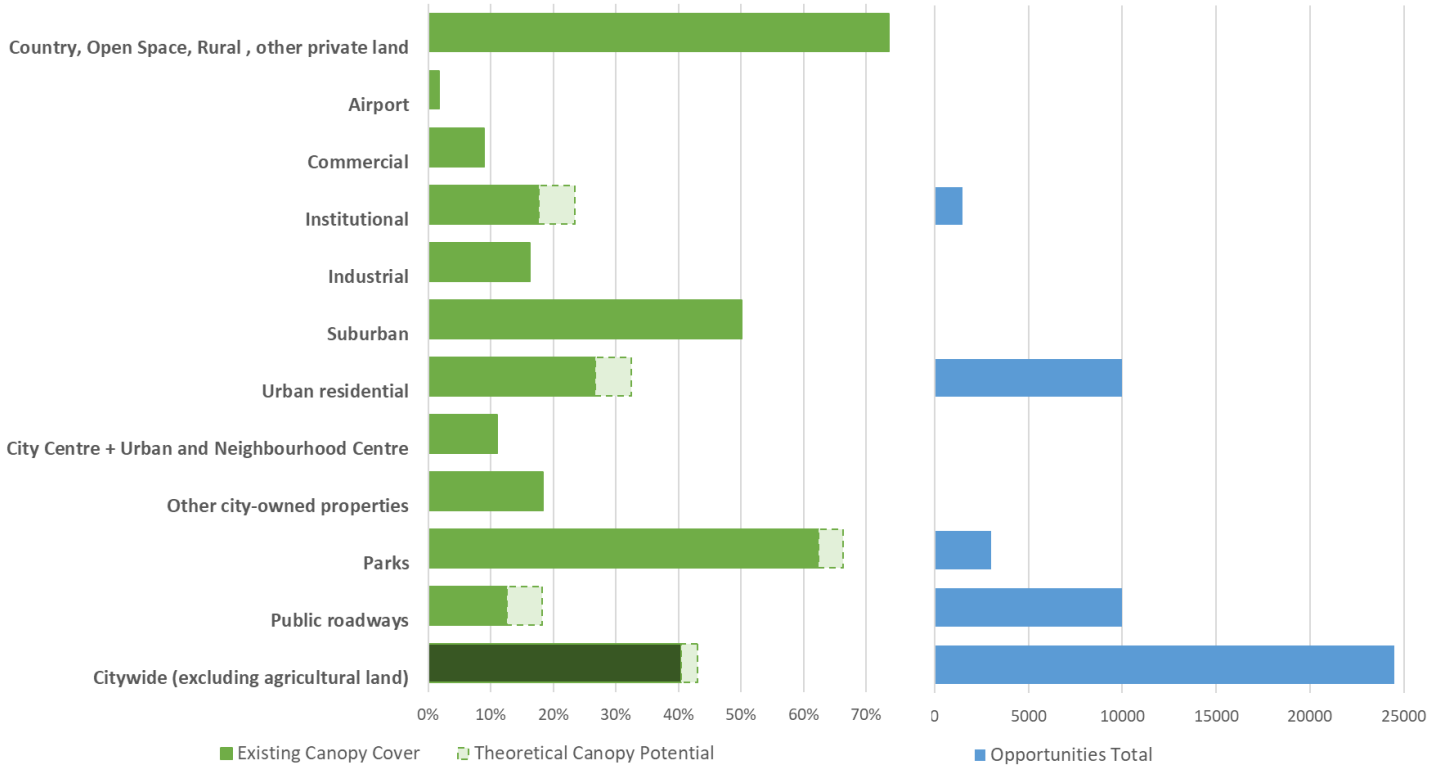
Potentially plantable spaces in Abbotsford were estimated for land uses other than agriculture. To estimate planting opportunities, the permeable area in each land use minus areas of active use (e.g., sports fields etc.) was assumed to be available for planting. A stocking level range of 40-60 stems per hectare was chosen to calculate planting opportunities. In a typical lot in the urban 3 infill area for example, this density would result in two to three trees on each property.

The total number of current planting opportunities in these land uses is estimated at almost 25,000. This estimate does not include areas where new planting sites could be constructed in the future as land is redeveloped.

About half of the current opportunities estimated are on public (roads and in parks), and half are on private land (mostly urban residential and on institutional lands).

No opportunities were assigned to suburban land uses because of their already very high canopy cover. Industrial lands were also assumed to have no opportunities due to the type of use. Abbotsford's City Centre and commercial land uses have very low permeability and low canopy cover due to large building coverage and extensive surface parking lots. Landscaping requirements or streetscape upgrade projects can be used to create improved tree planting in streets and surface parking areas in the future when these areas undergo development.

The graphs below show the current canopy cover and approximate canopy potential if all opportunities were planted. Planting out existing opportunities is estimated to have the potential to increase canopy to roughly 43% city-wide (excluding agricultural land). However, this coarse estimate does not factor in canopy loss due to development or natural causes.



Planting opportunities and canopy potential by land use

Choosing a Canopy Cover Target

Three canopy cover scenarios have been developed to identify a potential canopy cover target. The three scenarios include:

Scenario A: Assumes no further tree planting occurs and no other action is taken.

Scenario B: Assumes all opportunities are planted on public land an no other action is taken.

Scenario C: All opportunities on public and private land are planted over 10 years, bylaws require replacement of all trees removed, minimum density target of 50 stems per hectare post-development and surface parking lot landscaping plans must target 15% canopy cover of trees at maturity.

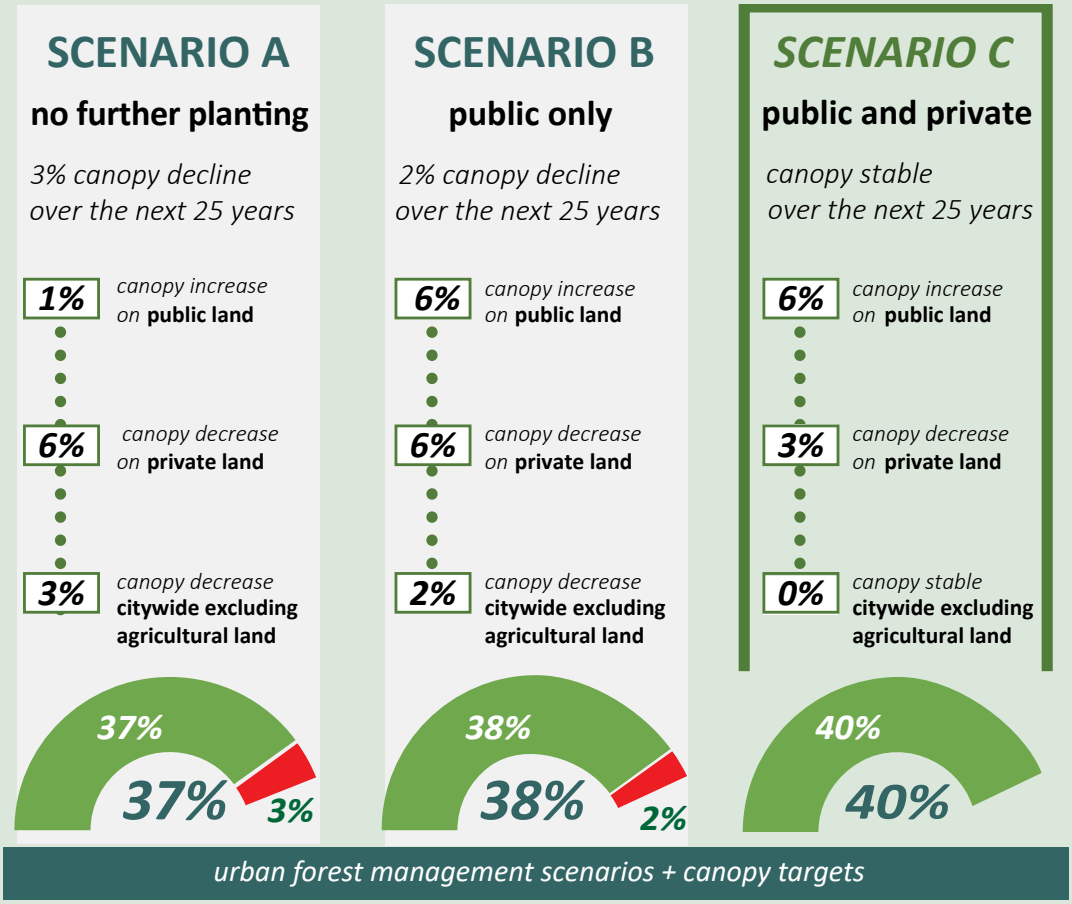
The anticipated 2045 canopy cover under each scenario is illustrated below. Each scenario has been modeled under the same assumptions for tree mortality, growth and development related loss. Country, Rural and Open Space land uses were assumed to remain forested at similar levels to today.

Scenario A explores the anticipated canopy cover if no action is taken. In this scenario canopy continues to decline on private land but remains steady on public land due to growth from recent planting. Canopy is anticipated to decline by about 3% under this scenario.

Scenario B explores canopy outcomes if planting is only prioritized on public land and no other action is taken. Canopy is anticipated to decline by about 2% under this scenario. The small difference is due to the fact that most of the land base is private land and so changes on public land have small impacts on overall tree canopy.

Scenario C explores the canopy outcomes if public and private land are planted, and regulatory changes are made to increase tree replacement. This scenario maintains canopy cover at 40%, and is considered an ambitious target given the level of action required to compensate for canopy loss from future development on private land. A no net canopy loss target is recommended for Abbotsford.

