

Sustainable Urban Forest Strategy

August 2024



City of
Kelowna

ACKNOWLEDGEMENTS

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STRATEGY AT A GLANCE: KELOWNA'S URBAN FOREST

Trees and forests improve quality of life for Kelowna's residents and visitors by providing cooling, clean water, critical habitats, and by beautifying the city. Kelowna's first Sustainable Urban Forest Strategy was adopted in 2010, and, since then, challenges associated with rapid growth and climate change have resulted in a need to update the Strategy. The 2024 Sustainable Urban Forest Strategy will guide the City of Kelowna's (the City) urban forest management for the next 10 years.

Our Urban Forest Vision

Kelowna's urban forest will continue to expand, connecting our green urban centres to our natural areas. Our urban forest will be managed to be a healthy, safe and viable nature-based solution that improves our livability and helps our community mitigate and adapt to a changing climate.

In 2023, 22% of the City's land area (excluding the Agricultural Land Reserve) was covered by tree canopy. Canopy cover was measured using LiDAR and imagery to map individual tree canopies. While this estimate is higher than the 16% (+/- 2%) estimate in the previous Strategy, and likely indicates canopy growth, the different methods mean that the absolute change is difficult to determine.

What is certain is that the benefits provided by trees, like cooling the urban heat island, filtering polluted air and water, diverting floods, and improving people's physical and mental health, are more available in some areas than others. Tree canopy is lower than the city-wide average in four of five Growth Strategy Districts used for land use planning: Urban Centres, Core Area, Gateway, and Suburban. The fifth Growth Strategy District, Rural, is where 80% of Kelowna's trees are found. The relative lack of trees in urban areas means more work is needed to provide urban forest benefits where most people live, work, and go to school. At the same time, natural forests in the Rural area backstop city-wide ecosystem services and native biodiversity, but face significant challenges from climate change, wildfire, and forest health factors like insects and fungi.

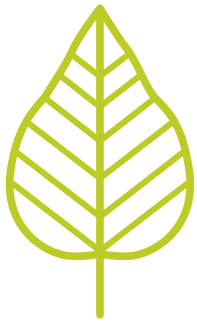
The Strategy proposes establishing new targets for urban canopy cover in each Growth Strategy District that reflect the need to increase urban forest canopy in urban areas. By 2050, canopy cover should reach:

- ▶ 20% in Urban Centres and the Core Area
- ▶ 25% in Suburban and Rural areas
- ▶ 15% in the Gateway

Reaching the targets will require continued and expanded initiatives for urban forestry involving the entire community.



Actions to reach the targets in the Sustainable Urban Forest Strategy are guided by **ten strategies** organized into **four goals**:



Goal 1: Protect, connect, and expand the urban forest

- ▶ Strengthen policy, planning, and implementation to protect, connect, and expand tree canopy
- ▶ Expand the urban forest equitably in Urban and Core areas
- ▶ Improve the quality and suitability of trees being planted for the site and climate requirements



Goal 2: Maintain a healthy, safe, and viable urban forest

- ▶ Clarify City procedures and standards to improve efficiency and manage risk
- ▶ Transition from reactive to proactive maintenance of City trees
- ▶ Ensure resourcing is sufficient to deliver levels of service that maximize urban forest benefits



Goal 3: Involve people and organizations in urban forest management

- ▶ Improve awareness of and participation in urban forest management
- ▶ Build relationships with syilx/Okanagan communities, First Nations Governments and Indigenous peoples through urban forest management



Goal 4: Monitor and innovate to achieve our urban forest vision

- ▶ Monitor change, report, and adapt management to new information
- ▶ Trial innovative approaches to dryland urban forestry

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1 INTRODUCTION

1.1 Purpose

Kelowna's Sustainable Urban Forest Strategy (the Strategy) serves as a comprehensive plan to manage the urban forest over the next decade. Kelowna is a semi-arid city, naturally vegetated with grasslands and scattered forest cover, and planted with street, park, and yard trees. For the 144,576 people (2021) who live in Kelowna, the urban forest is an essential part of the city's character, livability, biodiversity, and climate resilience. Trees provide shade and habitat, reduce stormwater runoff and erosion, absorb and store carbon, increase property values, and enhance health and well-being. However, urban forests in Kelowna face mounting challenges due to climate change and extreme weather, development pressures, and challenges with forest health.

This is Kelowna's second urban forest strategy. The first, endorsed in 2011, set out a ten-year action plan to preserve and enhance urban forest tree canopy. Over the last decade, the City has continued to improve urban forest management through the NeighbourWoods program, updates to the Municipal Properties Tree Bylaw, updates to landscaping requirements in the Zoning Bylaw, wildland fuel management treatments and staffing and funding increases for the City's Urban Forestry Department.

For the next 10 years, we need to protect, expand, and maintain an urban forest that will be a healthy and resilient asset in the future. The updated Strategy reports on trends in Kelowna's urban forest over the past decade and responds to current challenges and opportunities with updated actions. The Strategy provides a structured approach to maximizing the benefits of the urban forest, while supporting the City's goals for improved protection of the environment, acting on climate change and building an equitable community.

1.2 Strategic alignment

The Strategy builds on and refines actions towards achieving the Imagine Kelowna vision to "...protect the environment, manage growth and be resilient as our future unfolds."

The Strategy also builds on several other key long-term planning documents, including the 2040 Official Community Plan (OCP), the Climate Resilient Kelowna Strategy (under development to replace the 2018 Community Climate Action Plan), the Clean Air Strategy, and the Transportation Master Plan, all of which identify the importance of a healthy and growing urban forest as an important asset for creating an attractive, walkable city, protecting and restoring the environment, and for taking action on climate.

1.3 How to read this document

The Sustainable Urban Forest Strategy contains the following chapters:

1. Introduction

Introduces the Sustainable Urban Forest Strategy, provides background on why the Strategy is being updated, and describes the contents of individual chapters.

2. Urban Forestry 101

Explains what the urban forest is, why it matters, and key principles of urban forest management.

3. Kelowna's Urban Forest Management Program

Describes the City's existing urban forest management program, including how different tree asset classes are planted and cared for over their life cycle, and the policies impacting the urban forest and its management.

4. Status and Trends for Trees in Kelowna

Provides background on the urban forest in the City, offers a summary of what we know about the urban forest's current state and condition, and how it is changing.

5. Canopy Cover Targets

Revisits Kelowna's OCP canopy cover targets in the context of how land uses contribute to goals for each growth strategy districts.

6. Challenges and Opportunities

Discusses issues, trends, and impacts affecting the urban forest and frames what the ten-year implementation plan needs to address.

7. Principles and Vision

Reports on what we heard from the community through engagement and provides a vision for the urban forest to guide how the ten-year implementation plan responds to challenges and opportunities.

8. Goals, Strategies, and Actions

Provides the Strategy a framework for actions and explores case studies that Kelowna can use to help implement the actions.

9. Action and Monitoring Plan

Organizes actions and assigns priorities, key roles and responsibilities, and estimated resource needs, followed by a monitoring plan that identifies measurable indicators to help track implementation, organizes actions and assigns priorities, key roles and responsibilities, and estimated resource needs, followed by a monitoring plan that identifies measurable indicators to help track implementation.



2 URBAN FORESTRY 101

2.1 What is the urban forest?

Kelowna’s urban forest is the total collection of trees and their growing environments found within the City’s boundary. The urban forest encompasses all trees, whether on public or private property and whether planted or naturally occurring. It contains a variety of ecosystems, soils, and tree species and an unknown number of trees. Trees are found on the lakeshore, in urban centres, residential neighbourhoods, City parks and natural areas, rural and agricultural land, and even in commercial and industrial areas with extensive paving. The urban forest is therefore managed by the entire community, including private residents and landowners, major institutions, and City government. The City plays a prominent role in urban forest management through strategic planning, policy development, and the establishment of bylaws.

2.2 Why do urban forests matter?

2.2.1 Urban forests provide ecosystem services

The benefits derived from trees and other green infrastructure are called ‘ecosystem services’ since they parallel the roles and functions of conventional (“grey”) service infrastructure¹. Examples of urban forest ecosystem services that offset the need for conventional infrastructure include rainfall interception and avoided runoff^{2,3}, shading and natural cooling through evapotranspiration^{4,5}, and filtration of pollutants from water and air^{6,7}. Kelowna’s urban forest delivers an

estimated service value of \$9.2 million each year for just eight related services and currently stores an amount of carbon worth an estimated \$81.6 million* . Urban forests also provide numerous other benefits, some of which are harder to quantify, such as wildlife habitat, enhanced biodiversity, and the cultural significance of mature trees⁸ . Ecosystem services can be grouped into four main categories⁹:

- **Provisioning:** the direct products of trees and forests such as medicines, fruits, and nuts
- **Regulating:** functions that maintain ecosystems such as climate regulation, air and water filtration, and erosion control
- **Supporting:** functions that underlie other services, like photosynthesis, pollination, soil formation, and nutrient cycling
- **Cultural:** socioeconomic benefits produced by the urban forest, including beauty, sense of place, mental health, spirituality, recreation, and tourism.

2.2.2 Urban forests enhance climate change resilience

The urban forest can provide protection for people, buildings, and land from climate change impacts. Trees capture heavy rains and reduce erosion, and shade Kelowna’s streets, homes, schools, and parks. On a hot summer day, shaded paved surfaces can be 25 °C cooler than nearby unshaded surfaces of the same type¹⁰.

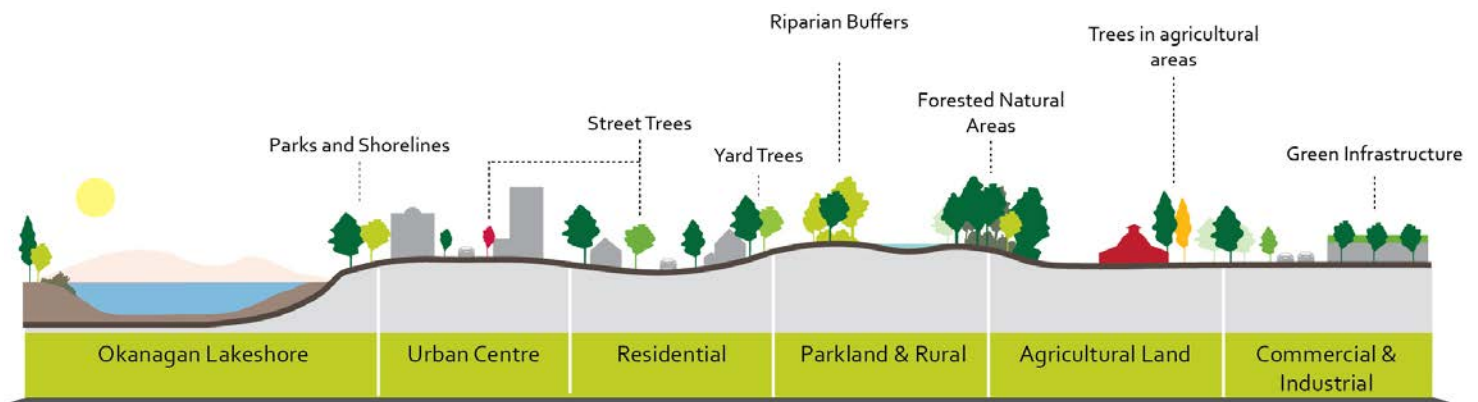


Figure 1. Components of Kelowna’s urban forest.

* Estimates of dollar values derived from i-Tree Canopy values for eight ecosystem services: annual rate of carbon sequestration; annual removal of six leading air pollutants (carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM2.5, PM10; and avoided runoff. These estimates are derived by multiplying the preliminary estimate of Kelowna’s tree canopy area (ha) in 2021 by i-Tree Canopy coefficients for each ecosystem service. Coefficients are regional averages and do not represent the cumulative ecosystem service value of individual trees.

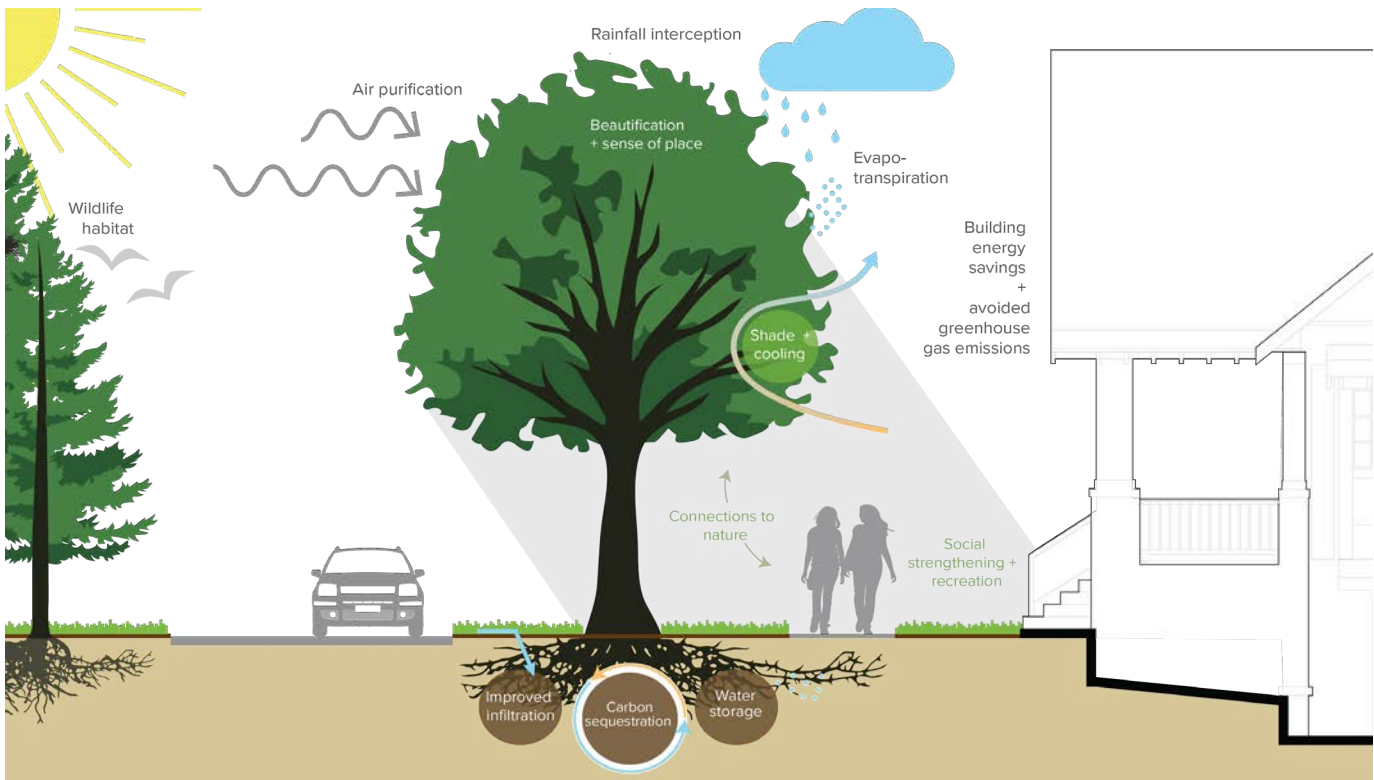


Figure 2. Urban forest benefits.

