



Urban Forest Management Plan

Our Official CommuniTree Plan



We respectfully acknowledge that the urban forest is located on the unceded lands of *SnPink'tn*, a *Syilx* (Okanagan) community.

Context on the land acknowledgement

The City of Penticton has prepared this Urban Forest Management Plan to address current and projected challenges for trees and natural forests in the City. The Plan is written from a perspective that promotes recognition of the “asset” or “service” value of trees and identifies priority issues for shorter-term management. This perspective can be at odds with Syilx perspectives on the urban forest, which emphasize the nature of trees as part of *tmix^w* – all living things and our relations. The 20-year horizon of the Urban Forest Management Plan is not a replacement for a multi-generational understanding of the innate value of trees and forest ecosystems in this landscape. Consultation with Penticton Indian Band representatives raised this difference in worldviews as an important preface for contextualizing the Plan.

Acknowledgements

We want to thank everyone who contributed to the Urban Forest Management Plan through online and in-person public engagement opportunities, reaching out to City and project staff, and advocating for public perspectives on the City’s urban forest to inform the Plan recommendations. There would be no Urban Forest Management Plan without your participation.

We also want to thank the 2 Billion Trees program for its generous financial support in the development of the city’s first urban forest management plan. Its contribution has enabled us to create a comprehensive and forward-thinking plan that will benefit our city and its residents for years to come.

Report Credits

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Glossary

Abiotic disturbance	<i>A discrete physical event in the environment, like a windstorm, heatwave, or wildfire, that directly damages trees and vegetation leading to a loss of plant biomass.</i>
Agricultural/rural trees	<i>Trees located on agricultural and rural property where landscapes are maintained, including orchard trees, shade trees, and windrows.</i>
Asset class	<i>In asset management, a group of similar objects provided with the same service levels for management activities.</i>
Biodiversity	<i>The variety of lifeforms and their interactions within an area, or on Earth.</i>
Biogeoclimatic ecosystem classification	<i>The “BEC” system of zones divides the province of BC into areas of similar vegetation potential based on climate and regional factors. It is a tool for categorizing the province’s natural vegetation communities, two of which are historically found in Penticton: the Bunchgrass and Ponderosa Pine zones.</i>
Biomass	<i>The quantity of organisms in any area or volume.</i>
Biotic disturbance	<i>The effects of biological agents such as insects, fungi, or humans, occurring such that they can reasonably be considered a discrete event, that directly damage trees and vegetation leading to a loss of plant biomass.</i>
Canopy cover	<i>The area of the ground that is obscured by tree stems, branches and foliage, when viewed from above. Canopy cover is frequently expressed as a percent of an overall area, e.g., 100% canopy cover means that trees cover all of a particular portion of ground.</i>
cikilaxʷm	<i>Cultural fire management as practiced by the Syilx (Okanagan) people.</i>
Diameter at breast height (dbh)	<i>The diameter through the centre of a tree’s stem, measured at 1.3 m along the stem above the high side of the tree’s connection to the ground.</i>
Evapotranspiration	<i>The process by which water is transferred from the land to the atmosphere by evaporation from soil and surfaces and by transpiration from plants.</i>
Genus	<i>The taxonomic level directly above species; a closely related group of species sharing a common ancestor, e.g., Acer (Maple), Pinus (Pine), or Populus (Poplar). Species scientific names are the combination of genus and a unique species identifier, e.g., Acer platanoides (Norway maple).</i>
Greenfield development	<i>Urban development that converts natural or rural landscapes and land uses into urban ones.</i>

Green infrastructure	<i>Any natural assets as well as designed or engineered elements created to mimic natural functions and processes that provide service value in relation to human interests.</i>
Hardscape	<i>A landscape dominated by impermeable surfaces. Most urban landscapes have characteristics of hardscape.</i>
Impermeable or impervious surface	<i>A surface that does not allow water or gas exchange between the environment and underlying soils, like concrete or asphalt.</i>
LiDAR	<i>Light Detection and Ranging (LiDAR), an aerial or satellite survey technology that uses invisible signals of light to remotely measure surface height and area.</i>
Natural asset	<i>A component of the natural environment that is of demonstrated value to society.</i>
Natural forests	<i>Unmaintained landscapes where indigenous tree species form a dominant vegetation cover, or forested areas specifically managed to promote natural ecosystem characteristics.</i>
nsyilxcən	<i>The language of the Syilx (Okanagan) people.</i>
Service level	<i>In asset management, a description of a management activity for an asset class and when or how frequently the activity occurs.</i>
SnPink'tn	<i>The preferred nsyilxcən name of members of the Penticton Indian Band; the origin of the City of Penticton's modern name.</i>
tmixʷ (Timixw)	<i>The community of all living things, as known to Syilx (Okanagan) people.</i>
Tree equity	<i>When every person living in the city has access to the urban forest ecosystem services they need.</i>
Tree inventory	<i>A record of trees within a specific area.</i>
Urban forest	<i>Every tree within the municipal boundary of Penticton.</i>
Urban forest program	<i>A collective description of the policies, procedures, resources used for urban forest management activities and the City staff undertaking those activities in the City.</i>
Urban heat island	<i>The physical effect by which highly paved areas in cities trap heat, leading to higher ambient temperatures than in surrounding rural lands.</i>
Urban trees	<i>Trees located in streets, yards, landscaped parks, and other urban developed property outside agricultural areas.</i>

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Plan in Brief

Penticton's urban forest includes every tree within the municipal boundary, encompassing trees in natural forests, agricultural areas, and urban neighbourhoods. The urban forest is part of our cultural landscape and provides benefits to the community called ecosystem services, including shade and cooling, soil stabilization, clean air and water, carbon sequestration and storage, nourishing food, and peaceful places to visit and recreate.

However, trees in Penticton face challenges from changing climate to development-related tree loss to the cumulative impacts of a busy events calendar on City parks and gardens. This document, the City's first Urban Forest Management Plan, sets a direction for the City to lead by example while conserving and building our urban forest for the next 20 years and beyond.

Two phases of public engagement, conversations with interested parties, and consultation with Penticton Indian Band representatives informed the Urban Forest Management Plan. Themes that emerged through engagement included concern about tree loss impacting quality of life, need for the City to lead by example in tree retention and management, and the potential for urban forestry to strengthen relationships between the City and the Penticton Indian Band and Syilx (Okanagan) people more broadly.

The Vision:

Our urban forest vision is to keep our community healthy, beautiful, and green. Our urban forest is growing because of the care we give and the value we place on it. Our actions today are building a resilient future for the urban forest that we can be proud of across cultures and generations.

In 2020, 17% of the city's land area was covered by tree canopy. Penticton's urban forest is unevenly distributed, with natural areas contributing 70% of the total urban forest cover, while urban neighbourhoods have canopy cover of just 12%. Low canopy cover in Penticton's urban areas is problematic because it means few residents have adequate

access to the ecosystem service value of trees. While Penticton's semi-arid ecosystems naturally have fewer trees than coastal British Columbia, they still support the city's urban forest. Penticton's natural forests face challenges likely to reduce future canopy cover, including shifting climate and soil moisture, the threat of wildfire, and some development. The City will need to increase the tree canopy in urban areas to improve the urban forest where people live while sustaining the city-wide supply of urban forest ecosystem services by enhancing stewardship of natural forests.

The Urban Forest Management Plan presents three scenarios compared to the status quo (Scenario 1). Although the rate of tree loss city-wide is not currently known, estimates for City property show that under the status quo policies and resources, the rate of tree planting is likely less than the rate of tree removal, resulting in a decrease of Penticton's urban forest canopy from 17% to 16% by 2045.



Scenario 1: Status Quo

In Scenario 1, policies and resourcing for urban forest management remain similar to recent years.

City-wide canopy in 2045: 16% (-1%)

Three alternative scenarios are proposed:



Scenario 2: No Net Loss

In Scenario 2, the City improves planting and extends the lifespan of trees on public property to offset ongoing losses from private property.

City-wide canopy in 2045: 17% (=)



Scenario 3: Urban Forest Expansion

In Scenario 3, new tree protections on private property help reduce the rate of tree loss while rates of tree planting are increased on public and private property.

City-wide canopy in 2045: 18% (+1%)



Scenario 4: Green Future

In Scenario 4, tree canopy and planting targets are incorporated into development regulations to spur new tree planting additional to programs in scenario 3, which could double tree canopy in urban areas towards the end of the century.

City-wide canopy in 2045: 18% (+1%)

Canopy in urban land uses by 2085: 25% (+13%)

Recommendation:

The Urban Forest Management Plan recommends Scenario 4: Green Future to lead by example and achieve the vision. This recommendation reflects what we heard through public engagement and best responds to the desire to preserve and increase the urban forest throughout Penticton.

The path to Scenario 4: Green Future is laid out in the Urban Forest Management Plan. The Action Plan (Chapter 6) provides **4 Goals, 13 Strategies, and 90 Actions** to implement, coded by scenario, departmental leadership, approximate cost, and implementation priority. Complementing the goals, strategies, and actions are other components of the Plan's strategic framework: the vision statement, principles for management, and targets and performance measures intended for monitoring implementation. The Action Plan and strategic framework are grounded in fact-finding and the results of community engagement.

Goals for Penticton's Urban Forest

The four goals of the Urban Forest Management Plan are:

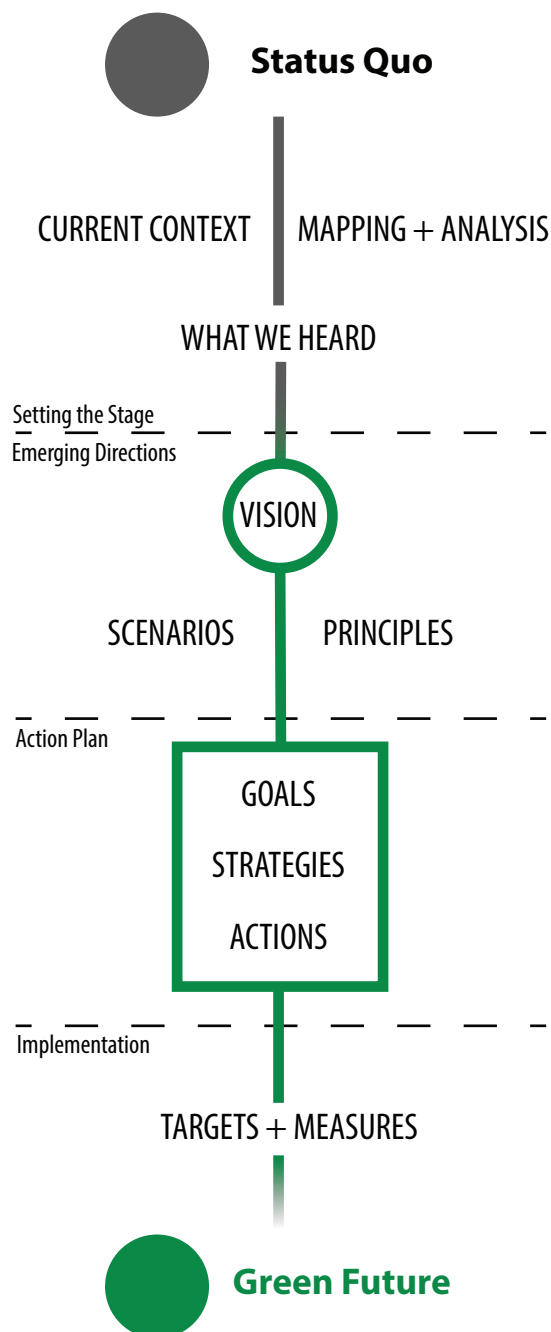
1. Plan, protect, and plant to expand the urban forest.
2. Manage for tree health and longevity.
3. Enhance partnerships and public outreach to increase awareness and capacity for urban forest management.
4. Monitor progress and adapt management to changing circumstances.

Strategies under each goal group interrelated Actions. The Goals, Strategies, and Actions map out a detailed path toward Scenario 4: Green Future, but the Action Plan can also be used to achieve any alternative scenario.

Supporting Implementation

Each of the alternative scenarios presented by the Urban Forest Management Plan carries significant implications for resourcing and staff time. Financial estimates supported the development of the Urban Forest Management Plan and showed that an increase of two to four times current resourcing for urban forest management is needed to fully implement any of the alternative scenarios. The growth in costs reflects underinvestment in the urban forest relative to other asset classes in the city. Cost recovery and external funding sources can help implement the Urban Forest Management Plan in a fiscally prudent manner.

Urban Forest Management Plan



BIG MOVES TO IMPLEMENT THE VISION

The Urban Forest Management Plan recommends **Scenario 4: Green Future** be advanced in the City by adopting a 20-year canopy cover target of 18% City-wide and long-term target of 25% in urban areas. The Action Plan (Chapter 6) provides **4 Goals, 13 Strategies, and 90 Actions** to implement, coded by scenario, departmental leadership, approximate cost, and implementation priority. The following nine Big Moves summarize the Action Plan's most significant recommendations.

- | | | Scenario |
|---|---|---|
| ① | Develop a Tree Protection Bylaw to apply throughout the City.
Tree protection is needed to reduce rates of loss and regulate replacement planting. |   |
| ② | Update City standards and bylaws to create more suitable planting environments and ensure at least 1:1 replacement of trees removed from City property.
The City will demonstrate its commitment to urban forestry through prioritizing replacement planting when tree removal must occur. |    |
| ③ | Integrate targets for tree canopy and new planting with development regulations.
New tree planting on private property is needed to reach a long-term target of 25% canopy cover (on average) in urban areas. |  |
| ④ | Create tree planting programs for public property that can deliver at least 125 (Scenario 2) or 175 (Scenarios 3 and 4) new (non-replacement) trees per year.
New tree planting on public property will help offset losses on private property. |    |
| ⑤ | Plant at least 200 (Scenario 2), 300 (Scenario 3), or 400 (Scenario 4) trees per year in natural restoration areas.
Expanding natural restoration efforts will help reduce the impact of invasive species, drought, and forest health issues in natural forests. |    |
| ⑥ | Offer a public tree sale to increase tree planting rates on private property.
Modelled after Kelowna's NeighbourWoods program, a public tree sale can spur additional tree planting on private property and increase awareness of urban forestry. |    |
| ⑦ | Maintain up-to-date inventories of urban street and park trees and natural forests.
Updated inventory information is needed to help operational planning, budgeting, and monitoring. |    |
| ⑧ | Involve the community in urban forest management.
Community champions are crucial for implementation of planting, monitoring, and building support for urban forest management on public and private lands. |    |
| ⑨ | Add staff capacity in the Parks department to lead implementation.
Up to 4 additional FTE will be needed to fully implement new and expanded programs recommended in the Urban Forest Management Plan. Alternative arrangements to supplement the department's human resources should also be explored. |    |

● 2: No Net Loss ● 3: Urban Forest Expansion ● 4: Green Future



CHAPTER 1.

INTRODUCTION



The introductory chapter of the Urban Forest Management Plan defines Penticton's urban forest as every tree within the municipal boundary and describes why the Plan is needed now.



Welcome to Penticton's first Urban Forest Management Plan. Urban forest management is the practice of planning, planting, protecting, and maintaining trees in communities for the benefits they provide to society and the environment. The overarching purpose of the Urban Forest Management Plan is to chart a course for Penticton's urban forest toward a resilient future.

Penticton's urban forest includes every tree within the municipal boundary. Trees on City property in parks and streets are part of the urban forest, as are trees in yards, parking lots, and landscaping on private property. Penticton's urban forest includes many trees that may not seem urban at all, such as those growing in natural areas and on rural property, or in orchards. All trees within the municipal boundary contribute to the overall value the urban forest provides to the community (Figure 1).

The urban forest is a living system that reaches its highest potential when its needs for soil, water, nutrients, and air are met. The other key ingredients for the urban forest are having the time and space it needs to grow. This means urban forest management is also concerned with the environment around trees in addition to the trees

themselves. Meeting these needs in urban areas can be challenging in a growing city, especially when systemic threats like climate change are considered.

The Plan is science-based and builds on best practices and extensive community engagement to support its recommendations. Unlike other features of the urban landscape, trees increase in value over time because of their ability to grow. With a 20-year horizon, it provides a strategic framework for the sustainable growth and maintenance of Penticton's urban forest. It recognizes the dynamic nature of urban forestry and the need to adapt as environmental conditions and community needs evolve. The Plan will require periodic reviews to ensure it remains responsive to both positive developments and emerging challenges, ensuring the urban forest continues to thrive and deliver benefits to the community.

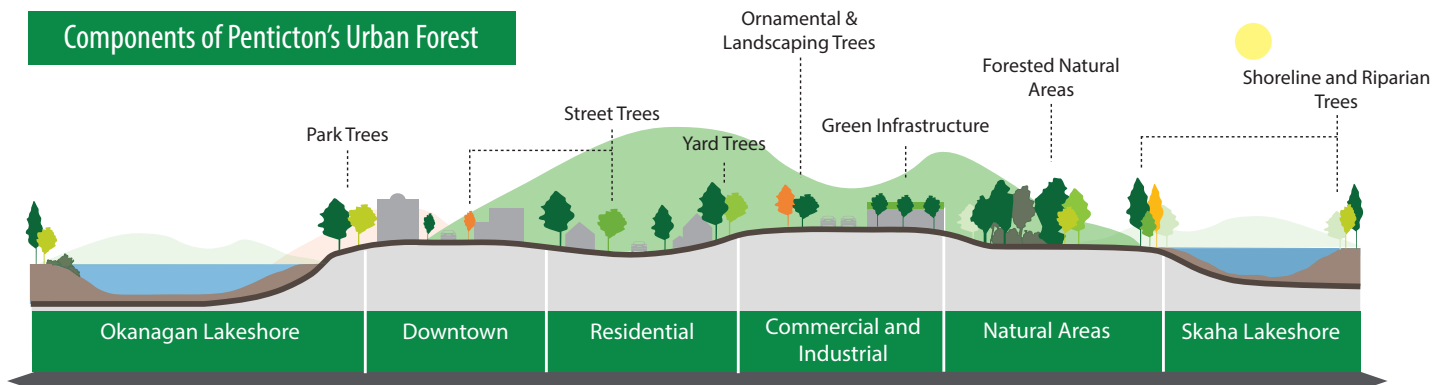


Figure 1. Components of Penticton's urban forest. Every tree in the municipal boundary is part of the urban forest.

1.1 WHY IS THE PLAN NEEDED?

The City's urban forest management today occurs without the guidance of a strategic plan or community vision, a critical gap the Urban Forest Management Plan seeks to fill. Drivers of the Urban Forest Management Plan include:

- Public expectations for the urban forest have increased, but the resources dedicated to urban forestry by the City have not grown with those expectations, or in alignment with the Penticton's growth.
- Trees on private property make up over half of the trees in the City and an even larger share of trees in urban neighbourhoods where most people live. Current policies and bylaws offer little guidance to property owners on how to preserve their trees or identify trees of high value.
- Climate change is altering the weather and conditions faced by trees and forest ecosystems in the city, leading to impacts such as increased wildfire risk, loss of habitat, and the spread of invasive species including rapidly establishing invasive tree species.
- Urban development and growth policies address trees but rarely require that new development preserve the urban forest or create environments in which trees can thrive.

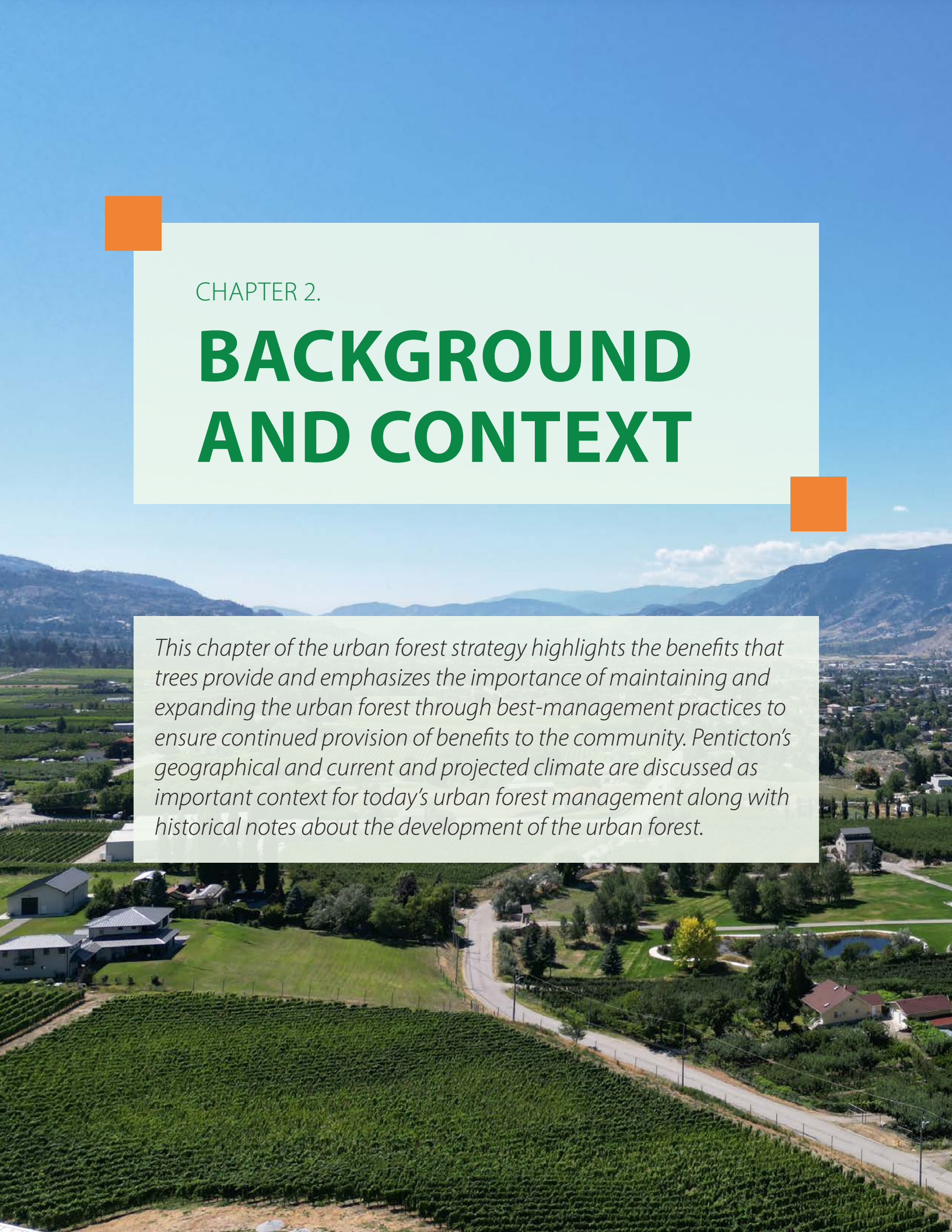
City policies have led to the development of the Urban Forest Management Plan. Penticton's Official Community Plan includes the following policy statement that directly supports the Urban Forest Management Plan:

"Create and implement an Urban Forest Strategy to identify and monitor the percentage of vegetation and canopy cover, and to develop direction on strategies to maintain and increase canopy cover and vegetation densities, as well as to regulate the removal of existing trees."¹ (Policy Statement 4.4.2.5, Official Community Plan Bylaw 2019-08)

The Official Community Plan makes several connections relevant to the Urban Forest Management Plan, such as supporting street tree planting in active transportation corridors, recognition of urban forest ecosystem services, protecting significant trees, and providing shade trees and natural areas in parks. The Urban Forest Management

Plan is one of several policy initiatives advanced by the Official Community Plan to support the community's vision, including the Community Climate Action Plan, Transportation Master Plan, and updates to development bylaws. The Community Climate Action Plan (2021) proposes tracking urban tree canopy as an indicator for climate adaptation, information that is a key component of the Urban Forest Management Plan and recommendations.

Finally, how the urban forest is managed has significance for the City's reconciliation journey, as it also impacts the interests of Indigenous SnPink'tn people, represented by the Penticton Indian Band.



CHAPTER 2.

BACKGROUND AND CONTEXT

This chapter of the urban forest strategy highlights the benefits that trees provide and emphasizes the importance of maintaining and expanding the urban forest through best-management practices to ensure continued provision of benefits to the community. Penticton's geographical and current and projected climate are discussed as important context for today's urban forest management along with historical notes about the development of the urban forest.

2.1 URBAN FOREST BENEFITS

Trees are living things rooted in place. Often perceived as stable features of the environment—background to family photos, scenery for walks and hikes, shade for backyard barbecues, and colour for downtown streets—trees play a much more active role, breathing the same air we do and extending the tips of their branches and roots further into space to capture rainwater, locate soil nutrients, and produce the next generation of the urban forest. Trees encourage environmental complexity, supporting a wide array of life forms, from plants and fungi to animals and bacteria.

Over time, trees change the environment in which they grow: they shade streams so fish can live in them; they capture rainwater and keep soil from washing away; they filter air pollution from cars and factories; they store carbon from the atmosphere safely in wood and soils; and their fruits and seeds feed families and whole ecosystems. These functions, known as ecosystem services, deliver significant benefits to humans and the natural world.

Figure 2 illustrates some of the ecosystem services provided by the urban forest, with numerical estimates for some services derived from software called i-Tree Canopy². This analysis includes a monetary evaluation of certain services based on the amount of canopy cover within a municipality. Penticton's urban forest is estimated to provide a benefit of over \$1.8 million in annual benefits from carbon sequestration, stormwater management, and air pollution filtration. The carbon stored by trees in Penticton is valued at over \$16.5 million, and annually, the urban forest stores an amount of carbon dioxide equivalent to the emissions from 1,530 gas-engine passenger cars.

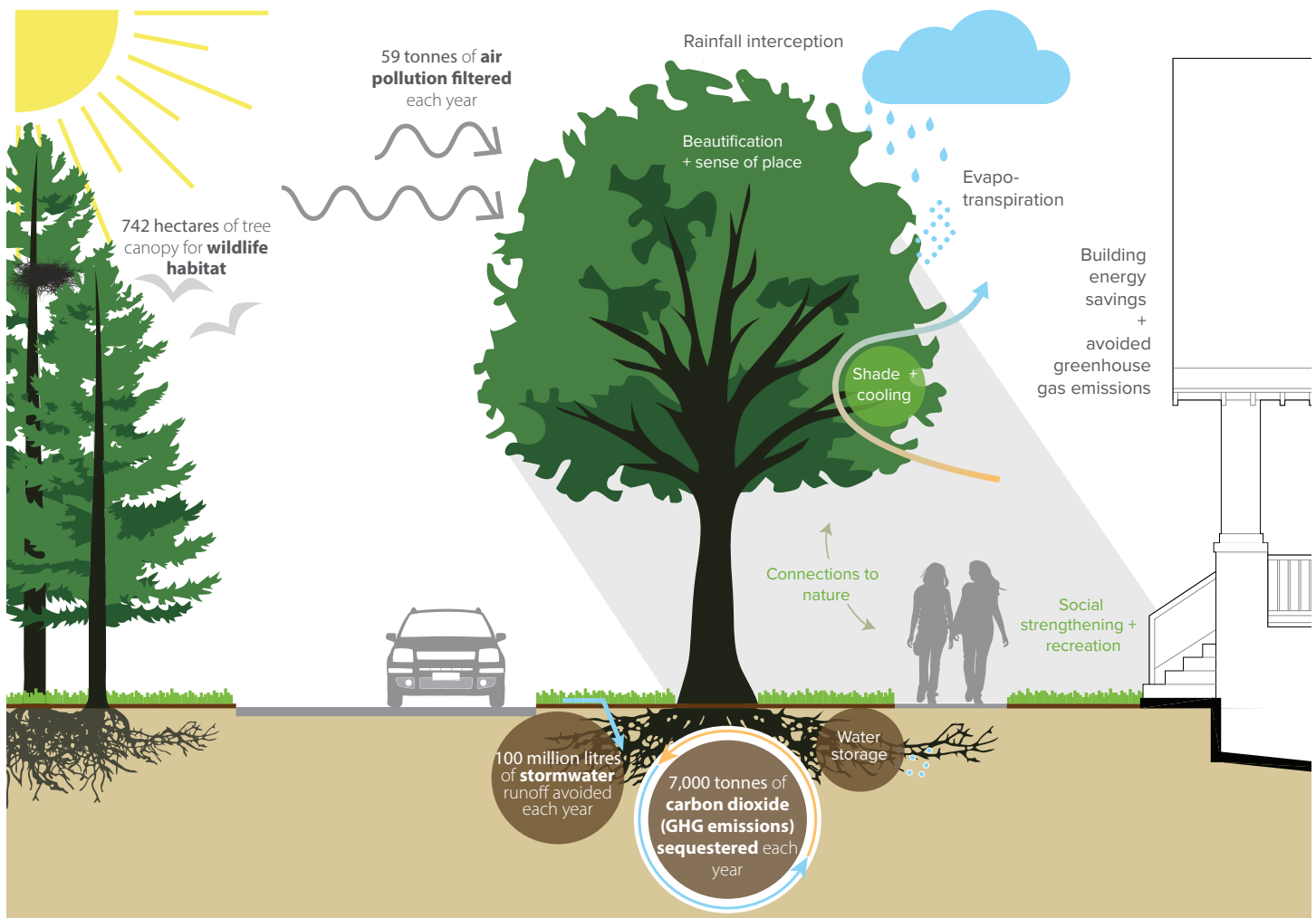


Figure 2. Examples of ecosystem services provided by Penticton's urban forest.

THREE KEY URBAN FOREST BENEFITS

Cooling the City

Penticton's urban forest is like a natural air conditioner for the City. Climate change is making Penticton's summers even hotter. Urban areas can experience even more extreme summer temperatures because of the urban heat island effect, when paved areas absorb and trap heat and become hotter than the surrounding countryside. The urban forest cools in two ways: firstly, trees directly shade pavement and their surroundings, which greatly reduces heat absorption by concrete and asphalt³. In general, greater canopy cover results in greater amounts of shade. Secondly, trees cool the air through evapotranspiration, the process by which they release water vapour into the air⁴. The combined effect of the urban forest's cooling potential in cities can be several degrees Celsius. In Penticton, the surface temperature difference between paved commercial or industrial areas with few trees and forested rural land can be well over 10 degrees Celsius on a summer's day (Figure 3).

Providing homes and pathways for biodiversity

The urban forest connects natural features and ecosystems surrounding the City. Historically, valley bottom development in the Okanagan has severed links between habitats by creating barriers in the landscape to the flow of animals, plants, and other forms of life. These barriers can be busy roads and highways, channelized rivers, parking lots, cement and brick buildings, or fenced in yards and orchards. But trees and canopy cover in natural and urban areas, can help reconnect habitats for some species. By bridging the gaps between suitable habitats, the urban forest helps preserve Penticton's native biodiversity⁵. Biodiversity itself underpins many more ecosystem services than the urban forest alone, giving its conservation a particular importance.

Land Surface Temperature by Census Dissemination Block

Detected June 16 2021 (7pm)

The coolest places in the city include its shoreline, forested areas, and rural areas.

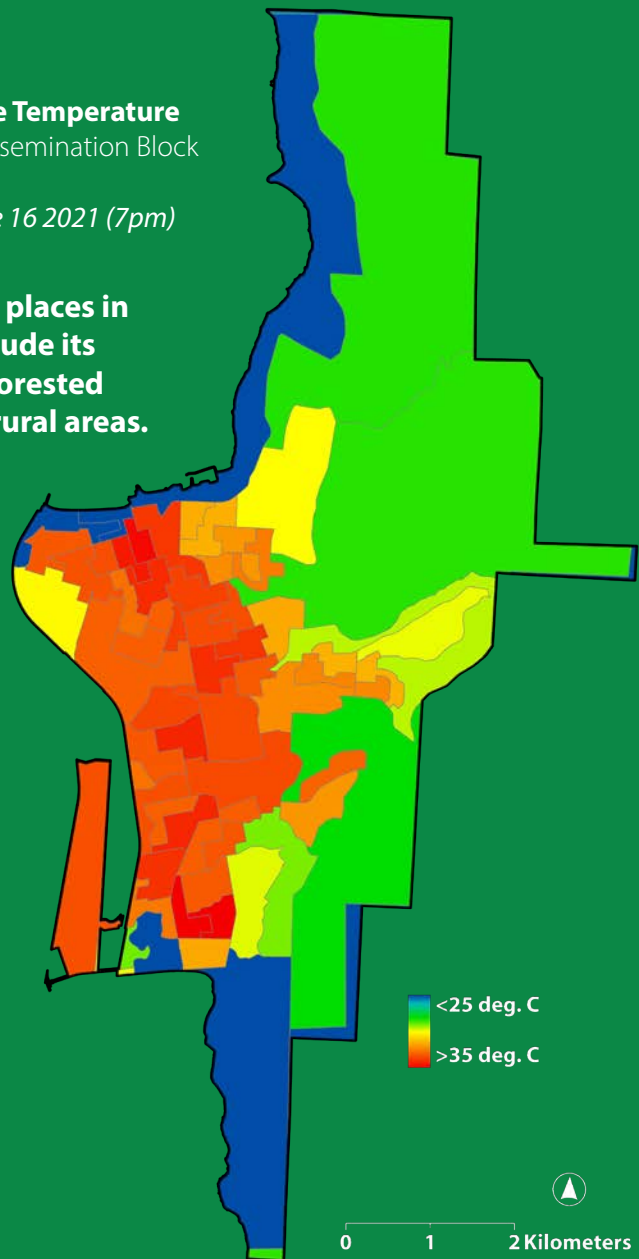


Figure 3. Land surface temperatures detected on June 16, 2021.