Canopy cover target: 40% by 2045 (no net loss)



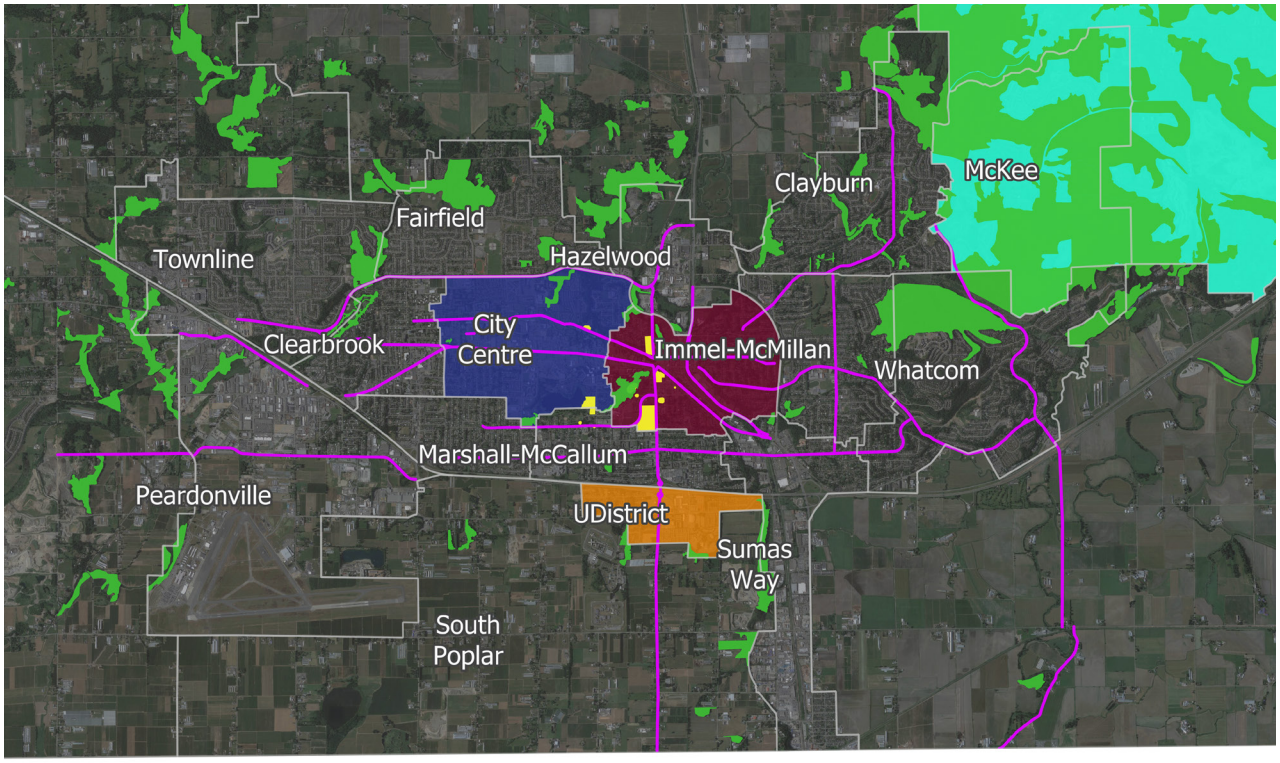
urban forest management scenarios + canopy targets

Urban Forest Character

Trees and vegetation in forests, streets, parks and private yards can significantly influence the character of Abbotsford's neighbourhoods.

The map below defines broad urban forest character for neighbourhood plan areas and highlights city and neighbourhood arterial gateways that could be strengthened with tree planting.

All existing neighbourhood plans seek to increase canopy cover above current levels. Urban forest character is not defined for every neighbourhood because future local area planning processes will capture local aspirations for the urban forest.



Historic Downtown

The neighbourhood plan identifies tree character for signature corridors consisting of Kentucky coffee tree, silver linden and American ash. Commercial streets are to be planted with Cappadocian maple, Japanese snowbell and Persian ironwood.

Sylvan Heritage

Historic trees such as those in Jubilee Park form an important part of the City's heritage landscapes in and around the Historic Downtown neighbourhood. Replacement planting in these locations should consider genetic conservation of the region's heritage trees.

City Centre

The neighbourhood plan identifies tree character for signature corridors consisting of Kentucky coffee tree, silver linden and American ash. Commercial streets are to be planted with Stewartia and paperbark maple.

UDistrict

The neighbourhood plan prioritizes high branching deciduous trees to create visual interest, such as ginkgo, honey locust, purple ash, Persian ironwood and October glory maple.

Significant Stands

Significant stands indicate the presence of protected species, sensitive ecosystems or tall stands of trees found across the landscape. They occur throughout the city in ravines, riparian areas and parks. Natural area character should be enhanced and extended by planting native species adjacent to these areas whenever possible.

City and Neighbourhood Gateways

Many gateway roads are arterials with boulevards and medians that can support medium to large trees. Gateway plantings should create unique urban forest experiences as people move through the city and create a strong sense of arrival in each neighbourhood using features such as significant tree groups, formal avenues and seasonal colour.

5. EXISTING APPROACHES

This section describes how Abbotsford's urban forest is managed today and describes the relationship between existing plans, policies and bylaws most relevant to the Urban Forest Strategy.

Who Manages Abbotsford's Urban Forest?

Managing Abbotsford's urban forest is a shared responsibility. Trees' lives extend over multiple human generations, and Abbotsford's trees and forests have passed through the custody of multiple 'owners' over time. At each point in that chain of custody, a land steward has made a decision to plant, retain or remove trees, leaving the urban forest legacy that Abbotsford has today.

Today's stewards of the urban forest, through their choices, will determine the legacy that will be left for the next generation. Collaboration between stewards of both public and private land will be essential to achieving Abbotsford's 2045 urban forest vision.

On Public Land

On public land and road allowances, Abbotsford's urban forest is primarily managed by the City's Urban Forestry Section, within the Department of Parks, Recreation and Culture. Urban forest management is divided into two main areas:

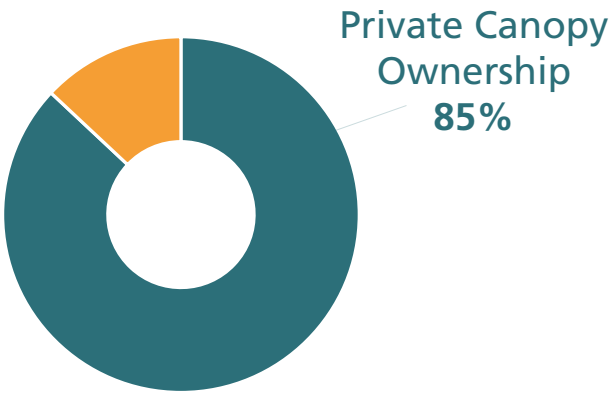
1) Arboriculture, with a focus on street trees and ornamental park trees

2) Trails and natural areas, with a focus on the management of vegetation on trails and natural forests.

Abbotsford's Urban Forestry Section is directly responsible for the management of trees in parks and trees planted in public streets. When trees are on City property managed by other departments (e.g., Engineering and Public Works or City Realty Services), the Urban Forestry Section acts as an in-house consultant and contractor to manage those trees on an as needed basis.

On Private Land

In Abbotsford, **87% of land and 85% of urban forest canopy is under private ownership**. Private individuals and organizations manage the urban forest on private land, sometimes with assistance from green professionals such as local arborists, landscapers and landscape architects. The City influences the private urban forest by regulating tree removal and replacement during the development process, and through educating and partnering with the public and stewardship groups to foster urban forest stewardship.



Guiding Policies

These documents provide the framework for planning and governance in Abbotsford, guiding the aspirations of the Urban Forest Strategy.

Official Community Plan Bylaw (No. 2600)

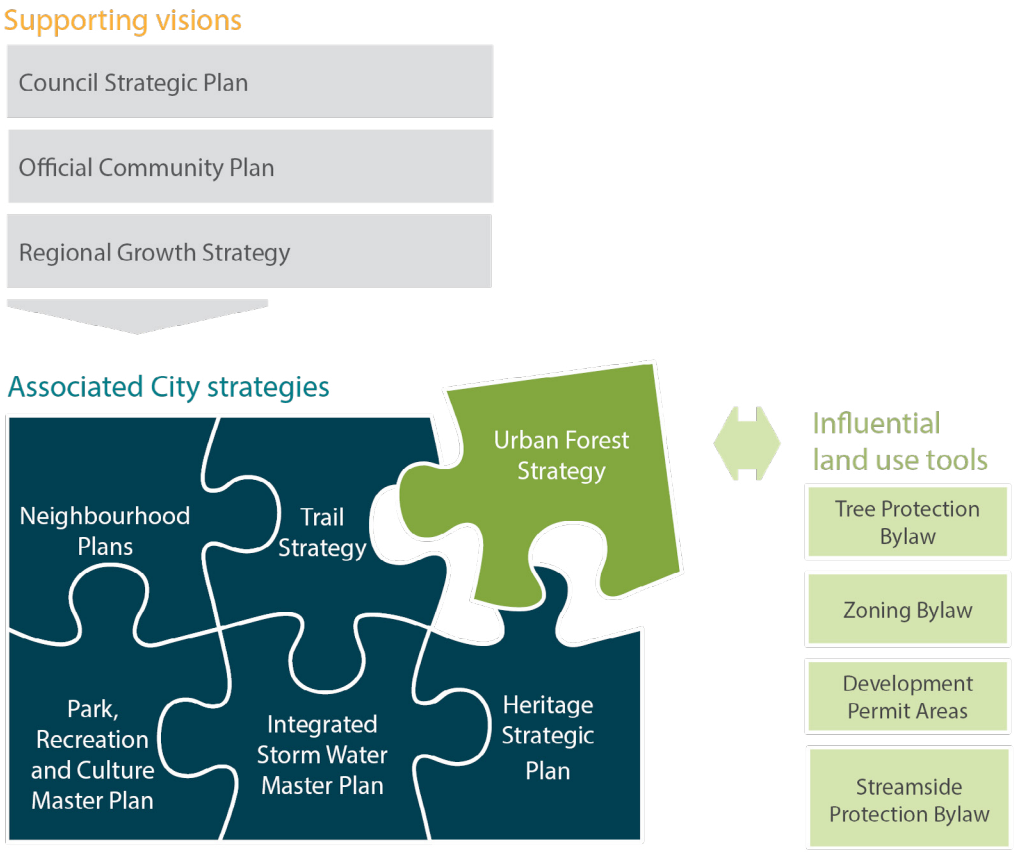
The Official Community Plan (OCP) supports the Urban Forest Strategy by mandating improved natural areas, increasing urban forest cover to a determined target in public spaces, requiring tree conservation strategies during development and accelerating street tree planting efforts over time, among others. The Urban Forest Strategy supports OCP implementation by establishing benchmarks and targets for tree canopy cover, diversity, tree health and making recommendations to improve Abbotsford's urban forestry program. Aligning with Abbotsford's Official Community Plan, the Urban Forest Strategy will contribute to a "green, prosperous, and healthy" city through effective management of Abbotsford's trees and forests

Regional Growth Strategy - DRAFT

As a member of the Fraser Valley Regional District, Abbotsford's planning initiatives comply with the Regional Growth Strategy, which includes goals for responsible land management, protection of the natural environment and creating sustainable communities. As a high-level document, the Regional Growth Strategy defines regional land use at the neighbourhood scale and contains provisions that support the conservation of signature green space and natural areas. The Fraser Valley Regional District is currently updating the Regional Growth Strategy.