Trees also provide active cooling through the process of evapotranspiration: releasing water vapour through leaves and needles. Evapotranspiration can lower ambient air temperatures by 1-5 °C¹¹. The combined cooling effects of shade and evapotranspiration are most significant where the urban forest covers extensively paved areas which contribute to the urban heat island effect¹². Public health is protected when the urban forest counteracts the urban heat island effect: for example, during the June 2021 heatwave, heat-related deaths in the BC Lower Mainland were predicted in part by low neighbourhood greenness¹³. Trees also remove carbon dioxide from the atmosphere, storing carbon in wood and reintroducing it to the soil^{14,15,16}. In the process, the urban forest helps offset Kelowna's estimated 767,132 tonnes (2021) of greenhouse gas emissions from transportation, buildings, and waste¹⁷.

2.2.3 The urban forest supports a healthy community

The urban forest is strongly connected to public and social health. Tree canopies promote physical fitness by creating comfortable places for walking, cycling, and exercise^{18,19}. Neighbourhood greenery decreases social isolation by encouraging outdoor activities^{20,21}. People with views of trees or green landscapes recovering

in hospitals from surgery heal faster than patients without these views²². Frequent "doses" of nature can reduce anxiety, leading a growing number of Canadian doctors to prescribe time in the urban forest as part of building mental wellness^{23,24}. Overall, the urban forest is an essential component to creating a healthy, livable complete community.

2.3 What is urban forest management?

Urban forest management is the practice of planning, planting, protecting, and maintaining trees to maximize their benefits and minimize risk in communities. Trees require space below and above ground to fulfill their essential requirements: sunlight, water, carbon, and nutrients. As they grow, their structure and size deliver an expanding array of benefits. Unlike other city assets, trees appreciate in value as they grow, with their worth increasing over time. It is only after several decades that they fully realize their potential as essential components of green infrastructure.

Urban forest management requires that trees live long enough and reach a large enough size to produce the

benefits required by the community. At the same time, tree risk needs to be managed to minimize outcomes like root damage to sidewalks or pipes, premature tree mortality, tree branches failing and impacting people or property, or the threat of wildfire. Urban foresters generally adhere to four key guidelines:

1. **Plant the largest tree suitable for the site:** Large-stature trees provide many times more benefits than small-stature trees.
2. **Retain healthy trees whenever possible:** Healthy, mature trees deliver the most benefits for the least cost.
3. **Manage diversity:** Diversity reduces the risk of large scale tree canopy loss from impacts like pests, disease and drought.
4. **Plant the right tree in the right place:** Planting the right species in the right location will maximize benefits and minimize the costs of management.

2.3.1 Plant the largest tree suitable for the site

The “Large Tree Argument” put forward by the USDA Forest Service summarizes how large-stature trees are able to provide far more benefits than small-stature trees²⁵. This is because large trees have more biomass – the leaves, branches, wood, and roots – which generate ecosystem services. Because trees extend into the soil and air in three dimensions, their volume and biomass increase faster than their canopy cover. Large-stature trees tend to live longer than small-stature trees, which means they enjoy a longer period of time in healthy maturity. Ensuring the urban environment has suitable places for large trees to grow, and that species that can reach large stature are used in planting, is an important goal for urban forest management.

2.3.2 Retain healthy trees whenever possible

Trees require more early- and end-of-life care than they do in middle age, assuming they are planted in

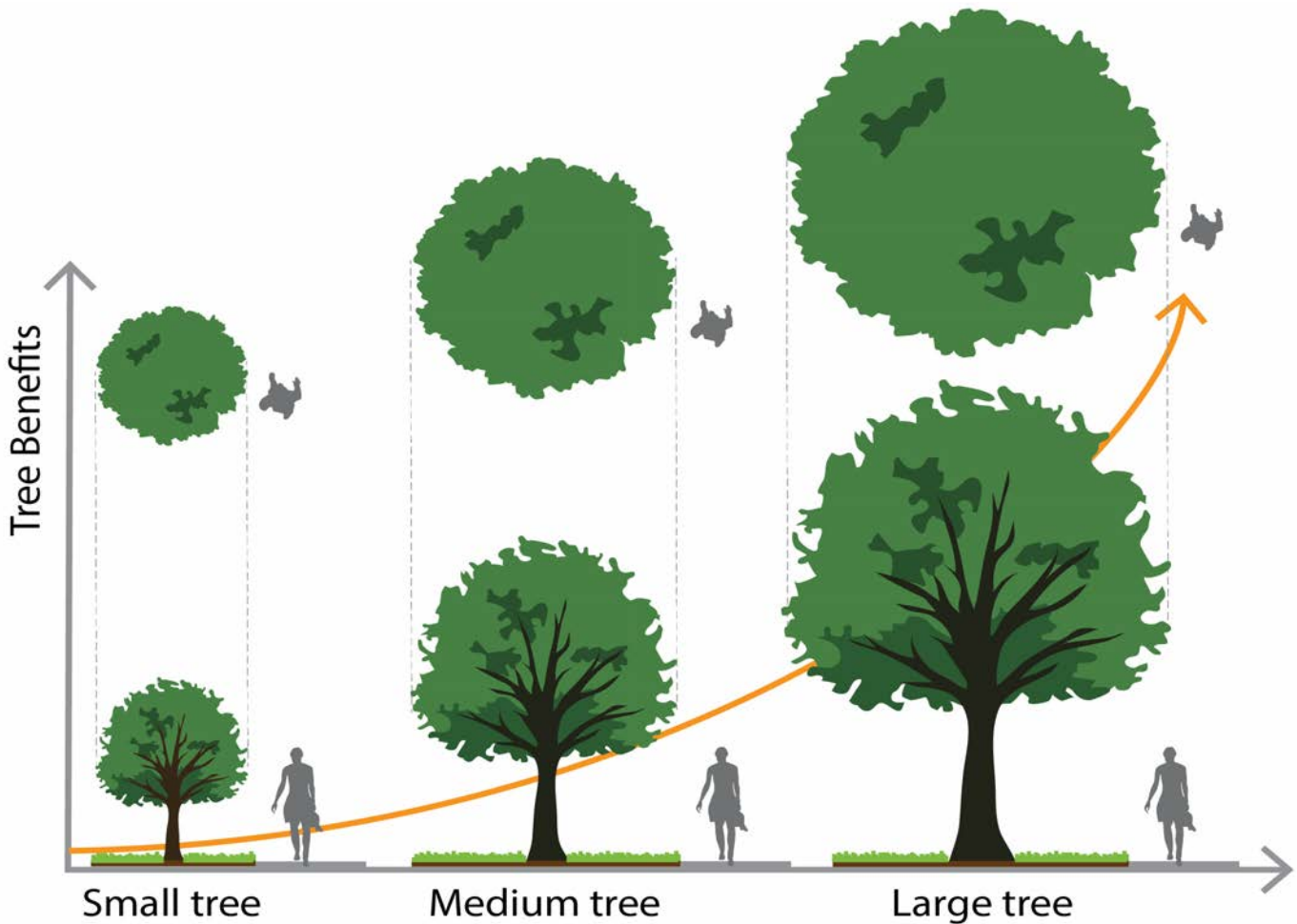


Figure 3. Benefits of large size trees compared to small and medium size trees.

the right place. The cycle of life and death in the urban forest, with associated costs of planting, watering, pruning, end-of-life, and replacement can be visualized to represent this principle. Good urban forest asset management will create conditions for trees to exist in healthy maturity as long as possible, while minimizing the time trees need establishment or end-of-life care.

and construction should be reconsidered. Identifying the right place to plant trees in cities should also consider equity factors, such as the heightened vulnerability of seniors to extreme heat, areas with limited access to green spaces, or low-income areas burdened with pollution from cars or industry.

2.3.3 Manage diversity

Diversity among assets, known as portfolio effect among asset managers, emphasizes that over the long-term, an urban forest with a large number of trees of different shapes, sizes, and species is less likely to be lost to any one cause, like a wildfire, pest infestation, or climate change impact²⁶. Emphasis on a diverse urban forest cover maximizes ecosystem services as it ensures a healthier, more resilient urban environment for both humans and nature²⁷.

2.3.4 Plant the right tree in the right place

Selecting a suitable tree for a specific planting site involves two factors: the site’s ability to support the tree at its full size, and the desired ecosystem services in that area. Planting a tree in an ill-suited location will necessitate increased maintenance, such as pruning, watering, fertilization, and inspection, as well as potential costs to address damage to infrastructure like sidewalks or conduits. If a planting site cannot accommodate the number or size of trees needed for the desired ecosystem services, then the site’s design

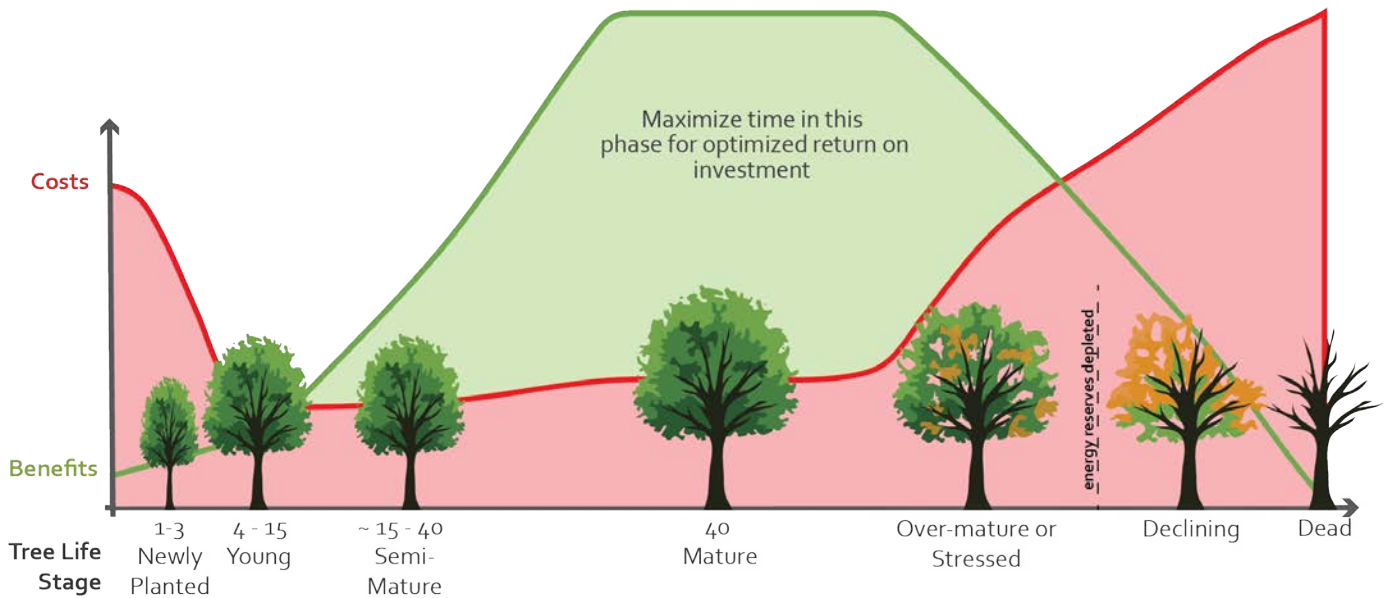


Figure 4. Tree life cycle as related to costs and benefits with asset management.

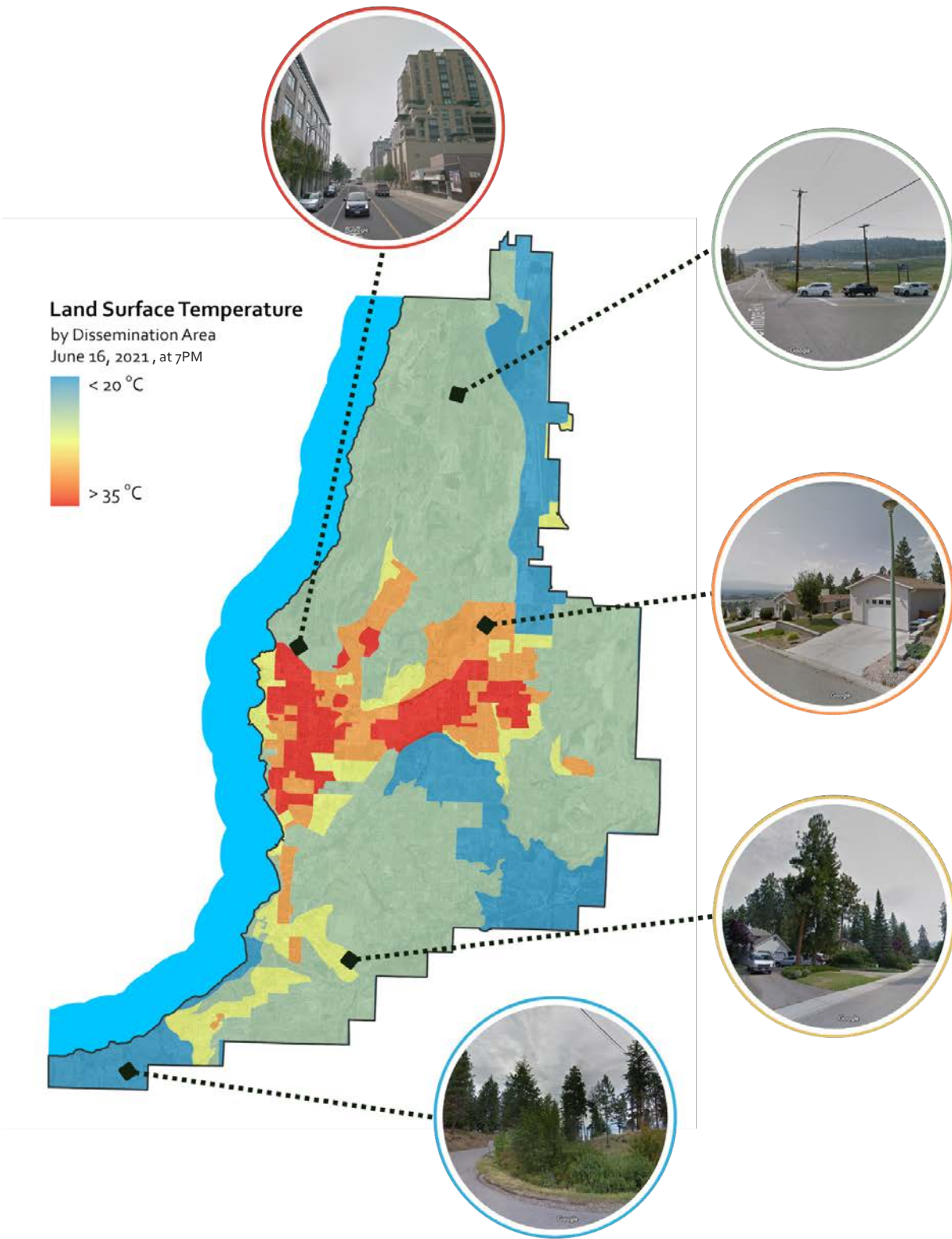


Figure 5. Trees planted in the right place can reduce the impacts of extreme heat. Higher land surface temperatures in Kelowna occur where tree cover is less on average and impervious pavements are extensive.

3 KELOWNA'S URBAN FOREST MANAGEMENT PROGRAM

3.1 Urban forest asset classes

Kelowna's trees are part of its overall asset portfolio. Trees can be grouped into classes of assets that reflect where trees are found in the city and how they are managed. A commitment to a standard of maintenance or service is called a "service level".