Healthier people, healthier city

Many studies have shown the benefits of the urban forest for public health. Benefits like urban cooling relate directly to reduced human mortality during heat waves, as British Columbia discovered in June 2021⁶. Tree canopies promote physical fitness by providing comfortable places for walking, cycling, and exercise⁷. On the side of mental health, neighbourhood greenery has been found to decrease social isolation among seniors by encouraging outdoor activities⁸, and frequent "doses" of nature can reduce anxiety⁹. People recovering in hospitals with a simple view of trees have been found to heal faster than patients without these views¹⁰.

2.2 WHY MANAGE THE URBAN FOREST?

The ability of the urban forest to provide ecosystem services is directly related to its extent and condition. The more urban forest there is and the better its health, the greater the ecosystem services it provides. The extent of the urban forest can be measured using the proportion of a city covered by tree canopy. The condition of trees and forests can also be evaluated using a range of indicators such as tree condition, species diversity, and the complexity of habitat provided by a forest among others.

There are many competing demands on space in cities as well as rural areas, including the need to build homes, workplaces, schools, and amenities. Trees in cities can also create risks, such as the potential for a tree falling and hurting someone, or for vegetation to act as a fuel in a

wildfire. Urban agriculture and solar panels require sunlight which can be blocked by trees. Urban forest management requires money and resources. Staff responsible for urban forestry seek to manage the urban forest in such a way that the costs of management over a tree's life cycle are outweighed by the benefits it produces for society. This must consider the most suitable location for trees and is consistent with a perspective on urban forestry informed by asset management, the practice of planning and implementing the care of service-producing infrastructure based on estimated costs and benefits to generate the highest return.

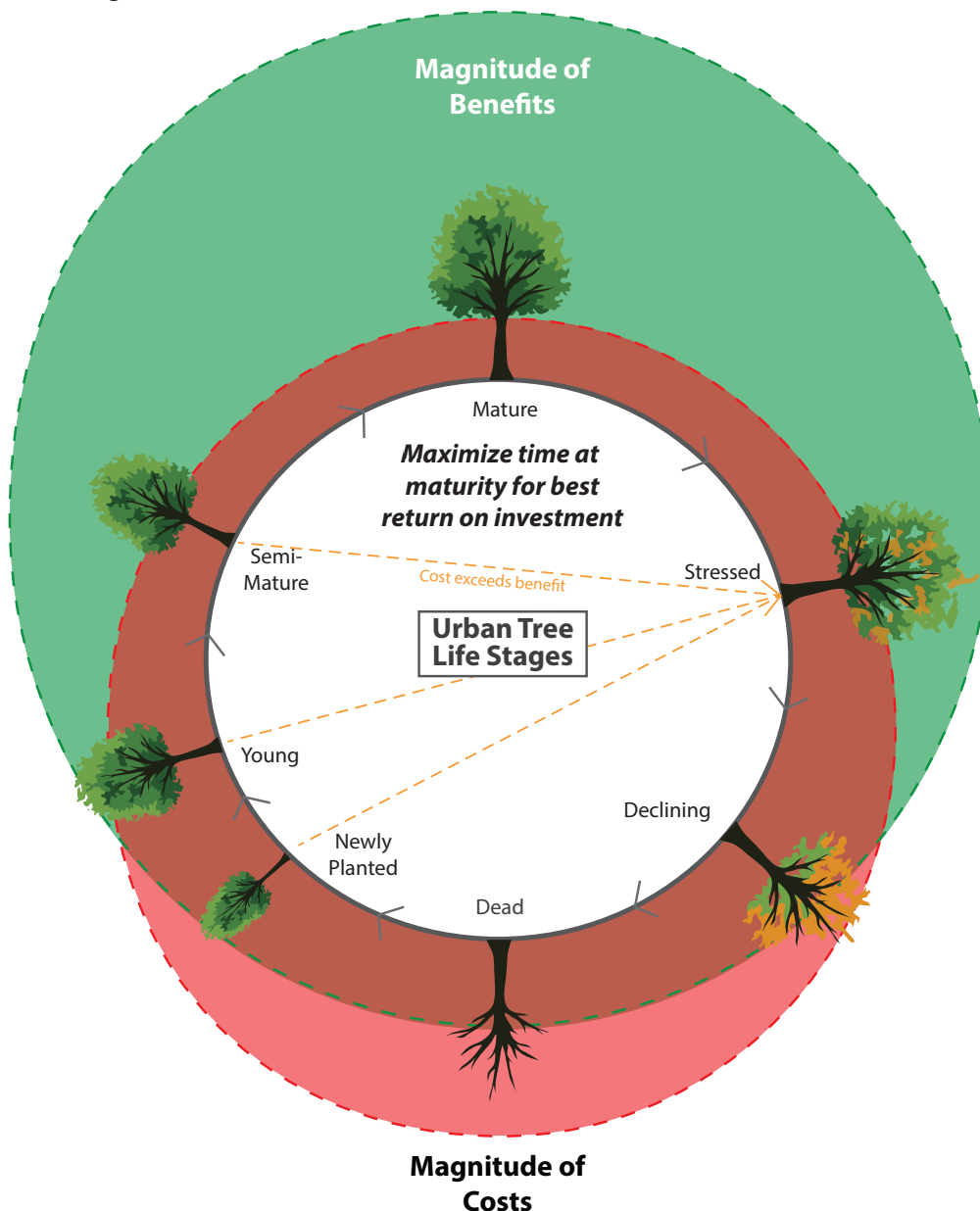


Figure 4. Conceptual representation of the magnitude of tree benefits and costs at stages of tree life cycle.

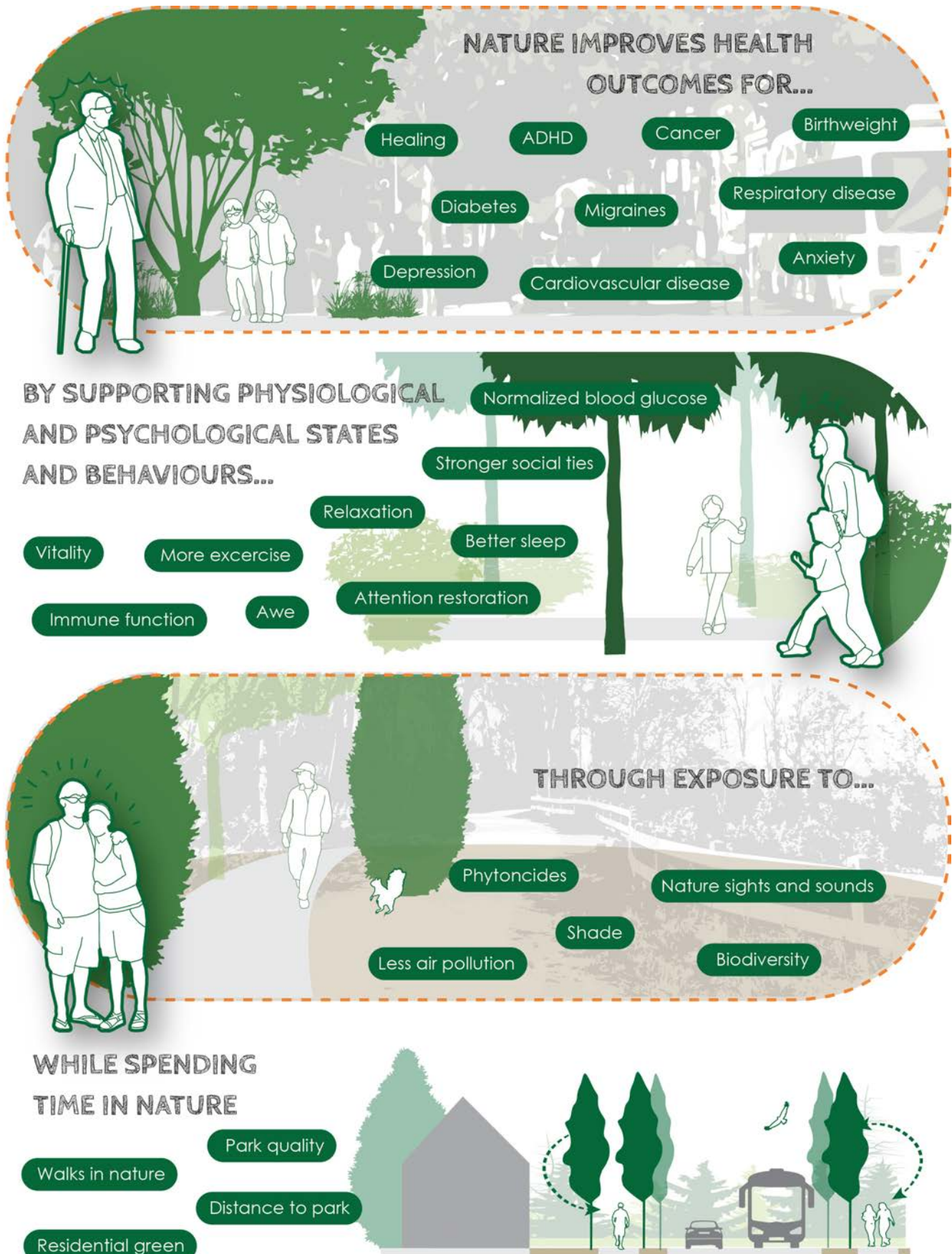


Figure 5. Health benefits provided by Penticton's urban forest ¹¹

To do this, urban foresters have adapted concepts from asset management that support overall urban forest health, stability, and longevity:

- **Plant the largest tree suitable for the site.** Large-stature trees provide many times more benefits than small-stature trees.
- **Retain healthy trees whenever possible.** Healthy mature trees deliver the most benefits for the least cost.
- **Support resilience by increasing diversity.** Diversity reduces the risk of large-scale tree canopy loss from impacts like pests, disease, and drought.

- **Plant the right tree in the right place.** Planting the right species in the right location will maximize potential benefits and help avoid conflicts with infrastructure or other issues that increase the lifetime costs of urban forest management.

This view of urban forestry as supporting asset management is a useful one for the City, but it is just one way of looking at the urban forest in all its complexity. As living things, trees have intrinsic value. The perspective of SnPink'tn people is that all trees are tmix^w, part of the community of living things to which humans also belong.

2.3 FOREST FUNDAMENTALS: GEOGRAPHY AND CLIMATE

If Penticton's urban forest is rooted in place, what is the nature of that place? Understanding key features of the environment is essential for urban forest management. Penticton's municipal boundary includes diverse landscapes and landforms, existing in a semi-arid climate unique in Canada.

2.3.1 GEOGRAPHY AND SOILS

Penticton and the urban forest sit in the Okanagan Valley between Okanagan and Skaha Lakes. Glacial ice and the flow of melt-water carved most of the landforms in Penticton. An ancestral lake much higher than today's Okanagan and Skaha Lakes formed deposits of sediment that were later cut down by the Okanagan River and its tributaries, leaving the slopes and terraces that form the sides of today's valley¹². Widespread sandy and silt soils are the legacy of melt-water, which has carried away much of the finer clays. The remaining soils are fast-draining, although with irrigation they can furnish productive orchards and vineyards. In some places, glacial ice scraped away most of the soil leaving outcrops of bedrock like Skaha bluffs, or left piles of mineral debris called moraines that make many of the valley sides. Trees would have re-entered the landscape from glacial refuges, mainly from the south. At first, cold-hardy species of pine and spruce were likely the most common trees¹³.

2.3.2 RECENT CLIMATE

Climate has varied since the retreat of the glaciers, influencing the forest species now common here. Penticton's climate in the past few thousand years has been "semi-arid", meaning annual precipitation is somewhat less than the potential loss of water from evapotranspiration. This limits the amount of water naturally available for vegetation, which favours drought-adapted plants and ecosystems. Between 1980 and 2010, the City averaged just 346 mm of precipitation annually¹⁴; about one-quarter of the average total in Vancouver. Precipitation is usually less than 30 mm each month except in May and June, when it averages 40-45 mm. While temperatures in winter are generally mild, winter cold fronts can force temperatures as low as -20°C for short periods of time. Summer temperatures are some of the hottest in Canada, with average daily highs of 25°C or more in June, July, and August. The hottest temperature ever recorded in Penticton was 46.0°C during the June 2021 heatwave. Plant hardiness zones are sometimes used as a shorthand for the climate influences faced by vegetation in an area. Since the 1961-1990 reference period used by Natural Resources Canada, Penticton's plant hardiness zone has shifted from 6a to 7a (and is likely still shifting). This reflects the trend towards warmer winter temperatures with fewer frost days.

2.3.3 EFFECTS ON ECOSYSTEMS

Penticton's relatively warm, dry climate acts as a control on the forest landscape. For thousands of years the warm valley has hosted fire-dependent forests of ponderosa pine and juniper, bunchgrass meadows, meandering creeks shaded by stately cottonwoods, and slopes leading up through forests of pine, Douglas-fir, larch, aspen, birch, and spruce. The City falls within two biogeoclimatic ecosystem classification zones (BEC zones) – a system used by the Provincial government to characterize the natural potential vegetation of any site in BC.

The Bunchgrass Zone characterizes the driest climates at low elevations in the rain shadow of the Coast and Cascade Mountains. Here, soil moisture during the growing season is insufficient to widely support forests. Arid-adapted herbaceous and shrub species dominate most ecological communities situated away from sources of water like creeks and ravines. Forest cover is limited to riparian areas and springs. Wildfires occur frequently in the landscape.

The Ponderosa Pine Zone is the driest and warmest forest ecosystem in British Columbia, generally found above the Bunchgrass Zone in the South Okanagan and filling the bottom of smaller side valleys. The Ponderosa Pine Zone represents the northernmost extension of a semi-arid forest type found widely in the western United States. Ponderosa pine co-evolved with wildfire, and trees have adaptations like thick corky bark that help mature pines survive frequent low-intensity fires that burn through the flammable underbrush created by grasses and the long, thin needles of the pine trees. The understory beneath the pines shares many species with the neighbouring Bunchgrass Zone, helping create forests that looked like parkland to early European settlers.

In fact, many of these forests and neighbouring grasslands were maintained ecosystems, with fires intentionally lit and managed by Okanagan people in addition to occasional fires ignited by lightning. The *nsyilxcən* word for these cultural fires is *cikilax^{wm}*. *Cikilax^{wm}* serves many purposes related to habitat management, resource provision, and landscape health as part of a spiritual connection to *tmix^w*. The Okanagan Nation Alliance is reasserting the role of Indigenous people in fire management throughout the region, with recent projects to reintroduce low-severity fire as a vital element in ecosystem-based management.



Although fire is historically the most important natural disturbance in Penticton's urban forest, it is not the only climate-related event that regularly affects trees here. Firstly, it is important to distinguish between low-severity (e.g., *cikilax^{wm}*) fires and the much larger, more damaging wildfires that burn the crowns of mature trees and can destroy forests over large areas. These high severity fires were present in the pre-settler landscape but there is evidence they are becoming more common because of climate warming, fire suppression leading to a build-up of forest fuels, and a variety of insect and forest disease outbreaks¹⁵.

2.3.4 CLIMATE CHANGE

Climate change is shifting the conditions for the urban forest, with consequences for natural forest landscapes as well as trees in urban areas. Penticton's climate is projected to become hotter year-round, with much longer summers and a shift in seasons¹⁶. Valley bottoms can expect almost triple the number of days with temperatures of at least 30°C as in the past¹². Summer heat will become more extreme, with potentially significant impacts on human and ecosystem health¹². Cold winter temperatures which historically limited the spread of some invasive species will rise, making the urban forest more vulnerable to new pests and diseases¹². Climate shifts also drive changes in the relationships between organisms within native ecosystems, supporting previously unproblematic insects and forest damage agents to become significant agents of damage and ecological transition¹⁷.

Other climate-driven disturbance events include freeze-thaw cycles that crack tree stems and damage roots and shoots, windstorms that funnel through the valley between the lakes uprooting trees and shearing treetops, and heavy rainfalls that erode sandy slopes and cause flooding in ravines and riparian areas. Events that at first seem to be driven by weather alone are often part of more complex relationships between these abiotic disturbances and biotic disturbance factors like forest disease and human-caused environmental change.

Although growing seasons will lengthen, temperature increases in spring and fall are expected to outpace any increase in precipitation¹². Rainfall in summer is expected to become rarer. Overall, evapotranspiration will likely increase aridity in the landscape, with drought conditions occurring earlier in spring and lasting later in fall¹⁸. Conditions supportive of wildfire will become more common, extending the fire season through more of the year¹⁹. Projected changes will push past the tolerance of many trees and forests currently here, meaning urban forest management needs to adapt to these shifting baseline conditions as well as plan for disturbances that may accelerate ecological change. If sustained, the urban forest is a valuable adaptation tool for the City, helping to reduce the impacts of extreme heat, flooding, and other climate-driven events.



Photo: Douglas Drouin.

BY THE 2050s, PROJECTED CHANGES* TO:



TEMPERATURES

Warmer temperatures year round, with three times as many days over 30 °C.



EVAPOTRANSPIRATION

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



PRECIPITATION

More rain throughout year, except in summer. Longer summer dry spells.



GROWING SEASONS

Longer and warmer growing season, lasting over 200 days per year.

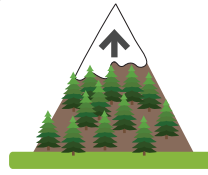


VARIABILITY

More frequent and unseasonal extreme weather

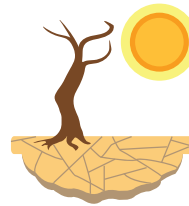
*Projected changes are adapted from the source document: Climate Projections for the Okanagan Region (February 2020)¹²

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 FIRE 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.

Figure 6. Projected climate drivers and likely impacts to Penticton's urban forest by the 2050s.

2.4 A BRIEF HISTORY OF THE URBAN FOREST

Understanding climate and geography is only half of the story of Penticton's urban forest. While climate and geography explain much of forest's composition in natural areas, recent human influence and landscape changes caused by urbanization are what make the urban forest

distinct. In this regard, the history of the urban forest is intertwined with the history of colonialism in the Okanagan.

HOW PENTICTON GOT ITS NAME

Syilx (Okanagan) people have lived in these lands for thousands of years. The place between the lakes where Penticton is now is called **SnPink'tn** in nsyilxcən, the Interior Salish language spoken by Syilx people. **SnPink'tn** means **"the place where people live year-round"**. The location was favourable because of its abundant freshwater, as well as its proximity to the many ecosystems of the valley: the open water of the lakes and river, the rich wetlands between the lakes, the pine and cottonwood forests scattered over the high ground amid the wetlands, the grasslands and meadows stretching along the terraces, and the mixed

forests reaching up to the sub-alpine. In addition to managing landscape health using cikilax'm (cultural fire), Syilx people maintain relationships with many forest plants, including cottonwood, which is used to carve dugout canoes, build cradles and treat ailments, and ponderosa pine, whose pitch was used to waterproof moccasins and other items. Europeans transcribed SnPink'tn, modifying nsyilxcən sounds they were unfamiliar with to create "Penticton" – the name that was adopted for the small town site at the foot of Okanagan Lake.



Photo: Penticton Museum and Archives (PMA0154: "Oxbows 1909"). Artwork by Gerlissa Chan.

2.4.1 NATURAL FORESTS

The term “natural forests” as used in the Urban Forest Management Plan refers to any tree-dominated ecosystem that has a significant population of indigenous trees and plants, whether largely unmaintained or deliberately managed to promote a natural structure or other natural characteristics. This definition is flexible to reflect the many contexts where natural forests can be found and their continuing value despite modification by invasive tree species and other management issues.

Natural forests in Penticton are the legacy of the City’s climate and geography as well as land-based practices of the Syilx people and ancestors over millennia, yet they

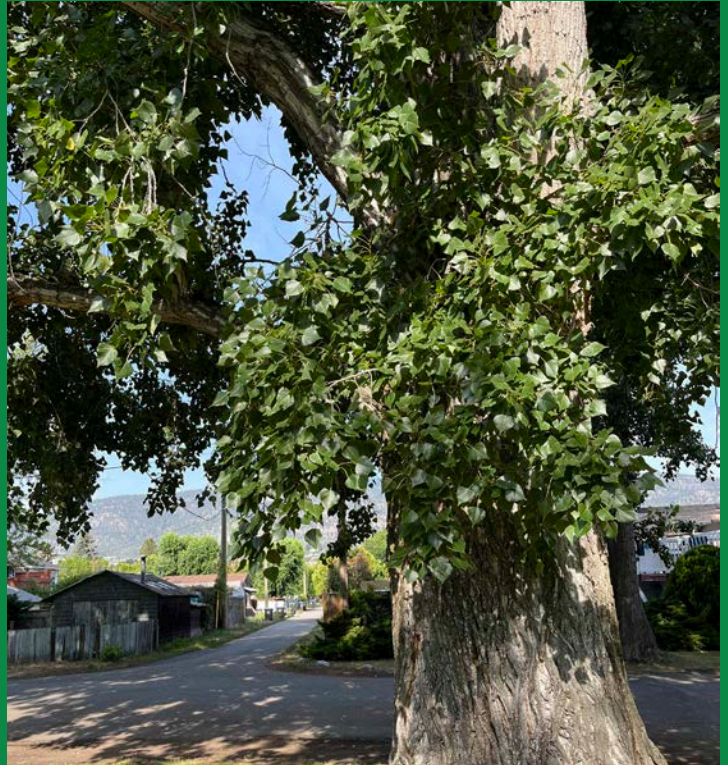
have been further imprinted by forest harvesting, wildfire suppression, and urbanization. Major alterations, such as the transformation of the Okanagan River into Penticton Channel, alongside other earthworks around Penticton Creek and Ellis Creek, the diversion and containment of many smaller creeks and draws, and the removal of forest to accommodate urban development and agriculture, have all been significant changes impacting natural forests in the City. Smaller scale changes are common throughout natural forests, where illegal dumping, the spread of invasive species, soil compaction, fire exclusion, and recreational development alter natural ecosystems in sometimes subtle ways.

Species spotlight: Ponderosa Pine (sʔatqʷɬp)



Ponderosa pine/sʔatqʷɬp (*Pinus ponderosa*) is the most common native tree species in Penticton, found in almost every natural area and many urban yards. This large coniferous tree develops a bullet-shaped crown of long slender needles in groups of three, supported by a trunk and branches with “puzzle-piece” bark in hues from rose pink to bright orange. Its cones are large and heavy, littering the ground on beds of old needles. The reason for Ponderosa’s success? It is the native tree most tolerant of drought, and makes the best use of our landscape’s limited water. Its shedding habit helps create the fuel for the frequent wildfires with which it co-evolved.

Species spotlight: Black Cottonwood (mulx)



Black cottonwood/mulx (*Populus balsamifera* ssp. *trichocarpa*) is the most common native tree found in riparian areas. This fast-growing deciduous tree appears wherever groundwater is ample, colonizing gravel river bars, streambanks, and old farmland with its thousands of white, fluffy seeds – Penticton’s June snowfall. Some of the largest trees in the City are the black cottonwoods in Lakawanna Park. Look for single-pointed oval or arrow-shaped leaves with luscious green tops and silvery undersides, as well as deep furrowed grey bark on older trees. In spring, large, sticky and highly aromatic buds open to release new leaves and strings of small flowers called catkins.

Naming Penticton's forest plants

The following glossary provides the names of some of Penticton's native forest plants in three languages. The nsyilxcən translations were provided by Syilx Artist and Knowledge Keeper, Krystal Withakay (spaxwawlm) to the Regional District of Central Okanagan Parks Services department for publication and have been reproduced here. For additional plant and wildlife names, see <https://www.rdco.com/en/parks-and-trails/syilx-okanagan-partnerships.aspx>.

<u>nsyilxcən</u>	<u>English</u>	<u>scientific (Latin)</u>
<u>trees</u>		
ćápaʔx̌	western redcedar	<i>Thuja plicata</i>
ciqʷfx	tamarack (larch)	<i>Larix</i> sp.
ćqitp	Douglas-fir (interior)	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>
mílmítitp	trembling aspen	<i>Populus tremuloides</i>
muíx	black cottonwood	<i>Populus balsamifera</i> var. <i>trichocarpa</i>
qʷəlqʷtín	birch	<i>Betula</i> sp.
qʷəqʷliʔt	lodgepole pine	<i>Pinus contorta</i> var. <i>latifolia</i>
sʔatqʷtíp	ponderosa pine	<i>Pinus ponderosa</i>
<u>shrubs and herbs</u>		
kʷətskʷətswixups	yarrow	<i>Achillea millefolium</i>
siyaʔ	saskatoonberry (serviceberry)	<i>Amelanchier alnifolia</i>
smúkʷaʔxn	arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>
sułàqa	poison ivy	<i>Toxicodendron rydbergii</i>
sx̌wmiłp	soopolallie	<i>Shepherdia canadensis</i>
tm̓tm'nyʔip	common snowberry	<i>Symphoricarpos albus</i>



2.4.2 AGRICULTURAL TREES

European settlement altered where indigenous trees grow in the City and introduced non-native tree species. The first settled industry in the area was cattle ranching, which re-purposed the area's grasslands, open pine forests, and freshwater while harvesting native trees for fence posts, building materials, and firewood. It is possible that non-native tree planting started during this era with seeded garden trees like apples, cherries, and hawthorns. By the end of the 1890s, investors started to see the potential of the region's climate and soils for orchards. Improvement of lake transportation and the coming of the Kettle Valley Railway in the 1910s opened the doors to the development of the fruit crop industry, which steadily encroached into woodlands and grasslands of the lower valley. Today, a portion of Penticton's urban forest still consists of cultivated fruit trees in orderly rows. Species like weeping willow and Lombardy poplar were introduced to act as windrows and yard shade.



Photo: Penticton Museum and Archives ("1950 AP #8 Looking North").

2.4.3 URBAN TREES

Urban growth followed incorporation, as Penticton became the commercial and service centre for the South Okanagan. Urbanization brought changes like the construction of roads and highways, homes on smaller urban lots, and new civic buildings. European ideas of beautification introduced willows, London planes, oaks, elms, and honey locusts to parks, yards, and gardens. Lakeshore Drive, Gyro Park and Lakawanna Park, with their grand trees, were established in the first half of the 20th century as Penticton developed its reputation for tourism.

By the City's re-incorporation in 1948, urban development had begun encroaching on natural forests. Many native trees were already incorporated into urban parks and yards. In the late 1940s, City Council passed a motion to preserve "Pine Tree Park" (Skaha Park), eventually transforming the ponderosa pine forest into a formal civic park where trees are set amid manicured lawns.

As Penticton's population grew, the landscape became more urbanized. The process of urbanization can be thought of as "hardening" the landscape by replacing soils and open water with paved roads, driveways, foundations, and constructed drainage. Impermeable or impervious surfaces make daily life in the City easier, but at the cost of fragmenting the urban forest into smaller and smaller islands. Fragmented ecosystems in urban areas are more vulnerable to invasive species establishment and the loss of biodiversity.

Wind as a natural disturbance



Photo: Penticton Museum and Archives (PMA2655, "Skaha Park ca. 1900")

Wind can be a significant natural disturbance in Penticton. In 2007 and 2008, major wind storms uprooted or damaged over 150 of Skaha Park's large ponderosa pine trees and many other trees throughout the City. The Skaha Park Centennial Tree Re-planting Program restored the park for both people and wildlife. The first of these trees were planted by school children on Earth Day, April 22, 2008.

Urbanization and development can also lead to new treed landscapes. Re-investment in downtown and commercial areas is adding trees to City streets, parks, and parking lots.

Trees in urbanized areas face significant challenges such as hotter temperatures due to the urban heat island effect, rapid changes in soil moisture (including inundation and effective drought) because of engineered drainage and poor soil quality, impacts from vehicles and machinery, vandalism, and conflicts with utilities. In Penticton, a busy summer events calendar and ever more popular parks are teaching visitors, residents, and City staff alike about impacts like soil compaction faced by some of the most treasured urban trees.

The City is shifting again as it strives to accommodate population growth. Development will be concentrated around its urban center near transit corridors through infill development, instead of sprawling towards its periphery. This is driven in part by the province's Bill 44 Housing Statutes (Residential Development) Amendment Act (see page 19). While this presents challenges to trees within Penticton's urban centre, it is the best way to provide much needed housing and conserve larger areas of natural forest on the City's outskirts, where most of its urban forest is located.

Hardscapes and the urban forest



Hardscapes are areas where impermeable surfaces have substantially changed the growing environment available to trees and forests by fragmenting soil volumes into smaller areas and redirecting precipitation runoff through constructed drainage. Think of a hardscape as a 3-dimensional environment – concrete buildings or blank walls, asphalt roadways, and the compacted mineral base underneath most modern construction all segment the potential growing environment for trees. New construction and design standards can make the urban environment more hospitable for trees, helping to stitch the urban forest back together.



Photo: Penticton Museum and Archives (PMA20532 "Lakeshore Drive 2007")



Photo: Penticton Museum and Archives ("1968 South Main Skaha Lake Rd").

Penticton's urban forest has undergone significant transformations, as illustrated in the photos below of Riverside Drive. The 1963 (top) image showcases the initial stages of infrastructure development along Riverside Drive prior to tree planting, while the 2023 (bottom) photo reveals the result of planting and tree growth since then. These changes highlight the impact of past decisions on our community. The UFMP has the potential to influence how our City will look and feel and provides an opportunity to lead by example as we accommodate both urban growth and urban forest expansion.



Photo: Penticton Parks Department



UPDATES IN HOUSING POLICY: PROVINCIAL LEGISLATION AND LOCAL PROGRESS

In late 2023, the provincial government introduced legislation to promote the construction of housing throughout the province. Bill 44: Housing Statutes (Residential Development) Amendment Act made it illegal for municipalities of 5,000 people or more to use zoning bylaws to limit the development of missing middle housing forms, including granny flats, townhouses, duplexes, and small apartments. Bill 46: Housing Statutes (Development Financing) Amendment Act aims to increase transparency around development costs and procedures while expediting Official Community Plan-conforming projects. Bill 47: Housing Statutes (Transit-Oriented Areas) Amendment Act increases the minimum allowable density within 400 metres from all Transit-Oriented Areas designated by regulation.

Council has previously directed the provision of attainable, accessible housing as a priority for the City. The Task Force on Housing reviewed housing policies in Penticton's Official Community Plan and made 18 recommendations in December 2023 to meet the demand for housing. The project team for the Urban Forest Management Plan presented to the Task Force on Housing about potential interactions between the urban forest and housing policy. Penticton's Official Community Plan and Zoning Bylaw are currently being updated to respond to the recommendations of the Task Force on Housing and new provincial rules. The direction is toward land use intensification in existing urbanized areas.

Shifting from extensive sprawl to intensive infill development can present challenges for tree retention but also benefits the urban forest. Land use intensification conserves much greater areas of natural forest on the outskirts of the city, while redevelopment in urban areas provides the opportunity to amend development standards to promote tree planting and reclaim paved landscapes. The Urban Forest Management Plan seeks to leverage growth, recognizing that planning and thoughtful design are solutions for sustaining Penticton's trees amid a growing community.





CHAPTER 3.

STATUS AND TRENDS

Chapter 3 provides context for Penticton's 17% canopy cover (2020) which is primarily located in its natural areas. It assesses the structure and composition of the urban forest, and how canopy cover and plantable area vary by land use. It also identifies areas of higher need for tree cover based on Tree Equity Score (TES), a system developed by American Forests to quickly assess tree planting and protection priority areas. The facts and figures in this chapter are based on three primary sources: mapping of canopy cover based on a City-owned LiDAR dataset (2017) corrected using a City-owned (2020) orthophoto; the City's partial inventory of about 8000 trees in urban areas; and field observations made by a professional forester in July 2023. This chapter seeks to answer questions like how much urban forest exists in Penticton, what we know about the size and species of trees, where trees grow in the City, and who is responsible for urban forest management.

3.1 URBAN FOREST EXTENT

To understand the extent of Penticton's urban forest, the Urban Forest Management Plan describes its canopy cover. Canopy cover is a measure of the area obscured by trees when viewed from above. It can be expressed as an absolute measurement or as a percentage in relation to a defined boundary. Canopy cover is a useful benchmark for the urban forest because it can be stated for any land use or ownership, be compared with results from other municipalities or regions, and has clear links to the ability of the urban forest to provide ecosystem services.

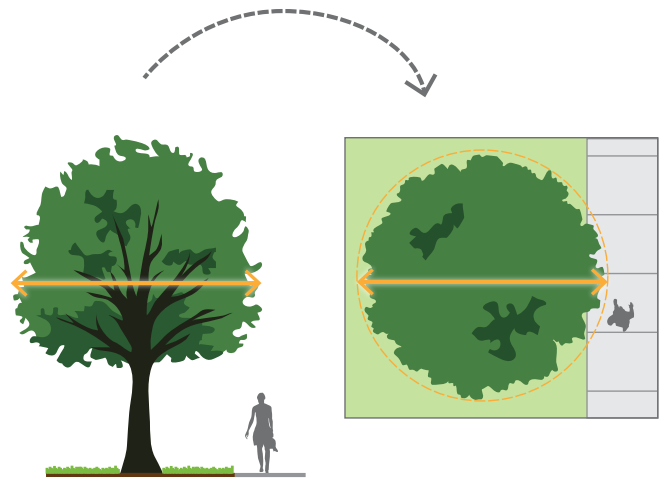


Figure 7. Canopy cover is the 2D area occupied by trees when viewed from above.



3.1.1 CITY-WIDE CANOPY COVER

Penticton's canopy cover is 17% within the City boundary. Trees cover 742 hectares within the City's 4,300-hectare land boundary. There are approximately 243,000 trees in the City, an estimate based on the analysis of LiDAR data and orthophotography. This tree count is likely an underestimate because the canopy assessment distinguishes between high and low vegetation using a height cutoff of two metres. Forest trees under the main level of the tree canopy can also be missed if they are completely obscured by larger overstorey trees.

Canopy cover in Penticton is believed to be declining over time, driven by interrelated climate change and forest health issues, construction-related tree loss, tree removal on private property, and insufficient tree planting on public property. This assumption can be confirmed by future monitoring of the urban forest canopy.