Community Sustainability Strategy

The Community Sustainability Strategy provides high-level direction to achieve environmentally sound operations and administration. The Urban Forest Strategy will support the implementation of the Sustainability Strategy by helping to integrate Abbotsford's trees and forest ecosystems with government operations.



Associated Strategies and Plans

These plans inform the Urban Forest Strategy or are relevant for the Urban Forest Strategy's scope and implementation.

Council Strategic Plan, 2019-2022

Abbotsford's Mayor and Council set strategic priorities for each four-year period. The current edition of the Corporate Strategic Plan sets the delivery of the Urban Forest Strategy as a priority for the City under the "Complete Community" goal.

Parks, Recreation & Culture Master Plan, 2018

The Parks, Recreation & Culture Master Plan addresses natural areas and urban forestry. The Plan identified several issues and opportunities that the Urban Forest Strategy can help address, such as: the protection of natural areas within parks from impacts caused by adjacent development; the adoption of best management practices in tree maintenance within park operations and infrastructure development; and, increasing understanding of the urban forest and its multiple values for Abbotsford and Indigenous peoples.

Heritage Strategic Plan, 2020

The Heritage Strategic Plan references Our Sylvan Heritage, by Susan Murray, which identifies a number of trees in Abbotsford with potentially significant cultural value and recommends their protection and commemoration. The plan recommends the development of guidelines for the maintenance and preservation of natural heritage features, including significant trees and culturally modified landscapes such as old fields and orchards. The Urban Forest Strategy supports the Heritage Strategic Plan by including guidance and recommendations for significant tree protection and management.

Neighbourhood Plans

To date, completed plans include the UDistrict, City Centre and Historic Downtown areas. Neighbourhood plans must include elements guiding existing and proposed open space, natural environment areas and policy tools for implementation of the plans. These plans will be highly influential in how the urban forest changes as they provide direction for streetscape improvements and landscaping within areas of high development potential. The Urban Forest Strategy provides tree canopy cover benchmarks and targets, best practices for tree species selection, spacing, soil volume, tree planting and maintenance that can be incorporated into Neighbourhood Plans.

The rendering of the City Centre Neighbourhood Plan vision shows a lush urban forest.

Renderings from the Historic Downtown Neighbourhood Plan also show an abundant urban forest integrated throughout the streets and public outdoor areas.

Integrated Stormwater Management Plans

Integrated Stormwater Management Plans direct the management of the City's stormwater infrastructure within defined watersheds and drainage areas. They contain details of where infrastructure renewal and investment is planned

which can be used to anticipate impacts to trees. The plans include utility standards and acceptable green infrastructure alternatives. The City has several integrated stormwater management plans in place, including for Clayburn Creek, Willnand Creek, Downes Creek and Marshall Creek.

Bylaws and Other Policy Tools

These tools and regulations will work to realize or limit the achievement of Urban Forest Strategy goals and recommendations.

Tree Protection Bylaw (No. 1831)

The City's Tree Protection Bylaw regulates tree protection and replacement on private land in the city. Given that most of Abbotsford's urban forest occurs on private lands, the bylaw is one of the most important tools for influencing city-wide canopy cover and urban forest health over time. In Abbotsford, a tree permit is required to cut trees on most properties within designated urban land uses. The bylaw does not prevent tree cutting so long as a permit application is authorized and the holder of the permit replaces trees at the required ratio. When tree replacements cannot be met, applicants may be directed to plant trees on City property or pay cash-in-lieu to the City for tree planting elsewhere.

The Urban Forest Strategy offers an opportunity for community engagement on the topic of tree protection and will provide rationale for any future updates to the Tree bylaw.

Development Bylaw (No. 2070)

The Development Bylaw is currently under review. Subdivision approvals or other development agreements may regulate the cutting of trees on a subject property instead of requirements under the Tree Protection Bylaw. The Development Bylaw contains construction standards for landscaping and minimum planting strip widths and soil volumes. The Urban Forest Strategy contains standards that can be incorporated into future Development Bylaw updates.

Development Permit Areas (Official Community Plan)

Development Permit Areas are planning tools housed within the Official Community Plan. Currently, the Natural Environment Development Permit Area and Steep Slopes DPA provide additional oversight of tree clearing on sites where high natural values or slope hazards are found, and adjacent to streams and other watercourses.

Streamside Protection Bylaw (No. 1465)

The Streamside Protection Bylaw meets provincial regulatory requirements for protecting fish habitat by subjecting development within defined riparian areas to additional review. Maintaining forest cover within riparian areas is a goal of the bylaw, as forest cover supports positive outcomes for watershed health. Streamside areas are important contributions to the city's total canopy cover, particularly in urbanized areas.

In Development

Abbotsford is working towards a number of additional policies alongside the completion of the Urban Forest Strategy.

Fishtrap Creek Integrated Stormwater Management Plan

Abbotsford is currently preparing a plan for City infrastructure carrying runoff through the landscape of Fishtrap Creek. The plan is not yet available for review, but will contain provisions relevant for urban forest health regarding utility standards and acceptable green infrastructure alternatives.

Trail Strategy

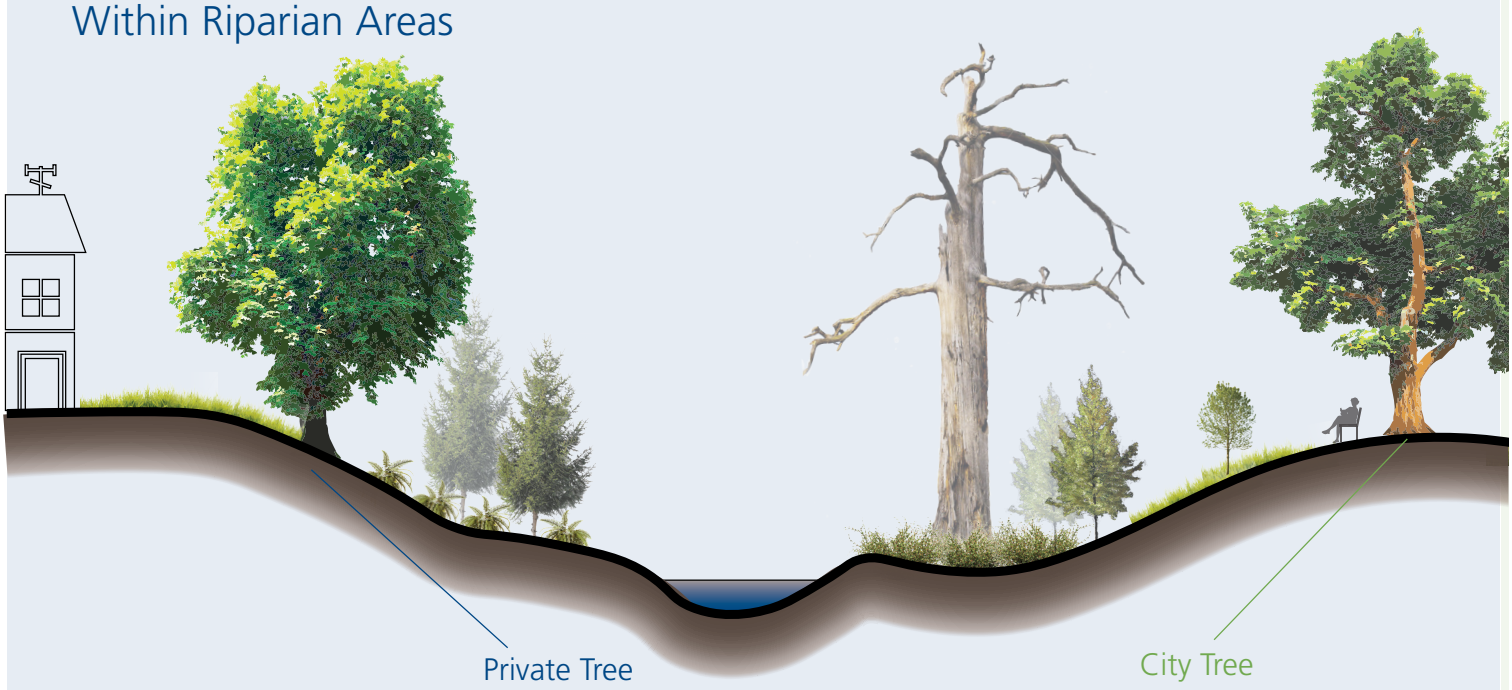
Under the Parks, Recreation & Culture Master Plan, the City is creating a comprehensive strategy to address the completion and maintenance of trails and the development of new trail infrastructure. Trails bring people to trees and forests, enabling the urban forest to offer its benefits for human health and social value. At the same time, trails need to be designed to mitigate the impacts of construction on trees and forests and protect Abbotsford's urban forest from the negative impacts of recreational use.

Quality of Life Survey

In 2018, the City of Abbotsford conducted a Quality of Life Survey to measure baseline community sentiment to determine levels of satisfaction. An additional survey was conducted in 2020 with questions on parks, recreation facilities, programming, and satisfaction with nature. In 2020, 91% of Abbotsford residents were satisfied/very satisfied with opportunities to enjoy nature. The survey results aim to inform future program and service design for the City of Abbotsford.