Kelowna's urban forest asset classes include:

- Street trees** Trees in the public street rights-of-way are maintained jointly by the City and the adjacent property owner. The City holds primary responsibility for structural maintenance, like pruning, to protect the health of these important assets because they grow in urban environments with lots of potential conflicts (e.g. limited space, buildings, traffic, sidewalks, utilities, sight lines, etc.). However, we also rely on the neighbouring private property owner to provide water to many street trees when there is no public irrigation source for those trees.
- Trees in urban parks** Trees in urban parks are maintained by the City and are usually inventoried. These trees have the most frequent assessment schedule of all trees on public lands due to the intensity of park use and the high importance of trees to the functioning of parks. When compared to street trees, park trees generally require fewer management interventions as they grow in better environments and have fewer conflicts.
- Trees in forested parks** Trees in these areas are not assessed individually. Instead, tree management areas are identified based on risk management assessments along trails/ gathering points to reduce safety risks to people using those trails. Larger forested areas are also assessed for wildland fire risk. Individual tree concerns are responded to on a complaint-driven basis.
- Trees on private property** The City does not manage private trees but does provide service related to administering and enforcing tree regulations that apply to private property. Landowners have responsibility for managing trees on private property, which make up the majority of Kelowna's urban forest.

3.2 Activities and urban forest program

The Park Services Division is assigned responsibility for the urban forest program, which includes strategic planning, program administration, tree maintenance and operations, overseeing tree protection and capital projects. Other City departments support the urban forest program; in particular, the Planning, Climate Action and Development Services Division oversees the Official Community Plan and development bylaws that influence urban forest outcomes, Financial Services supports Sustainable Urban Forest Strategy implementation through budgeting, asset management, and capital planning processes, and Infrastructure Operations are responsible for managing infrastructure which frequently shares space with trees on City property. The Parks Division maintains service standards for its day-to-day activities in urban parks and for street trees, while many aspects of the urban forest program, particularly in natural areas, have no associated target and occur on an as needed or as available basis. Table 1 lists the core activities of the urban forest program, existing service level targets, annual performance, and gaps.

Kelowna's urban forest program: By the numbers

In 2021 the urban forest program:

- Planted 250 new caliper-sized trees in streets and parks
- Planted 1200 new trees in parks and natural areas
- Responded to 1300 requests for service, which include inquiries about hazard trees, pruning, damage to infrastructure, and other requests
- Watered over 1000 trees through the summer and pruned 20% of the tree inventory
- Inspected 190 km of trail for tree risk and vegetation maintenance needs
- Addressed 150 hazardous trees on City property.

Table 1. Service level targets and recent annual performance of the public urban forest program for core activities.

Activity	Target service level	Annual performance (if known)	Best practices gap
Strategic planning and program oversight			
Program administration	No target	\$2.3 million dollar operating budget Renewal of the Urban Forest Strategy (2023)	Operating budget should be reviewed in context of The Strategy's Action Plan.
Public tree protection	No target	600 tree protection permits issued	Tree legislation not connected to canopy cover goals.
Tree fund	No target		Incomplete tracking of replacement trees.
Capital projects planning	No target		Interdepartmental referrals not consistently including Urban Forestry during initial planning.
Asset management	Include inventoried trees in AM system	Tree inventory is in AM system.	Target is being met.
NeighbourWoods	No target	600 trees	The Program currently is offered City wide – it could be revised or expanded to target low tree equity areas.
Tree maintenance and operations			
Service requests	Respond to 100% of service requests within 48 hours	1300 service requests responded to annually.	Target is not always met because of request volume/timing relative to staff capacity.
Tree planting – caliper-sized	No target	250 trees planted	No tree planting target connected to equity or canopy cover goals.
Replacement tree planting	1:1 on-site tree replacement	50 trees planted. Most replacement planting is done by developers.	Incomplete tracking of replacements in tree inventory.
Watering	Truck/bag watering of non-irrigated trees	2500 trees watered	The service target for watering trees is typically met; however, there are instances during drought years, high planting years, or when resources like staffing are insufficient, that the City's capacity to provide watering is stretched.
Preventive pruning	20% of inventory trees pruned per year	4,750 trees pruned	Target does not specify asset classes (street tree, urban park/plaza tree)
Risk management	Annual visual inspection of beach trees, remove hazard trees as needed	150 hazard trees removed citywide each year	No policy or operational procedures to establish inspection and documentation requirements or thresholds for risk mitigation.

Activity	Target service level	Annual performance (if known)	Best practices gap
Update tree inventory	No target		New trees that are planted by the City are added to the inventory; trees that are mandated for planting by developers are not included in the inventory. No updates were made as part of pruning cycle.
Pest/invasive management	Treat invasives that are removed / all re-growth	500 trees treated	Incomplete tracking
Natural areas/forest management			
Tree planting – plugs/10-gallon	No target	1200 trees planted (seedlings for restoration)	No tree planting target connected to biodiversity & habitat connectivity, equity, or canopy cover goals.
Trails inspection and maintenance	100% of trails inspected annually Maintain trail widths and accessibility	190 km of trail inspected 40 km of trail maintained for accessibility	Target is being met
Fuel management, mowing, and roadside debris	Maintain line of sight & reduce fire risk	Working in partnership with Fire Services to implement Community Wildfire Resiliency Plan	Target is being met

3.3 Policies guiding urban forest management

3.3.1 Relationship between legislation, bylaws, policies, and plans

Kelowna’s urban forest is shaped by legislation, bylaws, and municipal policies and plans. The Community Charter and Local Government Act provide a framework that allows the City to regulate trees on public and private land. The City’s primary tools for implementing urban forest management are bylaws, which create enforceable requirements relating to trees on public and private property. City bylaws and policies must be aligned with Kelowna’s Official Community Plan Bylaw and other relevant federal or provincial legislation.

3.3.2 OCP policies for the urban forest

Kelowna’s 2040 OCP Objective 14.2 is to “protect and expand a healthy and viable urban forest” with supporting policy statements to:

- Manage the urban forest as green infrastructure to enhance ecosystem services

- Expand tree canopy in relation to the growth strategy district
- Use the principle of “right tree in the right location”
- Maximize retention of existing trees on development sites.
- Connect urban forest with other habitats

The OCP also includes a variety of other policies throughout each of the growth strategy district chapters that also focus on encouraging expansion of the urban forest for comfort, cooling, habitat and beautification.

3.3.3 Bylaws regulating tree cutting and damage

The City implements the vision through several bylaws affecting trees and vegetation:

- Municipal Properties Tree Bylaw (No. 8042) protects trees on public property.
- Tree Protection Bylaw (No. 8041) protects designated trees on private property, such as within Natural Environment Development Permit Areas.
- Nuisance Trees and Shrubs Bylaw (No. 6469) addresses the requirement to mitigate private trees impeding public property.

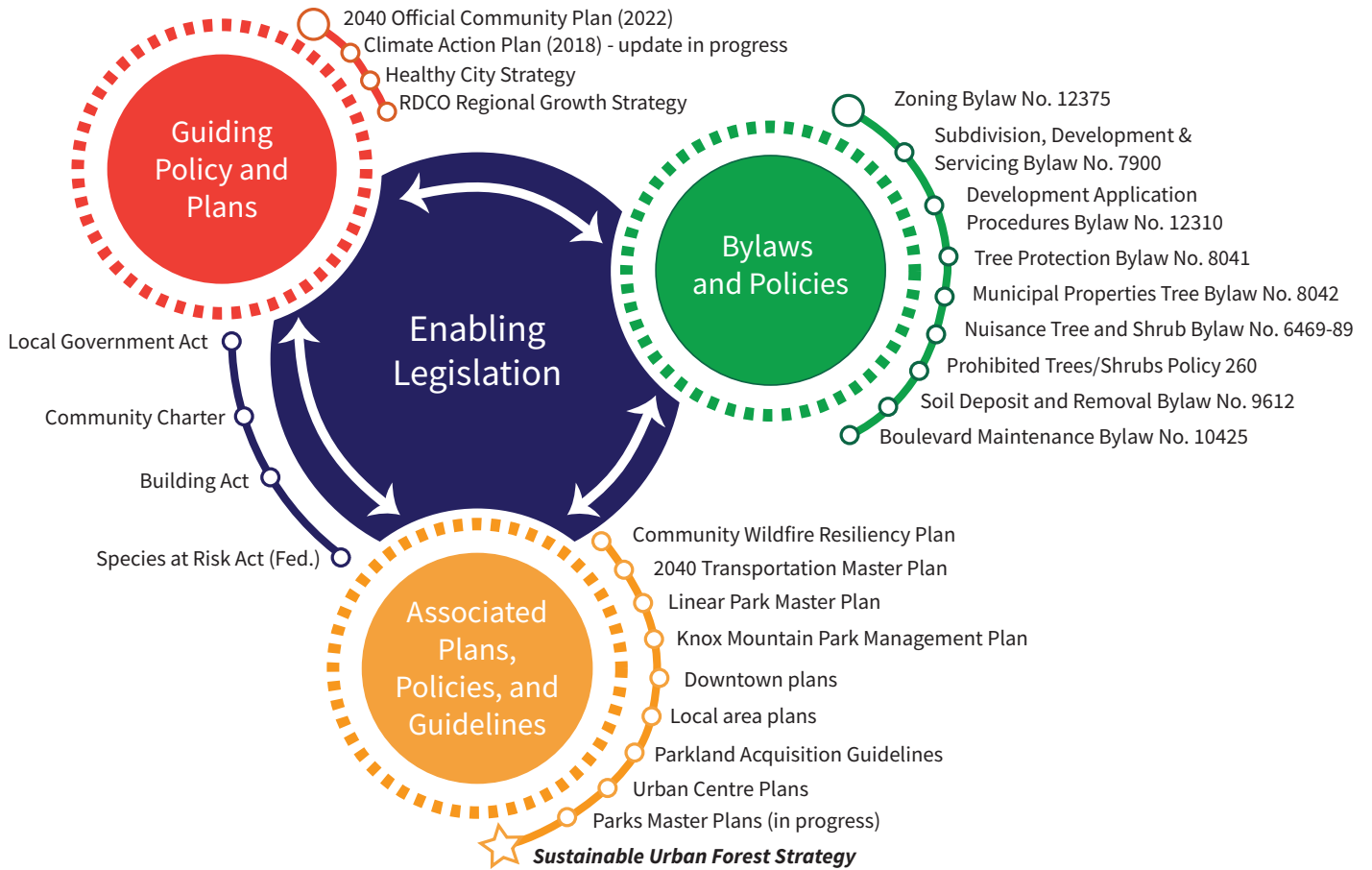


Figure 6. Relevant legislation, bylaws, policies, plans, and guidelines.

3.3.4 Bylaws regulating growing space and tree planting

The Subdivision, Development & Servicing Bylaw (No. 7900) and Zoning Bylaw (No. 12375) govern the urban forest during development, shaping growing environments. The Subdivision, Development & Servicing Bylaw sets the standards and specifications for street tree planting in new subdivisions or road extensions. No less than the greater of 1 tree per lot or per 15 m of frontage must be planted in streets by developers. Guidance is also provided for the selection of tree species, spacing from utilities, irrigation design, and minimum soil volumes.

The Zoning Bylaw governs the installation of trees on private property through development, as well as impacting the urban forest through regulating the size and setback of impervious surfaces on private property. The City recently updated its Zoning Bylaw to include additional requirements for landscaping by zone. There is now a requirement that trees be planted on private property for most zoning approvals other than those for single-family or two-family housing, supported by

requirements for minimum soil volumes of 30 m³ for each large tree.

3.3.5 Other regulatory tools

Other tools to regulate trees on private property include the Natural Environment Development Permit Area which can require trees in sensitive ecosystems become the subject of restrictive or “no-disturb” covenants which are entered on land title. These covenants provide for the retention of trees, mitigation of wildfire risk, or other environmental objectives on individual properties and subdivisions requiring a development approval. The Hazardous Condition Development Permit Area requires proponents to complete a wildfire hazard assessment that identifies where and what wildfire mitigation actions are required prior to approval. The Development Application Procedures Bylaw (No. 12310) requires that development applications prepare and include a landscape plan for certain types of development. These tools help the City achieve urban forest management goals on private property in the absence of a tree bylaw of general application.

Trees in Kelowna's Policies

Urban forest management theme	Federal, Provincial, or First Nations Land	Private property within Natural Environmental/Hazardous Condition DPA or Tree Cutting Permit Area	Private property requiring DP other than Natural Environmental/Hazardous Condition DPA	City assets on public property	Other private property
Protect	Trees are not protected by City bylaws. Federal, provincial, or Indigenous laws may apply.	Trees over 10 cm diameter are protected by Tree Protection Bylaw (No. 8041) . A permit application must be submitted to the City. Tree protection standards use a 6x multiplier to determine the root zone.	Trees are not protected, but City requests information through the Development Application Procedures Bylaw (No. 12310) to identify trees with potential to be retained. If retention candidates identified, a Tree Protection Plan is requested and included in the Development Permit conditions of approval.	Trees are protected by Municipal Properties Tree Bylaw (No.8042) . Tree cutting at discretion of Parks Manager. No security deposit is required. Tree protection standards use a 6x multiplier to determine the root zone.	Tree are not protected, other than by federal or provincial law.
Plant	Tree replacement or planting may be required or carried out by other governments.	Trees removed under permit are replaced using a size formula, ranging from 2:1 to 8:1 replacement. Replacement may be waived by the Director of Planning & Development Services. Tree planting is required by the Zoning Bylaw (No.12375) , except in rural areas or on urban lots with fewer than 3 dwelling units.	Tree planting is guided by development permit guidelines. Tree planting is required by the Zoning Bylaw (No.12375) , except in rural areas or on urban lots with fewer than 3 dwelling units.	Trees removed from urbanized City boulevards or formal parks are replaced at 2:1 ratio (can be off-site) (Bylaw No. 8042). The Subdivision and Servicing Bylaw (No. 7900) requires new trees be planted in City boulevards created by development at a rate of 1 per lot or 1 per 15m of lot frontage, whichever is greater (medium-sized trees).	No tree replacement is required for the removal of unprotected trees. Tree planting is required by the Zoning Bylaw (No.12375) , except in rural areas or on urban lots with fewer than 3 dwelling units. Planting requirements are enforced during development.
Maintain	There is no municipal requirement to maintain trees on federal, provincial, or Indigenous land. The City is sometimes consulted as a partner on issues like fuel management.	The Tree Protection Bylaw (No. 8041) requires replacement trees be maintained in accordance with the replacement plan specifications. Irrigation for a minimum of three years to support establishment is required. 125% of the landscape estimate value is taken as a security (paid back after inspections).	Maintenance obligations for landscaping are established through the development permit for the first two years after planting, including an inspection and performance security. No City regulations cover maintenance after this period.	The City's Urban Forest Policy Statement (Schedule A of the Municipal Properties Tree Bylaw No.8042) and Boulevard Maintenance Bylaw No.10425 establish that all trees and treed areas on City property or property managed by the City are the responsibility of the Parks Division.	There is no requirement to maintain trees, other than to avoid the creation of a nuisance tree defined by the Nuisance Trees and Shrubs Bylaw (No.6469) .
Monitor	The City does not inspect trees on federal, provincial, or Indigenous land.	Tree Protection Bylaw (No. 8041) allows City staff to inspect tree protection requirements and planting establishment to meet restoration conditions.	City staff may inspect trees/ landscaping required by a DP.	The City's Parks Division conducts inspections and monitoring on City-owned and City-managed properties.	There are no inspections of private property (other than during development). The City can enter private property if required to mitigate an identified Nuisance Tree after ten days' notice.