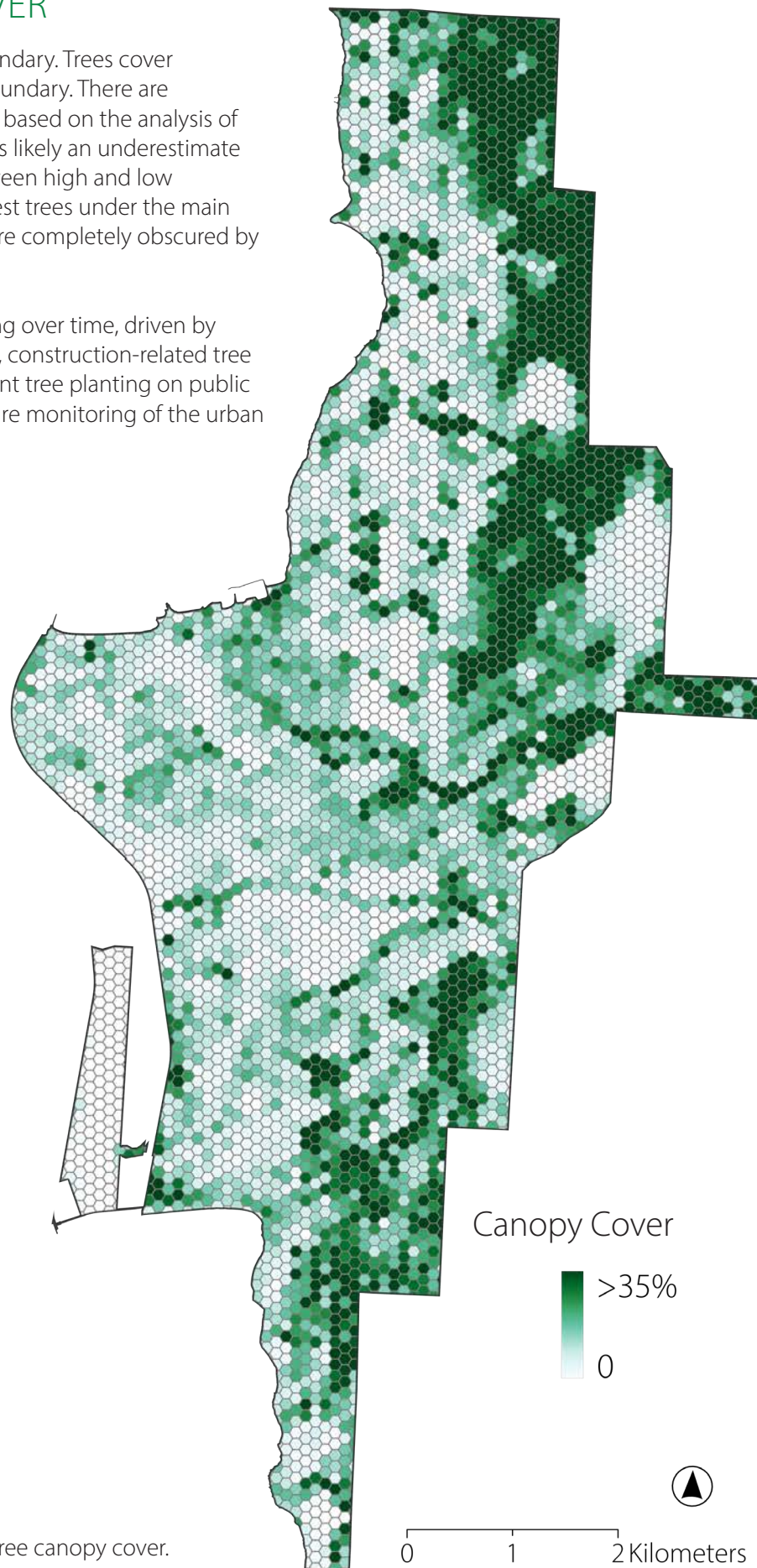
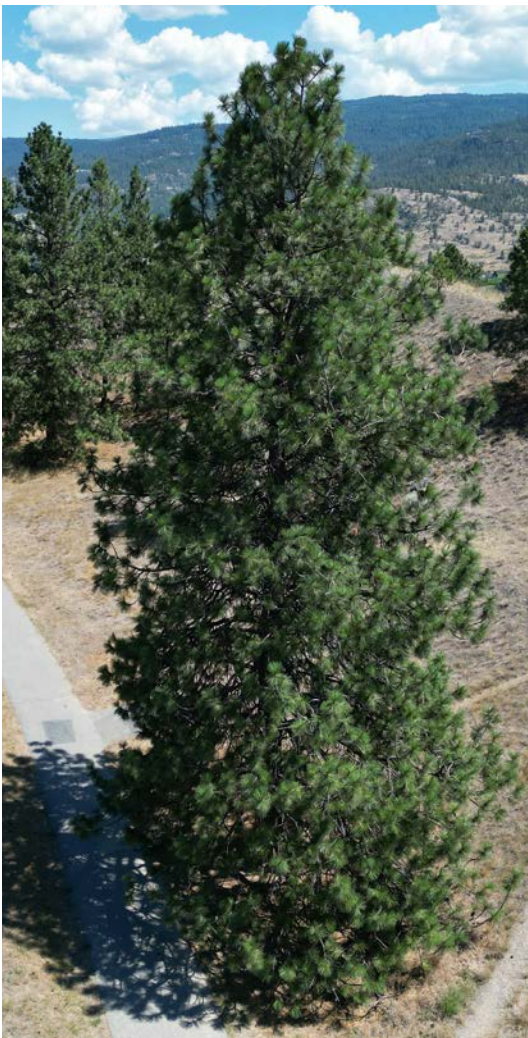


Figure 8. Tree canopy cover.

COMPARING CANOPY COVER

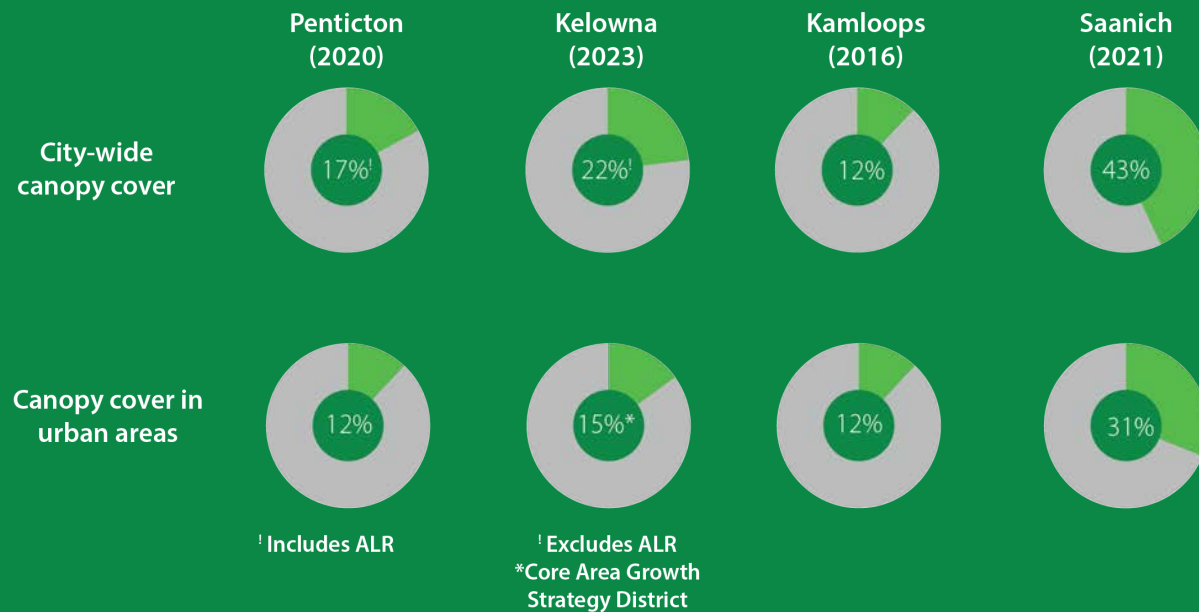


Figure 9. Comparison of Penticton's canopy cover with selected BC cities.

City-wide canopy cover is influenced by all the factors that affect trees in the City's landscape, including climate, geography, land use, and forest health. While municipal urban forest dynamics can vary widely, Penticton's 17% canopy cover is in the middle of cities that share similar contexts, land use patterns, populations, and urban forestry programs. Kelowna's 2024 Urban Forest Strategy found 22% canopy cover city-wide (excluding the Agricultural Land Reserve) while Kamloops' 2016 Urban Forest Management Strategy estimated 12% canopy cover city-wide. These southern Interior cities occupy semi-arid valleys with a legacy of lower tree cover. For contrast, the District of Saanich (Vancouver Island) is an example of a municipality in a primarily forested biome and has 43% canopy cover. Globally, cities in grassland biomes have been found to have 19% canopy cover on average, while forest biome cities have 31%²⁷.

Canopy cover in urban areas is often lower than city-wide. Of the comparison cities, only Kamloops had similar canopy cover in urban settings and city-wide. Notably, its canopy cover is the lowest (12%) of the comparisons. Penticton's urban areas have 12% canopy cover, as in Kamloops, but Penticton's natural and agricultural areas support more canopy cover increasing the City-wide total to 17%.

Kelowna's Urban Forest Strategy does not report on canopy cover across all urban areas but uses designations called Growth Strategy Districts to summarize its urban forest. The Core Area Growth Strategy District represents urban neighbourhoods with a mixture of housing densities, and has canopy cover of 15%. The Suburban Growth Strategy District (not shown in Figure 8) represents low density residential neighbourhoods and has canopy cover of 20%. This suggests canopy in Penticton's urban areas could be increased. Saanich's high urban canopy cover of 31% reflects the legacy of its coastal forest ecosystems as well as a more favourable climate for tree growth.

3.1.2 BUILDING BLOCKS OF THE URBAN FOREST

Three types of trees form the building blocks of Penticton's urban forest: natural forests, trees in rural/agricultural areas, and urban trees (see section 2.4). Estimates of the contribution of each building block to the urban forest were made by separating the city-wide canopy map using Penticton's existing natural areas and land use mapping, then refined following review in the field.

Urban trees are located in streets, yards, landscaped parks, and other urban developed property outside agricultural areas. They can include native species that have been preserved into new urban landscapes, such as the ponderosa pines at Skaha Lake Park. Urban trees generally lack an understorey of native plants, continuity with natural forests, or both. Approximately 51,000 (21%) of trees in the urban forest are urban trees. Urban trees provide 139 ha of canopy, or 19% of the total 742 ha of tree canopy in the City.

Natural forests are places where indigenous tree species and ecosystems form a dominant vegetation cover in areas that are either unmaintained landscapes or specifically managed to promote natural ecosystem characteristics. This includes pockets of forest in urban areas, such as along Ellis Creek, the oxbows, and steep slopes, as well as the broader forest landscape beyond Penticton's urban and agricultural areas. Natural forests contain approximately 151,000 (62%) of Penticton's trees and provide 518 ha (70%) of its canopy cover.

Agricultural/rural trees are located on agricultural and rural property. They include orchard trees as well as shade trees, windrows, and landscape trees whether they are self-seeded or planted by property owners. Agricultural/rural trees number approximately 40,000 (16%) of Penticton's total tree population and provide 85 ha (11%) of the total 742 ha of tree canopy in the City.

Key concept: Each of Penticton's urban forest building blocks faces challenges. Natural forests contribute more than two-thirds of the City's urban forest canopy but are being impacted by climate change, invasive species establishment, fire exclusion and changes in the natural disturbance regime, and tree removal for greenfield development. Agricultural trees are slowly being lost from orchard conversion to viticulture. In urban areas, development activity and the aging out of mature trees are the biggest threats. Combined, these issues could result in losses of several dozen hectares of canopy cover during the next 20 years.

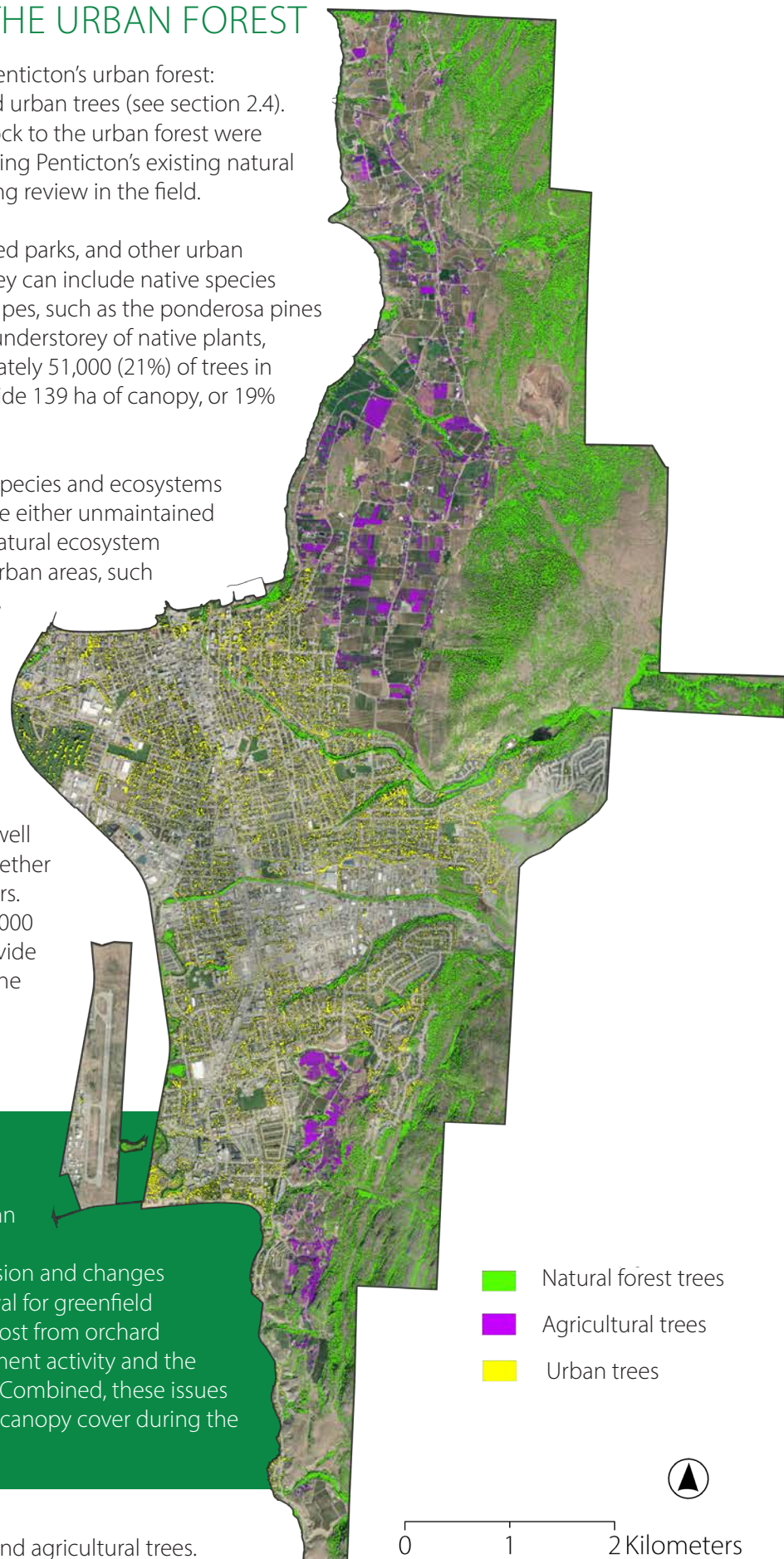


Figure 10. Canopy distribution of natural, urban and agricultural trees.

FOREST CORRIDORS

The Urban Forest Management Plan identifies Forest Corridors to support planning of natural restoration initiatives. Forest Corridors are linkages between natural forest canopy patches in the urban area, where they provide reserves of native biodiversity or potential pathways for the movement of native species between habitats on either side of the Okanagan valley. The urban area of the City of Penticton is a barrier to the natural movement of wildlife in the Okanagan valley, as it occurs at a critical point between Okanagan and Skaha Lakes where cross valley travel of wildlife would otherwise occur freely. This importance for wildlife movement is part of the reason SnPink'tn was "a place inhabited year-round" by Syilx people prior to colonization. Supporting natural forest cover around Penticton Creek, Ellis Creek, and other natural features that bridge the urban area can help reconnect habitats and preserve regional biodiversity. At the same time, supporting native biodiversity in remnant natural forests within the urban area provides ecosystem services, including cultural services of importance to Indigenous peoples, that urban residents may not otherwise be able to easily access. Penticton's Forest Corridors are a significant component of building tree equity and access to the therapeutic benefits of nature in the City.



Figure 11. Penticton's conceptual forest corridors.

- ① **Ellis Creek Corridor**
- ② **Penticton Creek Corridor**
- ③ **Skaha Lakefront Corridor**
- ④ **Channel-Oxbows Corridor**
- ⑤ **Wiltse Bench Corridor**
- ⑥ **Okanagan Lakefront Corridor**

Urban Connections

In the future, Penticton can enhance the role of Forest Corridors by improving the quality and connectivity of the urban forest. These Urban Connections are conceptual but reflect existing concentrations of urban tree canopy or planting opportunities that help bridge the gap between remaining natural forest areas. Both Forest Corridors and Urban Connections have many opportunities for enhancement through ecological restoration and tree planting. Creating additional connections between forest corridors is likely to require significant investments in improving planting sites in City streets as well as some new planting in parks or other urban settings. The location of urban connections can be refined through site assessments.



3.2 URBAN FOREST STRUCTURE

Urban forest structure refers to the size, age, and diversity of trees. Size can be used to broadly infer the age of the urban forest, as all trees start their lives as small saplings and only some grow to become large.

The Large Tree Argument



Figure 12. Benefits and costs from a large tree and a small tree over their lifetimes.

The large tree argument recognizes that increasing tree size multiplies the potential provision of ecosystem services²⁸. It takes four trees with a canopy five metres across to replace one tree with a canopy ten metres across. Large trees also provide ecosystem services, particularly for habitat and

biodiversity, that small trees cannot. Large trees are an essential piece of the urban forest that deserve planning and protection because they provide better value for management.

3.2.1 RESULTS FROM CANOPY MAPPING

Penticton's urban forest is dominated by trees that are small in height and canopy area (Figure 12). Trees of two to five metres in height represent 35% of all the trees in the City. A full 58% of trees in the City are less than ten metres in height. Just 9% of trees are 20 metres in height or more. Trees of 20 metres or more in height in Penticton represent large trees that are many decades if not over one hundred years old.

Despite their small number, these large trees provide 20% of the City's 742 hectares of tree canopy. Trees 10 – 20 metres in height represent one-third of the City's total trees but provide half of its total canopy. Trees less than ten metres tall provide less than one-third of the City's canopy despite their considerable number.

Key concept: Large trees are difficult to replace. Tree protection can help delay the loss of the largest mature trees and preserve medium-sized trees having the potential to replace them.

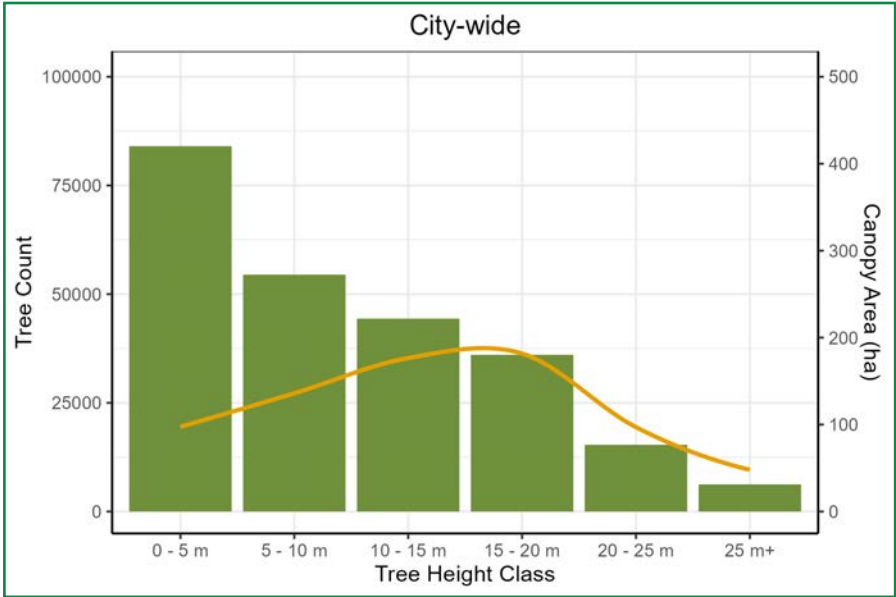


Figure 13. City-wide tree count (bars) and canopy area (line) by height class. Small trees (left) outnumber large trees, but provide far less canopy area.



<< This Ponderosa pine in the Penticton Creek watershed was measured to have a height of nearly 40 m.

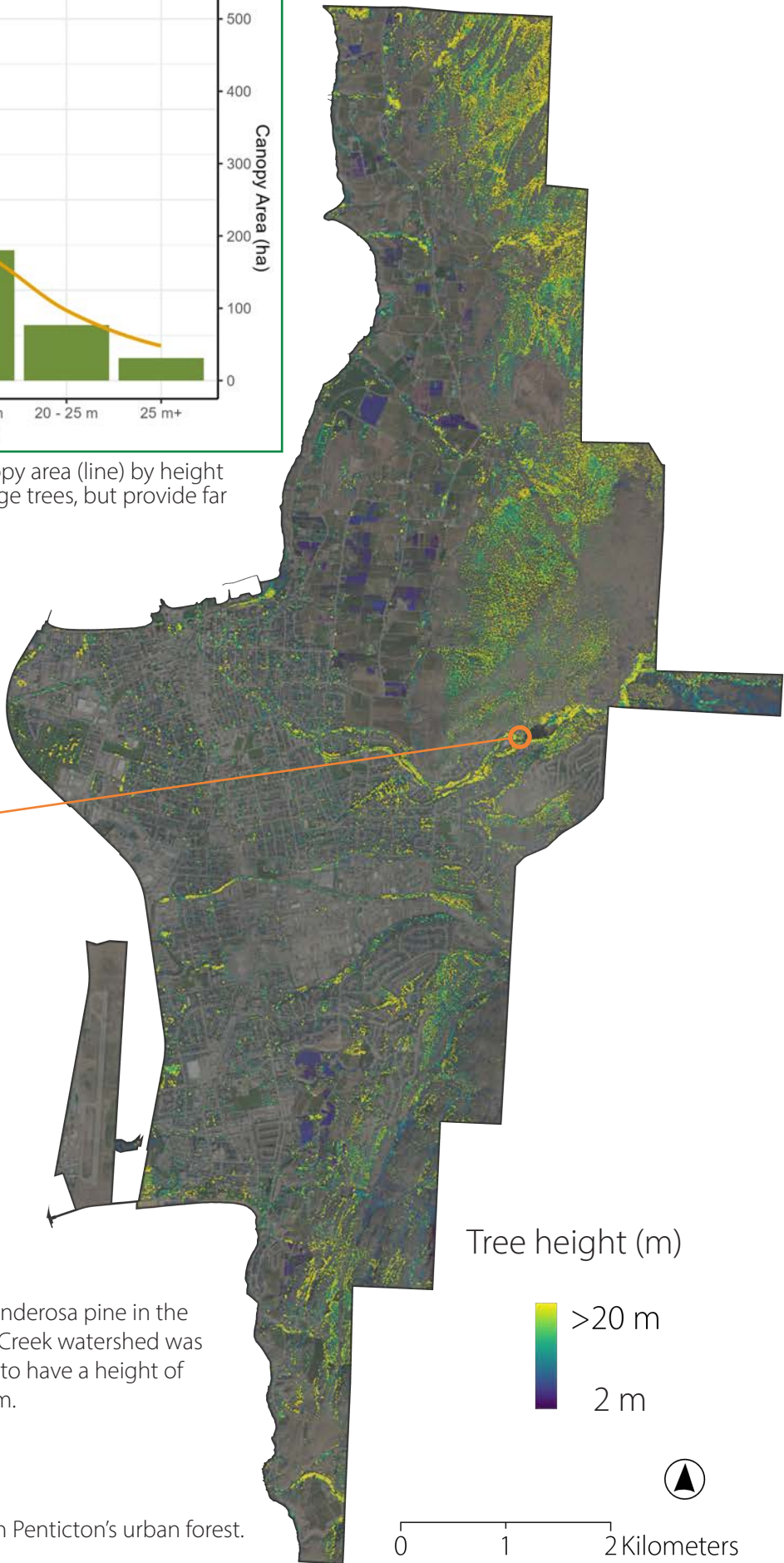


Figure 14. LiDAR-detected heights of all trees in Penticton's urban forest.

PENTICTON'S BIGGEST TREES

Penticton's biggest trees are scattered widely. The City's tallest trees are generally in natural areas, and reach heights of about 30 metres. Ponderosa pine and cottonwoods growing in riparian areas tend to be the tallest trees. Capable of rapid growth and living for centuries, the slight moisture advantage found around creeks and channels can be enough to propel them upward over their peers. The City's older deciduous trees tend to have the largest canopy spreads. Trees with 110 m² of canopy area or more are quite large, having an equivalent branch-tip to branch-tip spread of 12 metres. Stand-out trees include cottonwoods in Lakawanna Park, a London plane on private property near downtown, and the silver maple on the lawn of the Provincial Courthouse. With a canopy area of about 450 m² and a maximum height of 20 metres, the courthouse maple might qualify as Penticton's largest tree. ∨

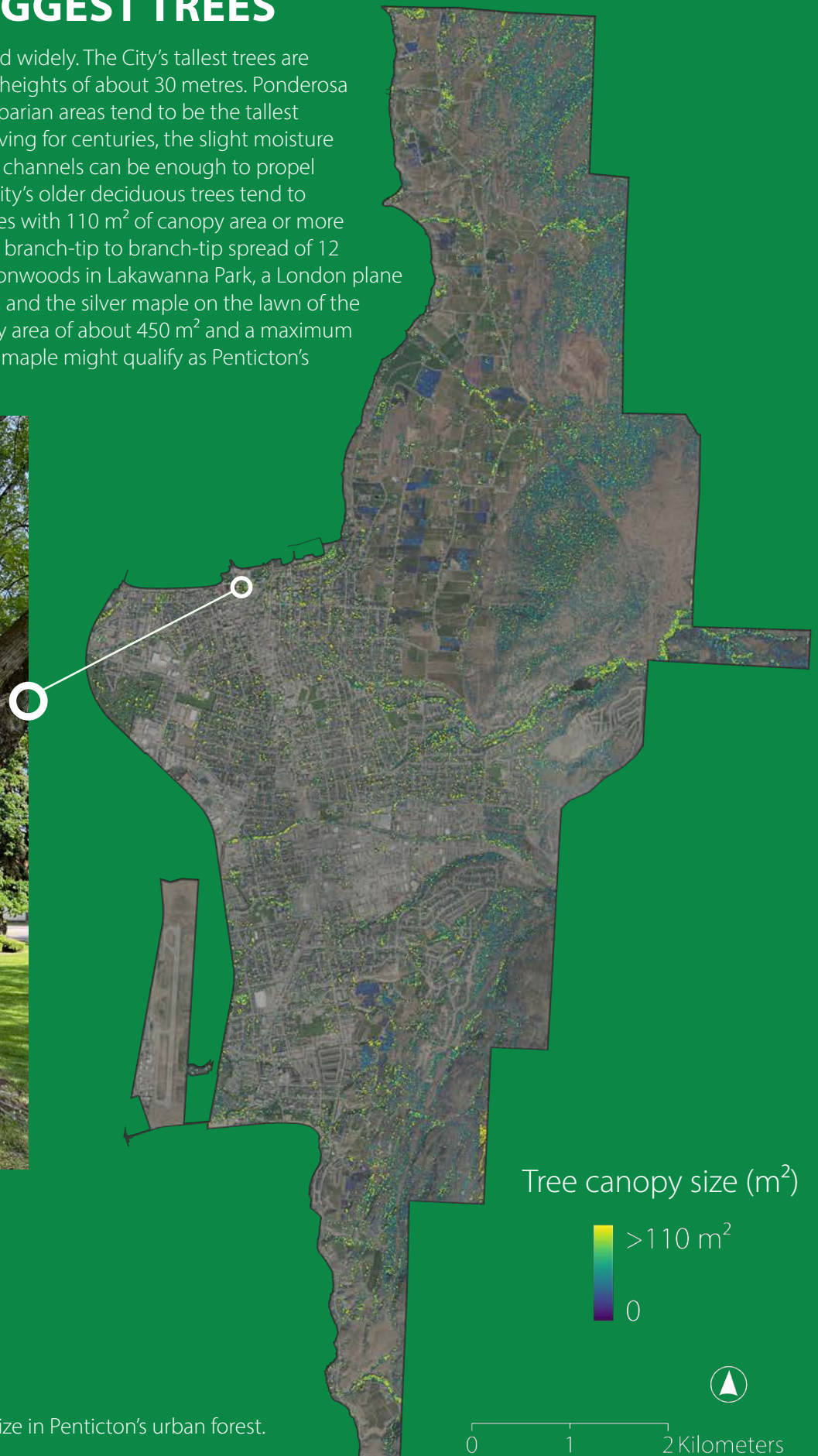
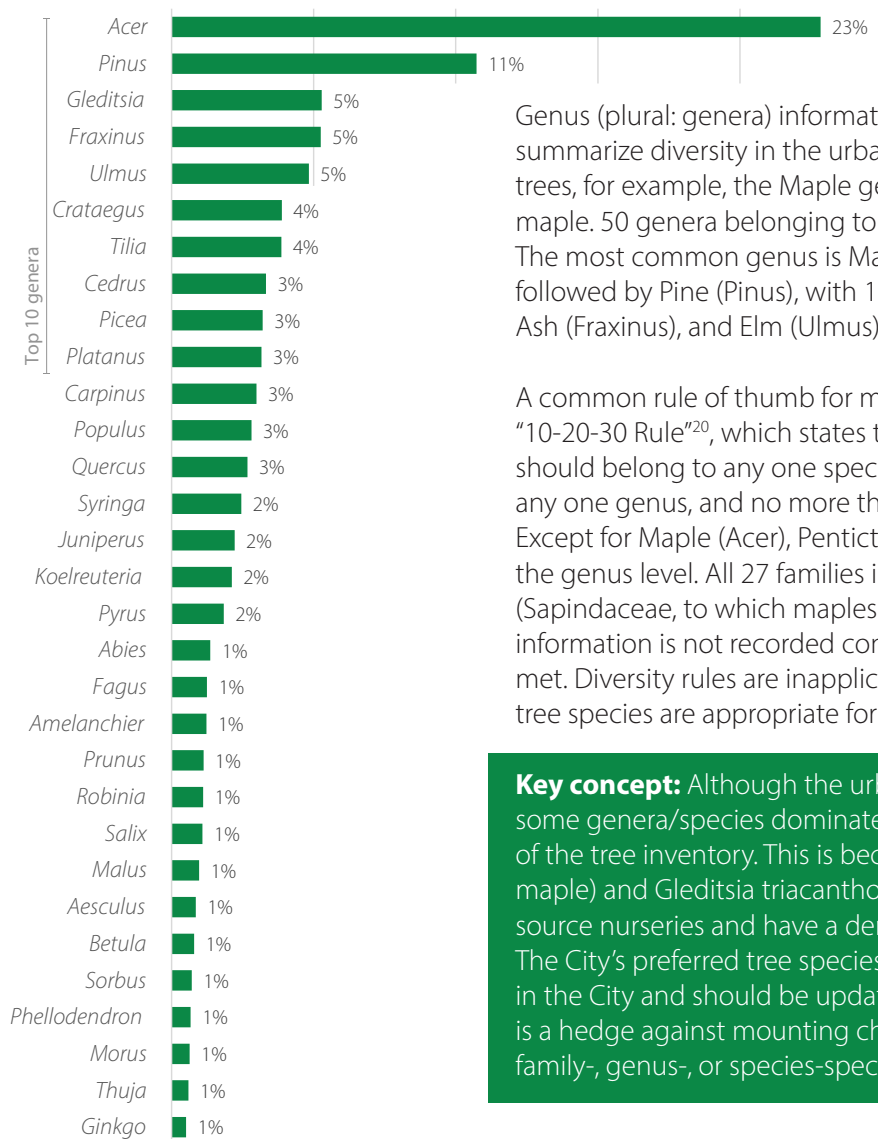


Figure 15. LiDAR-detected canopy size in Penticton's urban forest.

3.2.2 DIVERSITY IN THE CITY'S TREE INVENTORY



Genus (plural: genera) information recorded in the City's inventory helps summarize diversity in the urban forest. Genera are closely related groups of trees, for example, the Maple genus contains all of the different species of maple. 50 genera belonging to 27 families are present in the tree inventory. The most common genus is Maple (Acer), representing 23% of the inventory, followed by Pine (Pinus), with 11% of the inventory. Honey Locust (Gleditsia), Ash (Fraxinus), and Elm (Ulmus) contribute about 5% each to the inventory.

A common rule of thumb for managing diversity in the urban forest is the "10-20-30 Rule"²⁰, which states that no more than 10% of the urban forest should belong to any one species, no more than 20% should belong to any one genus, and no more than 30% should belong to any one family. Except for Maple (Acer), Penticton's tree inventory meets this guidance at the genus level. All 27 families in the tree inventory meet the 30% guideline (Sapindaceae, to which maples belong, leads with 26%). Species-level information is not recorded consistently enough to assess whether the rule is met. Diversity rules are inapplicable to natural forests, where only a few native tree species are appropriate for planting.