Summary of Policies Guiding Tree Planting, Retention, Removal and Maintenance

Within Riparian Areas



	Private Tree	City Tree
Preserving or Creating Space for Trees	The **Official Community Plan Bylaw and Streamside Protection Bylaw** restrict **development in** Streamside Protection Environmental Area (SPEA) and sensitive ecosystems**.**	Public works are exempt from the **Streamside Protection Bylaw** but must comply with Provincial and Federal standards and requirements including the Riparian Areas Protection Regulation.
Tree Planting	Restoration planting in a SPEA or natural environment areas development permit area (DPAs) designated by the **Official Community Plan Bylaw** may be required under a **development permit** on the advice of an **assessment report**. Species must be native to the Coastal Western Hemlock biogeoclimatic zone.	The Parks department carries out restoration plantings within streamside areas, using the native species recommended by the Natural Environment DPA guidelines in the **Official Community Plan Bylaw**.
Tree Retention or Removal	Tree removal is typically not permitted within a defined area of a stream or in areas containing a sensitive ecosystem without a **development permit or a tree permit**. An **Assessment Report** must contain measures to preserve trees in the SPEA. The **Official Community Plan Bylaw** promotes tree retention, including protection of wildlife trees, on the developable portion of the lot.	City trees are subject to the **Tree Protection Bylaw** when a tree cutting application is made for private purposes. Within the development permit area, additional protections may apply to on-site trees in order to ensure the continuing function of the protected riparian area. City works are exempt from the Tree Protection Bylaw, but must comply with Provincial and Federal standards and requirements**.** The **Parks Bylaw** prohibits damage to park vegetation.
Tree Maintenance	In general, pruning of trees inside a SPEA or a tree retention area defined in a development related permit is not allowed except with a **tree permit.** For trees outside of the SPEA or a defined tree retention area, owners may prune trees without a permit.	No formally adopted policy guides the maintenance of City Trees except that any trees planted by a contractor under a development permit are subject to maintenance requirements pending final acceptance.

Outside Riparian Areas

City Tree	Private Tree	Private Tree within scope of a Development
The **Development Bylaw** currently defines tree strip width, top soil area and structural soil requirements for non-hard and hard surface areas.	The **Zoning Bylaw** determines building setbacks, lot coverage and off-street parking requirements. The **Development Bylaw** defines driveway widths. The space that remains may be available for hard or soft landscaping.	The **Zoning Bylaw** determines building setbacks, lot coverage and off-street parking requirements. The **Development Bylaw** defines driveway widths. The space that remains may be available for hard or soft landscaping.
City trees may be planted by the City or by a developer as required during subdivision. The **Development Bylaw** includes requirements for siting, spacing, stock and species. The City reviews landscape drawings to determine the required number of trees and may charge a developer fee for each accepted tree, using the money to purchase, install, and maintain the stock.	The **Tree Protection Bylaw** defined the ratio and size of replacement trees for every removed tree. Owners can request to pay cash-in-lieu where suitable planting locations cannot be found on their property.	The **Development Bylaw** requires the planting of a defined number of trees for each single-family lot newly created in a subdivision. Planting stock must meet requirements within Schedule F of the bylaw. Schedule I contains the **Recommended Tree Species** list.
City trees are subject to the **Tree Protection Bylaw** when a tree cutting application is made by a private citizen or company, with no special provisions. City works are exempt from the Tree Protection Bylaw. The **Good Neighbour Bylaw** prohibits damage to boulevard trees.	The **Tree Protection Bylaw** regulates cutting trees, at a set diameter, except for farm use, and all trees growing in tree retention areas. The General Manager may refuse to issue a tree cutting permit for significant trees (none defined) and for trees in tree retention areas where the cutting is not necessary. Protection barriers may be required for retained trees.	The **Tree Protection Bylaw** regulates cutting trees, at a set diameter, for farm use, and all trees growing in tree retention areas. The **Tree Permit**, **Development Permit**, or **Preliminary Layout Approval Letter** will specify requirements for protection of retained trees. Tree removals may be authorized by either a Tree Permit or a Development Permit.
No formally adopted policy guides the maintenance of City Trees except that any trees planted by a contractor under a development permit are subject to maintenance requirements pending final acceptance.	The **Tree Protection Bylaw** regulates pruning of significant trees (none defined) and trees growing in tree retention areas. The **Good Neighbour Bylaw** requires people to keep landscaping from encroaching over roads and obstructing sight-distances.	The **Development Bylaw** requires the [planting] Contractor maintain all plantings for one year from the date of issuance of the Certificate of Substantial Completion (Landscape). This includes watering, pruning, and other activities as may be required to ensure a healthy growing condition.

6. PRIORITIES FOR URBAN FOREST MANAGEMENT

Section six discusses the priority issues for urban forest management in Abbotsford. These issues will significantly impact the quantity and quality of trees in the city for the term of this Strategy and beyond.

Planning for Climate Change

The urban forest provides important services to mitigate the impacts of climate change on Abbotsford's community by absorbing and storing carbon, intercepting stormwater and shading and cooling the air. For example, in 2009 temperatures soared higher than 36°C, resulting in a spike in deaths in the greater Vancouver area [24]. The urban forest can mitigate urban heat by shading hard surfaces and transpiring water into the surrounding air. However, at a time when Abbotsford's urban forest will be needed more than ever, climate change will create stress on trees and ecosystems.

Climate change projections for the Metro Vancouver predict an average annual temperature increase of 3°C in the 2080s [25] but embedded within that are varied seasonal changes that will have impacts on the urban forest. The anticipated climate changes and impacts on the urban forest are illustrated on the next page and include:

- **More frequent extreme weather event**s, such as the 2017 ice storm, which can cause extensive damage and require significant expenditure in responding to safety hazards and restoring damaged trees.
- **Less moisture availability,** which may reduce growth and create drought stress, either directly killing trees or making them more vulnerable to insect pests and disease. Tree species that are less tolerant to reductions in summer moisture availability, such as western redcedar and birch, are already showing signs of stress in some parts of the city. Decline of these species could become more prevalent.
- **Insect pests and invasive plants** may actually do better in our region due to climate change, which could increase the risk of outbreaks and infestations that kill trees and damage ecosystems.
- A potentially positive impact from climate change is that **more urban tree species** may be able to be planted in the region because of milder winters and longer growing seasons.

The impacts of these changes will be amplified by the difficult conditions often faced by urban trees, which include limited rooting environments, soil disturbance and less than ideal maintenance practices. For the urban forest to remain healthy and be resilient in the face of these challenges, Abbotsford's urban forest management will need to address:

- Selecting species well-suited to both site and future climate and testing species not yet seen here
- Ensuring planting selections are compatible with specific elements of City infrastructure, including green stormwater management
- Providing planting sites that maximize permeability, soil volume and quality
- Watering young trees and, where possible, irrigating street trees adjacent to new development sites
- Promoting strong branch structure by pruning trees when young and regularly throughout their lives
- Protecting trees and forest stands from the impacts of development activities and changes in hydrology
- Planning forest retention to conserve biodiversity, protect wet areas that may be buffered from climate change, and reduce risk from falling trees and forest fuel hazards adjacent to homes
- Inventorying and monitoring urban tree and natural forest health, and adapting management when changes are detected
- Preserving ecosystems and biodiversity

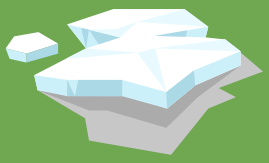
Climate Impacts on the Urban Forest

BY THE 2080s, EXPECTED CHANGES* TO:

TEMPERATURES
Average annual temperature increase of 3°C. Milder winters. Summer extremes of 41°C (1-in-20 hottest day).

EVAPOTRANSPIRATION
Increased rates of evaporation and transpiration from waterbodies, soil and plants.

PRECIPITATION
More rain except in summer. Longer summer dry spells. Less snow.



MELTWATER
Faster snowmelt. Earlier peak spring flows and flooding. Lower late-summer flows.

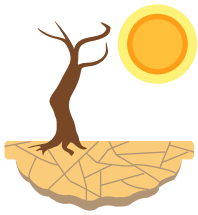
GROWING SEASONS
Longer, warmer growing seasons.

VARIABILITY
More frequent and unseasonal extreme weather

* Projected change is based on modeling for Metro Vancouver using the Intergovernmental Panel on Climate Change's Representative Concentration Pathway 8.5 scenario (RCP8.5), which represents a high emissions pathway with limited mitigation of greenhouse gas emissions by the end of this century (or "Business as Usual").

WILL LIKELY CAUSE

SPECIES DISTRIBUTION SHIFTS
Forest species may shift northward and upslope as heat and moisture conditions exceed their tolerance.



LESS MOISTURE AVAILABILITY
Evapotranspiration rates will increase relative to precipitation, resulting in drier soils and vegetation.

LONGER FIRES SEASONS AND LARGER FIRES
Fires may occur more often and burn larger areas. Fire risk is expected to increase based on warmer, drier summers.

MORE PESTS AND INVASIVE SPECIES
Pests may reproduce more rapidly and more often. Trees and ecosystems may be more vulnerable to attack and invasion.

LONGER, WARMER GROWING SEASONS
Longer growing seasons may support more growth, species diversity and potentially more carbon sequestration.

MORE EXTREME WEATHER EVENTS
Heat, extreme precipitation, freezing rain, heavy wet snow, flooding, landslides, windstorms and other events may happen more often leading to more tree damage.

Preserving Ecosystems and Biodiversity

Abbotsford's character of "a City in the Country" comes from both agricultural and forested landscapes visible from almost every point in the city. This unique character means Abbotsford is still home to rich biodiversity. Healthy ecosystems and biodiversity are essential to the provision of habitat and for sustaining natural processes to support life and help adapt to climate change. Natural ecosystems also play an important role in recreation quality, managing stormwater quality and quantity and recharging the aquifer.

Biodiversity loss from site disturbance, habitat fragmentation and introduced invasive species are common management challenges for urban communities.

Managing ecosystems and biodiversity on public land

Abbotsford's municipal property is home to 792 hectares of the city's significant stands of trees and additional hectares of natural forest. Several key issues require specialized management on public land:

- Many forest stands are composed of pioneer deciduous species, such as red alder and birch, that are dying or dead. This creates hazards from falling trees and also leaves these areas more vulnerable to invasion by non-native species.
- Forest health factors including drought, root rot fungal diseases (e.g., *Kretzschmaria duesta, Ganoderma applanatum, Phellinus weirii*) and insects (e.g., bronze birch borer) are causing branch or whole tree death, or instability in these stands. Climate change is anticipated to exacerbate these impacts.
- Invasive species are present throughout the city. but the extent of infestations is not inventoried and treatment is currently limited to knotweed.
- Up to 70% of the operational budget for PRC and Natural Areas is currently spent on risk assessment and hazard abatement. New development and new trails are steadily increasing the area requiring risk assessment each year.
- Forest stands on public land adjacent to road edges are not managed by Urban Forestry, and are not proactively risk assessed.