Policy gaps

- No general protection for trees on private property
- No protected status for trees retained through a DP, unless a covenant is used.

- Soil volume requirements in **No.7900** (tree planting on city boulevards) are lower than minimum soil volumes in **No. 12375** (tree planting on private property).
- No use of significant tree definition in **OCF** in either tree protection bylaw or municipal properties tree bylaw.

Figure 7. Trees in Kelowna's Policies.

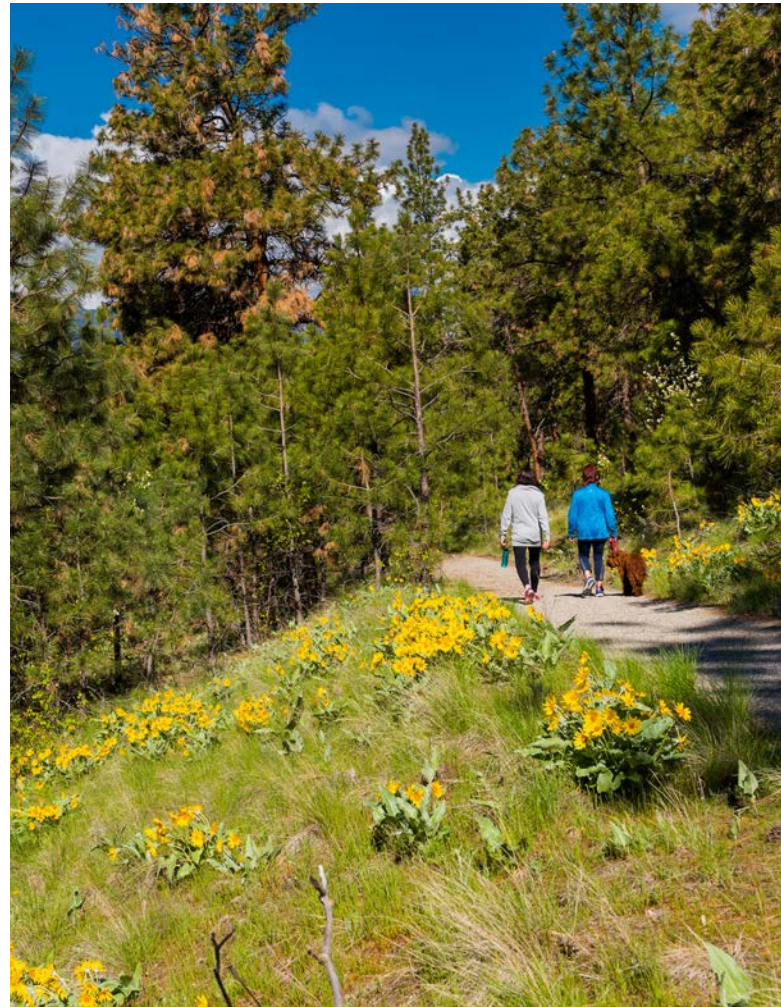
3.3.6 Other related plans

Some of Kelowna's other plans and strategies relate to urban forest management including:

- 2018 Community Climate Action Plan (currently being updated as a Climate Resilient Kelowna Strategy) – recommends implementing the Urban Forest Strategy to reduce GHG emissions.
- Clean Air Strategy recommends the City develop a policy to support reforestation, tree retention, and planting new shade trees.
- Transportation Master Plan – includes policies to incorporate trees and boulevards into streets.
- Community Wildfire Resiliency Plan – discusses wildfire risk on public lands and recommends strategies to reduce risk, including vegetation management.
- Parks Master Plan (in progress) – discusses strategies for providing park and recreation amenities throughout the City.
- Urban Centre Plans – envision walkable urban places supported by green infrastructure.

3.4 Urban Forest Report Card

Kelowna's urban forest program can be compared to best practices for sustainable urban forest programs to assess areas where the City is performing well and where the Sustainable Urban Forest Strategy should guide efforts for further improvement. This comparison provides the City with a "report card" that highlights where current service levels expose the City's urban forest to risk. Best practices come from several sources^{28, 29,30,31} and have been adapted to reflect Kelowna's context. The report card also shows progress since 2011, when the previous Urban Forest Strategy was endorsed. Purple marks on the report card indicate where Kelowna could reach if this Strategy's Action Plan is fully implemented.



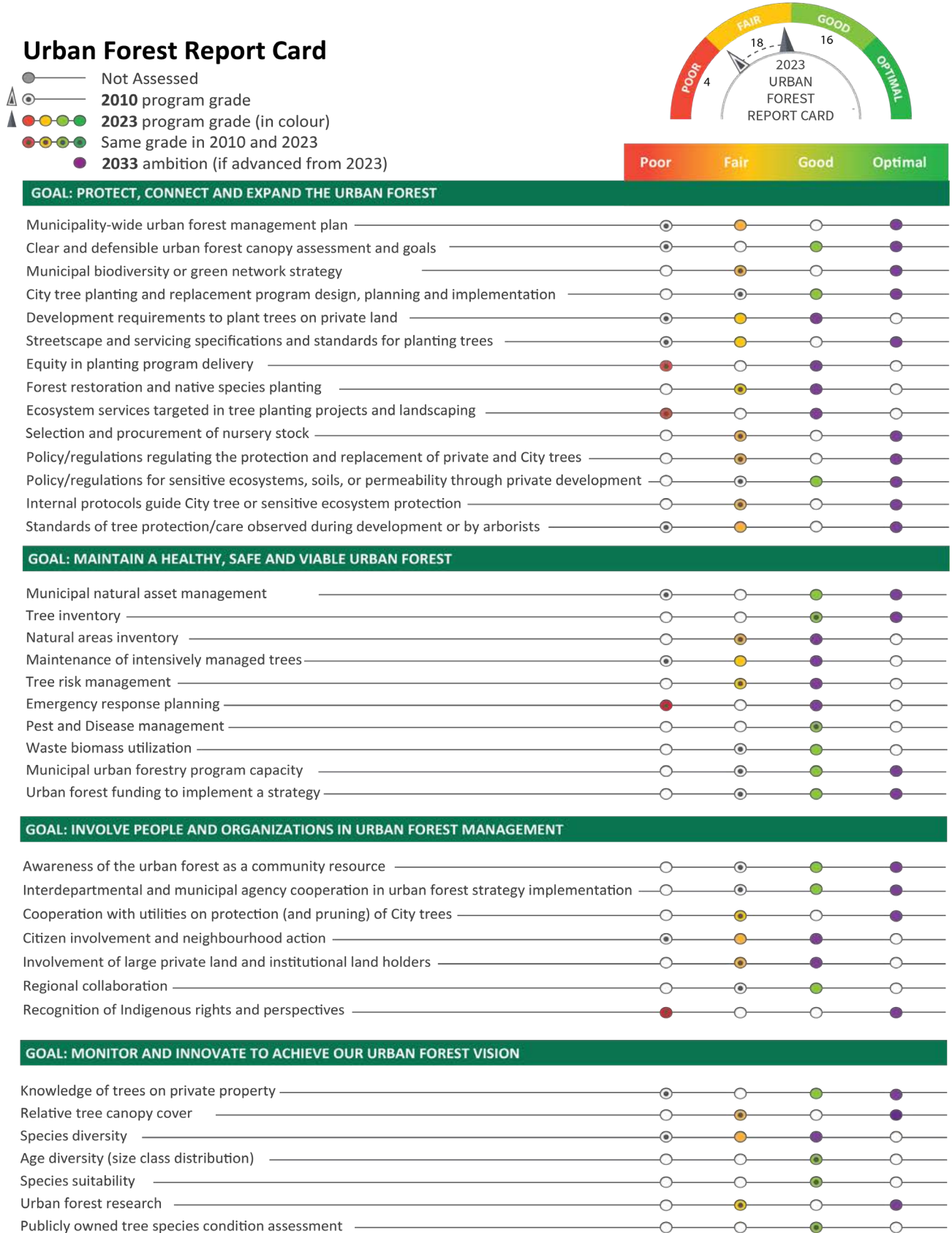


Figure 8. 2023 Urban Forest Report Card.

4 STATUS AND TRENDS FOR TREES IN KELOWNA

4.1 The land comes first

Kelowna’s urban forest has a rich and complex past. The ecosystems managed by syilx/Okanagan people since time immemorial includes grassland, open ponderosa pine forest, upland pine and Douglas-fir forests, riverbank forests of black cottonwood and a few western redcedar. The forests are home to Bear, Salmon, Saskatoon, and Bitterroot – the four Food Chiefs of the syilx/Okanagan people.

In the 1800s, European fur traders arrived, cattle ranchers and the first farmers. In the 1860s, informal trade relationships between Europeans and syilx/Okanagan people were replaced by the federal Indian Act. This move claimed colonial jurisdiction over the land and prioritized pioneer settlement over traditional syilx/Okanagan ways of being on, living with, and caring for the land. The townsite of Kelowna was laid out on this unceded land in 1892, and by incorporation in 1905 the surrounding landscape was rapidly changing as thousands of hectares of grassland and pine forest were transformed into grazed pastures, hayfields, and orchard trees.

Settlers brought various tree species like Norway maple, London plane, Pennsylvania ash, and Austrian pine to the Okanagan, reflecting their origins and contributing to the urban forest. Many of these early plantings are now mature trees in older neighbourhoods. Over time, the urban forest expanded with new trees in parks, residential areas, and roadways. The City established a parks department to manage green spaces, including the urban forest. The first tree inventory was conducted in 1992 and has since grown to over 24,000 trees on City property. The City enacted tree protection bylaws in 1997, and the 2011 Urban Forest Strategy provided strategic guidance for urban forest management. To address tree loss due to rapid growth, the Canopy Enhancement Strategy was explored. The updated Sustainable Urban Forest Strategy aims to ensure the urban forest remains a valued civic asset. As part of a broader commitment to meaningful reconciliation, the City is working to repair relationships with the syilx/Okanagan people and learn how to integrate syilx values and worldviews into how we manage our responsibilities to the land, including urban forests.

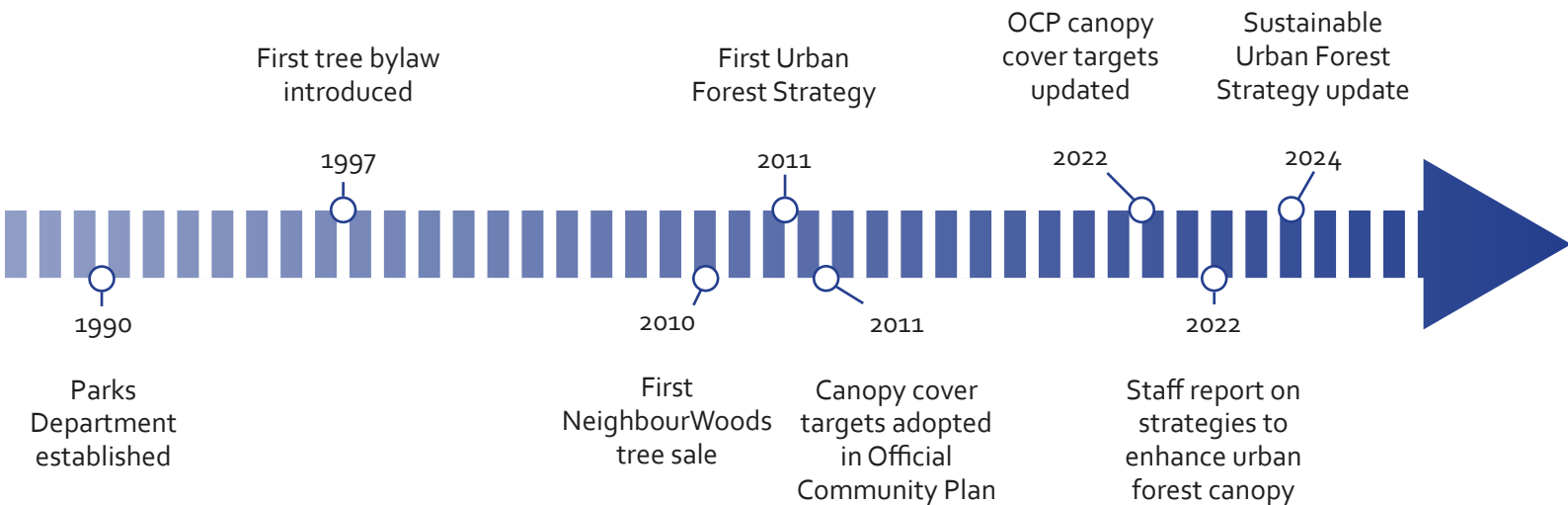


Figure 9. Recent events in Kelowna's urban forest management.

Returning Indigenous knowledge to land management

Urban forest management can start to address the recent legacy of settler-led land management and support the revitalization of Indigenous stewardship. The Indian Act curtailed land management by Indigenous peoples, with effects on the composition and shape of forests. The role of fire exclusion in landscape change is often cited as an example: prior to colonization, syilx /Okanagan people regularly used fire to clean debris from the forest floor, promote berry production and game habitat, obtain medicines, and reduce the potential for severe fire³⁷. Indigenous peoples have returned these practices to the Okanagan after decades of rigorous fire suppression that has increased forest density and allowed the build-up of forest fuels, driving more severe wildfires. Respecting Indigenous knowledge and stewardship practices can help create a more sustainable and resilient urban forest, fostering a deeper understanding of the land and fostering collaboration between Indigenous and non-Indigenous communities.



4.2 The urban forest now

4.2.1 Urban forest canopy

Urban forest canopy cover, a measure of tree coverage in cities, is estimated as the per cent of land covered by trees when viewed from above. In 2011, Kelowna’s canopy cover was estimated at 16% (excluding ALR) using i-Tree Canopy.

LiDAR imagery of Kelowna was collected in July 2023, providing a more accurate method to inform canopy coverage. It shows that the City’s canopy cover is 22% (excluding the ALR). Although it suggests growth since 2011, this result cannot be interpreted as growth of 6 percentage points since the development of the original Sustainable Urban Forest Strategy, because the i-Tree Canopy method did not represent individual trees in Kelowna. The new LiDAR-supported canopy analysis uses detailed 3D imagery and photointerpretation to

"map" the canopy of overstorey trees. It is believed to be more reliable than past estimates. Since it is based on analysis of individual trees, it is also likely to be comparable with future advances in measurement.

Canopy summarized by census dissemination area reveals that tree canopy distribution varies greatly across the city. Most urban areas of the City have canopy cover of between 10% and 20%. Areas with canopy lower than 10% include parts of Downtown, North End, Midtown, Gateway, and agricultural areas or rangelands. Areas with more than 20% canopy cover include newer neighbourhoods which interface natural forests, older neighbourhoods with mature trees, and rural areas. The highest canopy cover is in natural forests, where it is typically over 30%. Currently, canopy cover in natural areas may be higher than historical coverage in these areas due to fire suppression.