Key concept: Although the urban forest has increased in diversity over time, some genera/species dominate in urban areas. 10 genera make up two-thirds of the tree inventory. This is because some trees, including *Acer rubrum* (red maple) and *Gleditsia triacanthos* (honey locust), are relatively common in source nurseries and have a demonstrated tolerance for urban conditions. The City's preferred tree species list notes only *Gleditsia* as over-represented in the City and should be updated to reflect overplanting of maple. Diversity is a hedge against mounting challenges because many mortality factors are family-, genus-, or species-specific.

Figure 16. Genus distribution of trees in Penticton.

PENTICTON'S TREE INVENTORY

The City has a digital record of just under 8,400 trees on public and private property. This record is called a tree inventory. The tree inventory serves the Parks Department and Electrical Department. Trees in the inventory found on private property were previously pruned by the Electrical Utility. Inventoried trees on public property are mainly park and street trees maintained by the Parks Department. Attributes recorded for each tree in the inventory vary based on the purpose of including the tree and who completed the field assessment. Most entries identify the tree's genus, height and diameter at breast height (dbh). Some records also indicate the tree's species and other notes.

In total, 6,881 trees in the inventory are on City property or are City-managed. This includes 2,085 trees in public rights-of-way, 4,796 trees in City parks, gardens, and other properties. Another 820 trees in the inventory are on public land not managed by the City, like school district property or provincial land, and 683 are on private property. The tree inventory can be explored via the City's open data website.

3.3 LAND USE AND THE URBAN FOREST

Understanding how the urban forest relates to land uses in the City informs our predictions of future trends like the rate of tree loss and replanting with development. It also points toward where there are major opportunities for tree planting and policy amendments that can help sustain the urban forest for the long-term. Future land use is defined by the Official Community Plan (OCP), which sets a high-level direction for the kinds of economic activities that can occur in different parts of Penticton, and the Zoning Bylaw, which details the permitted land use on specific properties.

3.3.1 CANOPY COVER BY THE OCP FUTURE LAND USE

In the OCP, Future Land Use is mapped to show where and what type of development will be supported in Penticton. Future Land Use designations in the OCP were updated in 2024 in response to the recommendations of Council's Housing Task Force. Future Land Use may align with the existing form of development in a neighbourhood where only modest change is planned, but it can also indicate where changes in the form and character of an area are planned. Land uses that take up a larger area in the City will have a greater influence on the overall urban forest.

While canopy cover city-wide averages 17%, it varies widely by land use. In highly urbanized land uses like Downtown Mixed Use, Commercial, Industrial, and general Mixed Use, canopy cover averages less than 5%. Canopy cover over roadways is just 6%, though this includes long distances of rural roadway where tree planting would be of limited benefit to most residents. The average canopy cover across all urban land uses is 12%, with only Low Density Residential land use having canopy cover higher than this – at 17%. Natural and Conservation Areas, Parks, and First Nations land have the highest average canopy cover at 28-29%. Cover on Rural Residential property is also high at 25%. Agricultural land has 13% canopy cover. Because of right-to-farm legislation, the City has limited influence over the urban forest on agricultural property.

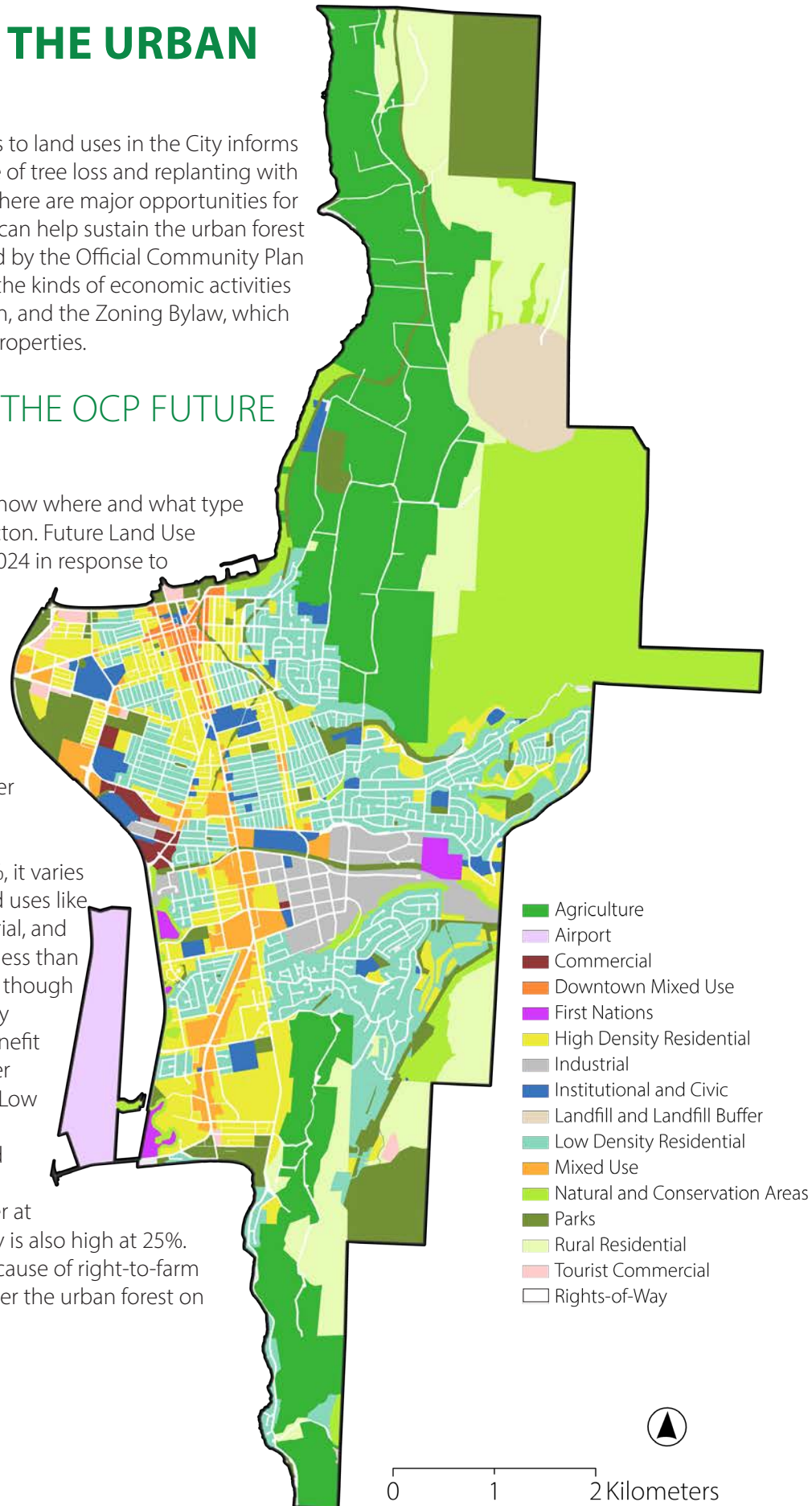


Figure 17. Future land uses in Penticton's Official Community Plan.

Key concept: Greenfield development where future residential land uses are currently occupied by natural forests could result in the net loss of 17 hectares (2.3%) of tree canopy during the next 20 years, with additional net loss of up to 29 (3.9%) ha occurring on other land uses (even with tree planting required under current zoning rules). Estimated canopy losses depend on factors the City can influence, like tree protection and development rules, as well as factors mostly beyond its control like climate-driven events, forest health issues, and conversion of orchards to vineyards. To avoid or offset the potential loss of trees over 20 years, the City will need to consider both new tree planting efforts and opportunities to slow canopy loss through enhanced tree protection.

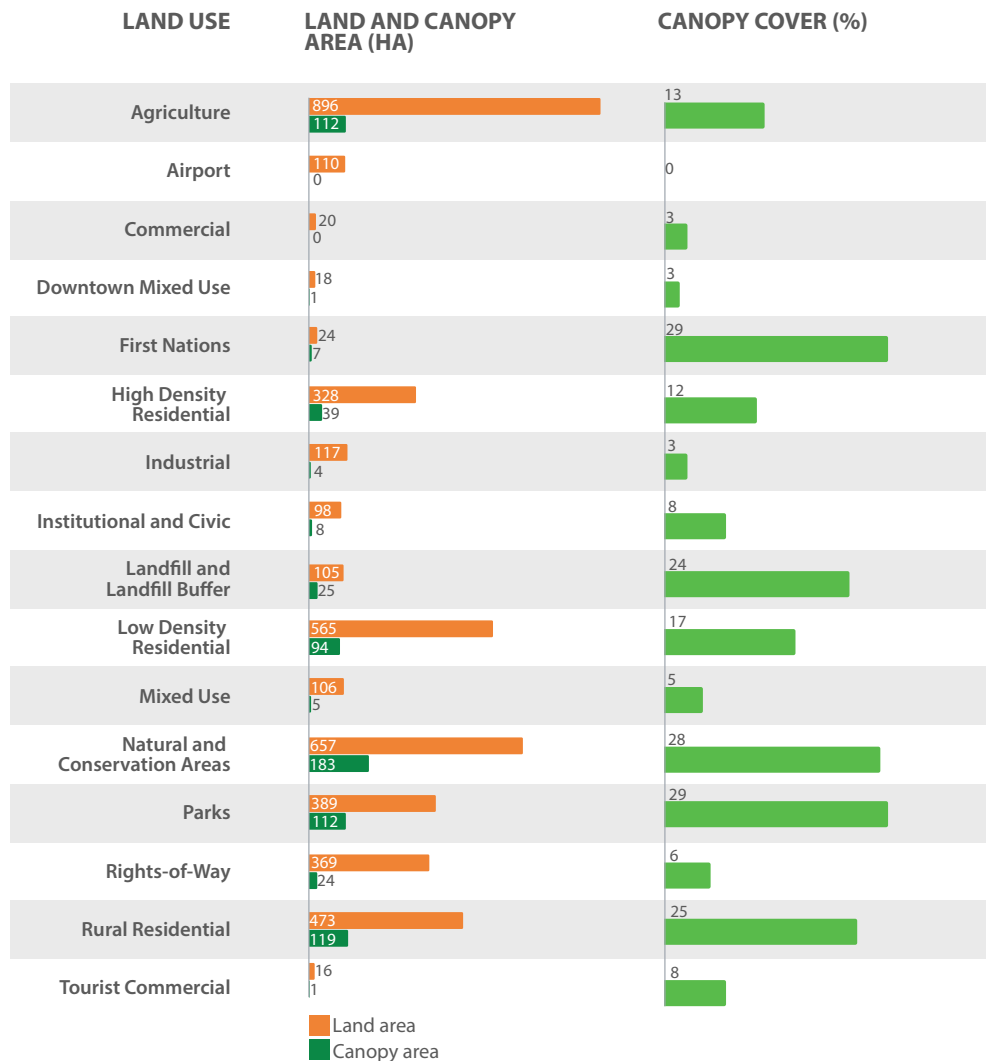


Figure 18. Land area, canopy area, and canopy cover in each Future Land Use (2024 OCP update).

How land use bylaws shape the urban forest

The OCP and Zoning Bylaw provisions complement each other, with policies in the Official Community Plan providing targets and guidelines general to all development or development within defined map areas and the Zoning Bylaw providing enforceable standards. Both sources of information can guide landscaping or tree cover. For example, Penticton's North Gateway Plan (a sub-plan of the OCP) contains a target to retain existing City trees and double tree canopy in the area through development, while

the Zoning Bylaw contains a requirement to plant trees on single-family and duplex properties. Landscaping provisions in the Zoning Bylaw are powerful tools for urban forestry because landowners are compelled to meet the Zoning Bylaw standards, sometimes taking precedence over other bylaws or City policies. A third bylaw, the Subdivision and Development Bylaw, controls the creation of the public realm in the City by enabling engineering standards for streets, utilities, and tree planting on public property.

3.3.2 IMPERVIOUS SURFACES AND PLANTABLE SITES

The Zoning Bylaw regulates requirements like lot line setbacks and total site coverage by buildings. Maximum lot coverages by zone are good indicators of where trees face the most limiting environments. Maximum lot coverage in the City ranges from 10% in conservation lands to 100% (allowing wall-to-wall construction) in downtown areas. Industrial areas have no maximum lot coverage, reflecting the unique operation and delivery needs of these facilities. Where allowable lot coverage exceeds 50%, space for larger trees becomes limited. When lot coverage exceeds 80%, the City's public realm (mainly streets and parks) becomes essential for providing tree canopy to neighbourhoods. Beyond lot coverage, landscape area for tree planting can be further limited by patios, driveways, parking, or other impermeable surfaces.

Lot coverage in the Zoning Bylaw represents what is allowed to be built on a property, but many properties are not currently built to their maximum lot coverage. To estimate the current availability of permeable landscape areas, an assessment was made using i-Tree Canopy software, which creates a statistical estimate of different land covers from user review of aerial photographs. The 2020 orthophotography supplied for the city's canopy analysis was used for this review. These results indicate that within the municipal boundary, 28% of the land (1,200 ha) is covered by impervious surfaces. 38% (1,700 ha) of land is permeable surface that potentially could be planted, of which two-thirds (1,200 ha) are private property and one-third (500 ha) is public property. An additional 14% (600 ha) of land has permeable surfaces unsuitable for tree planting – these areas present clear land use conflicts that exclude trees, like the middle of playing fields, agricultural fields, and safety clearances at Penticton Airport. Although 38% of the city's land base was assessed to be potentially suitable for planting, much of these places could be impractical (located in difficult to access places), ecologically unsuitable (e.g., grassland environments or moisture-limited pine forests), or could be ruled out by conflicts with infrastructure or land use on further investigation.

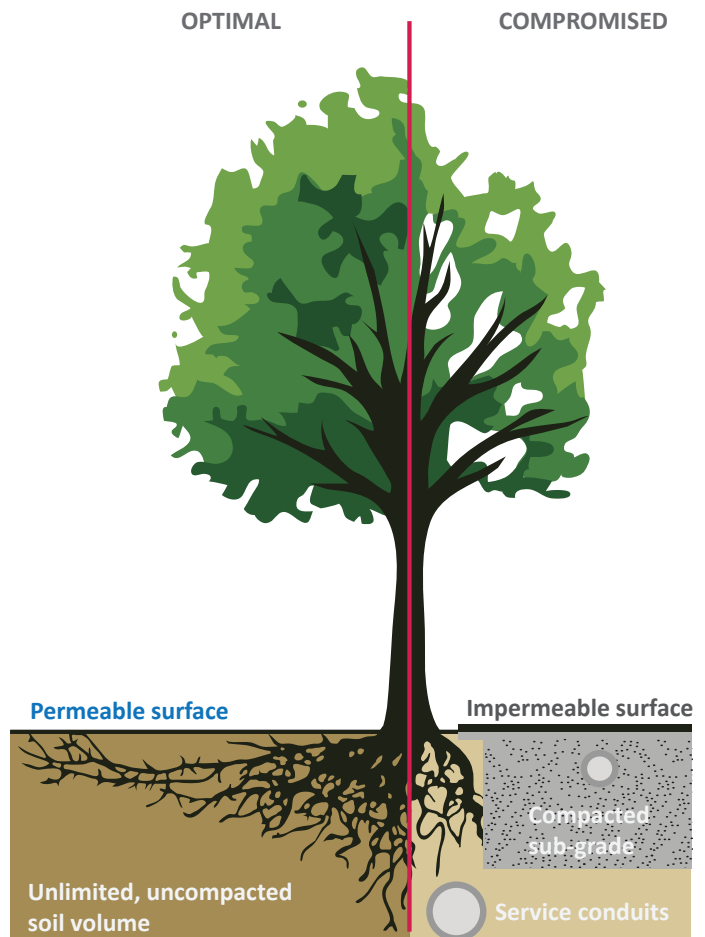


Figure 19. Impervious surfaces can impact tree longevity.

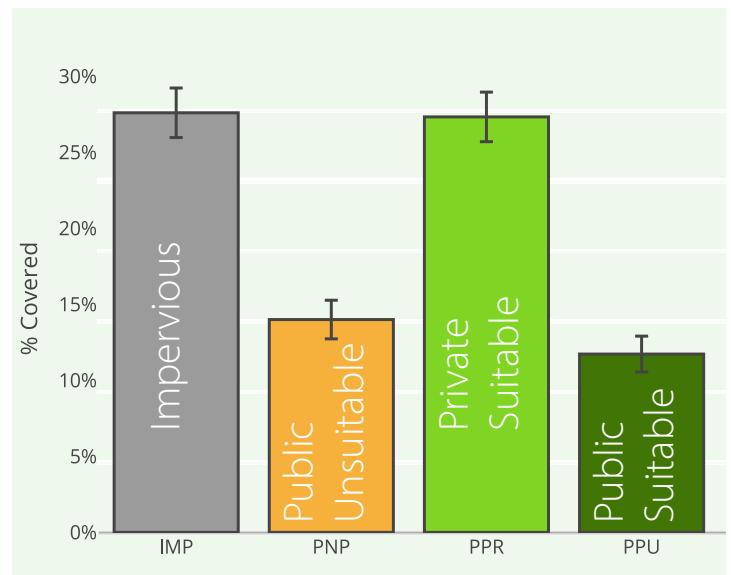


Figure 20. i-Tree canopy results of land cover by surface type.

Key concept: Impervious area in the City will trend upwards as development proceeds and land use intensification occurs. Zones with 50% maximum lot coverage or more already present challenges for finding tree planting sites, making regulating planting site requirements through landscape area standards for these sites important to preserve the urban forest on private property in the long-term. In neighbourhoods where lot coverage on private property exceeds 80%, such as Downtown and most industrial areas, the public realm becomes essential for providing urban forest canopy. In hardscapes, trees often need engineered soil and irrigation solutions to preserve planting site value.

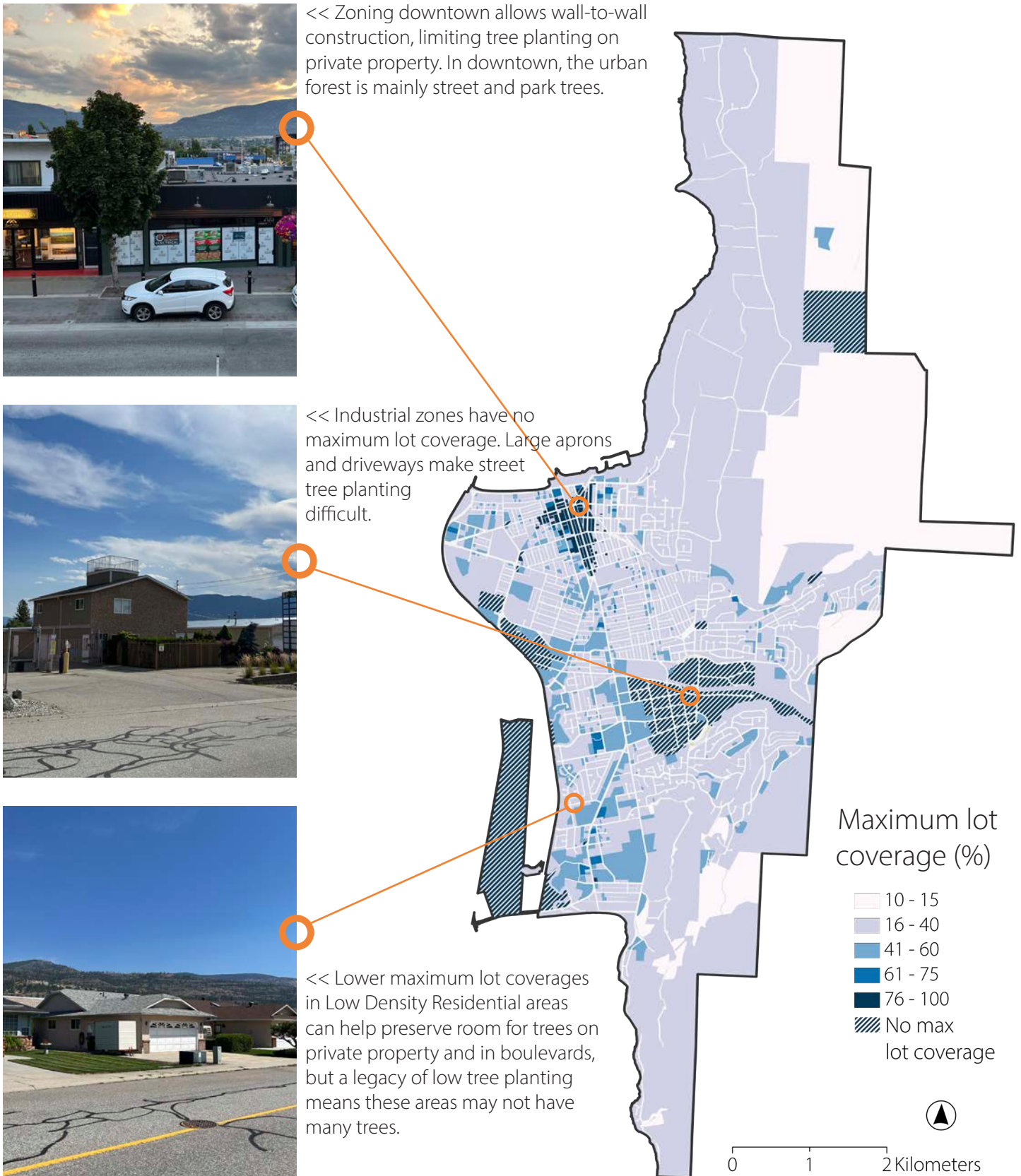


Figure 21. Maximum lot coverage by impervious surfaces in Penticton's zoning.

3.4 TREE EQUITY

Canopy cover in Penticton is not evenly distributed throughout the City. This uneven distribution impacts the health of our society and community, because it means people living in the City have different access to urban forest ecosystem services. The idea that every person deserves to have access to the benefits of trees is called tree equity. Several studies have shown that urban tree canopy tends to be higher in neighbourhoods with higher socioeconomic status and lower in areas with more socially disadvantaged people^{21,22,23,24} This is an important issue for urban forest management because environmental quality is a strong influence on people's life outcomes. Younger children and older adults, for example, tend to be more vulnerable to extreme heat, and lower-income households may not be able to afford modern building cooling systems.

An American non-profit organization, American Forests, has developed a method for calculating the equity in the distribution of a community's urban tree canopy²⁵. The approach called the "Tree Equity Score (TES)" explores how closely tree canopy and surface temperatures align with socioeconomic factors. To apply to Penticton, American Forests' method was adapted to use socioeconomic data available from the Canadian Census of Population. The adapted TES ranges from 0 to 100 and has been calculated for each census dissemination area in Penticton. A score of 100 indicates that tree equity has been achieved. Lower scores correspond to census dissemination areas where there is a combination of low canopy cover, high land surface temperature, and a high proportion of seniors and children, visible minorities, low-income people, and unemployed people.

Table 1. The five socio-economic indicators used in the priority index.

Indicator	Description
Climate	Land surface temperature, as measured from remote sensing data
Income	Percentage of people living on incomes below 200% of the federally designated poverty line (less than \$40,000 per annum)
Age	Seniors (age 65+) and children (0-14) as a proportion of working age adults (15-64).
Ethnicity	Percentage of people who belong to visible minority groups, as defined by the Employment Equity Act and, if so, the visible minority group to which the person belongs.
Unemployment	Percentage of unemployed people within the labour force.

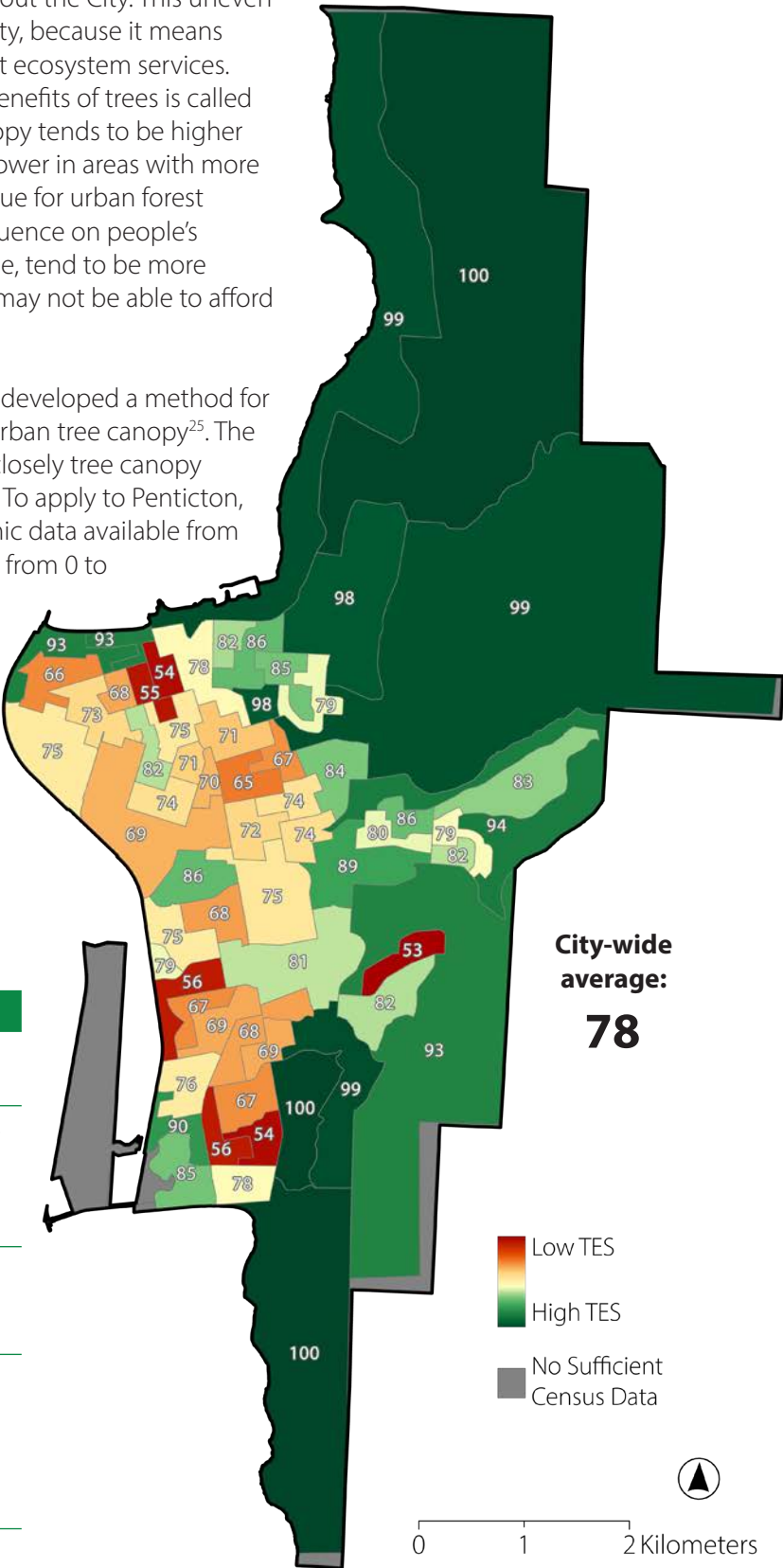
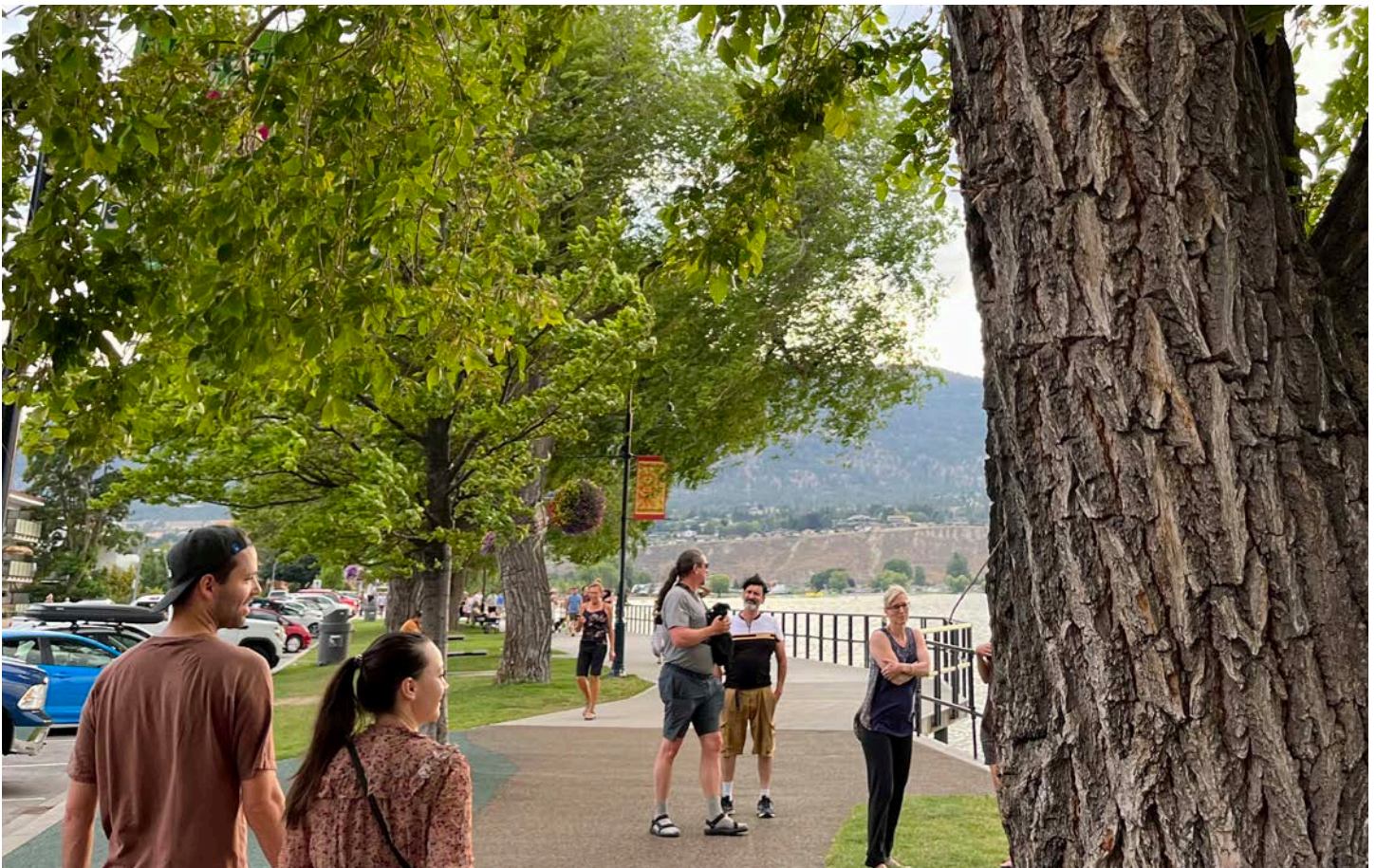


Figure 22. Tree Equity Score map by census dissemination area.

Tree Equity Scores in Penticton range from 53 to 100 (where 100 indicates tree equity is being achieved). The average TES across census dissemination areas is 78. Areas of below average TES are high priority locations for tree planting and tree retention to ensure residents have equitable access to urban forest benefits. Areas of low tree equity in Penticton are mainly found in valley-bottom residential areas, especially those where high temperatures coincide with higher numbers of seniors living on fixed incomes. Portions of the Wiltse neighbourhood also have low tree equity, driven by low existing canopy cover, high land surface temperature, and a relatively high proportion of visible minority population.

Key concept: Tree Equity Score mapping highlights neighbourhoods in Penticton where tree canopy is low relative to indicators of social vulnerability. These neighbourhoods tend to be older residential areas in the valley bottom, where the urban heat island is strongest, that overlap with high numbers of seniors. Increasing tree canopy in these areas can help reduce incidents of extreme heat-related illness which disproportionately impact seniors.



3.5 WHO MANAGES THE URBAN FOREST

Land ownership determines how trees are managed in the City. About one-quarter of the urban forest is owned or managed by the City, including approximately 43,000 trees in City parks and 8,400 trees in road rights-of-way. Another 43,000 trees are on other public land, i.e. crown land or property maintained by another government, including School District properties. Approximately 150,000 trees, or over half of the urban forest, are on private property.

On private property, the City's influence over the urban forest is limited. Landowners make decisions about how to care for trees on their property. The City currently interacts with private landowners regarding their trees for the following purposes:

- The Electrical Utility requires tree maintenance to access or protect its infrastructure.
- The Good Neighbour Bylaw allows the City to issue an order compelling an owner to clear unsightly or nuisance vegetation.
- Development rules in some areas, such as the Hillside and Streamside Development Permit Areas, require a tree survey be provided prior to the permitting of new construction.
- Zoning rules require one tree to be planted for every new primary unit of single-family and duplex housing.
- There is a request for the removal of trees that are shared property with the City.
- When construction activities are occurring near City trees or shared trees.

On City property, trees are protected by the Municipal Tree Protection Bylaw. Caring for trees on City property is the responsibility of the Parks Department, which undertakes care for urban forest asset classes as described in Chapter 4.