To increase the resilience of ecosystems and biodiversity on public land, urban forest management will need to address:

- Replacement of dead and dying early successional stands with long-lived later successional and climate adapted species
- Restoration of already degraded natural forest ecosystems, and requirements that developers mitigate tree risk, degraded soils and invasive plants prior to acceptance of new parklands
- Maintaining the current proactive risk assessment program for natural areas and incorporating roadside forest edges into proactive risk inspections and hazard abatement
- Inventorying natural stands and invasive species, and developing a plan for integrated pest management
- Continuing to work with stewardship partners to obtain grants and volunteers to assist with natural area restoration
- City-wide planning through a biodiversity strategy to guide the long-term vision for habitat restoration, connectivity, preservation and land acquisition

Abbotsford's natural forest areas are an important part of the city's character and natural heritage.

Managing ecosystems and biodiversity on private land

Most of the city's ecosystems are found on private land. The City has established Natural Environment Development Permit Area Guidelines (DPA guidelines) to protect riparian habitat within 50 m of streams and terrestrial habitat classified as sensitive ecosystems.

The DPA guidelines establish setbacks from development, promote conservation of groups of trees and wildlife trees and guide restoration work including planting and invasive species removal. The City's Tree Protection Bylaw works in tandem with these guidelines.

Several key issues need to be addressed to protect ecosystems and biodiversity on private land:

- The DPA guidelines address preservation of existing sensitive ecosystems, but not broader goals of connectivity or restoration to increase the resilience of these ecosystems.
- Hazard trees do not require replacement under the current Tree Protection Bylaw.
- When only a few trees are impacted in the DPA guidelines, an exemption can be granted and a Tree Cutting Permit can be issued instead but the Tree Protection Bylaw does not require replacement with appropriate native species.
- Tree protection enforcement is limited, which means that damage to trees at the edge of Natural Environment Development Permit Areas is not always detected.
- Windfirm boundaries are not always well designed, which can result in edge trees blowing over post-development.

To increase the resilience of ecosystems and biodiversity on private land, urban forest management will need to address:

- City-wide planning through a biodiversity strategy to guide the long-term vision for habitat restoration, connectivity and preservation that informs the DPA guideline updates
- Updates to the tree bylaw to close gaps in appropriate tree protection and replacement in Natural Environment Development Permit Areas

Biodiversity strategies complement Urban Forest Strategies. Where the Urban Forest Strategy is focused on the protection, management and enhancement of individual trees and forest stands to produce ecosystem services and minimize risks, a biodiversity strategy is focused on protecting, enhancing and acquiring natural ecosystems and habitats to support biodiversity. The extent of forested and non-forested ecosystems in agricultural, urban and rural areas of the city, and the City's commitment to enhancing the natural environment and biodiversity as part of its Community Sustainability Strategy, warrant a comprehensive plan for managing Abbotsford's biodiversity as the city continues to grow.

Development often creates new forest edges, subjecting trees to increased wind exposure.

Many birch, red alder and bigleaf maple trees in greenbelts show signs of stress, likely due to moisture stress and forest health factors. Declining trees increases demand for tree risk inspections and mitigation.

Conserving Soils and Water

Soil and water are key ingredients for growing healthy and resilient trees. We often focus on elements above ground when thinking about trees and forests. However, a vast amount of living biomass is below ground, including plant roots, fungal mycorrhizae and soil animals. Recent work by researcher Suzanne Simard and others has been exposing the importance of mycorrhizal fungal networks for facilitating inter-tree communication. These networks have been found to enhance understory seedling survival, growth, nutrition, and mycorrhization, improve plant defense chemistry and kin selection and enhance the health of the whole forest ecosystem [26, 27].

Soil is essentially a water storage reservoir replenished by rains and runoff that trees access throughout the year. In urbanized areas, concrete and compacted soils can limit the volume of water stored in the soil and impede water movement into or out of the soil [15].

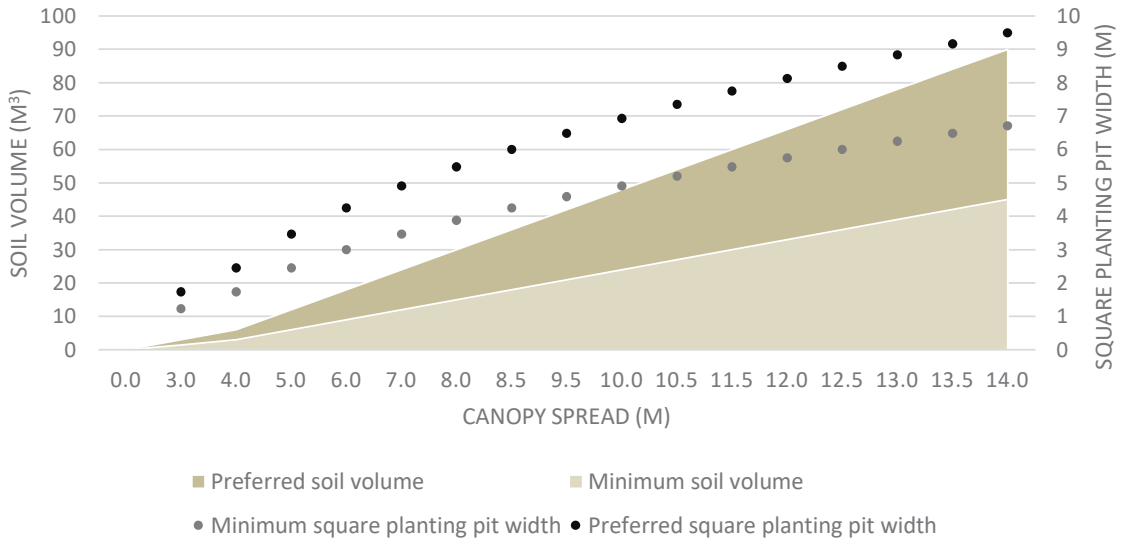
Given the importance of soil for biodiversity and plant productivity, management of soil in urban environments warrants more attention. The Green Infrastructure Partnership and municipalities such as Vancouver have been developing guidance for improving soil management to enhance green infrastructure performance. For example, the Green Infrastructure Partnership has developed a technical primer on how to obtain a performing topsoil layer to advance rainwater management [28], and Vancouver has a Best Management Practice Toolkit [29] for its Integrated Stormwater Management Plan.

Several issues need to be addressed to improve soil and water conservation including:

- Loss of native topsoils and compaction of sub-soils which reduces the land's capacity to support healthy trees post-development
- Inadequate provision of soil post-development which can decrease tree life expectancy and increase life-cycle maintenance costs
- Grading and servicing for subdivisions can result in hydrological changes that may impact adjacent natural stands of trees with either drought or waterlogging
- The Development Bylaw presently requires 14 cubic metres of structural soil in hard surfaced areas, which is only adequate to support a small tree

To improve soil and water management, urban forest management will need to address:

- Minimum soil volume requirements for trees in hardscape (see graph below)
- Updates to construction standards to allow soil cells or other engineering solutions that float pavement over intact soil profiles where appropriate
- Improvements to stormwater management approaches to achieve outcomes that both manage stormwater and improve tree health and resilience to climate change



Preferred and minimum soil volumes and tree pit dimensions for planting sites based on providing between 0.3 and 0.6m³ of soil per 1m³ of canopy projection [29]

Valuing Trees as City Assets

Public trees are assets that require management and provide services, similar to other City infrastructure. Unlike traditional, engineered assets, trees appreciate in value as they grow. Trees need to be managed proactively to ensure they can grow to maturity and maximize benefits while minimizing risk and costs.

Intensively Managed City Trees

Municipalities are increasingly incorporating trees into their asset management systems to account for their life-cycle costs, maintenance cycles, replacement time frames and asset value. Some municipalities are also exploring integrating other natural assets into these frameworks.

Several key issues for intensively managed trees could be addressed through an asset management approach including:

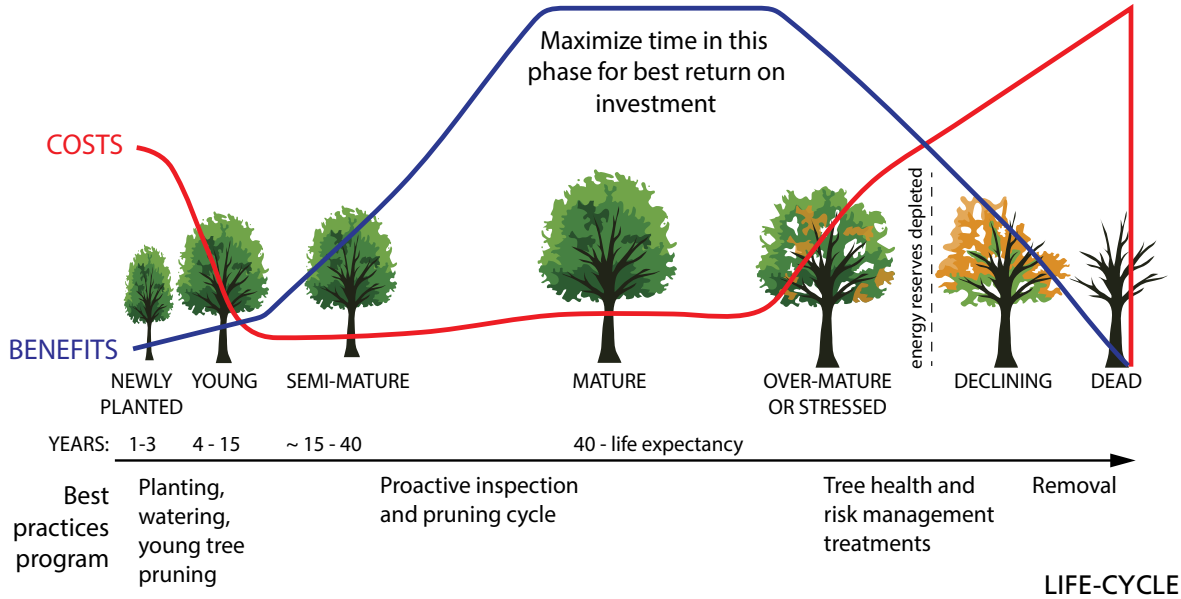
- Inadequate resourcing to plant or maintain trees at the level that will be required to achieve canopy targets or meet best practices
- Climate hazards increase the importance of regular watering and pruning, and current resourcing levels cannot achieve best practices maintenance
- Incomplete inventory of City tree assets makes it challenging to determine the appropriate budget levels
- Poor quality planting environments increasing the risk and cost of urban forest management by requiring frequent removal and replacement

To improve City tree asset management, urban forest management will need to address:

- Defining anticipated asset life cycles, levels of service and performance targets for the program to meet
- Expanding and updating the City's tree inventory to capture all intensively managed specimen trees, vacant planting sites and replacement costs and life cycles
- Transitioning to a proactive tree maintenance cycle so that every tree is visited and pruned if necessary within a known time period
- Planting at a rate that will replace trees removed and meet the City's canopy cover target

Asset life cycles for street trees could range from 30 years (downtown commercial) to 70 years (gateway boulevard). In parks, asset life cycles could range from 50 to 150 years, dependent on species. It is possible to plant and manage a tree with a useful life expectancy of more than 100 years - much longer than most other types of infrastructure assets.