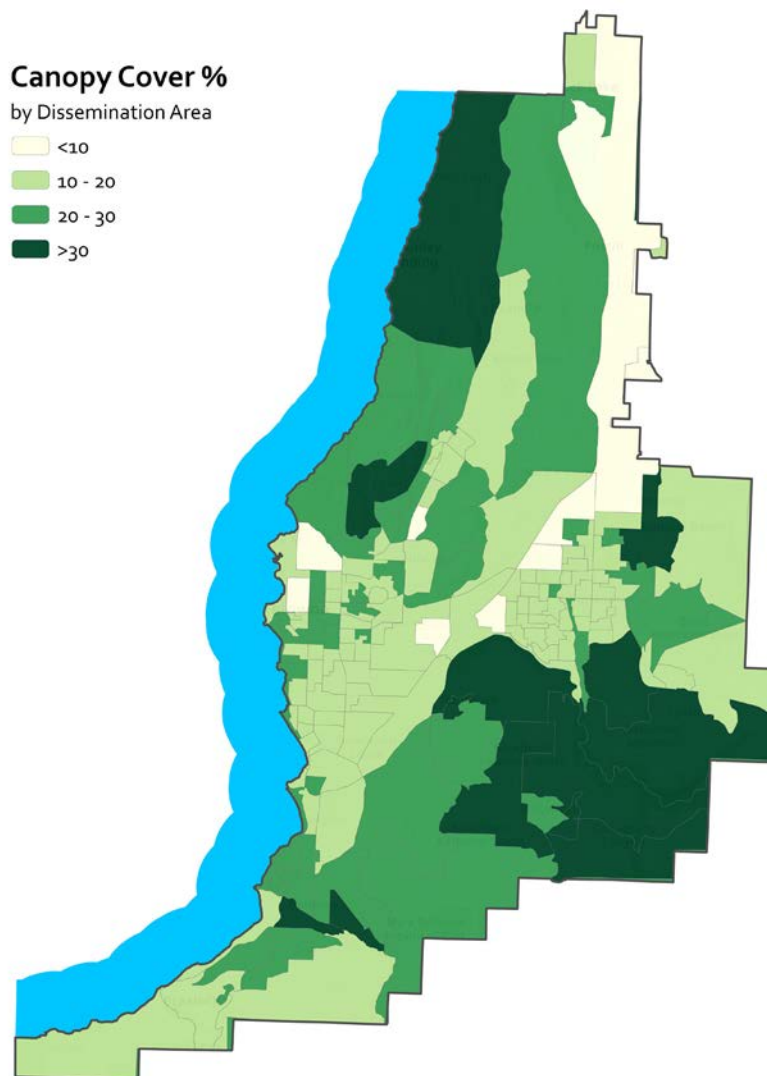


Figure 10. Kelowna's 2023 canopy cover summarized by Census Dissemination Area.

4.2.2 Management of Kelowna’s urban forest canopy

The City directly manages just 15% of the total urban forest canopy in the City: the 758 ha of tree canopy found over City-owned property (including parks) and street rights-of-way. 7% (359 ha) of the urban forest is on other public property, like Regional Parks, hospitals, schools, and Kelowna International Airport. The remaining 78% (3,868 ha) of the urban forest is found on private property. The City has limited influence over how trees are managed beyond City property, except where bylaws apply (i.e., in Natural Environment / Hazardous Condition Development Areas or other designated Tree Cutting Permit Areas).

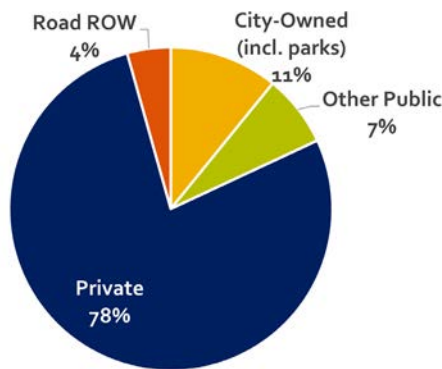


Figure 11. Urban forest ownership distribution.

4.2.3 Canopy cover within each Growth Strategy District

Five Growth Strategy Districts have been identified in the OCP for land use planning purposes: Urban Centres, the Core Area, the Gateway, Suburban Neighbourhoods, and Rural. Canopy cover in each Growth Strategy District is important because different challenges and solutions for urban forest management will arise in each one. Table 2 shows the 2023 canopy cover in each Growth Strategy District, excluding the area in each within the Agricultural Land Reserve (ALR). In the ALR, provincial right-to-farm legislation limits the City's influence over the urban forest.

Table 2. Summary of canopy cover results by Growth Strategy District (excluding Agricultural Land Reserve).

Growth Strategy District	Canopy Cover (2023)
Urban Centres	12%
Core Area	15%
Gateway	10%
Suburban	20%
Rural	27%
ALR (excluded above)	24%

Gateway has the lowest canopy cover followed by Urban Centres, Core Area, Suburban, and Rural (with the most). Only the Rural Growth Strategy District has higher canopy cover than the City as a whole. The area of the Rural Growth Strategy District outside the ALR is a mixture of natural forests and low density rural residential development, often on hillsides. This shows that there are relatively few trees in urban and employment areas, where most of Kelowna’s population lives and where most growth is planned to occur. There is a mismatch between where people live and work and the distribution of urban forest benefits.

4.2.4 Land cover and plantable area

i-Tree Canopy software can be used to estimate the proportion of Kelowna’s land area covered by different surfaces, such as impervious (paving or building), or pervious soil. Although the method is different than what has been used to estimate canopy cover, this shows where there are relatively more opportunities for tree planting or urban forest expansion and where there are barriers to expansion because of a lack of pervious surface. Kelowna’s land area was split by Growth Strategy District and given four non-tree land cover classes: impervious, plantable – private, plantable – public, pervious – non-plantable.

Impervious Hard-surfaced areas, including buildings, parking, or paved roads

Plantable – private Soft surfaces (e.g. soil, dirt, grass, low vegetation) on private land where a tree could be planted

Plantable – public Soft surfaces on public property, including the portion of street boulevards believed to be within City-owned rights-of-way

Pervious – non-plantable Soft surfaces on private or public property where trees cannot be planted because of evident land use conflicts, such as agricultural fields, playgrounds, sports fields, golf course fairways, and gravel or dirt-surfaced trails and roadways

Table 3. Results of i-Tree Canopy land cover analysis by Growth Strategy District.

Growth Strategy District	Land Area (ha)	Canopy Cover outside ALR (2023, LiDAR result)	Impervious %	Plantable – private %	Plantable – public %	Pervious – non-plantable %
Urban Centres	602	12%	70%	12%	5%	3%
Core Area	2,507	15%	55%	20%	7%	4%
Gateway	1,384	10%	29%	25%	6%	30%
Suburban	1,904	20%	25%	37%	12%	10%
Rural	15,380	27%	9%	33%	6%	33%

The land cover analysis indicates that in Urban Centres, 70% of the area consists of hard surfaces, the highest percentage among all Growth Strategy Districts. In the Core Area, over 50% of the land is covered by impervious surfaces. As development continues, impervious surfaces are expected to increase, since the maximum allowed coverage for buildings, structures, and impermeable surfaces in Urban Centre zones ranges from 90-100% of a lot, and at least 70% in all other zones except schools.

The findings indicate that numerous properties in each Growth Strategy District have not yet reached their maximum allowed impervious coverage as per the Zoning Bylaw. As land use intensification occurs, site coverage is likely to approach these maximums, reducing the permeable area available for tree planting on private property. The findings show that existing plantable space on public land is a small proportion of the landbase; however, more opportunities are evident in the Suburban Growth Strategy District. Suburban areas have the highest capacity to receive more tree planting, but also already have more tree canopy compared to other parts of the city that support higher population density.

In every Growth Strategy District, infill and intensification are expected to reduce permeable areas on private land. The Zoning Bylaw includes landscaping standards that mandate tree planting on private property in most development situations, which is likely to help maintain some canopy cover on private land during this transition. However, these standards do not currently apply to single- or two-dwelling land uses, which constitute a significant portion of the City. Supporting future canopy cover in Urban Centres and Core Areas, which have the highest impervious cover, is likely to require investment in public planting infrastructure, such as suspended pavements, to plant trees in streets.

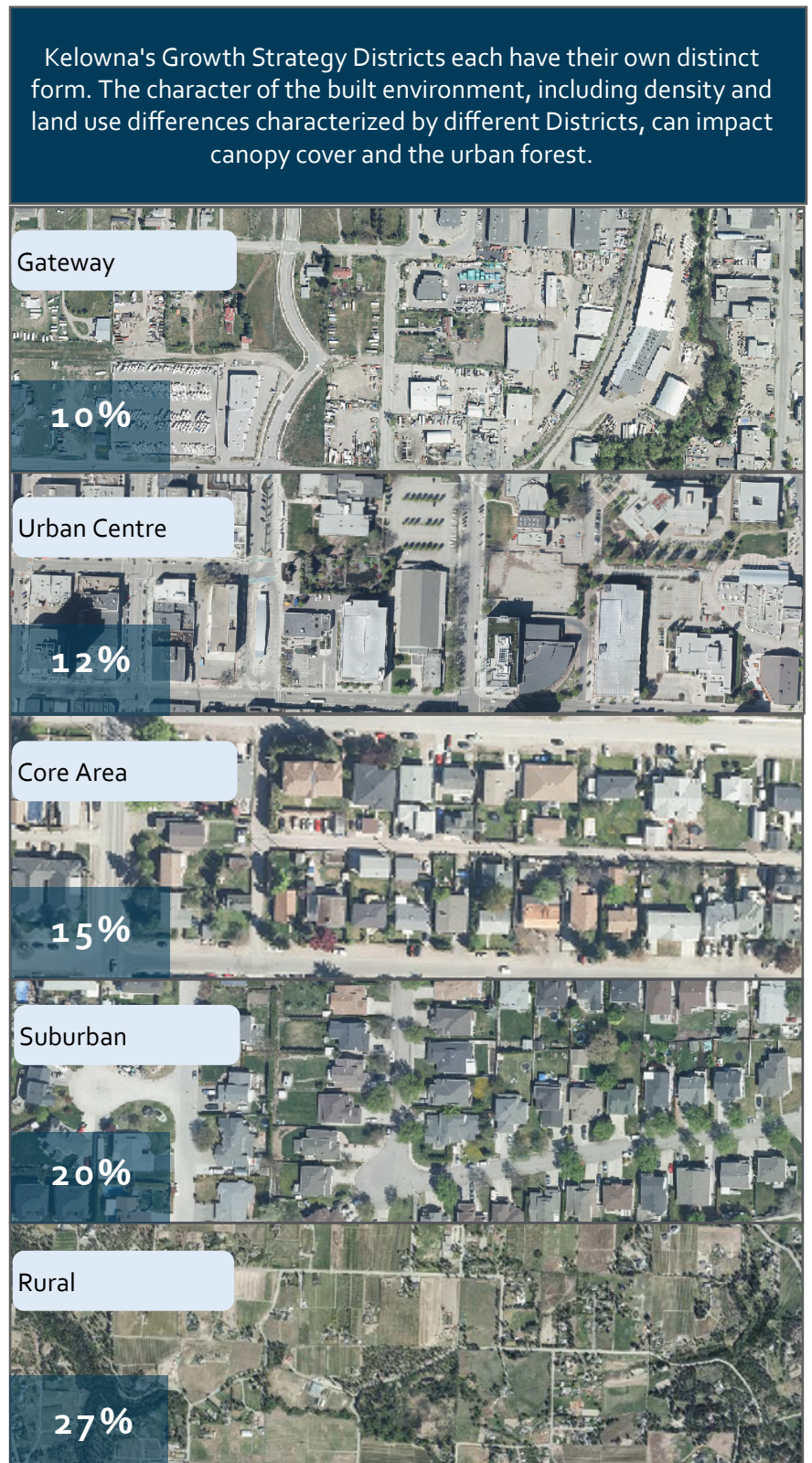


Figure 12. Orthophotos showing typical land use patterns in each Growth Strategy District and the canopy cover in each Growth Strategy District (excluding the Agricultural Land Reserve).

Examining Canopy Cover

Kelowna's canopy cover has been mapped using LiDAR and aerial imagery of the City captured in 2023. A machine learning approach is used to classify the data into areas of tree and non-tree cover. Results were then reviewed for accuracy. The following images compare the resulting canopy map of the City with aerial imagery used for analysis in the same location. Canopy cover information can be summarized for any area within the City, including land uses, ownership, and other layers used by the Sustainable Urban Forest Strategy.

20% canopy cover



Figure 13. 20% canopy cover is provided by a mix of small and large trees on this block with single-family homes and apartment buildings.

Land surface temperature and land cover

Temperatures are hotter where impervious surface is high and tree canopy is low. Research in Madison, Wisconsin found that daytime air temperature was substantially reduced with greater canopy cover (over 40%), especially on the hottest days³⁸. The extent of impervious surfaces remained an important factor in lowering nighttime temperatures – which are critical for public health. The research showed that the benefits of increasing trees in neighbourhoods can be paired with limits on impervious surfaces to provide daytime and nighttime temperature reductions. Land surface temperature detections from Kelowna show that areas of low tree canopy and high impervious cover overlap with the City's hottest temperatures. There can be a difference of over 15 degrees Celsius between the land surface temperature in rural areas and urban neighbourhoods (Figure 5, page 8).



4.3 Municipal trees

4.3.1 Urban tree inventory

Kelowna’s inventory of over 24,000 trees represents a partial record of trees on City-owned property. The inventory contains information on species, diameter, height and location of street trees and some landscaped park trees, which helps the City evaluate tree condition and make informed management decisions. These inventoried trees are primarily concentrated in Urban Centres and the Core Area, and in recent developments

in the Suburban area. The highest density of inventoried trees is found in Kelowna’s downtown waterfront parks. Older residential areas (> 70 years) and new developments generally have the highest numbers of street trees.

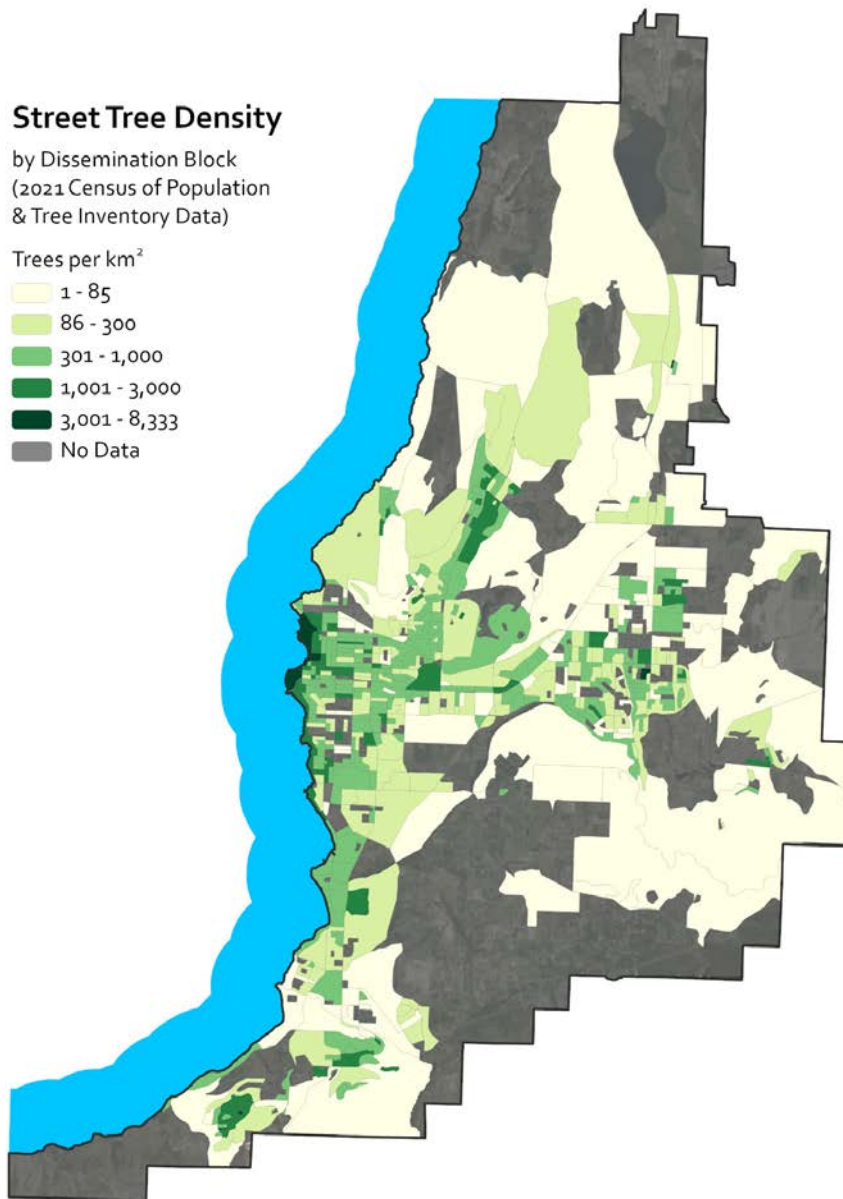


Figure 14. A map of street tree density by dissemination block using 2021 Census of Population and tree inventory data.