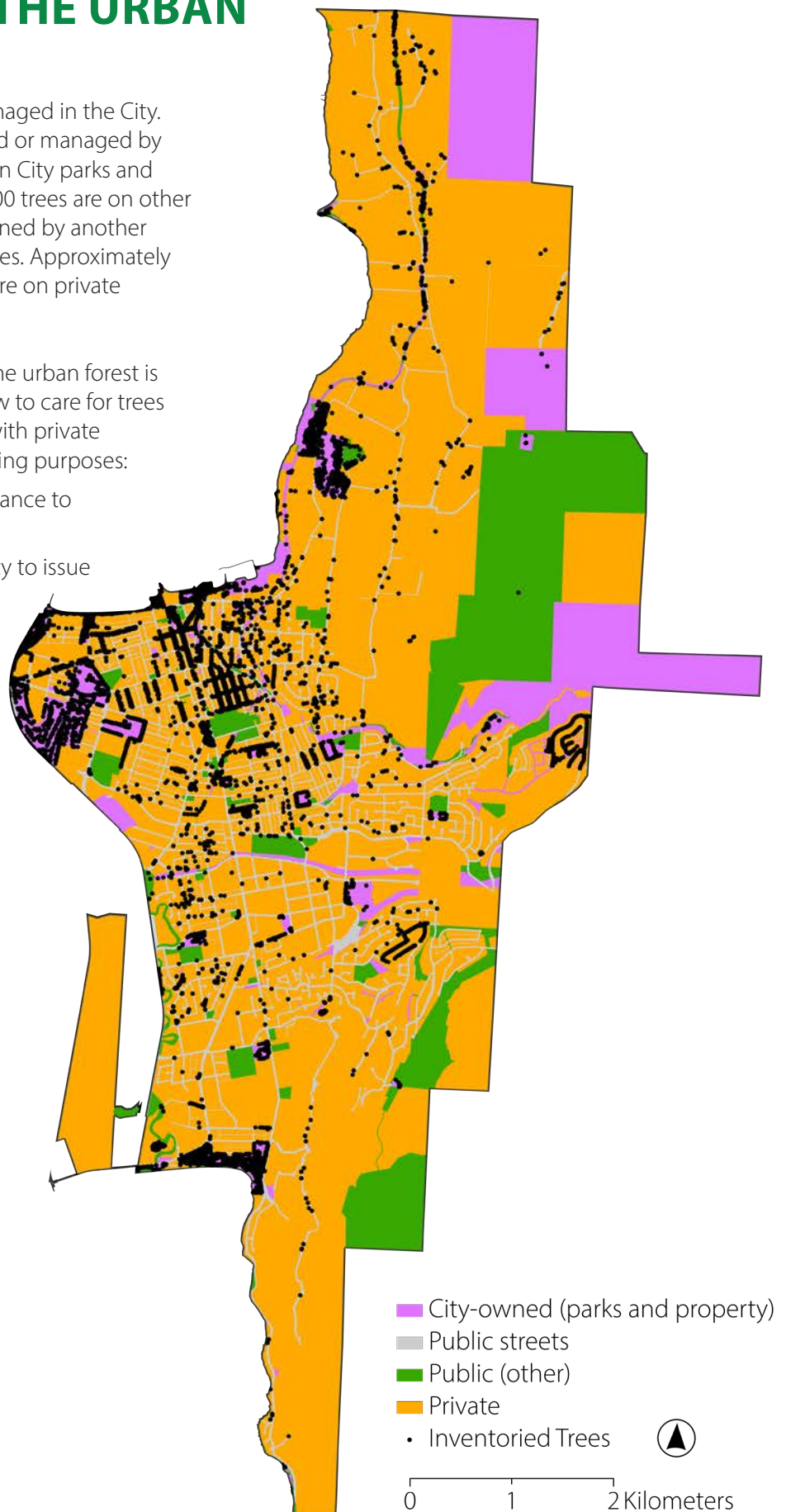


Figure 23. Generalized land ownership in Penticton.

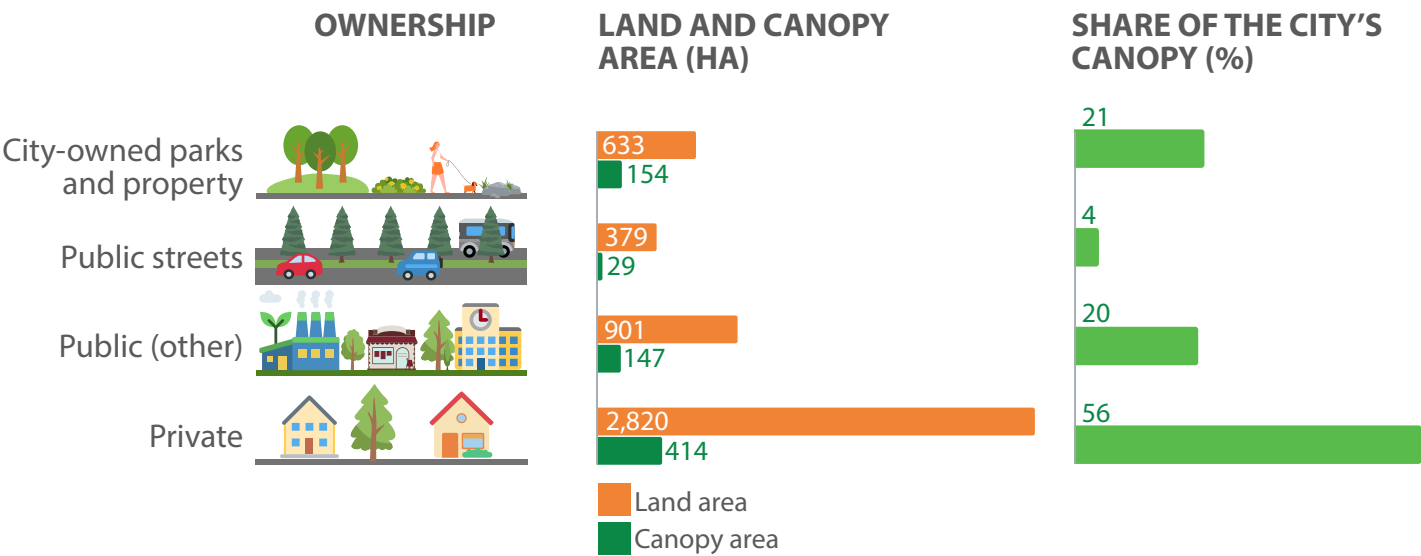


Figure 24. Land and tree canopy of each generalized ownership, with the share of the City’s urban forest represented.

Key concept: Only trees on City property are regulated by a tree protection bylaw. On City property, current urban forestry resources and policies are insufficient to provide one replacement tree for each tree removed. In 2022, 85 trees were removed from City property and only 30 replacement trees were planted. The number of trees lost from private property is not known, unless a development permit is required. Likewise, planting requirements in the Zoning Bylaw are not tracked following construction. Presently, trees planted under the Zoning Bylaw can be removed at any time by the landowner following development. For these reasons, staff expect that the current rate of tree canopy loss exceeds the rate of replacement.





CHAPTER 4.

PENTICTON'S URBAN FOREST PROGRAM

This chapter identifies the different types of tree assets that are considered within the scope of the Plan, as well as the policies and other written documents that influence the management of Penticton's urban forest. Penticton's urban forest program is the collection of policies, procedures, and resources used by City staff to manage trees and forests, as well as people involved in the City's management activities (including staff, contractors, and volunteers). The Parks Department has the overall responsibility for the urban forest program, while other City divisions support by enforcing bylaws and permit regimes that influence urban forest outcomes.

4.1 TREE ASSET CLASSES

The urban forest building blocks can be further divided into asset classes that require similar management because of their location or condition. The asset classes in Table 2 shape tree management in the City.

Table 2. Tree Asset Classes within Penticton's urban forest.

Building Block	Tree Asset Class	Description
Urban Trees	Boulevard (street) trees	Trees in public rights-of-way are maintained by the City and some are represented in the City's tree inventory. Boulevard trees not in the inventory may have been planted by neighbouring landowners in the public boulevard or self-seeded onto City property. Boulevard trees often require relatively high service levels for watering, pruning, and other management because they grow in soil-limited environments with many potential conflicts with buildings, traffic, or infrastructure. A small number of boulevard trees receive proactive, or scheduled, maintenance; however service levels are primarily driven by public complaints.
	Ornamental and shade trees on public property	Trees in urban parks and on other City property are maintained by the City. Some are represented in the City's tree inventory. These trees have generally been planted by the City or with its approval. These trees may occur in high-use areas where foot traffic, special events, or recreational activities can cause damage over time. While relatively high service levels are desirable for these trees, the services needed may differ from those required by boulevard trees or occur with different frequency. This asset class is further subdivided internally into Class A, B, and C parks and beaches, City-owned parking lots, undeveloped lots, and buildings/facilities.
Natural Forests	Trees in forested parks and trails	Trees in natural or naturalized forests are inventoried as groups or stands, not individual trees. Trees in these areas have generally lower levels of service and do not receive watering or pruning. Trees in these areas are usually managed as groups or forest stands (forested areas of similar character subject to similar influences). Individual tree management sometimes occurs to address tree risk along trails and City-owned rights-of-way. Management is usually driven by complaints from the public.
Urban Trees Natural Forests Rural Trees	Trees on private property	Trees on private property are managed and maintained by their owners. The City sometimes enforces tree pruning or maintenance on private property to ensure reliable and safe access to Electrical Utility infrastructure. Private trees that have been pruned or requires pruning by the Electrical Utility are included in the City's tree inventory but are recorded with less information than City-owned trees.

4.2 POLICIES

Policies such as bylaws, Council policies, plans, and operational standards or guidelines created by the City of Penticton impact how the urban forest is managed. The City takes a leading role in shaping the urban forest through its mandates for trees, municipal services, and land use planning.

4.2.1 HIGHER GOVERNMENTS

Provincial legislation, primarily the Community Charter and Local Government Act, allows municipalities to regulate the protection and management of the natural environment and affords other powers which can relate to urban forest management. Legislation such as the federal Species at Risk Act, Migratory Birds Convention Act, Provincial Heritage Conservation Act, and Water Sustainability Act can affect urban forest and natural areas management. The City has no authority in reserve lands of the neighbouring Penticton Indian Band, though maintains relations with the Penticton Indian Band to discuss matters of mutual interest. The City seeks to respect, honour and promote expressions of Syilx (Okanagan) culture and heritage in Penticton. In the future, this may influence the City's urban forestry.

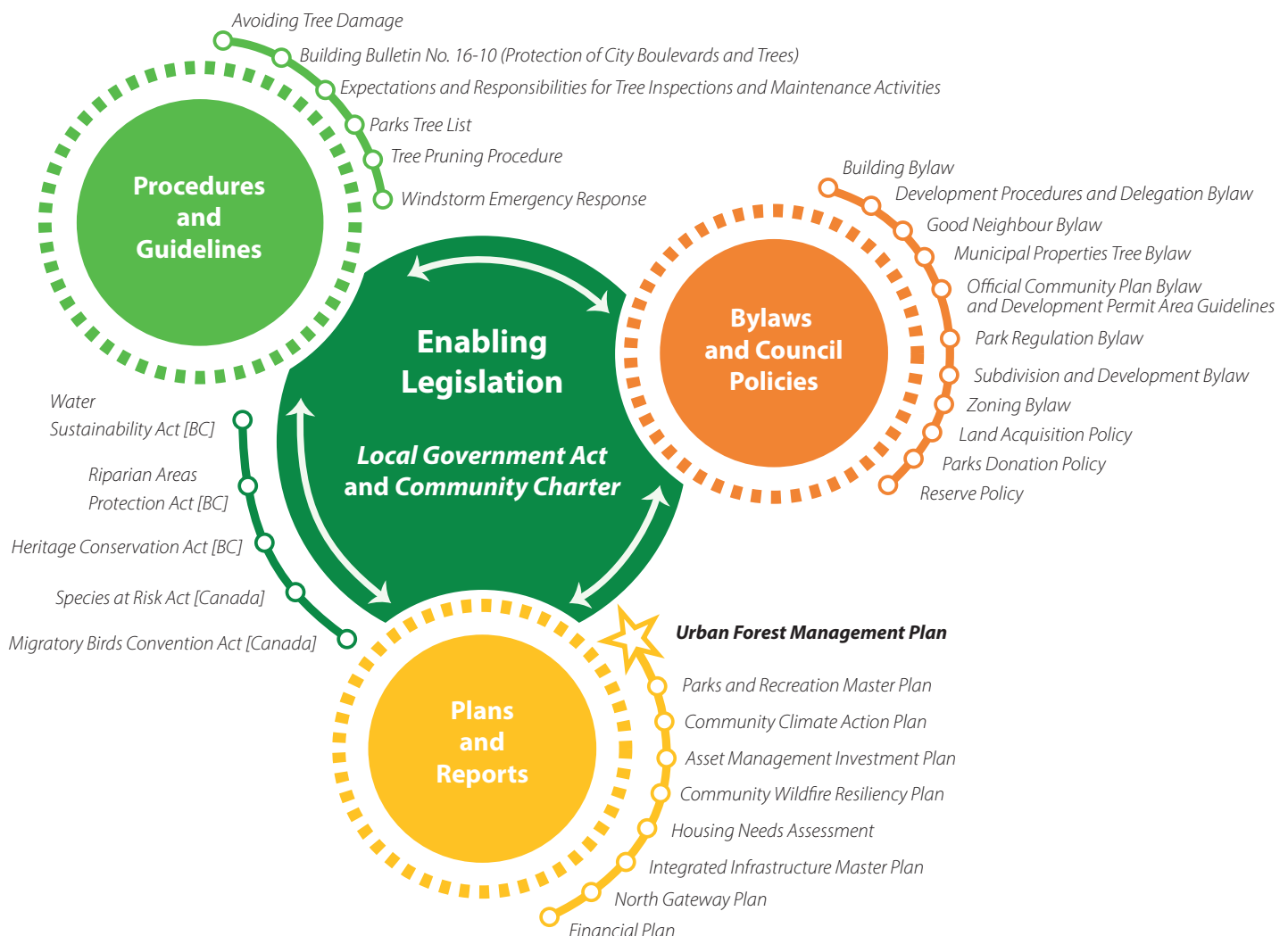


Figure 25. Regulatory context for urban forest management in the City of Penticton.

4.2.2 MUNICIPAL BYLAWS AND COUNCIL POLICIES

Penticton has several Bylaws and Council Policies that play key roles in shaping the urban forest. Some of the most significant are:

Tree protection & maintenance The **Municipal Properties Tree Bylaw** is the primary bylaw through which the City protects trees on public property. The bylaw provides for the management, improvement, and operation of the urban forest of any property held by the City of Penticton. The bylaw also contains definitions relevant to the City's urban forest planning and tree protection regimes. Although the bylaw establishes a list of heritage/significant trees in Penticton, significant trees are not given specific protection and can be removed without a permit from private property.

The **Parks Regulation Bylaw** regulates the use of City parks, prohibits the planting of certain tree species, and prohibits tree damage. The Parks Department also uses procedures documents that inform activities such as tree pruning, avoiding tree damage, protection of boulevard trees, expectations and responsibilities for tree inspections and maintenance activities, windstorm emergency works, and acceptable species to be planted in parks.

Council Policies provide direction on how Council and the City conduct its business and thus may affect the interactions between the public and the City of Penticton. The Land Acquisition Policy, Parks Donation Policy, and Reserve Policy allow the City to gain parcels of land, have trees donated to parks, and establish an Urban Forest Reserve Fund that is used to fund tree planting and receive cash-in-lieu of planting.

Planning, land use, and tree planting The **Official Community Plan** Bylaw adopts Penticton's Official Community Plan (OCP), a strategic document establishing a vision for planning and land use in the community until 2045. The OCP also establishes Development Permit Areas (DPAs), which are regulatory tools that allow the City to place additional requirements on development, including tree retention in environmentally sensitive areas.

The **Subdivision and Development Bylaw** defines minimum acceptable standards for the design and construction of municipal infrastructure, adopts the Master Municipal Construction Document, and includes specific requirements in certain DPAs. Boulevard trees are designated works and services under this Bylaw, meaning their installation can be a condition of development approval. The Bylaw also sets out what information requirements apply to applications.

The **Zoning Bylaw** regulates specific land use, building forms, and densities, as well as lot coverage and private property tree cover. Penticton's bylaw was recently amended to include a new planting requirement for trees on newly constructed single-family and duplex properties.

4.3 BUDGET AND RESOURCES

Penticton’s urban forestry program had an operational budget of approximately \$300,000 in 2023. Three core staff provide approximately 2.25 full time equivalent (FTE) hours, taking care of tree pruning and removals, maintenance, and stewardship. An additional \$15,000 per year in contracted services supplement City staff, particularly for utility arborist work and tree removal around power lines. Several dozen trees on City property are trimmed by the Electrical Utility each year, which is paid for by the utility’s budget. The total cost of delivering urban forest management in Penticton includes costs absorbed by the broader Parks Department budget for referral, plan review and program administration. Some costs, like referrals with the public or other departments on tree issues, are not specifically funded. Other departments carry out activities that support the urban forest, which are accounted separately from the Parks budget.

Table 3. Key resources for providing urban forestry services.

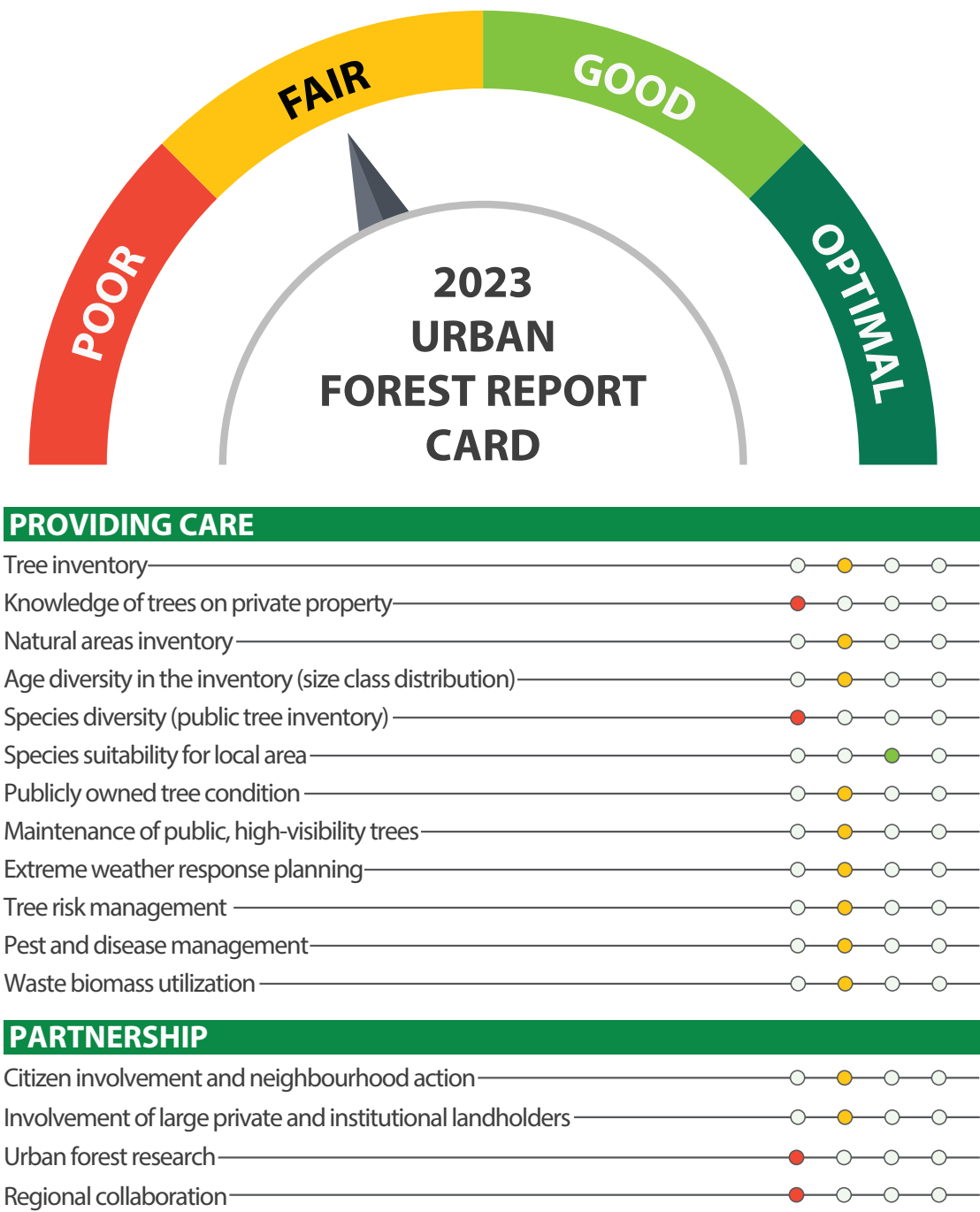
Resources
• 3 core staff, 2.25 FTE for tree care, planting, City tree protection.
• Bucket truck with 40-ft reach • Chipper • One-ton truck (shared) • 3-ton truck (shared)
• Misc. equipment (Saws, PPE, climbing gear) • Gator bags (watering non-irrigated trees)



4.4 PROGRAM REPORT CARD

The urban forest report card uses a “criteria and indicators” method to evaluate the City’s urban forest program for 2023. The approach used is based on a framework for sustainable urban forest management prepared by the US Forest Service²⁶ Criteria are areas of performance that appear in commonly used best practice guidelines or have been recommended by academic research in urban forestry.

Penticton’s performance is “fair” overall, which is typical for cities of similar size and levels of investment in urban forestry. Fair or poor ratings characterize the City’s performance on all five themes: Providing Care, Partnership, Planning, Planting, and Protection . The overall Fair rating reflects an urban forest program that has core components in place but lacks the resources and capacity to provide the service levels for urban forestry desired by the public.

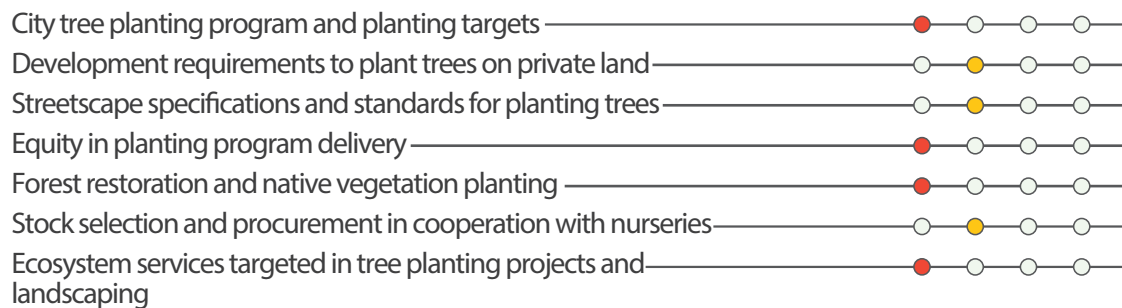


● Poor ● Fair ● Good ● Optimal

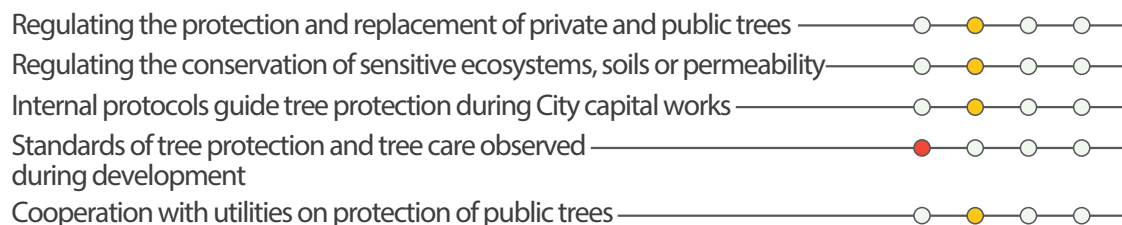
PLANNING



PLANTING



PROTECTION





CHAPTER 5.

VISION FOR THE FUTURE

Chapter 5 moves from where the City's urban forest program is today towards an urban forest vision grounded in public engagement. Public engagement results are reviewed before the Plan's vision statement is presented. The remainder of the chapter introduces the concept of scenario planning in urban forestry and describes four scenarios to inform canopy cover target setting and UFMP implementation. The scenarios described in this chapter are used to categorize targets and action language in Chapter 6, the Action Plan.

5.1 WHAT WE HEARD

Penticton’s Urban Forest Management Plan seeks to provide a community-supported vision of where management should take our urban forest over the next 20 years and beyond. The Vision is one part of the Plan’s framework for

urban forest management. The Vision leads the development of Goals and Principles, followed by Targets, Strategies, and Actions forming the remainder of the framework.

5.1.1 PHASES OF PUBLIC ENGAGEMENT

The UFMP involved two phases of public engagement. The initial phase took place between May and November 2023 with the goal of collecting the community’s input regarding a long-term strategic urban forestry vision and supporting goals for protection and management. The public was invited to provide input through the 2023 Citizen Survey, a mapping tool hosted on the Shape Your City project page, in-person information shared at neighbourhood events in September 2023, and an online open house held on October 4, 2023. Community advocates for the City’s urban forest were invited to participate in an online workshop held in June 2023. More than 2,250 people participated in the first phase of engagement. This includes 1,069 voluntary Citizen Survey respondents, 322 randomized Citizen Survey respondents registered on Shape Your City Penticton, and more than 860 visits from the project website. The project team presented to Penticton Indian Band leadership through the Major Projects Committee (the City’s

consultative forum with PIB) in June and September 2023, to seek feedback and input on potential alignments with PIB community priorities. At the request of Penticton Indian Band representatives, the project team also engaged directly with representatives of Sn’pink’tn Forestry LP on November 17, 2023.

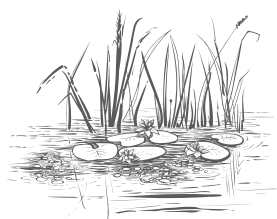
Phase 2 of public engagement occurred in June 2024. The draft UFMP was placed on Shape Your City Penticton and the public was invited to contribute feedback via an online feedback form or via direct contact to the project team. 46 respondents completed the feedback form. On June 15, City staff and the consultants held an in-person open house information during the Penticton Farmers’ Market at Gyro Park, speaking with over 80 people. The City presented the draft Plan to representatives of Penticton Indian Band on June 13, 2024.



Figure 26. Project timeline for the Urban Forest Management Plan.

5.1.2 URBAN FOREST BENEFITS

When engagement participants think of the urban forest, they most value the environmental (pollution reduction) and climate adaptation (shade, cooling, carbon sequestration) ecosystem services it provides. People are potentially less familiar with the benefits trees provide to biodiversity or human health and well-being. When prompted to prioritize their concern with factors challenging the urban forest, open house participants rated development and construction impacts as their most significant concern, followed by tree protection, tree planting rates and planting success.



Air and water pollution removal



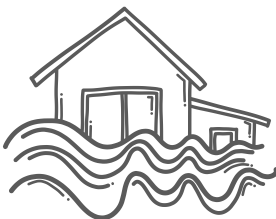
Climate change adaptation



Intrinsic, intangible, and cultural values



Habitat for animals, plants, and other life



Flood and storms buffer



Human health and well-being

Figure 27. Urban forest benefits that residents said they appreciate.



5.1.3 SPECIAL PLACES AND PLACES NEEDING HELP

Visitors to Shape Your City Penticton had the opportunity to contribute to a community map of “special” places in the urban forest and places that “need help”. Participants identified 420 locations in total, including 188 special places and 232 that need help. Special places in Penticton’s urban forest include the waterfront parks at Okanagan and Skaha Lakes, natural forests threatened by development in the northeast sector, natural areas around Penticton Creek,

and older residential neighbourhoods with large mature trees. Places needing help echoed these areas, reflecting recognition by participants that there is always potential for improvement. Overall, places needing help were much more likely to be urban in character than Penticton’s special places, with more representation of commercial and industrial areas, as well as downtown Penticton and adjacent residential areas with little tree canopy.

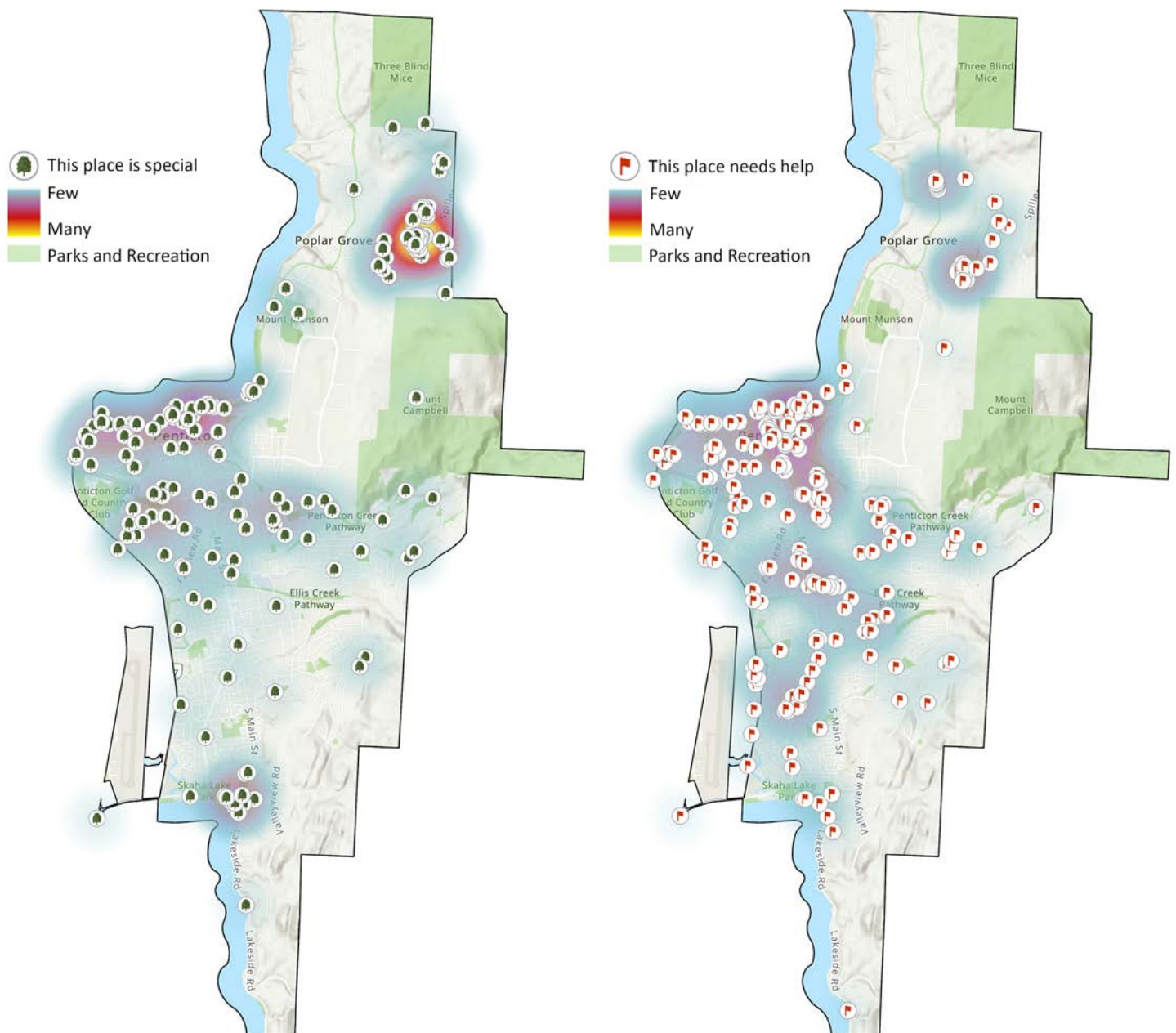


Figure 28. Results of the mapping tool on Shape Your City, showing places in the urban forest that respondents consider “special” and places that “need help”.

5.1.4 TREE PROTECTION AND PRIORITIZING URBAN FORESTRY

Across all engagement opportunities, support for urban forest management and concern for trees was widespread. There was strong support in the community for elevating urban forest management as a civic priority and acting to arrest and reverse the loss of urban forest canopy. Just over 45% of Citizen Survey respondents rated the protection of “high-value” trees on private property as a high priority or essential, compared to only 23% who rate it as low or not a priority. Results were consistent across both the voluntary and random samples used by the Citizen Survey. 80% of Citizen Survey respondents in the random sample assessed tree protection for high-value trees on private property to have at least “medium priority”.

Online open house participants unanimously recommended the City to pursue a higher (>17%) City-wide tree canopy over the next 20 years, even if that would be difficult or expensive to achieve. Similarly, when asking about their vision for Penticton’s urban forest, there was a consensus among participants for the need for more trees and more tree canopy, especially in urban areas like streets, urban parks, and residential neighbourhoods.