Over a tree's life-cycle, the greatest costs are at the time of planting and removal (see the diagram below). Planting long-living trees in suitable locations, combined with proactive maintenance, extends the beneficial service life of trees.



LIFE-CYCLE COSTS

Trees cost the most at the start and end of their lives and produce the greatest benefits in the middle, when they are healthy and mature. Good tree planning, selection and maintenance maximizes each tree's healthy lifespan and minimizes how often the City has to pay removal and replanting costs.

Natural Area Trees

Abbotsford's natural areas also provide significant ecosystem services to the community, particularly when it comes to stormwater management and recharging the city's aquifer.

The Municipal Natural Assets Initiative has emerged to work with communities to value the services that natural resources and ecosystems provide in municipal asset management and financial planning. Green infrastructure can then be used to build living resilience into community infrastructure as cities grow and renew their municipal assets. Abbotsford could consider the initiative to pilot incorporating natural assets into the City's asset management system.

Issues in natural forests that could be addressed through an asset management approach include:

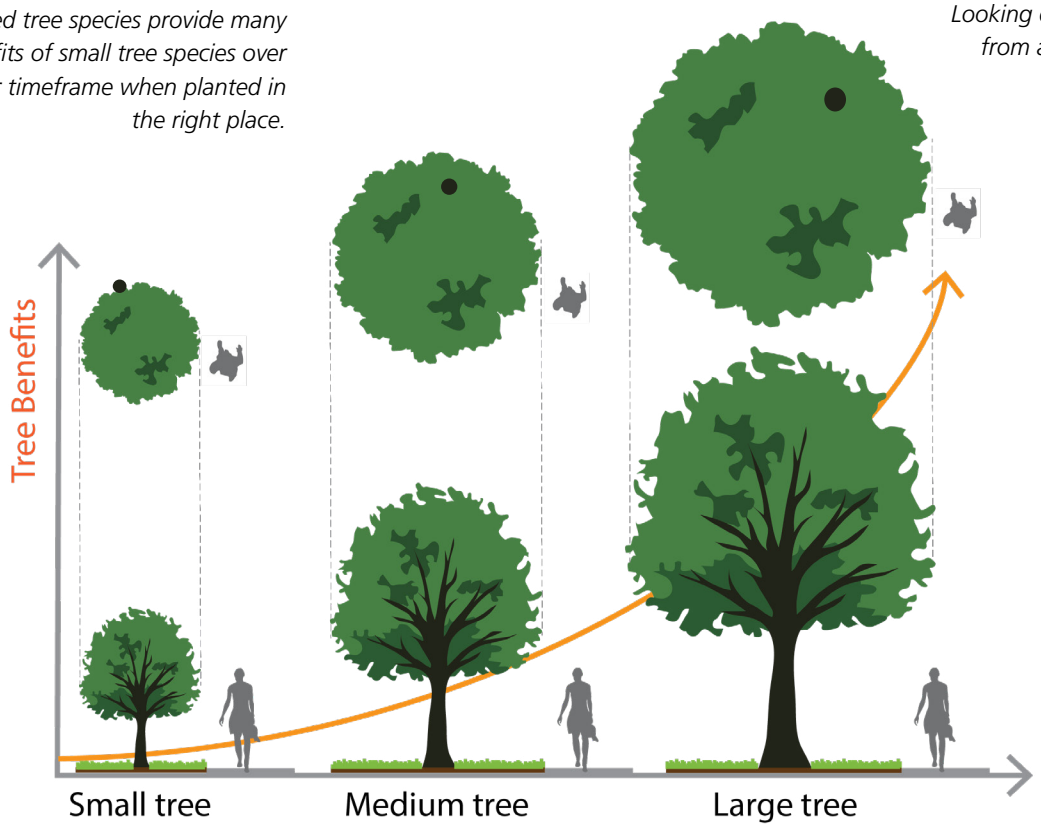
- Inconsistent standards of service for managing forest trees in parks compared to in road rights of way
- Declining tree health in forests stands and Inadequate resourcing to inventory or restore forest health in natural areas
- Continuous increases in the extent of forest edge requiring hazard assessment without accompanying budget

To improve natural area tree asset management, urban forest management will need to address:

- Defining levels of service and performance targets for the program to meet
- Inventorying the location and length of all trails and forest edges requiring hazard assessment and abatement
- Inventorying forest stands for structural stage, species composition, forest health issues, invasive species and the proportion of live and dead trees
- Transitioning to inspecting and abating tree hazards on roadside forest edges
- Proactively removing pioneer species and underplanting with long-lived forest species

THE LARGE TREE ARGUMENT

Large, long-lived tree species provide many times the benefits of small tree species over a much longer timeframe when planted in the right place.



Streetscape Improvements

In 2017, canopy cover over Abbotsford's streets was estimated at 13%. In contrast, Vancouver's tree canopy over streets is higher, averaging 24%. A survey of Abbotsford residents indicated there is room to improve Abbotsford's streetscapes, with most people being unsatisfied with their current streetscape and instead preferring:

- Regularly spaced medium or large trees, or
- Irregularly spaced, diverse mix of trees.

In total, 81% of respondents want canopy cover increased along streets. In addition, many people want to see increased tree planting in low canopy areas such as City Centre. However, several key issues need to be addressed to improve tree cover in streetscapes and low canopy areas including:

- Lack of defined street tree standards have resulted in boulevards that are often too small for street tree planting.
- Small boulevards and/or improper species selection of newly planted trees create infrastructure conflicts such as sidewalk cracks or buckling, even when trees are relatively young.
- High density developments sometimes require removal of both onsite and offsite trees because of the extent of excavation and underground parkades, which also restricts future street tree planting.
- City Centre neighbourhoods and higher density subdivision and commercial areas have high impermeability because of the building footprints on private land, driveways, parking lots, wide sidewalks and roadways.
- In newly constructed neighbourhoods, boulevard tree planting strips often fail to meet the standards of the Development Bylaw due to lack of enforcement.
- In existing neighbourhoods, streetscapes often lack boulevards so the City right-of-way is blended with the front yard and the resident may not support the City planting a tree in that location.
- Narrow tree strips more often result in reduced tree growth, life expectancy, and infrastructure conflicts such as lifting sidewalks or utility maintenance conflicts.

Streetscape improvements can be made either by planting trees in existing boulevards or with future development to construct new planting spaces. To improve streetscapes, urban forest management will need to address:

- Increasing the rate of tree planting into existing spaces and new spaces created through development.
- Using future neighbourhood planning processes to clearly define urban forest character at the neighbourhood scale to guide future streetscapes.
- Requiring adequate rights-of-ways, excavation set-backs and soil volumes to support large canopy trees on public land in high density areas like downtown.
- Increasing the minimum soil volumes required and support the use of modular-suspended pavement systems in new streetscapes.
- Using transportation improvement projects or other Capital works to retrofit tree planting while also integrating stormwater management objectives and enhancing the climate adaptation benefits in those streets. The federal government has been funding green infrastructure projects and climate innovation projects in municipalities, including tree planting.
- Engaging with existing land owners to increase street tree planting in areas without tree planting boulevards. Regulation of Tree Protection and Replacement.

An enhanced streetscape and surface parking area with stormwater management was installed as part of the Jubilee Park Improvement Project.

Regulation of Tree Protection and Replacement

The rate of development in Abbotsford has been increasing rapidly, as indicated by the value of building permits almost doubling between 2015 and 2019. Development brings both challenges and opportunities for preserving and growing the urban forest.

When land use changes from forested land into a subdivision, there is no practical way to retain or replace the equivalent forest canopy cover in that same location. While development will result in the loss of existing trees, there are practices that can be implemented through the development process to improve tree protection and planting outcomes. If strategies are applied across the city, it may be possible to offset future canopy losses.

Members of the community have expressed the need to improve tree protection. In the survey developed for the Urban Forest Strategy, the majority of respondents want to see:

- City trees protected
- A minimum number of trees retained or replaced during development
- Private trees protected

The main types of regulation that influence tree preservation and replacement in Abbotsford are the tree bylaw, natural environment development permit area and the zoning bylaw. Issues to be addressed through updates to urban forest policy include:

- Inadequate space for tree retention or large tree replacement on newly developed lots due to what is permitted to be built under zoning.
- Lack of clarity for tree retention/replacement outcomes, standards and specifications for development.
- Lack of clear information requirements for arborist reporting standards.
- Lack of resources to review tree plans for development permits, monitor and enforce planned tree retention, removal and landscape creation for tree planting.
- Lack of resources to review landscape plans and follow up on implementation of approved landscape plans.
- The tree bylaw does not include provisions for appropriate tree replacement outcomes in natural environment development permit areas.
- Hazardous and dead trees do not require tree replacements.
- No policy speaks to the standards for City tree protection, removal and replacement for construction activities on City land.