4.3.2 Diversity in the tree inventory

The tree inventory contains over 250 species but only 20 species make up most of the inventory. The three most common species are golden honeylocust (12%), Norway maple (8%), and London plane (8%). At the genus level (groups of related tree species), maples are most common (21% of the inventory), followed by ash (13%), honeylocust (12%), pine (10%) and sycamore/ plane (9%). A common guideline for species diversity is the 10-20-30 Rule³²: a city’s urban tree inventory should contain no more than 10% of any one species, 20% of any genus, and 30% of any family. In the face of climate change and increasing uncertainty around the intersecting impacts of pest introduction, urban foresters are considering whether a 5-10-15 Rule or another guide based on the ecosystem services different tree species provide is more appropriate^{33,34}. Research has also shown that even the 10-20-30 Rule can be difficult to achieve in cities with more continental climates³⁵. Kelowna’s tree inventory is currently over-reliant on honeylocust at the species level and maple at the genus level under species diversity guidelines.

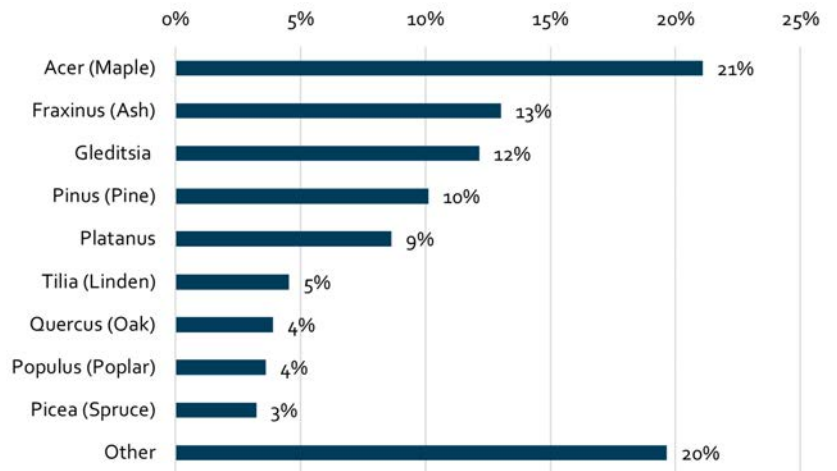


Figure 15. Tree inventory species diversity.

Species selection and climate suitability

Extreme weather events can damage urban vegetation, disturbing years of growth in a single event. Across the Okanagan region, previously abnormal weather conditions such as heat waves, extended periods of drought, and flash freeze events are becoming more common. Species suitability and diversity of Kelowna's canopy cover is important for the long-term health of the urban forest in the City, and is determined by considering a variety of attributes, including hardiness. Hardiness, drought tolerance, and limb strength all vary by species and factor into a tree's resilience to extreme weather and ability to overcome adverse growing conditions. These are metrics that can be used to guide species selection to match changing climate conditions and weather events. As climate change increases the variability of weather, trees that are adapted to a variety of conditions as well as rapid change should be preferred. The City's tree inventory and the observations of tree mortality by community members are important sources of information to understand which species are having problems in Kelowna. Common species that have been observed to have poor responses to recent weather events include red maple and European aspen.



4.3.3 Size and age of trees

Tree size can be used as a proxy of age diversity in the urban forest. As they age, trees grow in height and width (diameter), meaning larger trees are generally older. The median tree in Kelowna’s inventory of over 24,000 trees is 20 cm in diameter, while the average tree size is 33 cm, influenced upward by a few large, old trees. This is consistent with findings of forest structure, which suggest that much of the City’s tree canopy is composed of medium-sized trees (10-20 m in height) which could be a few decades old. Mature size is also species dependent, making this use of the diameter distribution somewhat uncertain. The largest trees in the City tend to be willows (average diameter: 107 cm), catalpa (93 cm), elm (93 cm), giant sequoia (81 cm) and horse chestnut (77 cm).

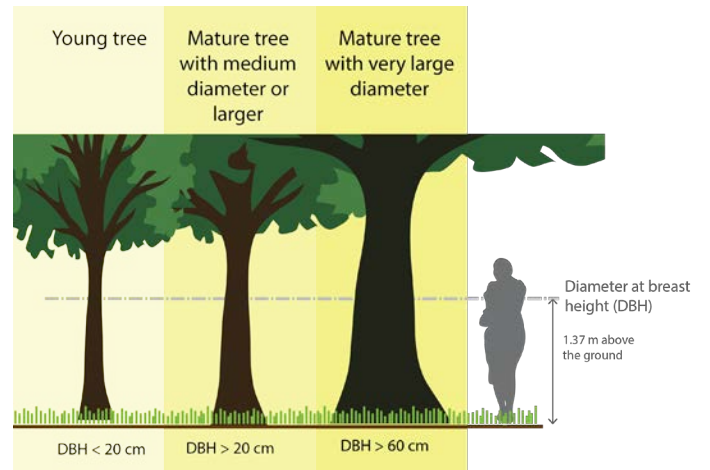


Figure 16. Size of city trees (diameter at breast height).

4.3.4 Threats to urban trees

In addition to the stresses of climate change impacts and potential impacts of development, urban trees face several additional threats to their health and vitality:

- Vandalism and accidents* Trees are damaged by people intentionally, such as unauthorized trimming for views, or accidentally from vehicle impacts.
- Invasive species* Introduced species with a competitive edge can disrupt local ecosystems. Both non-native and native urban trees may be vulnerable. Pests often target specific species or types of trees, and Kelowna's urban forest is particularly at risk from pests affecting maple, pine, honey locust, ash, and plane trees, which constitute a significant part of the City's inventory.
- Agricultural pests* Kelowna's agriculture industry and urban forest overlap, particularly when it comes to pests impacting fruit trees. Several fruit tree species are prohibited from planting in the urban forest. Damage agents that can affect both orchards and the urban forest include fire blight canker, foliar diseases, and problem insects.
- Urban infrastructure* Trees in urban areas face more extreme environmental conditions than those in natural areas, driven by the impacts of high impervious landscaping like road pavement, sidewalks, and buildings. Hard surfaces absorb heat and raise ambient temperatures through the urban heat island effect, increases water consumption by trees. Hard surfaces also collect, channel, and accelerate runoff from heavy rains, which can divert water away from trees and contribute to erosion or localized flooding. Building and roadway foundations compact the soil, alter the natural slope of the land, and create impermeable barriers to groundwater flow, fragmenting urban forest soils into small, isolated patches. These patches can become too dry in summer, too wet after rains, or unable to support beneficial biodiversity like fungi and soil animals, making it harder for trees to withstand increasing climate change impacts.

4.3.5 Trees in natural areas

Forests in natural areas are not captured in the tree inventory because they are managed as a population, rather than as individual tree assets. Forests are monitored for forest health issues and are managed for wildfire fuel reduction, ecological restoration, and hazard tree mitigation along trails. Sensitive ecosystems

identified by the OCP occupy 5,640 ha or 26% of the City’s land base and contribute 1,720 ha of tree canopy, or 34% of the total canopy cover in Kelowna. Natural areas are important generators of ecosystem services for the city. They also perform the vital work of connecting Kelowna’s habitats together, supporting increased biodiversity.



Figure 17. A map of Sensitive Ecosystems and Water Courses Development Permit Areas.

4.3.6 Natural forest communities

Most of Kelowna is situated in the Ponderosa Pine zone of the province’s biogeoclimatic ecosystem classification (BEC) system. Within this zone, diverse terrain features create a variety of forest types. The most prevalent trees in Kelowna’s natural areas include ponderosa pine, Douglas-fir, black cottonwood, lodgepole pine, and trembling aspen. Other tree species found around the city are paper birch, western redcedar, Douglas maple, Rocky Mountain juniper, and more. Kelowna’s natural forests consist of dry ponderosa pine woodlands, mixed conifer forests of ponderosa pine and Douglas-fir on slopes and ridges, floodplain forests are dominated by black cottonwood and trembling aspen, and other ecological niches. Ponderosa pine, the most tolerant native tree of dry environments, encounters a “lower tree line” in the Okanagan Valley below which grassland communities are found. Mature trees can grow to heights of 25 meters or more, particularly in sheltered areas with sufficient soil moisture.

4.3.7 Threats and natural disturbances in forests

The natural forests of Kelowna play a vital role as repositories of native biodiversity, hosting diverse plant, animal, insect, and fungal species that contribute to the

overall health of the ecosystem. This unique dryland forest ecosystem in the Okanagan supports several protected species exclusive to the region. The natural forests within the city boundaries seamlessly blend with the landscape forests found at higher elevations in other BEC zones, which predominantly consist of closed-canopy coniferous forests featuring spruce, pine, larch, Douglas-fir, and subalpine fir. However, climate change poses significant challenges for Kelowna’s natural forest cover. The projected hotter future could potentially shift the lower tree line further into the mountains, leading to the loss of urban forest canopy in beloved areas like Knox Mountain. Kelowna landscape may shift towards being more grassland-dominated. In 2011, the urban forest cover in natural areas of Kelowna was estimated at approximately 23%, aligning with the average canopy cover of grassland biomes in US cities. A global survey also found that cities in grassland regions had an average urban tree cover of 18.5%. With climate change, it is expected that Kelowna’s natural forest cover will decline as existing trees succumb to drought stress, and tree regeneration faces greater challenges due to moisture and heat limitations.

- Wildfire* Wildfires are the most common natural disturbances in Kelowna’s forests. Many native tree species have adapted to fire through thick bark (ponderosa pine, Douglas-fir), serotinous cones (lodgepole pine), or sprouting and suckering (trembling aspen, black cottonwood). However, historical fire suppression and forest management have led to unnatural conditions, such as increased stand density and debris levels, which the City aims to address through its Community Wildfire Resiliency Plan.
- Forest health* Natural forests face insect and pest epidemics, including bark beetles of pine and Douglas-fir, and can host pests that impact the region’s vital agriculture industry. Significant tree diseases include Phellinus and Armillaria root rots.
- Invasive species* Invasive species, including invasive trees like Russian olive, Siberian elm, and tree of heaven threaten native forests.
- Climate change* Climate change-induced stresses, including heatwaves, droughts, and extreme weather events, can significantly impact the health of forests and trees. Kelowna’s natural forest cover is anticipated to decline due to increased tree mortality resulting from drought stress. Additionally, tree regeneration is likely to face higher failure rates due to the combination of limited moisture and elevated temperatures that can impact seedling survival and growth. Damage caused by extreme weather like high winds or hailstorms can exacerbate the occurrence of wildfires by building forest fuel stocks and increases the vulnerability of trees to pests and diseases by leaving them with open wounds.

4.4 Tree equity

Tree equity refers to the idea that equal access to the benefits of urban forests is a crucial social issue, especially in times of population growth, greenspace loss, and increasing climate change impacts such as heat and flooding. Community members have varying levels of vulnerability to climate change. For instance, older adults and young children are more susceptible to extreme heat, while lower-income households may struggle to afford cooling systems for protection during heatwaves.

The non-profit organization American Forests has developed a methodology for assessing tree equity, which combines social vulnerability indicators with existing tree canopy and future canopy goals. Kelowna can use sociodemographic indicators from the Canadian census to identify communities in need within the city. Table 4 contains five indicators adapted to utilize Canadian data sources or LANDSAT land surface temperature detection.

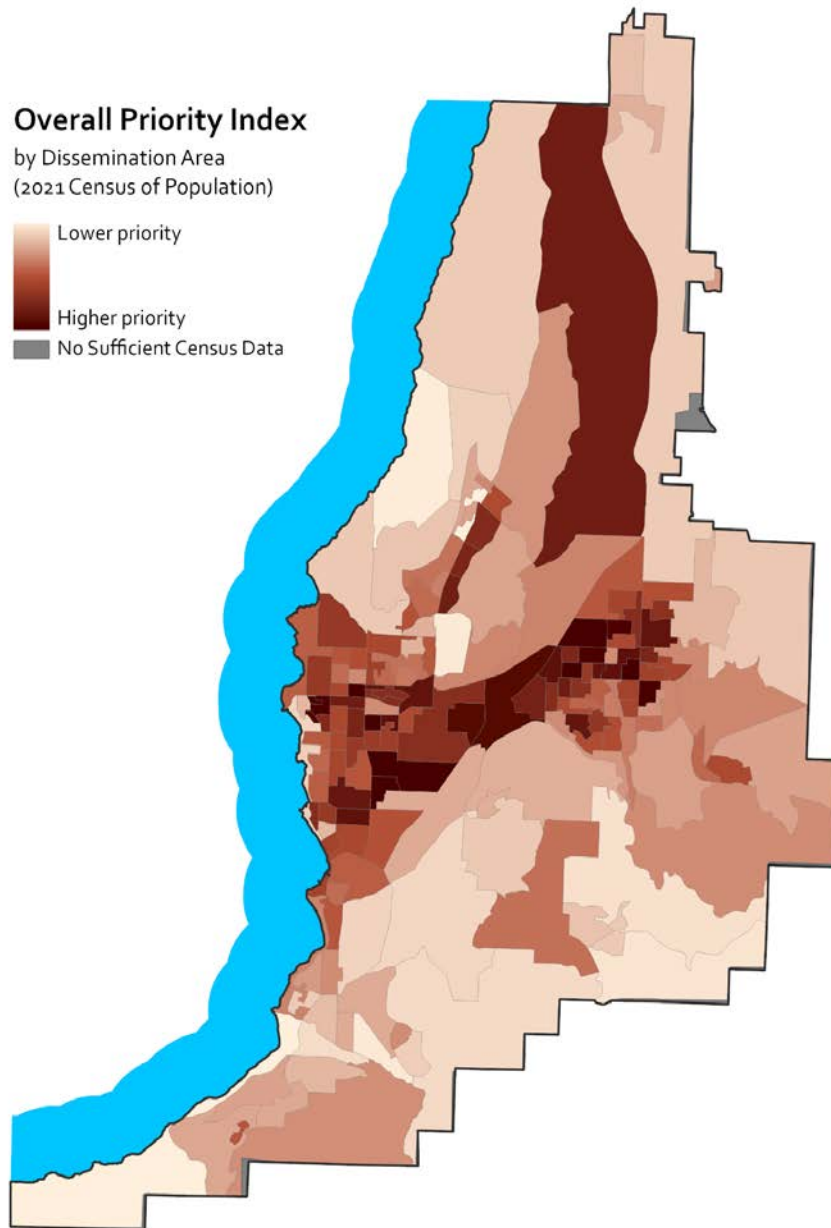


Figure 18. A map of the overall priority index for urban forest canopy expansion, based on five vulnerability indicators.