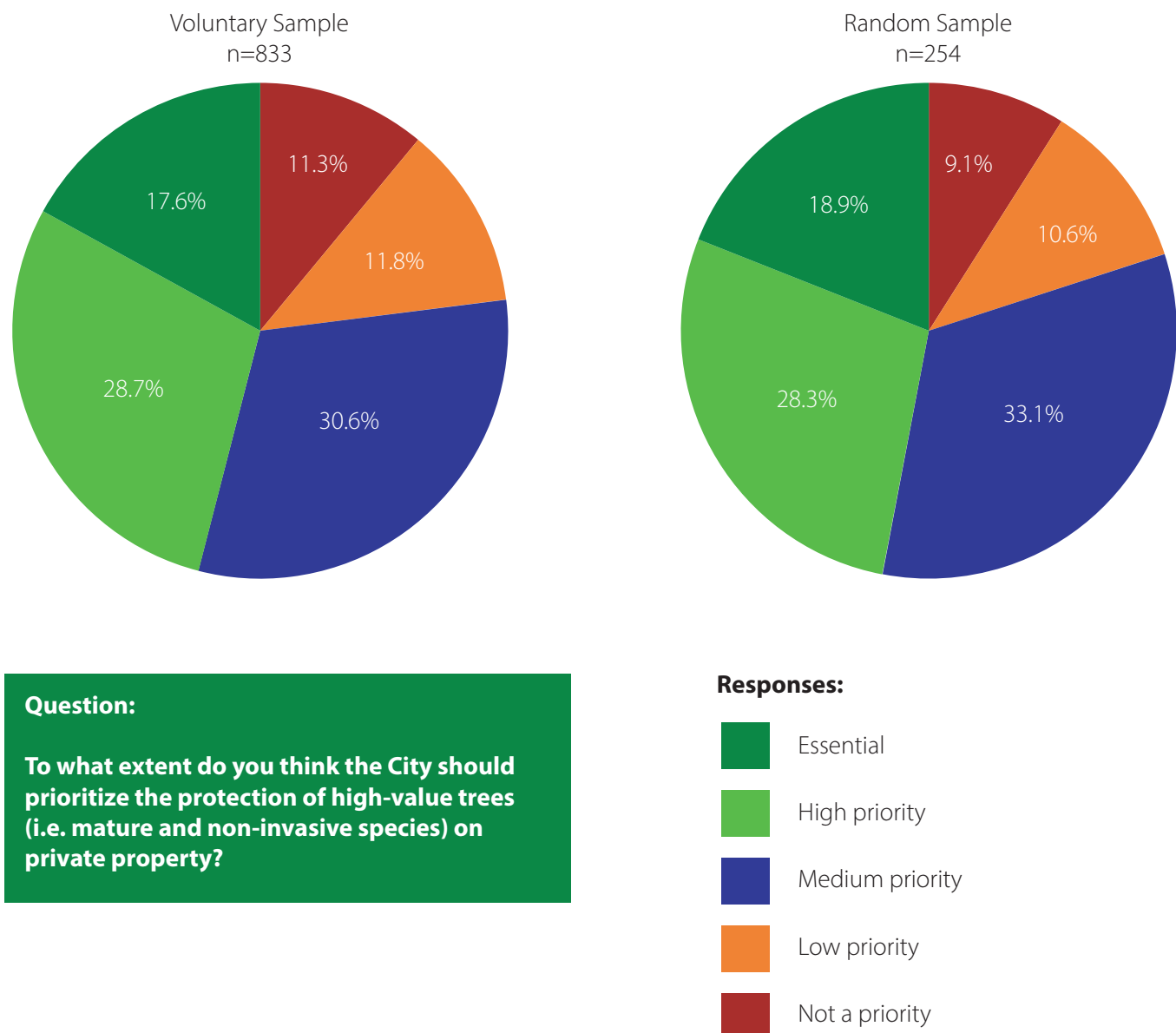


Figure 29. Citizen Survey respondents’ views on tree protection on private property.

5.1.5 FEEDBACK ON THE DRAFT UFMP

During Phase 2 engagement, the public and community members had opportunities to inform the Final Draft by providing comments. The majority of feedback form respondents and open house attendees expressed support for the Vision Statement (see section 5.2), with 78% of feedback form respondents indicating strong support. 17% of feedback form respondents indicated opposition to the vision statement, often because they believed the City should focus on other priorities such as fire protection, housing, and crime prevention. Respondents during Phase 2 engagement participants generally support the implementation of Scenario 4: Green Future (see section 5.3), though some people reported concern with the potential impacts on private property and costs associated with enforcement of development and tree protection regulations. A few individuals were concerned that tree planting could increase the potential impacts of wildfires, while others wanted to see much higher rates of tree planting proposed in parks and streets. Several open house attendees described their desire to see more emphasis on biodiversity conservation in future environmental management initiatives.

Penticton Indian Band representatives expressed interest in seeing more representation for Syilx culture and language in the Plan, as well as opportunities for the City and PIB community to collaborate on planting initiatives that are ecologically sensitive and respect the diversity of Penticton's historic habitats, such as pine forests and grasslands.

In response to Phase 2 feedback, the draft plan was amended to include additional nsyilxcən-language content and reflect feedback from Penticton Indian Band in the Action Plan. Community feedback caused changes in the representation of natural disturbances like wildfire, additional context on the relationship between urban forest management and other areas of priority for the City, such as housing and climate action, and clarifying the scenarios to make it easier to identify potential impacts to private property.

IN THEIR OWN WORDS: ENGAGEMENT PARTICIPANTS ON PENTICTON'S URBAN FOREST

Respondents to the Citizen Survey (voluntary and random samples) contributed a diversity of ideas about how Penticton's urban forest should be managed. While many respondents were concerned by the potential cost and regulatory changes needed to support urban forestry, many also highlighted the value of urban forest benefits in the City and desired additional tree planting in beaches, parks, neighbourhoods, and streets. The selection of comments below have been lightly edited for clarity:

>> *You need a strategic plan to make tree planning effective (e.g. right tree species in right areas).*

>> *It's hot here and [trees] serve many purposes beyond providing shade. They keep our soil strong and prevent erosion of heavy rainwater and flooding.*

>> *Every tree planted needs to be maintained which costs the City money!*

>> *Trees must be planted where they can be maintained. If residents are forced to water and care for them, many will go neglected or vandalized.*

>> *Shade for Skaha beach would be lovely. The weeping willows are missed.*

>> *If [urban forestry] is a priority what services would the City be willing to reduce/eliminate to fund it?*

>> *There should be more courtyards and greenspaces inside each development.*

>> *Focus on not removing trees from natural areas; leave them in their natural state and replace trees where development has destroyed habitat.*

>> *Trees are a tough one; it will be years before the true benefit is realized. Plant as many as possible: we will never have too many trees!*

5.2 VISION STATEMENT

The Vision is intended to be a community-supported statement that represents the overall direction for the UFMP and Penticton's urban forest management. The Vision is informed by input from the community, city staff, and partners while grounded in the current condition of the urban forest and the City's urban forest management program. The Urban Forest Management Plan seeks to bring the City's urban forest toward the proposed Vision over the next 20 years.



*Our urban forest vision is to keep our community **healthy, beautiful, and green**. Our urban forest is growing because of the care we give and the value we place on it. Our **actions today are building a resilient future** for the urban forest that we can be proud of across cultures and generations.*

5.3 SCENARIO PLANNING

5.3.1 SETTING A CANOPY COVER TARGET

Tree canopy cover is a common metric that municipalities use to understand the extent of their urban forest and track canopy changes over time. Many municipalities establish a specific target to attain their desired level of canopy cover within a defined time frame. The canopy target connects the vision to a measurable outcome and helps to drive the implementation of Urban Forest Management Plans.

Approaches to setting canopy targets have evolved over the past two decades, reflecting a growing understanding of the complexities of urban forest management and consideration of other uncertain factors that will have an impact on canopy, such as climate change and population changes. To set a feasible and reasonable canopy target, communities should consider their current canopy cover, development patterns and density, population changes, land use, and tree regulations. To set Penticton's canopy cover target, the project team:

- Measured current canopy cover across all land uses.

- Identified where and how much development and other land use changes would be expected to occur and estimated how these changes would impact canopy.
- Forecasted canopy cover city-wide as well as across all OCP land use designations based on the following factors:
 - Tree planting program and compatibility of land uses.
 - Tree retention efforts enabled by tree regulations (existing and recommended).
 - Anticipated growth of existing trees.
 - Anticipated loss due to development and other factors (e.g. natural causes).

Four scenarios were developed to show how canopy cover could change in Penticton over the next 20 years.

Scenario 1 Status Quo | Canopy cover decreases to 16% by 2045

This scenario assumes no changes in development policy, resulting in a decreasing canopy, particularly in urban residential areas. On public property, forest health issues and wildfires are estimated to cause approximately 10 hectares of canopy loss in the next 20 years. Combined canopy loss in the City is expected to reach 34 ha over 20 years, of which only 12 ha is expected to be replaced at current planting rates. Canopy cover in urban areas could decline from 12% to 11% by 2045.

Scenario 2 No Net Loss | Canopy cover remains at 17% by 2045

In this scenario, the City leads by example locally on public property and introduces a new City Tree Policy and other policy updates applying to public property. These changes will reduce tree loss on public property and return the City to no less than 1:1 replacement of removed trees on City property within urban areas, reducing loss on public property by 2 ha. In addition to replacement planting, a total of 325 trees per year will need to be planted to offset losses from private property. 125 of these new trees will need to be caliper-sized planting stock intended for urban parks and streetscapes, while 200 can be smaller seedlings in natural restoration areas. Additionally, the City shifts toward proactive street and park tree maintenance, with a small amount of new resources for natural forests management. Canopy cover in urban areas is held at 12% by 2045.

Scenario 3 Urban Forest Expansion | Canopy cover increases to 18% by 2045

Scenario 3 builds on improved urban forest management for public property by working directly with landowners to preserve or increase tree canopy on private property. Scenario 3 presumes that a new Tree Bylaw is developed to increase tree protection throughout the City, with provisions for tree replacement applying on public and private property. The City introduces new planting programs through a public tree sale and community partnerships, aiming to install 275 trees per year on non-City property, while new programs for planting more trees in streets and parks deliver 175 caliper-sized trees and 300 smaller seedlings in natural restoration areas. Canopy cover in urban areas is increased from 12% to 13% by 2045.

Scenario 4 Green Future | Canopy cover increases to 18% by 2045, with 25% canopy cover in urban areas by 2085

Additional changes to tree planting requirements, protection, and urban design could further lift the urban forest towards an aspirational target of 25% in urban areas toward the end of the century. This would be accomplished by fully incorporating trees into land use and development regulations with strong tree protections in place throughout the City, setting Penticton as a regional leader in urban forest management. Setting urban forest targets by zoning or land use, backed up by landscaping requirements in City bylaws, would be essential to achieving this level of canopy cover on top of new programs to improve planting rates on public property. Planting rates on public property of caliper-sized trees equals 175 trees per year while additional focus on natural restoration increases the rate to 400 trees planted per year in natural areas.

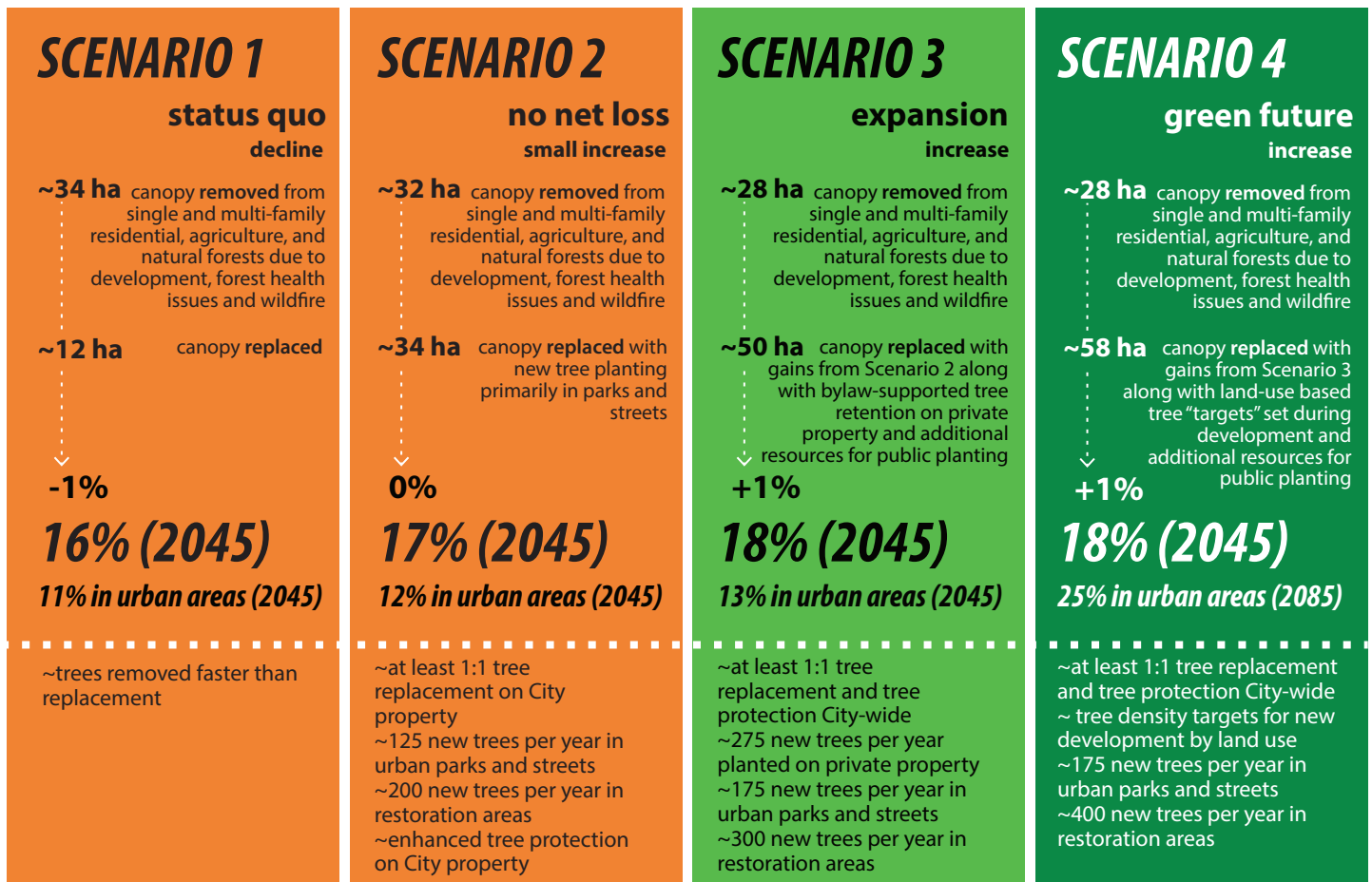


Figure 30. Scenario summary used to inform target and action plan setting for the Urban Forest Management Plan.

Recommendation:

Based on the urban forest vision, community and partner feedback, and the canopy scenario/modelling outcomes, the UFMP recommends a target of 18% city-wide canopy cover by 2045 and a long-term target of 25% canopy cover within urban land uses, consistent with **Scenario 4: Green Future**. While the long-term target is considered aspirational and is unlikely to be fully realized within the planning horizon, the 18% target is achievable within the twenty year plan horizon based on the strategies and actions outlined in the UFMP.

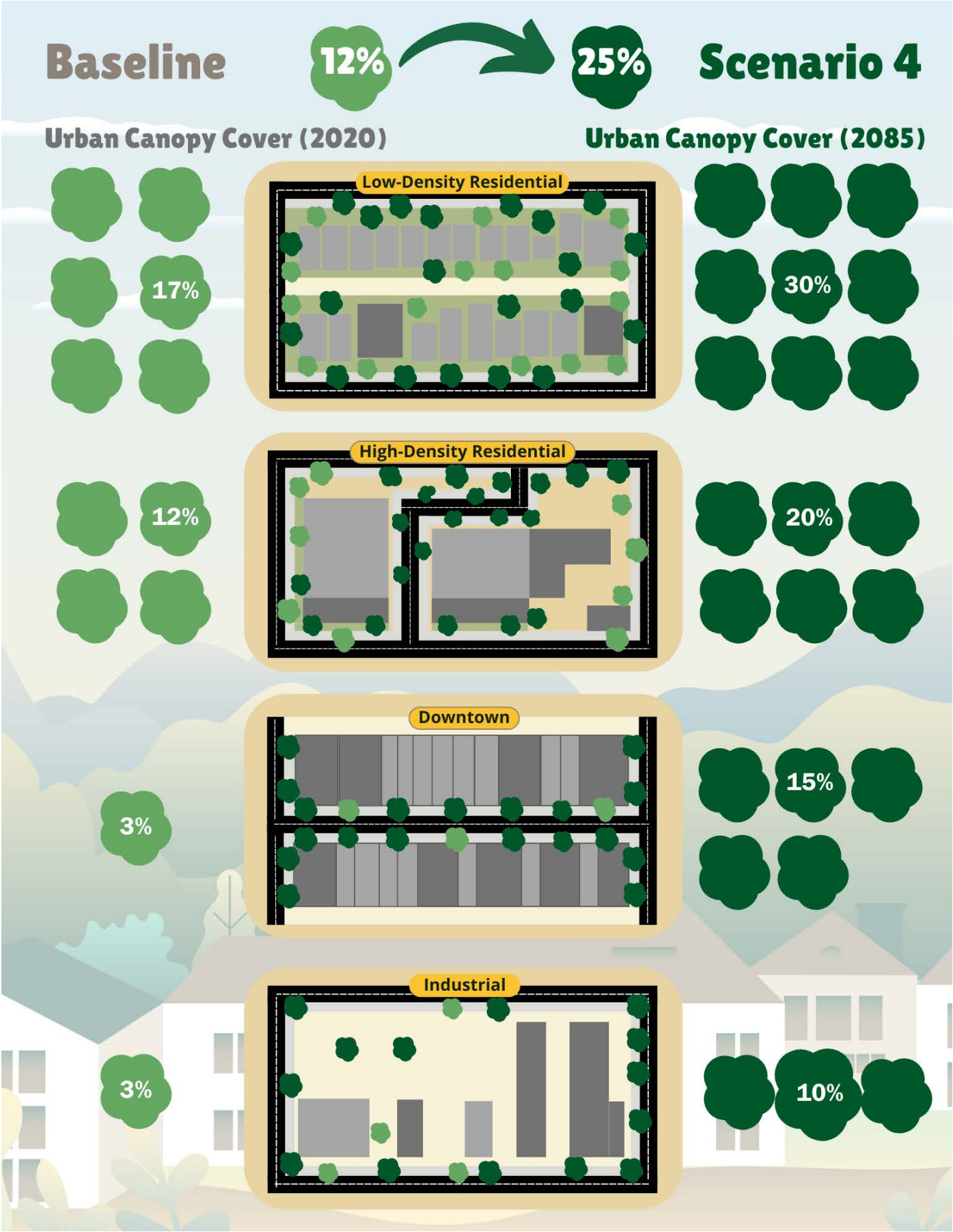


Figure 31. To reach 25% canopy cover in urban areas, Penticton could promote these canopy targets by land use.

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PRINCIPLES FOR URBAN FOREST MANAGEMENT

Penticton's urban forest management program should adhere to the following principles that summarize best management practices and respond to Penticton's ecological and cultural context. Action Plan language has been developed with these principles in mind:

① **Prepare for climate change and mitigate impacts**

Climate change is affecting the urban forest and will continue to do so. Shifting climate will increase the demand for urban forest management services like watering, pruning, and hazard tree removal. To prevent the worst impacts, the City should refocus on preventive maintenance and setting trees up for success with high quality planting sites.

② **Promote equity and diversity**

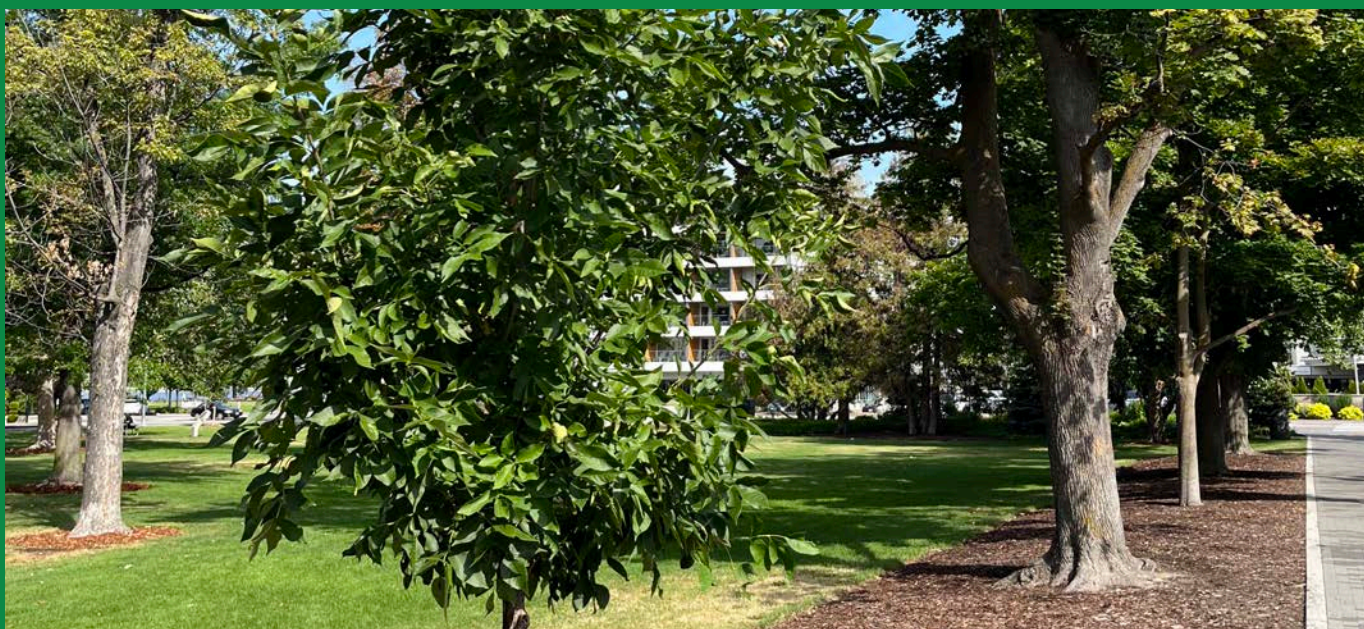
Research shows that the effects of low greenness in cities are disproportionately felt by people who may be socially vulnerable, such as seniors, children, people with low income, or Indigenous people and ethnic minorities. Penticton's urban forest can become an expression of the community's diversity and efforts to enhance neighbourhood canopy cover should take community needs into account.

③ **Keep the right tree in the right place**

Large, mature trees provide a relatively high share of the City's urban forest benefits because of their well-developed canopy. Wherever possible, mature trees in healthy condition should be retained to reduce the need to compensate loss with new tree planting. Species' habits and potential mature size should always be factored into decision-making to avoid future conflicts with infrastructure or land use.

④ **Value the urban forest in decision-making processes**

While it can be difficult to correctly value urban forest ecosystem services individually, there are several means of estimating tree value for consideration during the planning of developments and construction on public and private property. Adopting a method of accounting for tree value can support clear design instructions and help decision makers evaluate the opportunity costs of tree removal.





5 Maintain trees as healthy, functioning natural assets

Although asset management is not the only perspective through which trees in the urban forest should be viewed, it can help staff define service levels for “classes” of urban forest assets that enable scheduling and budgeting to shift from reactive to proactive maintenance. Increasing preventive maintenance is an important component of securing ecosystem service delivery.

6 Monitor, learn and innovate as part of every-day management

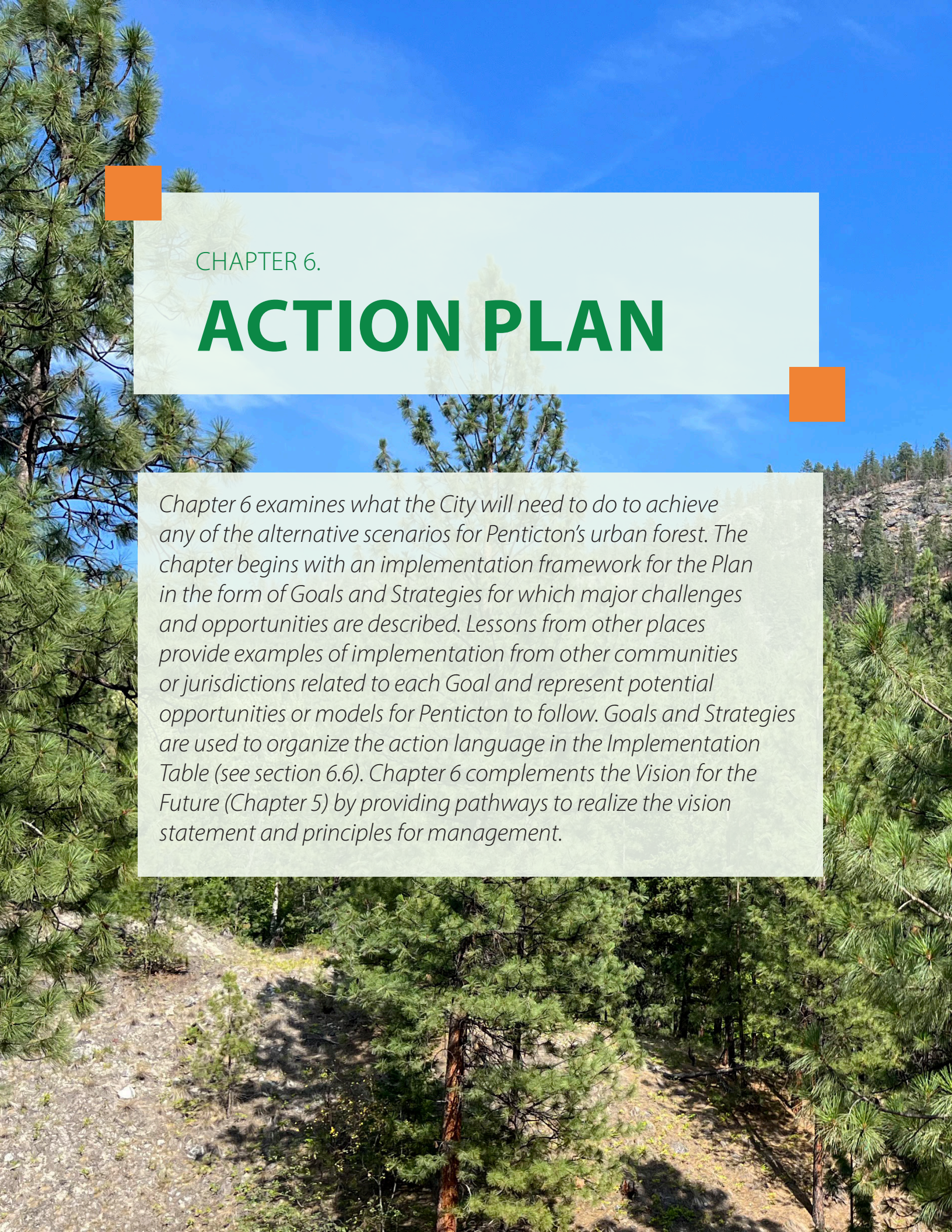
The urban forest is constantly changing. While the Urban Forest Management Plan presents the best information available currently on trees and forests in Penticton, change will require updates to the plan on a cyclical basis. To support adaptive management, monitoring capacity is urgently needed to support better asset management and develop the City’s capacity to manage issues in natural forests.

7 Involve the community to build awareness and capacity

Some readers of the Urban Forest Management Plan may be hearing about how the City manages trees for the first time, while other readers will be more familiar and may have engaged in the preparation of the plan. Community awareness of urban forestry will need to be increased to support growing the urban forest in the City, which requires developing additional tree protections on private property. Community members also contribute valuable effort to the City’s current efforts to monitor the tree inventory and participate in tree planting, restoration, and advocacy activities.

8 Recognize Syilx worldview and promote respect for trees in the community

Penticton Indian Band representatives have shared with the City that there is innate value in trees that comes from their status as our relations in *tmixw*. The City respects this perspective and acknowledges that the western framework for asset management can be at odds with it. There are opportunities to reflect Syilx land management principles and traditional ecological knowledge in urban forest management that will be explored through the parties’ continued relationship-building. A first step to acknowledging the value placed by Indigenous Syilx people on the community’s urban forest is promoting their perspectives on an equal footing with western ones.



CHAPTER 6.

ACTION PLAN

Chapter 6 examines what the City will need to do to achieve any of the alternative scenarios for Penticton's urban forest. The chapter begins with an implementation framework for the Plan in the form of Goals and Strategies for which major challenges and opportunities are described. Lessons from other places provide examples of implementation from other communities or jurisdictions related to each Goal and represent potential opportunities or models for Penticton to follow. Goals and Strategies are used to organize the action language in the Implementation Table (see section 6.6). Chapter 6 complements the Vision for the Future (Chapter 5) by providing pathways to realize the vision statement and principles for management.

GOALS AND STRATEGIES FOR PENTICTON'S URBAN FOREST

Goals are high-level descriptions of outcomes sought by the Urban Forest Management Plan. Four goals will guide the City's work towards achieving the urban forest vision. Strategies are groups of interrelated actions designed to work towards a goal. 13 strategies are proposed by the Urban Forest Management Plan.

Goal 1: Plan, protect, and plant to expand the urban forest.

Strategy 1: Update bylaws, policies and plans to promote urban forest retention and expansion.

Strategy 2: Develop a new Tree Protection Bylaw to apply throughout the City

Strategy 3: Plant trees with a focus on equity

Strategy 4: Restore forested natural areas to connect habitats and promote biodiversity

Strategy 5: Enhance stock selection and adapt planting for the future climate.

Goal 2: Manage for tree health and longevity.

Strategy 6: Establish service levels for tree assets.

Strategy 7: Extend documentation of operational procedures to promote good asset management.

Strategy 8: Secure resources and build capacity needed to implement.

Goal 3: Enhance partnerships and public outreach to increase awareness and capacity for urban forest management.

Strategy 9: Align priorities within the organization to facilitate tree retention and service delivery.

Strategy 10: Explore partnerships with the community to enhance urban forest management and build awareness.

Strategy 11: Engage Syilx/Okanagan communities, Penticton Indian Band, and urban Indigenous peoples to share knowledge and invite collaboration.

Goal 4: Monitor progress and adapt management to changing circumstances.

Strategy 12: Monitor and report on change to promote adaptive management and increase transparency.

Strategy 13: Test new ideas and technologies that can help adapt the urban forest to an uncertain future.

6.1 GOAL 1: PROTECT AND EXPAND THE URBAN FOREST

The need to provide essential housing through greenfield or infill development can result in the loss of trees. However, amendments to municipal landscaping standards and bylaws can lead to more sustainable development that retains more trees and creates new planting opportunities. Implementing a tree protection bylaw across public and private property would also support the retention or replacement of existing trees, helping to sustain the urban forest over time.

6.1.1 CHALLENGES

DEVELOPMENT

The City is striving to provide much-needed housing based on the recommendations of Council's Housing Task Force and has made OCP and zoning changes to comply with Bill 44: Housing Statutes (Residential Development) Amendment Act, boosting support for a wide variety of housing forms and infill development. Cities without comprehensive tree protection bylaws struggle to maintain their urban forest canopy as neighbourhoods densify^{25,26}. Currently, City-owned trees or trees in Environmentally Sensitive Development permit areas require permission before their removal. However, tree removal and replacement are not regulated on the remainder of private property, which contains over half of the urban forest.



Figure 32. Examples of tree canopy across different land uses.

GROWING SPACE

Trees require space above and below ground to meet their need for sun, water and nutrients. As they grow large, they provide more benefits to the public, increasing in value over time. However, urban soil conditions are challenging for trees to withstand, such as limited amounts of soil to grow in, compacted soil that inhibits root growth, and few surfaces that let water become available to trees. These conditions can reduce the health, growth and longevity of trees, reducing the benefits that they provide to the public.

TREE EQUITY

The benefits of the urban forest are inequitably distributed throughout the City. Older adults, low-income residents, and minority groups are often most impacted by the lack of canopy cover, which can exacerbate climate change impacts while reducing the physical and mental health benefits that the urban forest provides. Building equity in the urban forest is a long-term task that will require sustained investment in new trees and planting sites in underserved areas.

6.1.2 STRATEGIES

- Strategy 1** Update bylaws, policies and plans to promote urban forest retention and expansion.
- Strategy 2** Develop a new Tree Protection Bylaw to apply throughout the City
- Strategy 3** Plant trees with a focus on equity
- Strategy 4** Restore forested natural areas to connect habitats and promote biodiversity
- Strategy 5** Enhance stock selection and adapt planting for the future climate.

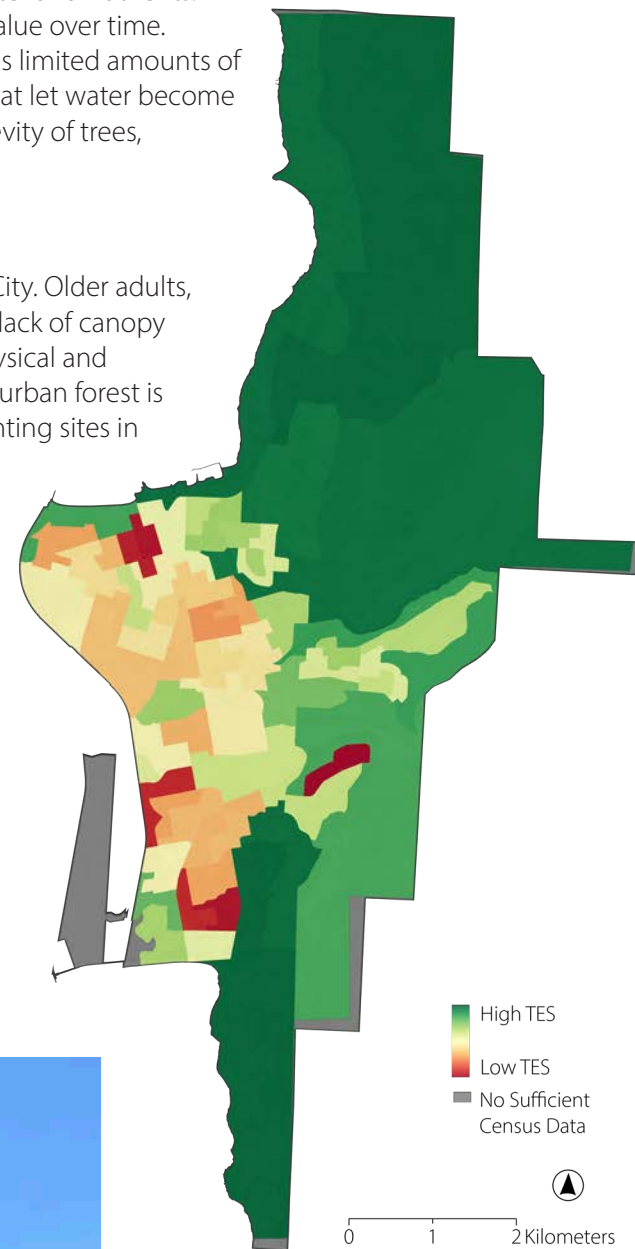


Figure 33. Tree Equity Scores (TES) show where residents face uneven access to urban forest benefits

Soil management is part of urban forest protection

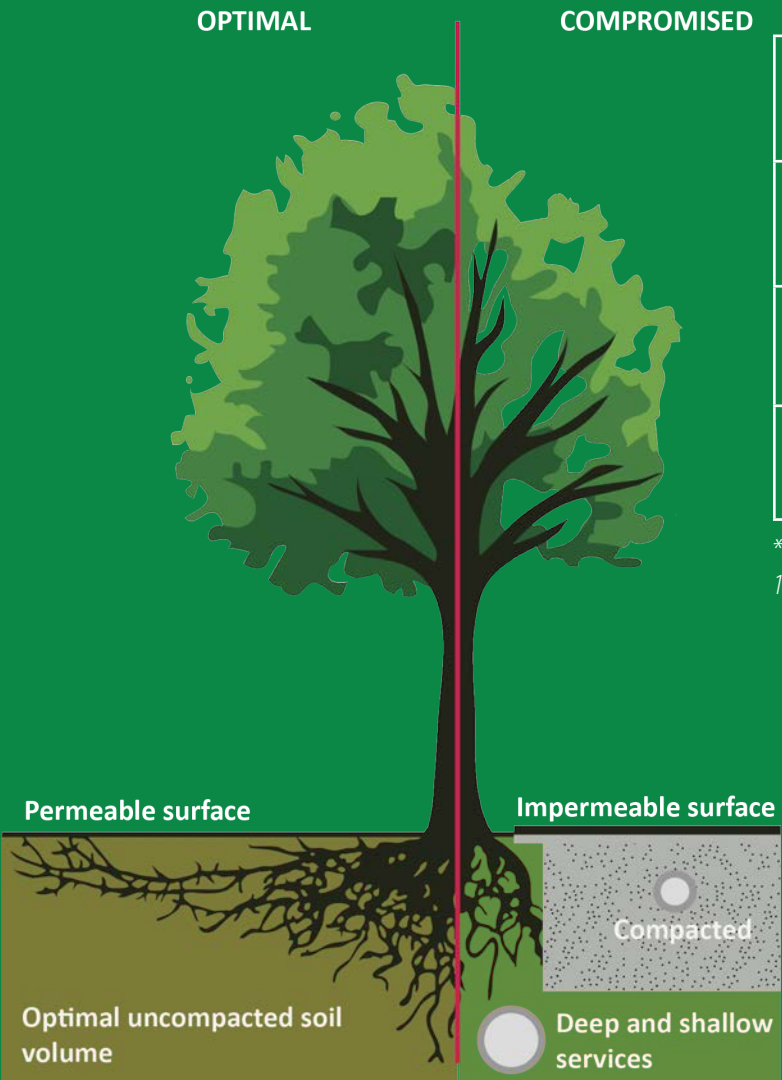
Soils are the foundation of any urban forest. Soil needs to sustain a balance of air, water, and nutrients to support healthy tree and plant growth. This balance is unique to every soil profile, contributing to the diversity of ecosystems in a landscape.