To improve regulation of tree protection and replacement, urban forest policy updates will need to explore:

- Dedicated space or setbacks to provide soil areas for trees with development
- Requiring a minimum of 60 tree per hectare be achieved post development
- Incentives to retain trees with development
- Strengthening the tree bylaw to restrict cutting of large, healthy trees, and require replacements for more trees
- Developing a City tree policy to establish standard for tree protection, removal and replacement on City lands
- Creating a development arborist position to review development related applications and capital projects
- Establishing standards for tree retention and replacement within natural environment development permit areas consistent with Ministry of Environment standards

A bigleaf maple tree retained as a feature of a new development

Stewardship

Managing Abbotsford's urban forest is a shared responsibility. Collaboration between stewards across public and private land will be essential to implement the Urban Forest Strategy, particularly given that most of the tree canopy is found on private land. Survey respondents during community engagement showed interest in stewardship themes, including improving community knowledge of tree selection and siting, tree care and public stewardship opportunities.

Volunteer stewardship is focused on engaging individuals and groups in specific activities such as tree planting and invasive plant removal, as well as forming partnerships for managing specific areas. Regular corporate grant-funding from TD, TransCanada Trail, BC Hydro and Tree Canada supports volunteer stewardship. Abbotsford is home to many groups actively engaged in stewardship, including the Abbotsford/Mission Nature Club, Fraser Valley Land Conservancy, Abbotsford School District, British Columbia Institute of Technology (BCIT) and University of the Fraser Valley.

Stewardship groups have initiated secured capital and project managed restoration plantings within Abbotsford and add much needed capacity to the City's planting efforts natural areas.

Several issues need to be addressed to improve urban forest stewardship in Abbotsford including:

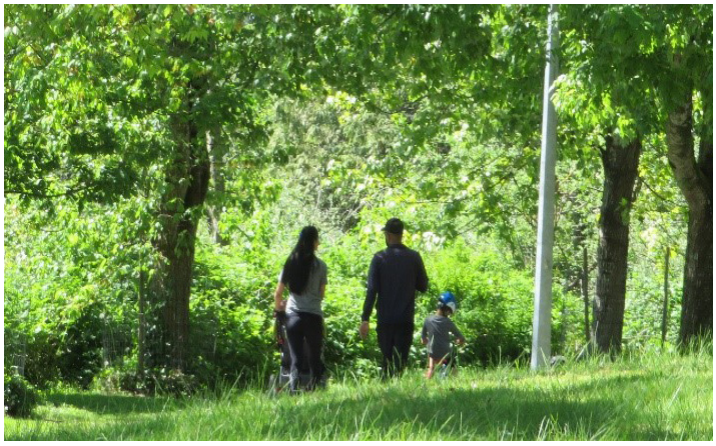
- Limited capacity among residents to plant and care for trees on private property despite the significant opportunities that exist
- Support from residents for the City to plant street trees, and resident support to help water newly planted trees on City property
- Limited City capacity to meet the demand for urban forest stewardship opportunities from community groups and schools
- Untapped capacity from academic institutions and other levels of government to improve knowledge of Abbotsford's urban forest and implement the Urban Forest Strategy

To improve stewardship outcomes, urban forest management will need to address:

- Planning and resourcing an urban forest stewardship program
- Establishing and adopt-a-tree program for residents to water new trees
- Exploring new ways to work together with local people and organizations to increase private land tree planting
- Partnering with organizations to implement the Urban Forest Strategy and adapt to climate change challenges
- Providing grants or support for people to plant and maintain private trees

7. VISION, GOALS AND ACTIONS

Abbotsford's urban forest vision and goals were informed by the aspirations and values expressed by the community during public engagement. This section summarizes the goals and associated strategies, targets and actions that will guide implementation of the Urban Forest Strategy.



The 2045 Vision:

Abbotsford's vibrant urban forest celebrates our city's beauty, identity and environment. The city's forests are connected by a network of rural forests, parks, treed yards and tree-lined streets that deliver nature into every neighbourhood and into the heart of our thriving City Centre. Abbotsford's healthy, well-managed urban forest shows our commitment to sustaining our natural heritage and to our community's green, prosperous and healthy future.

The Strategy is built around five goals:

1. **PLAN** for a connected Green Network of trees and natural assets

Changes in municipal policy and planning are fundamental to preserving a healthy environment for trees, forest ecosystems and people in the long-term.

2. **PRESERVE** trees strategically on public and private land

To minimize future canopy loss, strategic tree preservation is needed throughout the city, with an emphasis on high-value trees and forests.

3. **MANAGE** public trees so they are healthy and safe

Public trees are part of the City's "green infrastructure", and require regular maintenance to secure a long, useful service life.

4. **GROW** the urban forest equitably

Prioritizing equitable growth of the urban forest can ensure all residents of Abbotsford have fair access to trees, greenery and ecosystem services.

5. **PARTNER** broadly to foster urban forest stewardship

A diversity of partners needs to be engaged to implement the Urban Forest Strategy because the urban forest spans public and private land and has many land uses.

Goal #1: **PLAN** for a connected green network of trees and natural assets

Planning for a connected Green Network will ensure that trees and other natural assets are appropriately preserved, grown, managed and stewarded as Abbotsford continues to grow.

Strategy: Establish canopy cover targets
(excluding the Agricultural Land Reserve)

Action 1: Adopt 2045 canopy cover targets to maintain city-wide canopy cover at 40%, with sub-targets for:

- Urban development boundary canopy cover exceeding 25% with no neighbourhood less than 20% (excluding airport)
- Public land canopy cover exceeding 30%

Action 2: Re-measure LiDAR derived city-wide canopy cover polygons every 5 years to update urban forest metrics.

Strategy: Develop a City tree policy

Action 3: Develop a City tree policy to establish criteria for City tree removal decisions, tree planting and pruning request response and timing protocol, tree protection standards and commit to City tree replacement at a 1:1 ratio.

Action 4: Update or create new recommended species lists for streets, landscaped parks and streamside restoration areas that incorporate future climate suitability.

Action 5: Integrate City tree protection and replacement requirements into contracts and holdbacks related to public works and capital projects.

Action 6: Pursue 'Tree City' status through the Tree Cities of the World program to recognize Abbotsford's commitment to caring for its trees and forests.

Action 7: Create an interdepartmental working group to support implementation of the Urban Forest Strategy.

Strategy: Develop a biodiversity strategy

Action 8: Develop a biodiversity strategy to update the Sensitive Ecosystem Inventory (if necessary), define green infrastructure network of connected natural assets and update the Natural Environment Development Permit Area. Prioritize land acquisition for natural areas and prioritize city owned and managed natural areas for enhancement and adaptation.

Action 9: Develop native forest management plans for City owned and managed natural areas including site-level adaptation plans to replace dead/dying early successional stands with long-lived later successional and climate adapted species. Create site-level enhancement plans to restore degraded natural forest ecosystems.

Goal #2: **PRESERVE** trees strategically on public and private land

Preserving existing trees strategically is an efficient way of maintaining maximum benefits from the urban forest.

Strategy: Strengthen tree protection and replacement on all private land

Action 10: Update the tree bylaw to align with the Urban Forest Strategy targets and strengthen tree protection and replacement for trees on private land including natural environment development permit areas.

Action 11: Develop a Terms of Reference for arborist reports and tree surveys. Require letters of assurance for arborist supervision, require tree planting locations to be submitted with tree replacement plans and require GPS coordinates of planted trees upon confirmation of planting.

Action 12: Consider the need for a Development Arborist position to provide tree comments for all development related applications, and to issue and enforce tree permits. Consider the need for an Urban Forest Manager position to implement the Strategy.

Action 13: Develop standard operating procedures for staff to apply the updated Tree Bylaw in a fair and consistent manner and create communications material to communicate changes and guidance to permit applicants.

Action 14: Create a significant tree nomination process to populate Schedule "D" of the Tree Bylaw.

Strategy: Prioritize the protection of significant stands of trees

Action 15: Consider updating the Natural Environment Development Permit area (Map 13 of the Official Community Plan) to include Significant Stands identified by the Urban Forest Strategy.

Strategy: Improve planting sites construction standards for streetscape and development

Action 16: Consider updating the Development Bylaw to increase soil volume and spacing requirements.

Action 17: Consider updating the Development Bylaw to support use of modular suspended pavement systems, require irrigation, increase the minimum boulevard planting strip width, encourage retention or stockpiling of topsoil and establish a hierarchy of preferred and alternative standards for streetscape elements.

Action 18: Improve the inspection and enforcement process for confirming planting sites have been constructed per City requirements.

Action 19: Update internal servicing review processes to ensure that space for utilities and trees are designed into projects.

Action 20: Identify effective methods and opportunities to use low impact design, retain forest to manage hydrological impacts, repair sidewalks without tree removal and configure utilities and infrastructure to minimize conflict with trees.

Goal #3: **MANAGE** public trees so they are healthy and safe

Maximizing benefits and minimizing risk from trees requires best practices approaches to tree management to ensure that public trees are healthy and safe.

Strategy: Establish levels of services for urban forest management and integrate trees into the asset management system

Action 21: Transition from a reactive to a proactive pruning and risk inspection cycle for specimen trees.

Action 22: Define levels of service targets for specimen tree and natural areas planting and maintenance operations.

Action 23: Develop a 5-year plan to transition to recommended urban forest management operations service levels.

Action 24: Explore opportunities that considers the annual operational budget impact for each new tree added to the City maintained inventory.

Action 25: Explore opportunities to participate in the Municipal Natural Assets Initiative, or other similar initiatives, to quantify the value green infrastructure serves in municipal asset management systems.

Action 26: Explore Federal Government climate adaptation and resilience funding options to support implementation of the Urban Forest Strategy.

Action 27: Establish and monitor performance targets for specimen trees and natural areas.

Action 28: Track poorly performing specimen tree species or cultivars and proactively replace those species.

Action 29: Review and/or prepare response protocols for extreme damage or mortality event scenarios (e.g., storms, earthquake, etc.).

Action 30: Develop an Integrated Pest Management plan.

Strategy: Update the City's inventory of specimen trees and natural stands

Action 31: Update and expand the City's specimen tree inventory to capture all intensively managed trees and vacant planting sites.

Action 32: Inventory City owned and managed forest stands for structural stage, species composition, forest health issues, invasive species and the proportion of live and dead trees.

Strategy: Develop a tree risk management policy

Action 33: Develop a tree risk management policy to guide operational tree risk management.