Table 4. Indicators for assessing tree equity.

Indicator	Metric	Description
Climate	Land surface temperature	Land surface temperature (°C), captured remotely by satellite on June 16, 2021.
Income	People in poverty	Percentage of people living on incomes below 200% of the federally-designated poverty line.
Age	Dependency ratio	Seniors (65+) and children (0-14) as a portion of working age adults (15-64).
Race/ethnicity	People of colour	Percentage of people who belong to visible minority groups as defined by the Employment Equity Act.
Employment	Unemployment rate	Percentage of the labour force that does not have a job and are available and looking for one.

Kelowna's equity indicators reveal a need for increased canopy in several neighbourhoods along the Highway 97 corridor between Downtown and Rutland. While many high-priority areas for improving tree equity have average canopy coverage (10-20%), a few have less than 10% canopy coverage. These areas include neighbourhoods with apartment buildings and older single-family homes near commercial districts with very low canopy cover. Some suburban neighbourhoods appear to be in greater need, possibly due to recent tree planting in newer areas where trees are still small. The University of British Columbia Okanagan campus also emerges as a high-priority area, possibly because a large number of student residents reported low income and/or unemployment.

While trees throughout the community on private and public property influence tree equity, the City has a role in building equity in every neighbourhood, namely by investing in extending its inventory of street trees. When compared against the priority indicators of tree equity, the distribution of Kelowna's street trees shows

some areas are under-served with City tree canopy and could be a priority for planting on public property where space allows. This "street tree canopy equity" shows that older, historically lower income neighbourhoods like Rutland and the North End have relatively little street tree canopy to meet the needs of their populations. Some of the street tree canopy equity analysis results are influenced by the age of neighbourhoods, as trees in newer neighbourhoods are generally younger and smaller in size than in older neighbourhoods with a greater diversity of tree ages.

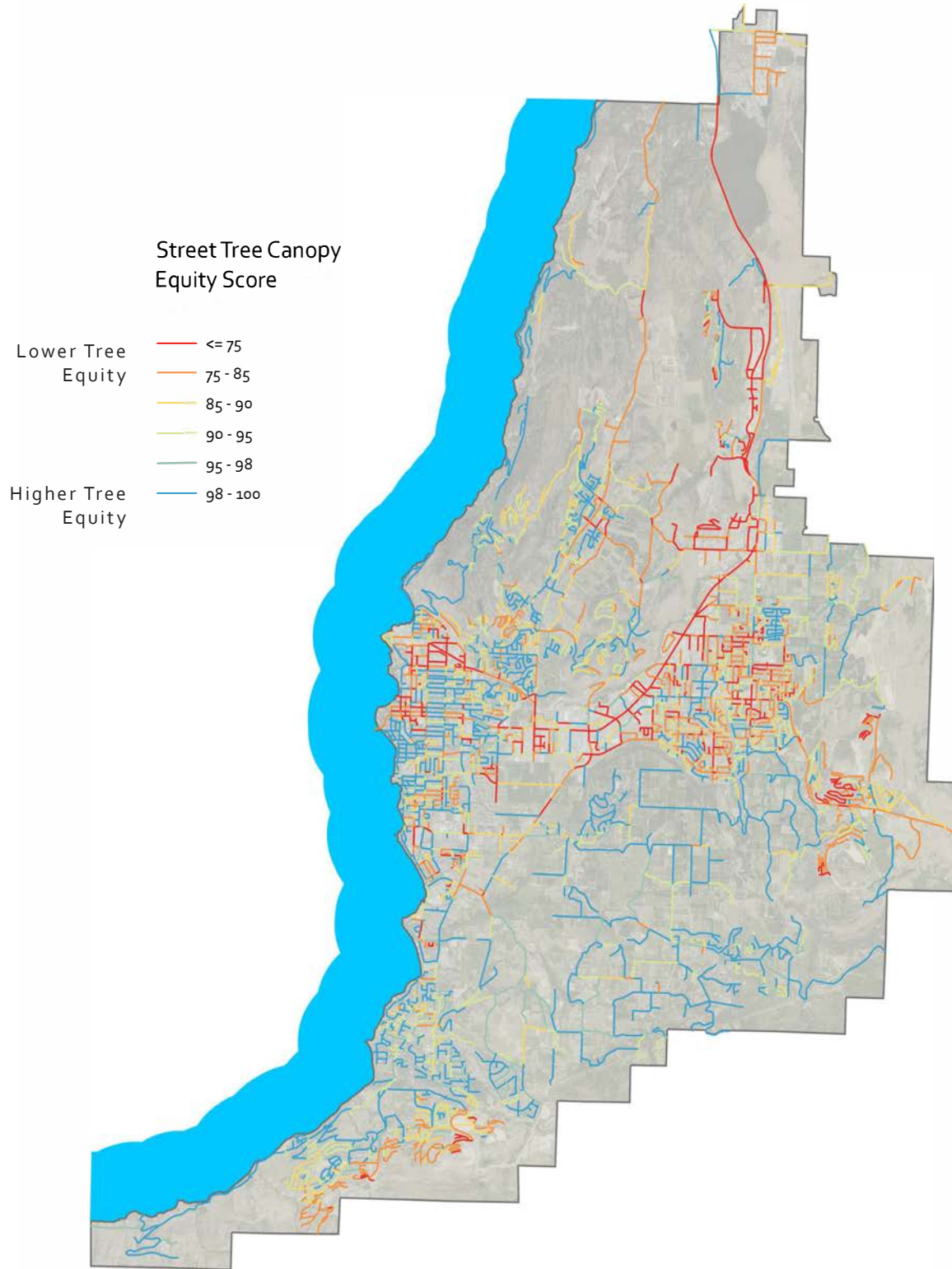


Figure 19. A map of street tree canopy equity by score from low (<=75) to high (100).*

*Notes: To prepare Figure 19, street tree canopy coverage includes both City planted trees as well as canopy from trees on private property that extends within 20 meters of road centerlines. A technique called gap analysis is used to compare how canopy coverage within the street compares with a target of 20% canopy cover for streets. For example, a street segment with 15% canopy coverage would have a "gap" of 5 percentage points. To estimate the final tree equity, the gap score for each street segment is compared with the equity priority index shown in Figure 18. Low street tree canopy equity segments have large gap scores and adjoin census dissemination areas with high equity priority index values. The intent of Figure 19 is to identify potentially high-need areas for street tree planting. The canopy status of a roadway may change over time in response to tree planting, growth, and removal on neighbouring properties and in the street's public realm.

4.5 A changing landscape

One of Canada's fastest growing cities, Kelowna is expected to welcome 45,000 new residents by 2040. To align with the OCP's vision of a thriving, sustainable city, much of this growth needs to be directed toward urban neighbourhoods in Urban Centres and the Core Area where City services can be provided more efficiently. This approach also alleviates development pressure on the forested natural areas surrounding the city. However, conventional city-building relies heavily on hard landscapes serviced with grey infrastructure, which exacerbates the impacts of heat, drought, and heavier rainfalls expected by the 2050s due to climate change.

Converting low-density housing into denser urban areas typically leads to a rise in hard-surfaced or impervious areas, resulting in fragmented and reduced soil volume available for trees. Impervious surfaces already cover 70% of Urban Centres (Downtown, Pandosy, Capri-Landmark, Midtown, and Rutland) and 55% of Core Area neighbourhoods. For example, an analysis in the City of Vancouver showed that canopy cover became increasingly limited as impervious surfaces exceed 50%, and almost non-existent once they exceed 85%³⁶.

In addition to increasing impervious surfaces, urbanization often involves the renewal or installation of new services like stormwater, sewer, and electrical connections. Aboveground power lines and belowground conduits or pipes are essential infrastructure but can interfere with tree-growing spaces. High foot or vehicle traffic can lead to various issues for trees, such as soil compaction in root zones, vandalism or physical damage, and exposure to pollutants like road salt. Overall, Kelowna's urban environment poses challenges for trees, further complicated by a changing climate that enhances these vulnerabilities. In higher-density neighbourhoods and those with a greater proportion of impervious surfaces, it becomes increasingly important to proactively plan and create environments that accommodate the required urban forest canopy. With increasing density, the reliance on roadways for tree canopy increases.

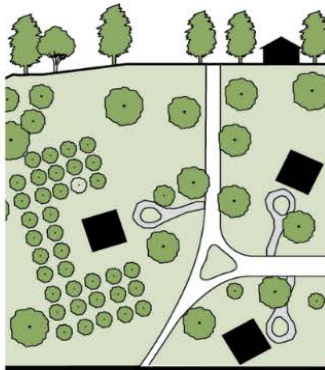
Don't trees use too much water? Tree cover conserves water in a semi-arid climate³⁹

One of the most significant impacts of climate change will be summer drought. A shift to less snowpack and more rainfall, coupled with lower summer precipitation, means Kelowna's water supply will be under greater pressure by the middle of the century. 24% of domestic water use in the Okanagan is used in outdoor landscaping – a figure the City is trying to reduce through its Water Smart program.

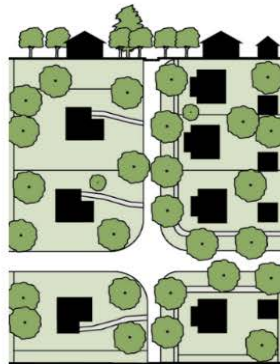
The urban forest can help conserve water by reducing this demand. Researchers in Colorado examined city-wide water demand in Fort Collins, a mid-sized city of 170,000 people with a semi-arid climate. The research revealed that tree cover was associated with lower water consumption. This result challenges conventional wisdom that trees elevate water demand in semi-arid climates because they are large and often require watering. Instead, the study suggests watering trees helps reduce overall water demand, potentially because the shading and cooling benefits of trees prevent water used in landscaping from rapidly evapotranspiring through grass and other plants.

Where can trees fit?

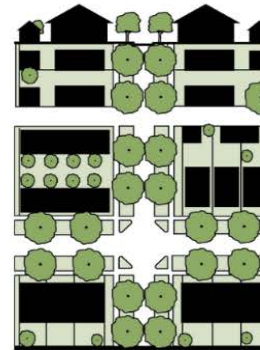
It depends on land use...



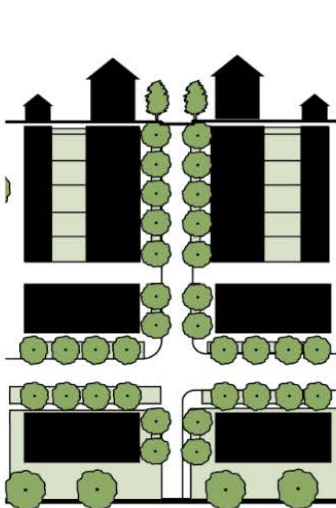
Rural
Trees in forests, windbreaks, yards
Forest canopy ~ 25%



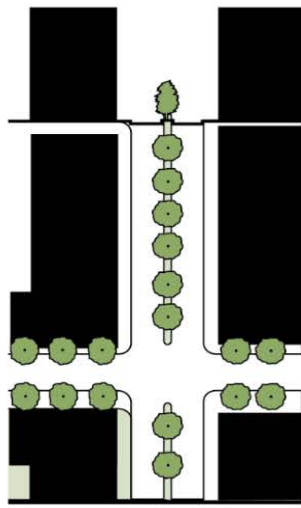
Suburban single-family
Trees in yards, parks, sometimes street trees
Canopy 20 - 30%



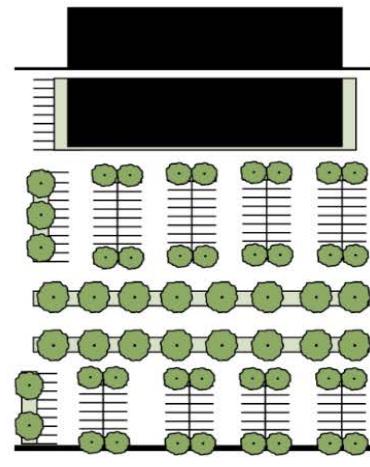
Core Area infill
Trees in streets, parks, sometimes yards
Canopy 15 - 25%



Core Area multi-family
Trees in streets, parks, common areas
Canopy 10 - 20%



Urban Centres
Trees in streets, plazas
Canopy typically 10 - 15%



Commercial
Trees in streets, surface parking
Canopy typically 10- 20%

With increasing residential density, streets and parks become more critical for supporting tree canopy

Figure 20. Appropriate tree location and canopy coverage based on different land uses.

5 EXPLORING CANOPY COVER TARGETS

Establishing “ideal” canopy covers for different uses of land in the city can help refine targets for each Growth Strategy District. The information presented in this section informs setting new targets for each Growth Strategy District.

Figure 21 graphs the land cover over each urban Growth Strategy District and illustrates where canopy and plantable areas are concentrated.

Setting targets for Kelowna should reflect the city’s arid climate and urban context. Temperate cities with high canopy cover targets, like Toronto (40%) or Vancouver (30%) naturally have more canopy cover and lands will naturally regenerate with trees. Natural forests in Kelowna are more open than forests on BC’s coast or in the interior wet belt, and urban areas will have lower tree canopy cover unless tree planting and watering programs are in place. **On average, grassland cities similar to Kelowna have approximately 20-25% canopy cover.** Kelowna’s canopy cover target should be established based on the ideal level of greening that can be achieved in different urban land uses, and to provide canopy cover where people most need it.