Soils can be damaged through heavy use, disturbance, pollution, or other urban factors. Compaction occurs when heavy use or machinery compress the air pockets in the soil profile, which can suffocate tree roots and other soil organisms. Artificial drainage or impervious surface barriers can affect the flow of water through the environment, soaking some soils while leaving others dry. Engine oil, road salts, cleaning products, excessive fertilizer, and metal oxides can leach into the soil profile and impact the health of vegetation. Construction or excavation can disturb soil and sever tree and plant roots.

Protecting soils is part of protecting trees and setting up the urban forest for success. Trained arborists typically identify

the “protected root zone” around a tree within which soil should not be disturbed. This may be a radius 10 to 18 times the tree diameter. The protected root zone can be identified on landscape or construction plans to allow appropriate review and monitoring. Connected to this is the “minimum soil volume”, which recognizes available soil for root extension is a limiting factor for urban trees. Trees should be planted in environments that will provide for their long-term needs. 30m³ soil volume is the minimum recommended soil volume for large trees capable of growing to 15 metres in height or more, while smaller trees may be supported with 0.3 to 0.6 m³ per square metre of canopy spread.

Preventive maintenance is the best approach for soil management. Once volumes are designed they can be difficult to increase. Likewise, once soil damage has occurred, repairing it is challenging. Time is often the key ingredient in restoring soil structure, working in concert with physical aeration, amendments like mulch or biochar, irrigation, or technologies to extend soil volume like soil cells.



Tree Size	Approximate Soil Volume Required per Tree*
Small Tree <i>spread ≤ 6m</i>	15 m³
Medium Tree <i>spread 7-10m</i>	20 m³
Large Tree <i>spread >10m</i>	30 m³

*Assumes trees are planted in soil. For soil cells, multiply by 1.1 (92% soil), and structural soils (20% soil) multiply by 5.

6.1.3 LESSONS FROM OTHER PLACES

MAKING ROOM

Several approaches can increase the volume of soil provided to trees, including the use of structural soils to connect boulevard planting pits with soil on private property in new subdivisions (City of Campbell River). Suspended pavement systems (City of Toronto) and development variance permits that reduce parking requirements in exchange for the retention of mature-tree and soil (City of North Vancouver) have also been used.

PRESERVING TREES

Seattle offers a compelling example of rebalancing zoning codes in favour of tree retention called “Exceptional Tree Zoning”. Exceptional trees are designated heritage trees or trees meeting a species-specific size threshold and receive additional protection during development review. Seattle’s zoning codes mandate deviations from height and setback to retain exceptional trees, making it clear to developers that they will be required to retain large and mature significant trees. Guides and rules have been set up for developers to understand how they can vary from zoning code for retention of an exceptional tree.

LANDSCAPE INCENTIVES

The Toronto Green Standard is the City of Toronto’s sustainable design requirements for new private and city-owned developments. Initially introduced in 2005 as a voluntary standard, it is now structured into a tiered program that offers a combination of mandatory and voluntary elements. Projects that fulfill higher tiers of performance are eligible for a refund on development charges paid to the City. This is accomplished through requirements for

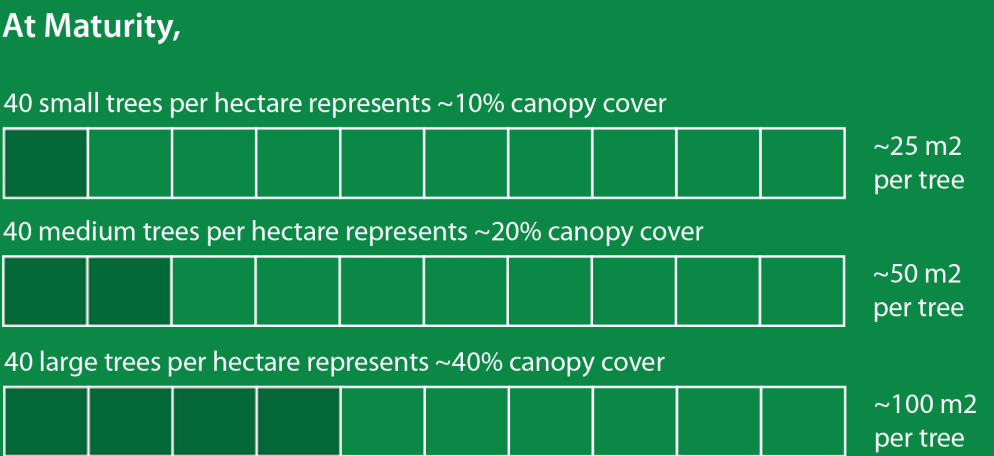
- Soil volume on site and in adjacent public boulevard
- Tree placement and spacing
- Watering and maintenance of trees after installation

The Standard also requires all new developments to increase tree canopy, soil volumes, and tree watering, promote native species, and exclude invasive species. Additional tree planting or ecological restoration is voluntary and can be used to qualify for a development charge refund.

TREE DENSITY REQUIREMENTS

Maple Ridge has requirements to regulate the growth of the urban forest through several bylaws, such as its Tree Protection and Management Bylaw (or “Tree Bylaw” for short). The Tree Bylaw requires a minimum of 40 trees per hectare on all private lots either through retention of existing trees or planting replacement trees. Several other cities in Metro Vancouver use tree density replacement requirements to ensure a certain level of tree canopy is maintained on private lots. For example, the Township of Langley requires a minimum of 30 replacement trees per acre (i.e. 74 trees per hectare) through its Subdivision and Development Servicing Bylaw.

Figure 34. Connecting tree density, tree size, and potential canopy cover.



6.2 GOAL 2: MANAGE TREE HEALTH AND LONGEVITY

The urban forest is increasingly exposed to climate change, pests, pathogens, and other stressors that can negatively impact trees. Urban forest resilience can be achieved by investing in more proactive tree care, implementing urban forestry standards and best practices, and incorporating natural assets into the City's asset management framework.

6.2.1 CHALLENGES

CLIMATE CHANGE

Penticton will experience a hotter year-round climate, with longer summers, and less summer precipitation. Extreme heat, prolonged drought and lack of water can all impact tree health and longevity. Wildfire is the most common natural disturbance in Penticton's forests and the region evolved with frequent low-intensity fires. Fire suppression, poor forest health, and climate change are combining to increase the risk of more severe fire behavior, and population growth in the region means more people and infrastructure are at risk. Adapting our urban forests to extreme heat, prolonged droughts, and disturbances like severe wildfires requires proactive management that would require additional staff and resources.



INVASIVE SPECIES

Invasive species include noxious weeds, tree species, and pests such as fungi and insects that lack natural controls in their new surroundings. Invasive species have adverse effects on the urban forest by reducing biodiversity or by directly attacking trees, leading to a decline in urban forest benefits. Disruptive events such as wildfires are expected to become more frequent with climate change. This could create additional opportunities for invasive species to rapidly colonize open sites, impacting the long-term ecological community.



URBAN CONDITIONS

Trees compete for space in urban environments and are pruned to reduce conflicts between a wide range of structures and infrastructure. The lack of standardized operational procedures can lead to poor pruning practices that result in numerous entry points for pests and diseases. Urban environments also tend to be hotter and drier than their rural surroundings, which can lead to rapid water loss, leaf scorching, and reduced growth which can make trees more susceptible to pests, disease and climate change.



VALUING TREES AND FORESTS IN MUNICIPAL ACCOUNTING

Cities are increasingly including inventory trees in their asset management systems. However, quantifying the value of trees can be difficult, and traditional accounting frameworks must be adapted to accommodate natural assets that increase rather than decrease over time. Technical gaps such as the lack of systematic species identification or tree condition assessments in the City's tree inventory further limit its ability to assess the value of the urban forest and efficiently prioritize maintenance for public trees.

6.2.2 STRATEGIES

- Strategy 6** Establish service levels for tree assets.
- Strategy 7** Extend documentation of operational procedures to promote good asset management.
- Strategy 8** Secure resources and build capacity needed for implementation.

6.2.3 LESSONS FROM OTHER PLACES

INVASIVE SPECIES MANAGEMENT

City of **Mississauga's Invasive Species Management Plan and Implementation Strategy** (ISMP & IS) provides the City with a coordinated approach to managing terrestrial invasive species in an economically efficient manner while enhancing the ecological integrity of natural areas. A comprehensive review of current invasive species management practices and the identification of priority species and management areas to efficiently use City resources informed the development of Mississauga's ISMP & IS. It was designed to adapt to new information based on regular monitoring, emerging best practices and professional insight. Two threat categories were used to focus invasive species management:

- 1) Priority 1 species are managed across the city
- 2) Priority 2 species are managed only in priority sites
- 3) Other species are managed on a site-by-site basis where their removal supports a project's success.

Fire as a restoration and risk management tool

In the middle of inner-city Toronto, prescribed fire is helping to bring back rare black oak woodlands and savannahs. The City of Toronto has led the restoration effort since 2000, with almost annual prescribed burns occurring in the city park's natural areas. Initiated with a goal to enhance native species and control exotic understorey plants, annual monitoring has shown significant decline of invasive plant species and a resurgence of native ecosystem components like dryland blueberry, woodland sunflower, and goldenrod.

Locally, members of the Okanagan Nation Alliance have significant experience and traditional ecological knowledge to draw on for prescribed burns. Successful prescribed burns have been carried out in SnPink'tn traditional territory at Garnet Valley to restore habitat value and reduce wildfire risk.



FIRESMART AND URBAN FORESTRY

Penticton's FireSmart program helps prevent fire from crossing between wildland fuels (vegetation) and the built environment. The Okanagan is a fire-influenced landscape with wildfire being a frequent event in most natural forests historically. FireSmart programming acknowledges this reality and seeks to build a more resilient community through changes to landscaping and construction materials in higher-risk areas.

Expanding the urban forest may seem at odds with FireSmart vegetation management. Context is key for resolving tensions between policy priorities. In high-risk areas for wildfire, "hardening" of buildings through use of non-combustible construction materials and vegetation management are important tools. The City is preparing a Wildfire Hazard Development Permit Area which can help guide landowners in higher-risk areas toward appropriate landscaping and construction on their properties. Landowners in lower-risk areas should feel confident that adding trees to their neighbourhood has a marginal impact on overall fire risk when those trees are low-flammability deciduous species such as crab apples, sweetgum, and oaks^{29,30}.

Homeowners concerned about wildfire risk can research FireSmart BC's landscaping guide, which describes species of trees, shrubs, groundcovers, and decorative grasses that are appropriate for different distances from the home in FireSmart's "Priority Zone" system. It is always a good idea to keep vegetation more than 1.5 metres away from your home, and prioritize low-flammability deciduous trees for use in landscaping close to buildings.



URBAN FOREST OUTLAWS: PENTICTON'S INVASIVE TREES

Penticton's urban forest contains several types of trees that can outcompete native plants. Many of these species were originally brought to the City to serve as shade or erosion control. Their ability to rapidly reproduce means that they have escaped their original purpose and are now found in unwanted places like natural forests and road rights-of-way. Managing invasive tree species is a significant burden on the City's urban forest program.

Tree-of-heaven, *Ailanthus altissima*

Problem: This large, fast-growing tree produces copious winged seeds and can sucker from roots and stumps. It has a high tolerance for pollution in air and soil. It produces a chemical called ailanthone that enters the soil and is toxic to many other trees. Tree-of-heaven is the favourite food of the invasive spotted lanternfly, an important pest of crop and fruit trees, and can act as a breeding ground from which the insects spread elsewhere in the urban forest and agricultural areas.

Control: Mechanical removal often fails because of incomplete root removal, which allows sprouting. Systemic herbicide injection to kill the tree and root system may require multiple rounds for successful eradication

Siberian elm, *Ulmus pumila*

Problem: High seed production and germination rates make this tree an efficient colonizer of disturbed riparian areas and undeveloped property margins. This tree was introduced as an agricultural windbreak due to its ability to tolerate dry conditions and poor soils. It can quickly shade out native understorey species and monopolize available soil moisture. It has weak wood and is susceptible to ice and storm damage.

Control: Small seedlings can be pulled easily from wetted soil. Girdling of mature trees can be an effective control treatment, though requires care to reduce potential sprouting response. Pairing mechanical treatment with herbicide application to leaves, stumps, or girdles can be highly effective. Prescribed fire is a potential method of cultural control.

Russian olive, *Elaeagnus angustifolia*

Problem: Birds and wildlife help spread the seeds of this tree, allowing it to rapidly colonize new areas. Originally planted as an agricultural windbreak and for erosion control, this tree is highly effective at spreading into open grassland habitats. It suckers from an extensive shallow root system when top-killed.

Control: Physical removal must usually follow herbicide application to cut stumps, stem injection, or basal bark application.

Black locust, *Robinia pseudoacacia*

Problem: With toxic seeds and a thick seedcoat, this tree's seeds are avoided by animals and remain viable in the soil for many years. Once favourable conditions allow a tree to establish, it can sprout from the root system leading to the formation of dense colonies. This tree was sometimes planted as a source of firewood and for fenceposts or early mining construction.

Control: Applications of herbicide are typically required to control mature tree colonies. Top killing methods are ineffective without herbicide application to address root suckering.



Tree-of-heaven, *Ailanthus altissima*



Siberian elm, *Ulmus pumila*



Russian olive, *Elaeagnus angustifolia*



Black locust, *Robinia pseudoacacia*

NATURAL ASSET MANAGEMENT PLANS

Trees require more early- and end-of-life care than they do when they are healthy and middle aged. If trees can reach this state, their benefits offset the costs of management and provide a net service value to the community. Timely and effective urban forest asset management creates the conditions for trees to live long, healthy lives, maximizing the return on investment and reducing the life cycle costs of removal and replacement.

Magnitude of costs and benefits over the tree life cycle

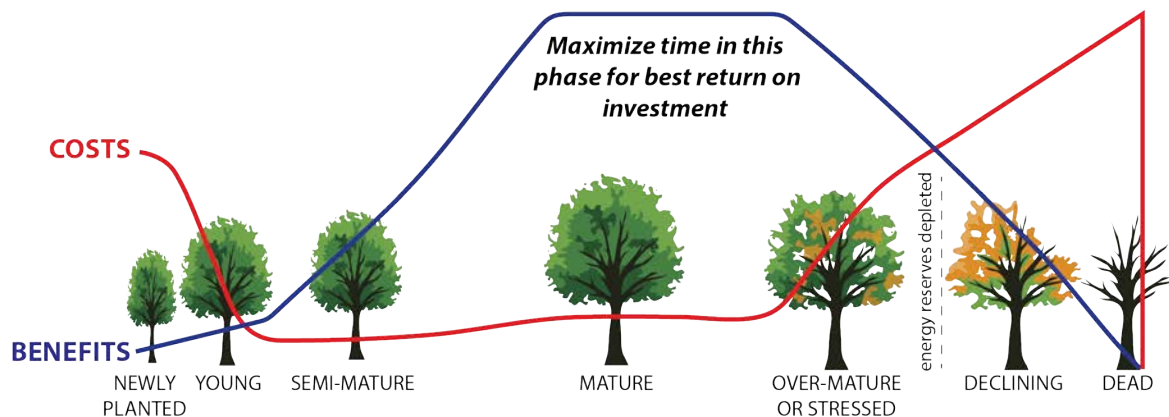


Figure 35. Typical magnitude of benefits and costs associated with urban trees over the life cycle.

The **City of Vaughan's Asset Management Plan** categorizes urban forest assets and provides financial and technical guidance for their effective management. The Plan consists of four components:

1. **State of the urban forest** that details tree asset quantities and replacement values
2. **Service levels for urban forest asset classes** with qualitative and technical performance indicators
3. **Life cycle management strategy** describing the operational and capital activities to maintain and manage urban forestry assets to ensure they are in a condition to provide the level of services identified
4. **Financial strategy** that forecasts operational and capital expenditures to fund the identified life cycle activities

The integration of urban forestry assets provides evidence-based decision-making, promoting responsible and sustainable tree asset life cycle management while ensuring financial sustainability.

FUNDING OPPORTUNITIES

Several federal and provincial grants are designed to support local governments make investments in urban forestry.

The Government of Canada's **Two Billion Trees (2BT) program** aims to motivate and support new tree planting projects. By 2031 up to \$3.2 billion will have been invested in tree planting efforts to plant two billion trees across Canada. It can support municipalities under various funding streams, and provided the funding for the City to develop the UFMP.

The Green Municipal Fund's **Growing Canada's Community Canopies (GCCC) initiative** is a new program that will support tree planting in and around communities across Canada for climate resilience and other social and environmental benefits. The initiative launched in the spring of 2024 and will provide tree-planting and strategic planning and operational support grants to local governments partnering with them. The initiative is funded by the Government of Canada's 2 Billion Trees (2BT) program and is a partnership between the Green Municipal Fund and Tree Canada.

The **Community Emergency Preparedness Fund**, funded by the Province of British Columbia and administered by the Union of BC Municipalities (UCBM), financially supports local governments and First Nations to help increase their resilience and ability to respond to emergencies, natural hazards, and climate change. The City of New Westminster has received funding through the Disaster Risk Reduction-Climate Adaptation stream of funding to increase climate resilience through tree planting in low-equity neighbourhoods.

6.3 GOAL 3: ENHANCE PARTNERSHIPS AND PUBLIC OUTREACH TO INCREASE AWARENESS AND CAPACITY FOR URBAN FOREST MANAGEMENT

The UFMP welcomes the role of the community in sustaining Penticton's urban forest. Over half of the urban forest is on private property, while another quarter is located on land owned by other levels of government. Building the urban forest program will require partnering with the community. Continuing engagement with Penticton Indian Band is needed to inform plan implementation and show respect. Increasing staff and financial resources specifically for outreach and engagement on urban forestry would increase the Parks Department's ability to develop and maintain partnerships while also supporting residents in their ability to plant and care for the urban forest at home.

6.3.1 CHALLENGES

MANAGEMENT CAPACITY

Penticton currently has three core staff that provide 2.25 full-time equivalent (FTE) hours for tree maintenance, removals, and public outreach. While interdepartmental relationships have strengthened, greater alignment of departmental priorities could further support tree retention and service delivery. However, the limited number of employees and hours available to steward the urban forest restricts the City's ability to enhance partnerships and expand public involvement.

IMPACTS OF LARGE OUTDOOR EVENTS

The City's parks host dozens of events bringing thousands of people to Penticton every year. These events are integral to the City's tourism industry and civic identity, but event operations and heavy visitation can take a toll on park trees. While city staff have designated areas in high-use parks for event setups, much of the damage is believed to be caused by vehicles entering the park while loading and unloading. The short duration of these activities and lack of staff capacity make it challenging to monitor event operations or prevent damage to trees and their roots through enhanced partnerships with event organizers.



6.3.2 STRATEGIES

- Strategy 9** Align priorities within the organization to facilitate tree retention and service delivery.
- Strategy 10** Explore partnerships with the community to enhance urban forest management and build awareness.
- Strategy 11** Engage Syilx/Okanagan communities, Penticton Indian Band, and urban Indigenous peoples to share knowledge and invite collaboration.

6.3.3 LESSONS FROM OTHER PLACES

PLANTING TREES ON PRIVATE LAND: KELOWNA'S NEIGHBOURWOODS PROGRAM

Planting can be a whole-community effort. Since many of the available planting sites are located on private property, Kelowna developed a partnership tree program – NeighbourWoods – in 2010 following the adoption of its Sustainable Urban Forest Strategy. The program is simple: the City coordinates with local nurseries to determine an annual tree list that is available for residents to order. The City takes orders from residents and uses its buying power to secure the trees at a lower cost than would be available to individual homeowners. The City's Urban Forestry team also provides printed and online extension resources to explain tree planting and other common questions. Over 6,500 trees have been planted on private land through the program since 2010.

COMMUNITY PLANTING PROJECTS: LONDON'S TREE MATCHING FUND (TREE ME)

The City of London, Ontario's Neighbourhood Tree Matching Fund (treeME) helps fund neighbourhood-level and resident-led tree planting to help grow the urban forest. Applicants match 25 percent of the total requested amount per project through a combination of volunteer labour, donated services, donated materials, supplies, and other funds raised. In 2023, \$200,000 was available in treeME funding to be allocated to successful applicants, with a maximum allocation of \$50,000 per project.



6.4 GOAL 4: MONITOR PROGRESS AND ADAPT MANAGEMENT TO CHANGING CIRCUMSTANCES

Penticton's tree inventory could be used to monitor the health, mortality, protection and replacement of its trees, prioritize service delivery, and increase efficiency. Monitoring will help ensure that the City continues to make progress towards an ambitious long-term canopy cover target of 25% in urban areas. In effect, monitoring changes in the urban forest over time will enable Penticton to adapt to forest health issues in real time, supporting a more resilient urban forest. Regular monitoring can also help to inform future iterations of the UFMP so that it remains responsive to current conditions.

6.4.1 CHALLENGES

INVENTORY STANDARDS

Penticton is working on updating its inventory to better inform asset management. Currently, not all attributes of interest such as tree condition have been included, limiting the ability to inform urban forest management and move towards proactive maintenance. Multiple departments use the tree inventory, resulting in inconsistent data entry standards.

EXTREME WEATHER EVENTS

Extreme weather events are expected to become more frequent because of climate change. These include heatwaves, prolonged droughts, and unexpected frosts, which can negatively impact trees that are maladapted to Penticton's future climate. Strong winds and storms can also contribute to tree failure or physical damage. In general, trees that are already stressed by urban growing conditions are also more vulnerable to extreme weather events induced by climate change. Innovative technologies such as soil cells and permeable or floating pavements can improve growing conditions for trees, helping them adapt to Penticton's future climate.



6.4.2 STRATEGIES

Strategy 12 Monitor and report on change to promote adaptive management and increase transparency.

Strategy 13 Test new ideas and technologies that can help adapt the urban forest to an uncertain future.

6.4.3 LESSONS FROM OTHER PLACES

MANAGING ADAPTIVELY

The City of Seattle reports annually on its Urban Forest Management Plan, monitored by a working group called the Core Team with representation from multiple City departments and select external agencies, supported by an independent Urban Forestry Commission with a role to advise the government on its implementation. Observations from annual progress reports are fed into operational and strategic planning.

MONITORING FOREST HEALTH

The Town of Oakville has been a long-time leader in monitoring the health of its urban woodlands. Since 2014, the community has a third of its woodlands audited each year, on a three-year rotational basis, for signs of pests, disease and other disturbances. Observations from the assessments are reported on through public-facing 'report cards', which are used to inform subsequent management action(s). In 2019, Oakville committed \$216,000 in capital funding toward supporting the audit and subsequent invasive species controls.

Beyond the formal audit program, Oakville's Forest Health Ambassador program leverages engaged residents to help monitor neighbourhood street trees for invasive insects, disease and other issues related to forest health. The program runs through the summer months and Ambassadors can survey as many or as few trees as they like at any time that is convenient for them.



6.5 BIG MOVES TO IMPLEMENT THE VISION

The Urban Forest Management Plan recommends **Scenario 4: Green Future** be advanced in the City by adopting a 20-year canopy cover target of 18% City-wide and long-term target of 25% in urban areas. The Implementation Table (Section 6.6) provides **4 Goals, 13 Strategies, and 90 Actions** to implement, coded by scenario, departmental leadership, approximate cost, and implementation priority. The following nine Big Moves summarize the Action Plan's most significant recommendations.

		Scenario
①	Develop a Tree Protection Bylaw to apply throughout the City. Tree protection is needed to reduce rates of loss and regulate replacement planting.	 
②	Update City standards and bylaws to create more suitable planting environments and ensure at least 1:1 replacement of trees removed from City property. The City will demonstrate its commitment to urban forestry through prioritizing replacement planting when tree removal must occur.	  
③	Integrate targets for tree canopy and new planting with development regulations. New tree planting on private property is needed to reach a long-term target of 25% canopy cover (on average) in urban areas.	
④	Create tree planting programs for public property that can deliver at least 125 (Scenario 2) or 175 (Scenarios 3 and 4) new (non-replacement) trees per year. New tree planting on public property will help offset losses on private property.	  
⑤	Plant at least 200 (Scenario 2), 300 (Scenario 3), or 400 (Scenario 4) trees per year in natural restoration areas. Expanding natural restoration efforts will help reduce the impact of invasive species, drought, and forest health issues in natural forests.	  
⑥	Offer a public tree sale to increase tree planting rates on private property. Modelled after Kelowna's NeighbourWoods program, a public tree sale can spur additional tree planting on private property and increase awareness of urban forestry.	  
⑦	Maintain up-to-date inventories of urban street and park trees and natural forests. Updated inventory information is needed to help operational planning, budgeting, and monitoring.	  
⑧	Involve the community in urban forest management. Community champions are crucial for implementation of planting, monitoring, and building support for urban forest management on public and private lands.	  
⑨	Add staff capacity in the Parks department to lead implementation. Up to 4 additional FTE will be needed to fully implement new and expanded programs recommended in the Urban Forest Management Plan. Alternative arrangements to supplement the department's human resources should also be explored.	  

● 2: No Net Loss ● 3: Urban Forest Expansion ● 4: Green Future



6.6 IMPLEMENTATION TABLE

The implementation table provides action language for each Strategy and Goal, totalling 90 actions for consideration. The implementation table provides the following context for each action:

Pathway	●	The action is recommended for achieving Scenario 2 (no net loss)
	●	The action is recommended for achieving Scenario 3 (expansion)
	●	The action is recommended for achieving Scenario 4 (green future)
	●)	A modified target within the action applies to this scenario
Responsibility	Parks	The department(s) leading implementation for the action
	Parks	Key department(s) supporting implementation for the action
Cost	(\$)	The action will reallocate existing staff time or involves significant potential cost recovery
	\$	The action will incur a one-time cost of <\$10,000
	\$\$	The action will incur a one-time cost of \$10,000 to \$50,000
	\$\$\$	The action will incur a one-time cost of \$50,000 to \$100,000
	\$\$\$\$	The action will incur ongoing costs above current or a one-time cost exceeding \$100,000
Priority	A	The action is considered essential for implementing the Green Future scenario.
	B	The action supports implementation of a Priority A action.
	C	The action can be deferred with limited impact on implementation.