Action 34: Define any specific risk assessment areas for inspection at more frequent intervals than the pruning cycle and following storm events.

Action 35: Define acceptable risk mitigation options for retaining old trees and wildlife trees in parks and natural areas.

Action 36: Collect statistics on current tree risk claims by area, species and age or size class and maintenance history.

Goal #4: **GROW** the urban forest equitably

Increasing tree canopy in low canopy neighbourhoods will ensure that everyone in the community benefits from the urban forest.

Strategy: Increase City tree planting in areas with low canopy cover

Action 37: Prioritize tree planting in neighbourhoods within the Urban Development Boundary with less than 20% canopy cover.

Action 38: Develop 5-year area planting plans to prioritize and guide tree planting across the city and to define how and where the annual tree planting program will achieve canopy cover and diversity performance targets.

Action 39: Plant 500 to 1,000 new specimen trees per year, and 1,000 to 2,000 seedlings per year in natural areas.

Strategy: Identify areas of the city and types of development where new opportunities and strategies for tree retention and planting could apply

Action 40: Consider updating the Zoning Bylaw and development guidelines to establish permeability targets, and provide adequate space and soil volumes to support medium to large trees.

Strategy: Require more tree retention or replacement across all types of development

Action 41: Use neighbourhood planning processes to clearly define urban forest character and canopy targets that will guide future streetscape outcomes.

Action 42: Pursue opportunities for new and unique planting sites in the public realm.

Action 43: Require land transfer or parkland dedications including natural or treed areas to address soil mitigation, tree risk and invasive species issues prior to acceptance by the City.

Action 44: Require that commercial surface parking areas achieve a density of 1 tree per 6 stalls supported by a minimum soil volume of 20 cubic metres per tree (15 if shared) and, for very large lots, configured for stormwater management.

Action 45: Establish a stocking level target of 60 trees per hectare (or an equivalent canopy area target) for all new development.

Goal #5: **PARTNER** broadly to foster urban forest stewardship

Responsibility for preserving, managing and growing the urban forest is shared between the City and all those who manage and care for land in Abbotsford.

Strategy: Develop and implement a communications and stewardship plan

Action 46: Develop and implement a communications and stewardship plan that explores opportunities to share key messages about the urban forest, engage community members in stewardship and provide educational opportunities.

Action 47: Explore opportunities to enhance environmental education within the City/Urban Forestry to implement engagement actions.

Action 48: Provide the canopy cover and other urban forest data on a public map viewer and Open Data system.

Action 49: Host the Urban Forest Strategy and implementation updates on the City's urban forestry page.

Strategy: Partner broadly on Urban Forest Strategy implementation

Action 50: Partner with government, municipal and third party utilities and green industry to implement the Urban Forest Strategy and address climate adaptation challenges.

Action 51: Partner with government and the agricultural sector to implement stewardship programs that would support farmers to preserve and restore forested areas.

Action 52: Partner with institutions such as BCIT, University of the Fraser Valley and UBC Urban Forestry to identify research and co-op student opportunities to study the urban forest and effectiveness of management outcomes.

Action 53: Maintain regular contact with the Canadian Food Inspection Agency, Pacific Forestry Centre and other stakeholders that track pests and diseases.

Action 54: Continue to collaborate with community organizations that can support the City's implementation of the Urban Forest Strategy.

Strategy: Explore ways to provide grants and to encourage tree planting and tree care on private land

Action 55: Explore programs that encourage people to regularly plant trees and to maintain large trees (>50cm dbh) on their properties.

8. TRACKING PROGRESS

This Strategy is intended to inform Abbotsford's future policy, operational work plans, budget proposals and stewardship efforts. Ensuring that targets are being met and actions are implemented will require progress to be tracked.

The Urban Forestry Section will be responsible for tracking implementation progress but many departments will be involved in implementation. The following quantitative key performance indicators will help to measure implementation progress.

Quantitative Indicator	Measurement Frequency	Method
CANOPY		
City-wide canopy cover 40% by 2045 (excl. agricultural land)	5 years	LiDAR
Urban development boundary (UDB) 25% by 2045		
No neighbourhood within the UDB less than 20% (excl. airport)		
Public land canopy cover exceeding 30%		
SPECIMEN TREE DIVERSITY		
No more than 10% of any species, 15% of any genus and 25% of any family	Yearly	Tree Inventory
Target 40% of trees <20 cm DBH, 30% 20-40 cm DBH, 20% 40 to 60 cm DBH, 10% > 60 cm DBH	Yearly	Tree Inventory
PLANTING		
Plant 500 to 1,000 new specimen trees per year in streets and parks	Yearly	Work history
Plant 1,000 to 2,000 seedlings per year in natural areas		
MANAGEMENT		
Specimen tree pruning cycle 5 years	Yearly	Work history
Less than 5% of specimen trees in poor or dead condition each year		
Park tree pruning cycle 10 years		
Young tree pruning cycle 3 years for first 3 cycles		
Re-establish 250 tree well and mulch each year		
TREE REPLACEMENT		
City planting site vacancy rate less than 5% annually	Yearly	Tree inventory
Minimum 1:1 tree replacement on City property	Yearly	Work history
Minimum 60 stems per hectare with new development (or cash-in-lieu to plant on City property)	5 years	LiDAR/Bylaw records
SOIL VOLUME		
Minimum shared volume of 6 m^3 (small trees), 15 m^3 (medium trees), 30 m^3 (large trees)	Per project	Plan review
Minimum boulevard width of 2 m when services sharing space	Per project	Plan review

Urban Forest Report Card

This Report Card captured the state of Abbotsford's urban forest management program. In 2019 Abbotsford's urban forest program was rated as *fair,* approaching *good*. A full description of each criteria is provided in the *Urban Forest Strategy Key Finding Report (2019).* Implementing the Urban Forest Strategy should aim to shift Abbotsford's program towards optimal. Anticipated progress post-implementation is reflected in the 2045 column. The Strategy has prioritized reaching optimal for most but not all indicators. This report card should be re-assessed every 5 years and recommendations should be updated as needed to continue improvement.

Legend

Poor
Fair
Good
Optimal

2045

Qualitative Indicator	Rating	2045
PLANNING		
Awareness of the urban forest as a community resource	Fair	
Green infrastructure asset valuation	Fair	
Clear and defensible urban forest canopy assessment and goal	Fair	
Municipal-wide biodiversity or green network strategy	Fair	
Interdepartmental and interagency cooperation on urban forest strategy implementation	Good	
Municipal urban forestry program capacity	Fair	
Urban forest funding to implement the strategy	Fair	
GROWING		
City tree planting program design, planning and implementation	Good	
Development requirements to plant trees on private land	Good	
Streetscape and servicing specifications and standards for planting trees	Fair	
Equity in planting program delivery	Poor	
Forest restoration and native species planting	Good	
Selection and procurement of stock in cooperation with nursery industry	Fair	
Climate adaptation/mitigation integration with tree planting projects	Fair	
MANAGING		
Tree inventory	Good	
Knowledge of trees on private property	Good	
Natural areas inventory	Good	
Maintenance of publicly-owned, intensively managed trees	Fair	
Extreme weather planning	Good	
Tree risk management	Fair	
Pest and disease management	Fair	
Waste biomass utilization	Fair	
PROTECTING		
Regulating the protection and replacement of private and City trees	Good	
Regulating conservation of sensitive ecosystems, soils or permeability	Good	
Interdepartmental cooperation on urban forest strategy implementation	Good	
Internal protocols guide City tree or sensitive ecosystem protection	Good	
Standards of tree protection and tree care during development	Fair	
STEWARDSHIP		
Citizen involvement and neighbourhood action	Fair	
Involvement of large private and institutional landholders	Fair	
Urban forest research	Fair	
Regional collaboration	Fair	

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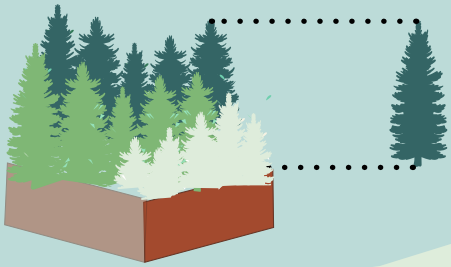
Abbotsford's Urban Forest Strategy

The urban forest includes every tree in Abbotsford, along with the **vegetation, soils** and **natural processes** associated with **individual trees and forests** in our urban and rural landscapes.

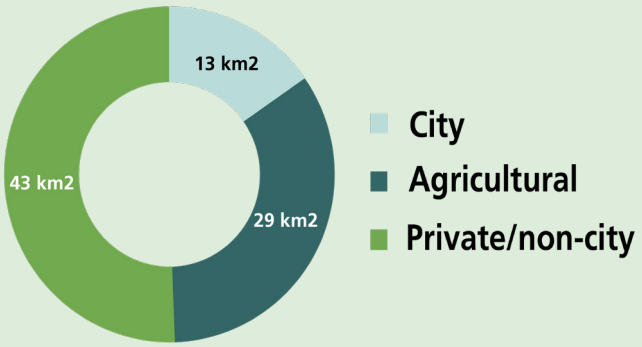


Canopy Cover Metrics

40% City-wide Canopy Cover
excluding agricultural land

25% Canopy Cover
in the urban development boundary

Canopy management
by area



Benefits of Abbotsford's Trees

651 kilotonnes
carbon stored

22 kilotonnes
carbon sequestered annually

55 Olympic size swimming pools
of water kept out of the storm system annually

779 tonnes
pollutants removed annually

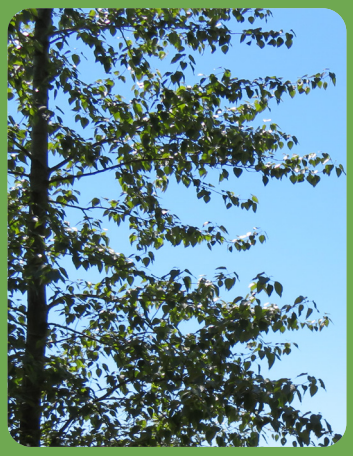
Challenges for managing the urban forest

Forest Health
Pests and disease

Development + Infrastructure

Climate hazards and adaptation

Funding and resourcing
to shift urban forest management from a fair to good or optimal state



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