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Strategy 1. Update bylaws, policies and plans to promote urban forest retention and expansion				
Action 1 Secure Council endorsement of the Urban Forest Management Plan including a city-wide canopy cover target of 18% by 2045, and a long-term target of 25% canopy cover for urban areas.	●	Parks Planning	(\$)	A
Action 2 When next updating the Official Community Plan, consider incorporating targets for urban forest canopy cover city-wide and in urban areas and minimum canopy cover targets for OCP land use designations, including: • 30% canopy cover in Low Density Residential land uses. • 20% canopy cover in High Density Residential, Institutional and Civic land uses. • 15% canopy cover in Commercial, Downtown Mixed Use, and Mixed Use land uses. • 10% canopy cover in Industrial land uses.	●	Planning Development Services, Parks	(\$)	A
Action 3 Explore policy options to enable financial incentives for properties that meet canopy cover targets, including DCC waivers, density bonuses, and stormwater utility fee credits.	●	Planning Development Services, Engineering, Legal, Parks	(\$)	B
Action 4 When next updating the OCP, consider establishing policy to protect, restore and connect forest corridors, building on the conceptual “Forest Corridors” map in the UFMP.	● ●	Planning Parks	(\$)	A
Action 5 Consider amending landscaping standards in the Zoning Bylaw to: • Establish minimum tree density requirements by generalized land use: • 15 trees per hectare in industrial zones. • 25 trees per hectare in commercial, mixed use, institutional and high-density residential zones. • 50 trees per hectare in low density residential zones. • For properties requiring a development permit, require the submission of a Landscape Plan that demonstrates achievement of minimum tree density • Establish a system of counting trees towards the tree minimum that accounts for size at maturity based on the City’s Tree List: • “Large” species count as 2 trees. • “Medium” species count as 1 tree. • “Small” species count as 0.5 trees. • Establish a minimum permeable planting area required on each lot by generalized land use, starting from an absolute minimum plantable area of 30m² per lot and ensuring that permeable planting areas are consolidated to support adequate soil volume for trees. • Require irrigation be provided for consolidated permeable planting sites. • Require any parking lot with 6 stalls or more to incorporate 1 tree per 6 stalls, planted in a suitable permeable planting area. • Establish minimum soil volumes by mature tree size of: • 30m³ per large tree, or 25m³ per large tree where multiple trees share a volume. • 20m³ per medium tree, or 18m³ per medium tree where multiple trees share a volume. • 15m³ per small tree, or 12m³ per small tree where multiple trees share a volume.	●	Planning Development Services, Legal, Parks	\$\$\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 6 Amend the City's Building Bylaw to require site plans to indicate the surveyed location of all protected trees on the property plus all trees on neighbouring or City property that could be impacted by construction, and allow an Arborist Inspector to fulfill the role of a building official for the purposes of executing bylaw requirements related to trees on private property.		Building Development Services, Legal, Parks	\$\$\$\$	A
Action 7 Consider amending Development Permit Area guidelines within the Official Community Plan to promote tree retention and planting as an outcome of site design, including acceptable design alternatives to achieve minimum soil volumes and pervious areas.		Planning Engineering, Legal, Parks	(\$)	A
Action 8 When next amending the City's Delegation Bylaw, consider defining "Minor Development Variance Permits" that can be delegated to staff when Significant trees are being retained, such as changes to setbacks, an increase in building height or reduced parking.		Development Services Legal, Parks, Planning	(\$)	A
Action 9 Consider amending the Subdivision and Development Bylaw to: • Update the reference to a Preferred Tree List for the City. • Establish preferred spacing and soil volumes for each tree size class as follows: • Small trees: 8 m spacing, 15 m³ soil volume per tree. • Medium trees: 10 m spacing, 20 m³ soil volume per tree. • Large trees: 12 or 15 m spacing, 30 m³ soil volume per tree. • Develop new standard drawings for infiltration tree pits and planting beds, root trenches, and suspended pavement systems to support roots below hardscape. • Align the minimum clearance from service infrastructure for newly planted trees with clearances in the City Tree Policy. • Allow for reduced spacing of trees in specific situations where higher density of canopy is desirable from an urban design perspective, guided by neighbourhood plans or development permit area guidelines. • Establish minimum boulevard widths to support tree health of: • 1.5 m width for small trees. • 1.8 m width for medium trees. • 2.0 m width for large trees. • Extend the maintenance period for new street trees from one to five years and clarify that maintenance begins at tree planting. • Update the security value for new street trees to reflect the City's cost to acquire, install, and maintain an equivalent tree for a period of not less than five years, including the costs of watering/irrigation. • Allow the Director of Development and Engineering Services to vary these standards on the advice of the Parks Department to require irrigation be installed with separate metering and accommodate flexible design solutions such as suspended pavement systems, infiltration tree pits, and other green infrastructure installations.		Development Services Engineering Legal, Parks, Planning	\$\$\$\$	A
Action 10 Amend the Land Acquisition Policy to: • Add reforestation/afforestation potential as features for acquisition. • Add proximity to designated Forest Corridors as a land assessment criterion. • Add the Urban Forest Reserve Fund as a funding source, only for acquisitions related to reforestation/afforestation.		Legal Parks, Planning	(\$)	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 11 <i>Update the Climate Action Plan to integrate natural asset values for climate change mitigation and adaptation, including carbon sequestration by the urban forest, the benefits of shade and evapotranspirative cooling, and potentially positive influence on landscape irrigation requirements. Replace references to Appendix G (Urban Tree Canopy Recommendations) with appropriate references to the UFMP. Provide educational backgrounds for the public/developing regarding benefits of trees as part of the Passive house step code to mitigate removal of trees.</i>		Sustainability Parks, Planning	\$\$\$	B
Action 12 <i>Make the following updates to the Preferred Tree List:</i> • Maintain the distinction of small, medium, and large trees while adding a suitability checklist for boulevard, park, hardscape, and other planting locations. • Reflect current climate adaptation considerations and knowledge of local arborists. • Engage Penticton Indian Band representatives to inform updates. • Ensure all trees on the list are cold-hardy to at least USDA Zone 7a. Drought and heat tolerance are important attributes for all of Penticton's tree species. • Adopt tree diversity targets to guide species selection for new tree planting of no more than 30% of any family, 20% of any genus, and 10% of any species, excluding planting palettes for restoration of forested natural areas where diversity targets cannot be met by native species. • Update indications of over-represented trees in the tree inventory to include maple.	  	Parks	\$	A
Action 13 <i>Amend the Fees and Charges Bylaw to reflect an updated cost for boulevard tree planting that reflects the City's cost to acquire, install, and maintain a tree for period of not less than five years, including the costs of watering/irrigation.</i>	  	Parks Legal	(\$)	A
Strategy 2. Develop a new Tree Protection Bylaw to apply throughout the City				
Action 14 <i>Develop a Tree Protection Bylaw to offer protection to a subset of trees throughout the City (including on private property), considering the need to preserve large, mature trees as well as trees planted as conditions of a development permit (e.g. under zoning requirements).</i>	 	Parks Building, Communications and Engagement, Development Services, Legal, Planning	\$\$\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 15 <i>Ensure the Tree Protection Bylaw considers the following issues:</i> • The definition of a protected tree, which should include replacement trees, trees planted as a condition of an approved development permit, any tree in an environmental development permit area, any tree on City property, any Significant Tree, and a subset of all trees on private property based on a minimum size threshold to be informed by public engagement. • The definition of regulated tree-damaging activities, which should refer to ISA Best Management Practices in defining exemptions for responsible tree maintenance. • When a permit will be required, including exemptions for tree-damaging activities undertaken by the City’s agents and potential exemptions to address hazardous trees, invasive tree species, or trees considered a wildfire hazard when identified by a qualified professional. • The standards for tree protection that are required, which should include the definition of a tree’s critical root zone and how it is determined, with a default CRZ of 10x diameter at 1.4 m above grade, as well as requirements for tree protection fencing standard, arborist reporting, and inspection related to permit issuance. • When replacement tree planting will be required and at what ratio, as well as provisions enabling cash-in-lieu as a last resort. Replacement ratios on private property should be no less than 1 tree planted for each tree removed (1:1). Replacement ratios on public property should be no less than 2 trees planted for each tree removed (2:1), when removal of the City tree is requested by a third party. The cash-in-lieu rate should be equal to the City’s cost to acquire, install and maintain the replacement tree for a period of not less than 5 years, including the costs of watering/irrigation. • The establishment of securities and a warranty period for retained trees, replacement trees, and trees planted as a condition of a development permit. In general, securities should reflect the City’s cost to acquire, install, and maintain an equivalent number of trees for a period of not less than 5 years, including the costs of watering/irrigation. • Reference to an updated Preferred Tree List maintained by the Parks Department and a requirement that the largest class of tree suited to the planting site be selected for replacement planting. • Inspection procedures for the release of securities and allowing the City to deduct assessed penalties from securities or transfer unclaimed securities to the Urban Forest Reserve Fund. • Penalties enabled by the Offence Act and Municipal Ticketing Information Bylaw of up to \$50,000 per offence and up to \$1000 per infraction, for example, defining the unauthorized removal of a Significant Tree as an offence with a penalty specific to defined classes of trees, with the largest evaluated using the appraised value of the tree using an industry-standard appraisal method (e.g. CTLA Guide for Plant Appraisal) acceptable to the City, up to a maximum of \$50,000. • Penalties may include requiring special replacement tree planting.		Parks Building, Communications and Engagement, Development Services, Legal, Planning	(\$)	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 16 <i>As a provision of the Tree Protection Bylaw, establish the protection of Significant Trees from the City's Significant Tree list and adopt the following definition of a Significant Tree:</i> - Any tree having at least one single stem having a diameter of 70 cm or more, measured at 1.4 m above grade. - Any tree listed in the Significant Tree list. - Any significant tree identified in consultation with the PIB. - Notwithstanding the other criteria, no tree considered an invasive tree species by the City of Penticton should be considered a Significant Tree.	● ●	Parks Building, Communications and Engagement, Development Services, Legal, Planning, Major Projects Committee	(\$)	A
Action 17 <i>If a Tree Protection Bylaw is not adopted by Council, amend applicable recommendations for protection, planting/cash-in-lieu, Significant trees, inspection/reporting, and updated securities costs into the existing Municipal Properties Tree Bylaw, and amend the Development Procedures Bylaw and Subdivision and Development Bylaw to incorporate off-site works, such as boulevard, tree, and landscaping work, as part of inspections, making such inspections the responsibility of an Arborist Inspector within the staff of the Parks Department.</i>	●	Parks Legal	\$\$\$\$	A
Strategy 3. Plant trees with a focus on equity				
Action 18 <i>Plan a 10-year urban tree planting program to prioritize areas for planting on public land where neighbourhood tree equity is low and existing City-owned trees have declining service value, supported by an inventory of 'vacant' boulevard planting sites that considers conflicts with utilities and planned capital works. Preparations for the program should seek to:</i> - Inventory 'vacant' boulevard planting sites in a GIS database that includes information on conflicts with utilities, planned works, and current planting suitability by tree size (informed by minimum soil volumes and boulevard widths in recommended by the UFMP). - Note special locations where opportunities exist to remove or shift parking or other paved surfaces in City-owned rights-of-way because of low traffic volumes or low parking demand that allow greater consolidated soil volumes on public property for boulevard tree planting, with attention to locations where improvements for tree planting could complement planned capital works. - Note potential for soil bridging between boulevards and adjacent private property, or areas where suspended pavement systems may otherwise be suitable to produce sufficient soil volume for the planting of a large tree. - Update the City's tree inventory with attention to poor condition and dead/dying trees that are suitable for replacement now or in the near future. - Identify additional park or open space locations where landscape tree planting is suitable, considering land use conflicts in parks and the need to avoid impacts to sports fields and other event venues. - Identify infrastructure and future capital or development works that could impact the timing and implementation of specific planting sites. - Inventory equipment regularly available for planting and assess the need for an improved scheduling system or purchase or lease of machinery to ease capacity constraints at critical times of the year, like the spring and fall. - Establish a program target for new tree planting on public land of 175 (125) caliper-sized trees per year, or 1750 (1250) trees by 2035.	(●) ● ●	Parks Information Technology, Public Works	\$\$\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 19 <i>Develop a program for streetscape retrofits within the 10-year urban tree planting program to fund tree planting in low-equity blocks and fund it to permit the planting of at least 25 trees per year until 2035.</i>	● ●	Parks Engineering, Public Works	\$\$\$\$	A
Action 20 <i>Develop a program for Partnership Tree Planting within the 10-year urban tree planting program, wherein residents can formally request a tree be planted in the boulevard in front of their home with input on species selection from the Preferred Tree List, planting undertaken by the City, and shared responsibility for watering during establishment. Fund the program to permit the planting of at least 25 trees per year until 2035.</i>	● ●	Parks, Communications and Engagement Engineering, Public Works	(\$)	A
Action 21 <i>Develop a program within the 10-year urban tree planting program to fund the remaining 125 trees per year towards the all-program target, allocating some of the approved budget to the trial of new species or cultivars believed suitable for Penticton's future climate and forest health, which will support the City to update its Preferred Tree List from time-to-time.</i>	● ● ●	Parks Engineering, Public Works	(\$)	A
Action 22 <i>Ensure at least 1 tree is planted to replace every tree removed from City property, and support replacement tree planting by considering amendments to tree protection policies to support higher cost recovery.</i>	● ● ●	Parks Legal	\$\$\$\$	A
Action 23 <i>Develop design guidance documents to support tree planting and low impact development in Downtown, low density and high density residential, industrial, and commercial areas. Preparation of the guidance documents should explore incentives to encourage private landscaping to exceed required tree planting minimums, or to provide other forms of greening in addition to trees, such as:</i> • Supporting low impact development with clear rules for density bonusing or other mechanisms based on an assigned-points system for trees or other green infrastructure. • Developing a tiered landscape standards program to incentivize higher performance, with additional incentives proportionate to the level of greening or tree planting achieved. • Providing standard drawings that demonstrate how tree planting requirements can be achieved on standard lot sizes.	● ●	Planning Development Services Engineering Parks	\$\$	B
Action 24 <i>Invite community feedback on the urban tree planting program by appointing a contact at the City in charge of responding to public questions and concerns.</i>	● ● ●	Parks, Communications and Engagement	(\$)	A
Strategy 4. Restore forested natural areas to connect habitats and improve biodiversity				
Action 25 <i>Complementing the 10-year urban tree planting program, plan a 10-year restoration program for forested natural areas to prioritize areas for reforestation/afforestation on public property where neighbourhood tree equity is low and there are known issues with forest health, wildfire risk, species invasion, and illicit use or vandalism. Planning the program should consider the following:</i> • A tree planting (plug or pail) target of 400 (300) trees per year in natural areas until 2035, or 4000 (3000) trees by 2035. • Prioritizing restoration of sites within the Forest Corridors mapped by the UFMP. • Within Forest Corridors, prioritize sites where natural forest cover has declining service value because of forest health concerns. • Develop criteria for when the City will target species conversion of invasive tree species in natural areas, which could result in loss of canopy, such as high risk to species of conservation concern (provincial or federal listing), co-benefits like mitigating impacts from illicit camping or reduction of wildfire risk, or identification of high priority sites in partnership with Penticton Indian Band. • Identify future afforestation/reforestation sites that can help connect Forest Corridors, increasing their habitat, biodiversity and ecosystem value.	(●) ●	Parks Major Projects Committee (PIB Liaison)	\$\$\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 1: Plan, protect, and plant to expand the urban forest				
Action 26 <i>Work with Penticton Indian Band to source native plant stock for restoration planting from the PIB's plant nursery and diversify the genetic sources of seedlings with plants further south in Okanagan traditional territory to assist migration of climate-adaptive traits like greater heat and drought tolerance.</i>		Parks Major Projects Committee (PIB Liaison)	(\$)	B
Action 27 <i>Consider information from the South Okanagan Similkameen Region Biodiversity Conservation Analysis on biodiversity hotspots and key habitat connections when planning future restoration efforts and future Forest Corridors.</i>		Parks	(\$)	B
Action 28 <i>Develop an Integrated Pest Management Policy that details the City's response procedures for major forest health issues, including thresholds for monitoring and response, and includes detail on methods of control preferred for natural areas by Penticton Indian Band.</i>		Parks Major Projects Committee (PIB Liaison)	\$\$	B
Strategy 5. Enhance stock selection and adapt planning for future climate				
Action 29 <i>Explore alternative procurement processes for tree stock or regional buying groups, that would enable the City to influence the species, genetic material, and stock quality so that there is greater access to and consistency of tree stock that is well adapted to future climate.</i>		Parks Finance	(\$)	B
Action 30 <i>Investigate creating a formal partnership with a local nursery to advance the species diversity of non-native caliper trees and support higher rates of tree planting, including potential agreements to supply a public tree sale.</i>		Parks Legal	(\$)	B
Action 31 <i>Trial the use of alternative, innovative, and emerging practices to enhance forests such as soil aeration, copse planting, coarse woody debris placement for soil shading and moisture retention, soil amendments like biochar, and the establishment of densely planted "mini forests" to accelerate stand development.</i>		Parks	\$\$\$	B
Action 32 <i>Ensure any new installations of adaptive green infrastructure (like soil cells, pervious pavements, and bio-infiltration structures) on public property are inventoried and uploaded into the City's GIS systems so that they can be included in the asset management program. Below ground installations should always be installed with a permanent marker in a visible above-ground location.</i>		Parks Information Technology Public Works	\$\$	A
Action 33 <i>Trial new irrigation systems on a selection of plantings on public property to encourage continuous improvement, supported by public realm design standards that refer to irrigation and supportive technologies like bio-infiltration pits, permeable surface materials and greywater recycling.</i>		Parks Engineering, Planning, Public Works	\$\$	C
Action 34 <i>Reflect FireSmart design principles in Landscape Plan review and development permit guidelines in the Wildland-Urban Interface, acknowledging that low flammability, low maintenance vegetation should be prioritized within 10 metres of any building face, accepting that this may limit the use of native landscaping immediately next to homes.</i>		Parks Development Services, Fire, Planning	(\$)	B

Action	Pathway	Responsibility	Cost	Priority
Goal 2: Manage for tree health and longevity				
Strategy 6. Establish service levels for tree assets				
Action 35 <i>Update the City's Tree Inventory with consideration for:</i> • Allowing records to be quickly identified by the entering department. • A system for indicating trees that are growing within the limits of approach of above ground electrical conduits. • Systematic recording of tree condition using dead/dying, poor, fair, good, and excellent condition ratings. • Systematic recording of risk assessment results using TRAQ methodology. • Populating the genus and species of all trees on City property and all Significant Trees. • Populating the maintenance frequency to reflect current service levels for each asset class on City property. • Recording the date of the last update for each record and by whom. • Quality control procedures to ensure data accuracy and completeness, such as the deployment of domains for class attributes like location and species name. • Setting a goal to capture all landscaped park and boulevard trees on public property, as well as replacement trees, trees required as a condition of development permit, and Significant Trees on public or private property. • Procuring an IT solution that allows real-time updates and direct input by Parks staff to transition to a “live” inventory from a static one.		Energy, Parks Information Technology	\$\$\$\$	A
Action 36 <i>Create a new inventory of forested natural areas to record species/ecosystem information, disturbance severity, forest health and condition, maintenance, and inspection information and set a target to update this inventory at least once every five years.</i>		Parks Information Technology	\$\$\$	A
Action 37 <i>Identify the following classes of trees in the City's asset management policies and program:</i> • Boulevard/street trees • Park/landscaping trees (Class A parks) • Park/landscaping trees (Class B and C parks) and other urban trees on public property • Forested natural areas (stands)		Parks	(\$)	B
Action 38 <i>Shift to proactive maintenance of Boulevard/Street trees and Park/Landscaping trees (Class A parks) on an 8-year block pruning cycle. Shift to proactive maintenance of other urban trees on a 12-year pruning cycle. Retain reactive management to address issues in forested natural areas and elsewhere as hazards arise.</i>		Parks	\$\$\$\$	A
Action 39 <i>Develop a tree risk management policy to establish inspection guidelines, standards of assessment, and thresholds for mitigation based on the results of the assessment standard which correspond to each asset class, reflecting the following service level targets:</i> • Annual Level 1 (walk-through) assessment: Boulevard/street trees, Park/landscaping trees (Class A) (other urban trees on public property and trailside as reported to the City). • Level 2 (visual) assessment or Level 3 (detailed) assessment. As required to determine whether a specific tree meets thresholds for risk mitigation, when there is a compelling competing interest in tree retention (i.e. large trees, wildlife trees, etc). • Identify TRAQ as the default methodology for risk assessment of urban trees.		Parks Legal	\$\$	A
Action 40 <i>Establish supplemental watering as a core service provided for the urban forest and increase budgets available to ensure all new boulevard/street trees and park/landscaping trees are fitted with drip irrigation.</i>		Parks Development Services	\$\$\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 2: Manage for tree health and longevity				
Action 41 <i>Transition maintenance of trees within the limits of approach of City-owned electrical infrastructure from (non-arborist) workers in the Electrical Department to a trained Certified Utility Arborist within the Parks Department.</i>		Energy, Parks	\$\$\$\$	A
Action 42 <i>Identify life expectancies for urban tree asset classes to inform life-cycle costing and replacement planning, and engage a plant health care approach when inventoried assets are observed to have recoverable defects, such as soil compaction, wilting, or other issues, considering the ratio of the current tree age (or approximate) to proposed life expectancy as a prioritization framework for recommending additional care.</i>		Parks Public Works, Information Technology	(\$)	B
Strategy 7. Extend documentation of operational procedures to promote good asset management				
Action 43 <i>Update the Operations Procedure for Tree Pruning to refer to ISA Best Management Practices and TCIA updated pruning standards for tree care.</i>		Parks	\$	B
Action 44 <i>Update the Storm Callout procedures to include a decision-making framework for resource allocation that prioritizes safety followed by preserving life-cycle asset value.</i>		Parks	\$	B
Action 45 <i>Create a new Operations Procedure for Tree Planting and Young Tree Care to refer to ISA Best Management Practices for tree planting and document the City's commitment to:</i> • Selecting appropriate species for the planting site based on diversity, maintenance, and size criteria as well as potential utility conflicts. • Installing new urban trees with drip irrigation. • Providing supplemental watering for no fewer than five years after planting where drip irrigation cannot be installed. • Structurally pruning all new planted trees as required. • Mulching where appropriate to conserve water and promote healthy soil structure.		Parks	\$\$	A
Action 46 <i>Compile procedures, technical details, and workflow descriptions for urban forest management activities into an Operational Guidance Document that addresses the day-to-day needs of urban forest management, defines levels of service for each urban forest asset class and program activity, and can act as a training and quality control reference for City staff.</i>		Parks	\$\$	A
Action 47 <i>Prepare a new utilization policy for waste wood that defines the best utilization for classes of debris generated by urban forest operations, considering in particular where there may be opportunities for cooperating with Penticton Indian Band or organizations in the Penticton community to find the highest and best purpose.</i>		Parks Sustainability, Major Projects Committee	\$	B
Strategy 8. Secure resources and build capacity needed to implement				
Action 48 <i>Develop an operational budget impact value for each new tree added to the inventory to account for increasing maintenance costs.</i>		Parks	(\$)	A
Action 49 <i>Conduct an integrated staffing review between the Parks, Bylaw/Enforcement, Building, Energy, Public Works, Development Services, and Planning departments in concert with new mandates (such as a new Tree Protection Bylaw) to examine where additional staff may be required to operate new permitting and enforcement, landscape plan review, interdepartmental liaising and project meetings, dedicated community outreach, tree inspections, and other program needs.</i>		Parks CAO, Bylaw, Building, Development Services, Energy, Planning, Public Works	(\$)	A

Action	Pathway	Responsibility	Cost	Priority
Goal 2: Manage for tree health and longevity				
Action 50 Expand the City's capacity for urban forestry by adding up to 4.0 FTE to support increased service levels recommended by the UFMP.		Parks Energy	\$\$\$\$	A
Action 51 Consider making the Urban Forest Reserve Fund a statutory reserve fund to advance tree planting, reforestation, and afforestation projects, to be funded by cash-in-lieu contributions enabled by a new Tree Protection Bylaw. The purpose of the Urban Forest Reserve Fund should consider including the purchase and installation of new trees on public property, purchasing property with high reforestation or afforestation potential, and potentially could include providing grants to private landowners to support tree planting on private property or care and maintenance of Significant Trees on private property.		Finance Development Services, Parks	\$	B
Action 52 Secure resourcing to plant an average of 175 (125) new caliper trees and 400 (200-300) new plug/pot seedlings every year until 2035.		Parks	(\$)	A
Action 53 Access employment funding, such as the Green Jobs program and Canada Summer Jobs wage subsidies, to employ students, youth, and early career professionals to enhance community outreach capacity, support inventory updates, and complete other tasks as desired.		Parks	(\$)	B
Action 54 Pursue external funding sources such as Growing Canada's Community Canopies or other grant programs as they become available, cooperating with neighbouring municipalities and Penticton Indian Band where appropriate to leverage joint funding.		Parks	\$	A
Action 55 Consider new financial tools to fund urban forest management, such as introducing a stormwater utility tax on impervious area, new development cost charges, permit and inspection fees, special levies, cash-in-lieu, or general property taxes to meet implementation needs identified by the Financial Framework supporting the UFMP.		Parks Development Services, Engineering, Finance, Planning	(\$)	B
Goal 3: Enhance partnerships and public outreach to increase awareness and capacity for urban forest management				
Strategy 9. Align priorities within the organization to facilitate tree retention and service delivery				
Action 56 Establish an interdepartmental working group chaired by Parks to collaborate on implementing the UFMP, meeting quarterly to start. The working group can be a forum for issues encountered and serve as a report out on initiatives scheduled by Parks for the urban forest program in a given quarter.		Parks All departments	(\$)	A
Action 57 Work towards clear rules for interdepartmental referrals involving trees, including building inspections, and aiming to have Parks Department informed of all capital works with a value of \$50,000 or more during pre-design stages so that input supporting planting program targets can be incorporated.		Parks All departments	(\$)	A
Action 58 Offer staff education, stewardship, and wellness opportunities to encourage connections to the urban forest, such as team-building tree planting days or nature walks.		Parks All departments	(\$)	B
Action 59 Develop a standard reporting protocol whenever proposed capital works will result in tree removal or planting site elimination so that losses to the urban forest caused by the City's competing interests can be reflected in annual reporting.		Parks	\$	B
Action 60 Seek Tree Cities of the World status to reflect Penticton's renewed commitment to urban forest management and consider pursuing Sustainable Forest Institute certification through the Urban and Community Forestry Sustainability Standard in the future.		Parks	\$	B

Action	Pathway	Responsibility	Cost	Priority
Goal 3: Enhance partnerships and public outreach to increase awareness and capacity for urban forest management				
Strategy 10. Explore partnerships with the community to enhance urban forest management				
Action 61 Prepare a communications and engagement plan to guide ongoing stewardship programming and community tree outreach.		Parks, Communications and Engagement	\$	A
Action 62 Engage with School District 67 to promote youth learning and engagement opportunities and identify champion teachers and classrooms for future tree planting and/or natural restoration events.		Parks	(\$)	B
Action 63 Explore a regional business licensing program with nearby municipalities to ensure arborists and tree care companies have appropriate certifications and training in local protection standards, permitting requirements, and best practices for tree care and retention. Explore supporting extension and training for contractors in Penticton to improve performance to standards.		Parks Legal	(\$)	B
Action 64 Engage with developers to promote proper planting practice and maintenance during warranty periods, and to gain information about appropriate and feasible incentives for tree retention on private property.		Parks, Communications and Engagement, Development Services	\$\$	B
Action 65 Develop a community tree sale program to incentivize tree planting on private property, wherein residents can purchase a tree from the City at the wholesale nursery cost and be provided with extension information about planting practices, young tree care and maintenance, siting, and other issues by staff arborists.		Parks, Communications and Engagement	(\$)	A
Action 66 Work with the Ministry of Transportation to replace trees with declining service value in the Highway 97 corridor and improve planting practices.		Engineering Parks	(\$)	B
Action 67 Partner with Interior Health and BC Family Doctors to explore opportunities to develop local trails and parks for forest therapy or "nature prescription" programs.		Parks Recreation	\$	C
Action 68 Develop a new handout guide for event organizers using City parks and facilities on common tree damaging activities and how to avoid them to be posted on the City's website and provided to organizers as part of their event agreements.		Parks Recreation	\$\$	B
Action 69 Establish a Urban Forest Monitor program for the purpose of: - Identifying and locating Penticton's Significant Trees. - Providing primary monitoring of common forest health conditions and invasive plant species in Penticton's parks and natural areas. - Reporting to the Parks Department on maintenance issues and potential planting sites in parks. - Attending community events as goodwill ambassadors to share information about tree protection and report potentially damaging activities to City officers.		Parks Communications and Engagement, Recreation	\$\$\$	B
Action 70 Offer annual educational opportunities and outreach to the general public, such as talks and walks hosted in partnership with the Penticton Museum, community groups focused on urban forest management, or the Penticton Indian Band, focused on building awareness of Penticton's urban forest and tree heritage, at which Parks Department representatives can also provide soft extension services for proper tree planting, care, and other urban forest issues.		Parks Communications and Engagement, Recreation	\$\$	B
Action 71 Update the City's website and other media properties to include information about the urban forest and UFMP implementation.		Parks Communications and Engagement	(\$)	A

Action	Pathway	Responsibility	Cost	Priority
Goal 3: Enhance partnerships and public outreach to increase awareness and capacity for urban forest management				
Strategy 11. Engage Penticton Indian Band, Syilx/Okanagan communities, and urban Indigenous people to share knowledge and invite collaboration				
Action 72 <i>Continue to share and develop urban forest management as a topic for government to government consultation with Penticton Indian Band.</i>		Parks Major Projects Committee	(\$)	A
Action 73 <i>Explore links between the urban forest program and cultural resource use, such as by using "waste" wood to provide access to desired wood and plant fibre, or encouraging joint resource management in forested natural areas.</i>		Parks Major Projects Committee	(\$)	B
Action 74 <i>Seek opportunities to represent Syilx worldviews on trees and forests, which can be in conflict with an urban forest management framework, equally with the City's management framework during public engagement and in-situ installations, like information boards in parks.</i>		Parks Major Projects Committee	\$\$	A
Action 75 <i>Invite Penticton Indian Band, Syilx, and urban indigenous resource management in natural areas by coordinating with elders to authorize cultural/medicine plant collection in natural areas, which may require amendments to the Park Regulation Bylaw or other Bylaws.</i>		Parks Major Projects Committee	\$\$	B
Action 76 <i>Examine mutually beneficial relationships with Penticton Indian Band, such as developing the PIB plant nursery as a source for City-led tree planting and natural restoration projects or involving Sn'pink'tn Forestry LP in invasive species control, fuel management, and forest monitoring.</i>		Parks Major Projects Committee	\$\$\$	B
Action 77 <i>Work with elders to identify areas where there are heightened risks of archaeological disturbance through tree planting, and develop a protocol for handling any cultural artifact finding that may occur during tree planting.</i>		Parks Major Projects Committee	\$\$	A
Action 78 <i>Share knowledge regarding the City's urban forest program through an annual progress report to Penticton Indian Band leadership.</i>		Parks Major Projects Committee	(\$)	A

Action	Pathway	Responsibility	Cost	Priority
Goal 4: Monitor progress and adapt management to changing circumstances				
Strategy 12. Monitor and report on change to promote adaptive management and increase transparency				
Action 79 <i>Develop an annual urban forest report card to track key metrics related to the City's urban forest program, such as:</i> • Tree planting rates • Tree removal rates • Service level and achievement rate • Service request volumes • Species and age diversity in the tree inventory • Hectares of natural area restored • City-wide and urban canopy cover or canopy cover by land use • Valuation of trees slated for removal and valuation of urban forest ecosystem services • Tree donations/sponsorships • Percent of trees represented in City's asset management system • Number or extent of supporting green infrastructure installations (i.e. soil cells, soil volume installed, etc.)		Parks Information Technology	\$\$	A
Action 80 <i>Develop a monitoring program for forest health issues in partnership with community Urban Forest Monitors. City staff should lead the tracking of:</i> • Tree mortality rates (new plantings) • General tree mortality and causes • Hazard trees • Water use and irrigation demand • Tree planting totals <i>Monitoring should be based on service level targets established by asset class. Staff should be encouraged to note incidental forest health or mortality issues when travelling around the City to attend site visits. An Urban Forest Monitors program can help fill gaps in the City's capacity to monitor by training dedicated volunteers to observe common forest health issues or remark on other maintenance issues.</i>		Parks Communications and Engagement, Recreation	\$\$	B
Action 81 <i>Track tree planting and mortality rates on private property through new programs such as the community tree sale and/or partnership tree program.</i>		Parks	(\$)	A
Action 82 <i>Establish soil moisture sensors in high priority locations where symptoms of drought have been observed, as well as in several "reference" locations where tree canopy appears healthy.</i>		Parks	\$\$	C
Action 83 <i>Liaise with the Canadian Food Inspection Agency annually to understand emergent pests and pathogens and incorporate updates as required into a new Integrated Pest Management Policy.</i>		Parks	(\$)	B
Action 84 <i>Review and update the UFMP every five years.</i>		Parks	\$\$	A
Action 85 <i>Reassess canopy cover at least once every five years using LiDAR or other accurate methods as technology advances and incorporate new information into updates to the UFMP.</i>		Parks	\$\$	A

Action	Pathway	Responsibility	Cost	Priority
Goal 4: Monitor progress and adapt management to changing circumstances				
Strategy 13. Test new ideas and technologies that can help adapt the urban forest to an uncertain future				
Action 86 Trial technologies for passive water infiltration into areas with trees on public property, such as curb cuts, bio-infiltration tree pits, biodegradable “tree cocoons” that retain water, trench drains, and perforated pipe distribution, monitoring outcomes to revise future deployments.		Parks, Engineering, Public Works Development Services	\$\$\$	C
Action 87 Trial planting smaller stock in boulevards outside of high traffic areas and compare maintenance cost and establishment success relative to larger planting stock.		Parks	\$\$	C
Action 88 Partnering with the RDOS, Penticton Indian Band, the Province, and the Pacific Forestry Centre as necessary, develop planting trials for native species seedstock originating from locations suitable for Climate-Based Seed Transfer; novel disease and pest-resistant cultivars of urban trees; and species with low invasive potential adapted to warmer, drier climate conditions for planting in urban settings.		Parks	\$\$	C
Action 89 Explore partnering with Okanagan College or other institutions of higher learning to open opportunities for applied internships or student research projects to support stewardship and monitoring, including: • Tracking tree planting and survival. • Creating and updating inventories. • Maintaining and monitoring natural restoration sites. • Supporting stewardship programming and community outreach.		Parks	\$\$	C
Action 90 Consider using City-owned land in areas most affected by the urban heat island to test mini-forests using the Miyawaki method, and based on this experience, consider expanding the program through partnerships with landowners in industrial/commercial areas.		Parks	\$\$	C

6.7 MONITORING

The Urban Forest Management Plan has been created as Penticton's urban forest continues to change. Building capacity for monitoring is considered within the Implementation Table. This section of the Action Plan considers performance measures that can be tracked by urban forest managers to assess progress towards the Vision Statement and the recommended target of increasing City-wide canopy cover by 1% in 20 years while building towards 25% canopy cover in urban areas by 2085. Where applicable, the monitoring table provides streamed targets reflecting the different outcomes and emphasis of scenarios 2 (no net loss) ●, 3 (expansion) ●, and 4 (green future) ●.

Performance Measure	Target	Frequency and method of measurement
Goal 1. Plan, protect, and plant to expand the urban forest.		
City-wide canopy cover	18% by 2045 ●● (1-point increase over 2020) 17% in 2045 ●	Every 5 years, LiDAR remeasurement (or future improved method)
Canopy cover across all urban land uses	25% average by 2085 ● (13-point increase over 2020)	Every 5 years, LiDAR remeasurement (or better technology)
Tree Equity Score	>75 in all census dissemination areas (Lowest score in 2020: 52)	Every 5 years, with canopy analysis
Tree replacement requirement	At least 1:1 on City property ● At least 1:1 city-wide ●●	Annually, program records
New tree planting in urban parks and streets (caliper sized)	175 trees per year (average) ●● 125 trees per year (average) ●	Annually, program records
New tree planting in natural areas (smaller sizes)	400 trees per year (average) ● 300 trees per year (average) ● 200 trees per year (average) ●	Annually, program records
Species suitability (urban trees)	100% of planted non-native trees are drought/heat tolerant or have drip irrigation installed.	Annually, planting records
Species diversity (urban trees)	Plant no more than 10% of a single species in any year, nor 20% or more of any single genus (inapplicable in natural forests)	Annually, planting records
Canopy area of natural forests	>500 ha in 2045 (Current canopy area: 518 ha)	Every 5 years, with canopy analysis
Forest Corridors	No elective tree removal (i.e. hazards, invasives, forest health/wildfire management removals only)	Annually, program records
Goal 2. Manage for tree health and longevity.		
Service levels	8-year block pruning cycle (Boulevard/Street trees and Class A Park trees) 12-year block pruning cycle (other urban inventoried trees)	Annually, by work plans
Inventory	Complete inventory of street/plaza trees and landscaped park trees on City property	Annually, by tree inventory records

Performance Measure	Target	Frequency and method of measurement
Young tree mortality	<1% annual mortality of young planted trees	Annually, site visits
Urban tree life expectancy	Inventoried tree asset life expectancy is increasing (declining rate of mortality year-over-year among inventoried trees with goal of achieving 1.3% to 1% mortality – 75 to 100-year average life expectancy)	Annually, by tree inventory and removal records
Operating budget	Operating budget allocation per new inventoried tree and hectare of natural forest area on city property no less than pro-rated unit cost for UFMP service levels.	Annually, through budgeting process

Goal 3. Enhance partnerships and public outreach to increase awareness and capacity for urban forest management.

Third party recognition	Achieve Tree Cities of the World Status	Annually, by application
Community satisfaction	>50% awareness of UF service levels, and >80% satisfaction among those aware	Annually, through Citizen Survey
Public tree sale	Sell 100 trees per year (average) by 2030	Annually, by program records

Goal 4. Monitor progress and adapt management to changing circumstances.

Reporting	Report annually on urban forest management outcomes	Annually
Community monitoring	Events held seasonally	Annually, program records



A photograph of a pine forest with a central text overlay. The image shows several large, mature pine trees with thick, reddish-brown bark in the foreground and middle ground. The forest floor is covered with dry, brown pine needles and some green grass. The background is filled with more pine trees and a clear blue sky. A semi-transparent white rectangular box is centered over the image, containing the word "REFERENCES" in a bold, green, sans-serif font. Two small orange squares are positioned at the top-left and bottom-right corners of the white box.

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