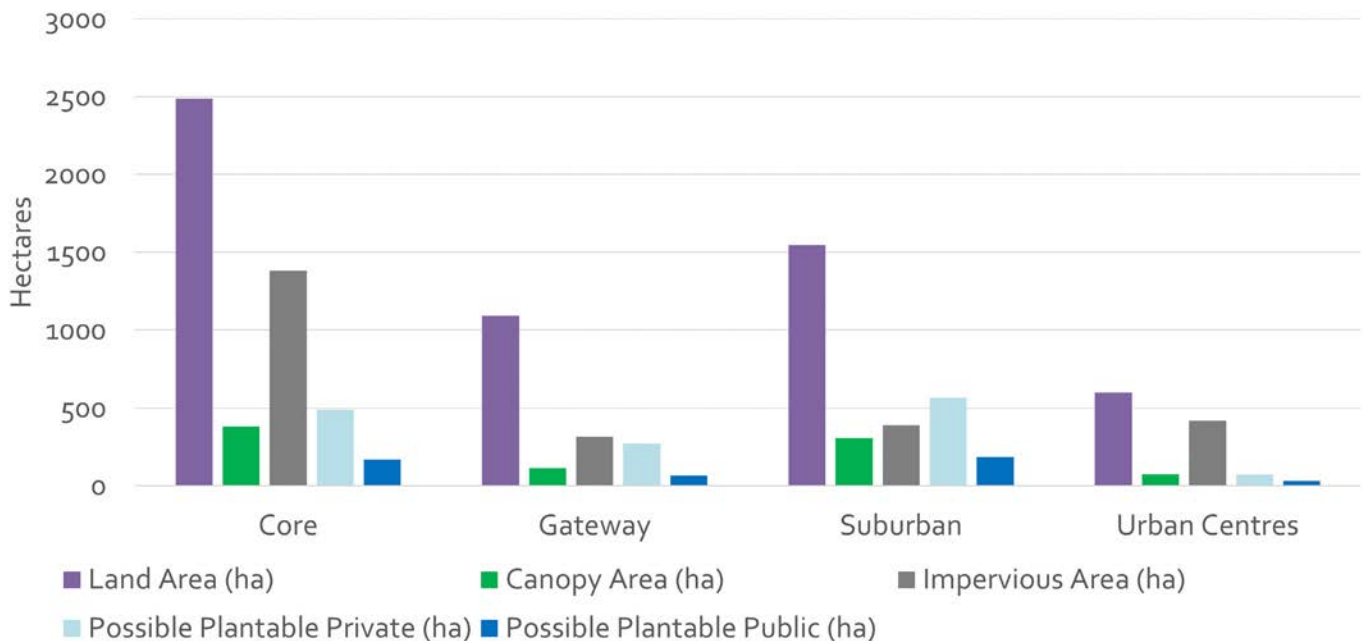


Figure 21. Land cover by Growth Strategy District (excluding Rural lands and Agricultural Land Reserve).

What are Growth Strategy Districts?

Kelowna’s Growth Strategy Districts are geographical areas within the city that have been identified for targeted growth and development. These districts are part of the city’s Official Community Plan (OCP), which outlines a long-term vision for sustainable development, land use, and growth management.

Growth Strategy Districts

- Urban Centres
- Core Area
- Gateway
- Suburban Neighbourhoods
- Rural

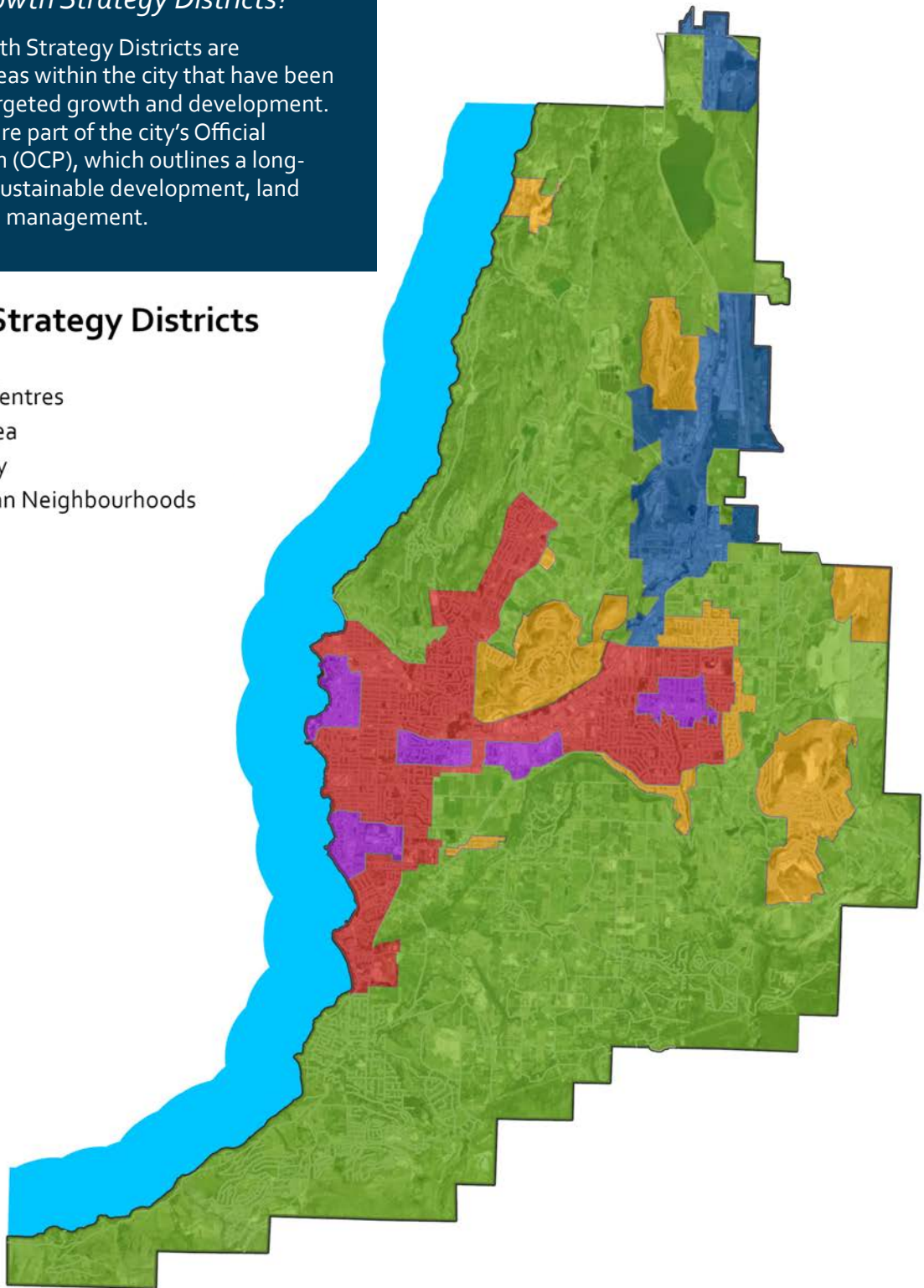


Figure 22. A map of Kelowna's growth strategy districts.

Each area has different land cover and planting potential, described below:

5.5.1 Urban Centres

Downtown, Pandosy, Capri Landmark, Midtown and Rutland. These five areas will have the highest concentration of employment, shopping, entertainment, and housing. While a small land area, Urban Centres are densely built. Canopy cover is low (~12%), impervious cover is high (~70%) and potentially plantable areas are low on both public and private land. Future development will eliminate some plantable area and existing trees but will also create opportunities for new tree planting on streets, in surface parking lots and on private landscapes. In Urban Centres, streets and parks will have to provide much of the tree canopy due to high building coverage on private land.

5.5.2 Core Area

The city’s central residential neighbourhoods are the predominant land use in the Core Area. Some commercial and industrial land uses also occur along Highway 97. Canopy cover is low (~15%), though higher than in Urban Centres. Impervious cover is moderately high (~55%), but there are plantable pervious areas, particularly on private land. The Core Area will see densification in the form of four-plexes, townhouses and low rise apartments, which will reduce the plantable area and create challenges for tree retention, but will also create opportunities for new planting on streets, and will include some private landscapes that support trees. There are also opportunities to plant more trees into existing private landscapes. Street trees will be an important component of increasing urban forest canopy in the Core Area.

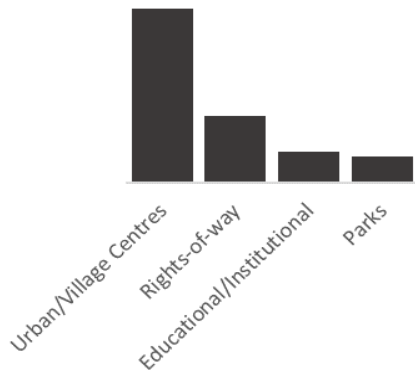


Figure 23. Urban Centre area dominant land use breakdown, land uses >10 ha

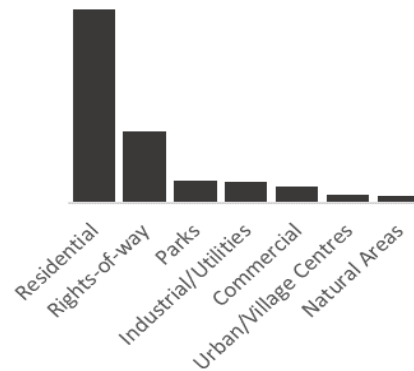
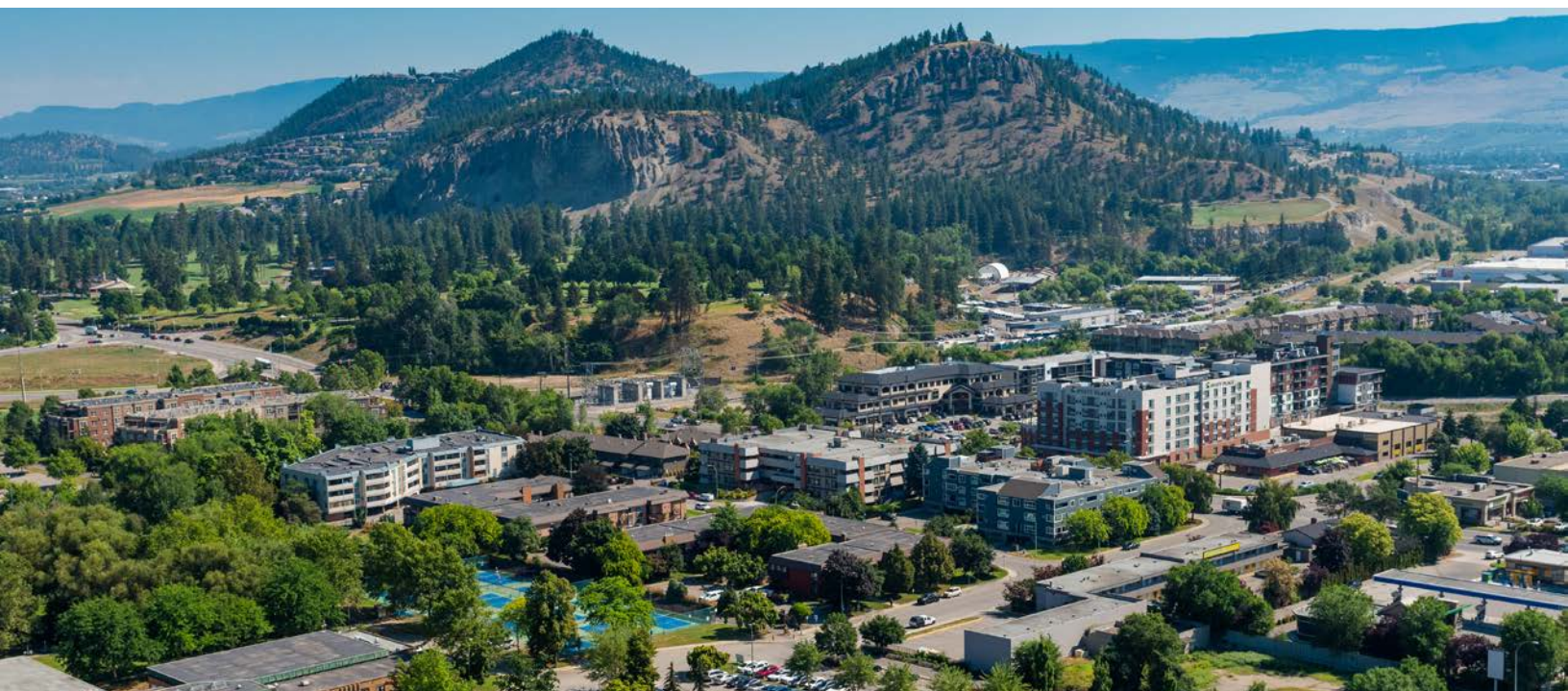


Figure 24. Core area neighbourhood dominant land use breakdown, land uses >10 ha



5.5.3 Gateway

The Gateway includes the University of British Columbia Okanagan (UBCO) campus, the airport and surrounding industrial and commercial lands. These lands, including ALR within the Gateway area, have low canopy cover (~10%), moderate impervious cover (~29%) and moderate plantable area concentrated on private land. However, this area will have growth focused on industrial land, employment and transportation that is likely to increase impervious cover in the Gateway area. This development will create opportunities for planting in parking lots and along transportation corridors. Given the future development of this area, planting in existing pervious areas is not recommended except where development is complete. Landscaped areas in surface parking lots, around buildings and along transportation corridors will contribute most of the tree canopy in the Gateway area. Natural areas within the Gateway may also have some opportunities for restoration, but the most significant benefits for workers and visitors are likely to be through planting in urban locations.

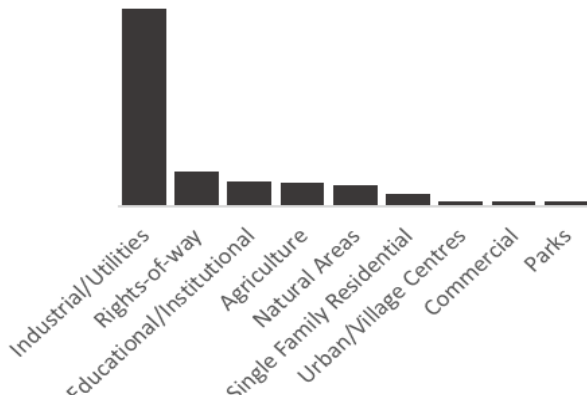


Figure 25. Gateway area dominant land use breakdown, land uses >10 ha

5.5.4 Suburban

The Suburban areas are dominated by residential land uses outside the core area but inside the growth boundary. Canopy cover is the highest among the urban areas (~20%), which is still lower than the City-wide average (excluding ALR) (22%). Impervious cover is relatively low (25%). There are substantial pervious areas that could support additional tree planting, particularly on private land but also on streets. These areas could receive additional tree planting in the immediate future. Trees in yards, parks, golf courses, natural areas and on streets will contribute most of the tree canopy in Suburban areas.

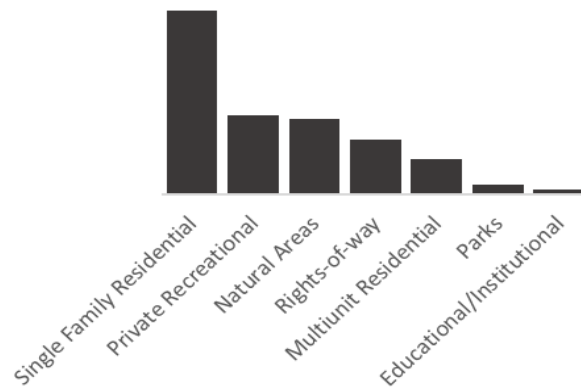


Figure 26. Suburban area dominant land use breakdown, land uses >10 ha

5.5.5 Rural

Rural lands, located outside the permanent growth boundary, primarily comprise agricultural lands and natural areas. As the largest growth strategy district, they account for 80% of the City’s total canopy area. However, due to extensive agricultural use, the City has limited control over canopy changes. Rural areas outside the Agricultural Land Reserve have 27% canopy cover, the highest of any land use division in Kelowna. However, trees and forests in this area are largely unmanaged, and are more likely than irrigated urban trees to be lost because of climate change effects or wildfire. The SUFS considers it probable that forest cover in Rural lands could decline in this area faster than reasonable efforts to offset canopy loss could take place. With low population density in these areas, street or other urban tree planting is considered a lower priority, despite the high plantable area and potential for forest health and climate-related losses. The primary

focus in Rural lands is the protection of agricultural and natural lands, while encouraging tree planting for restoration and biodiversity where feasible. There is also potential for natural forests in Rural lands to support renewed land management keeping with sylv principles and values.

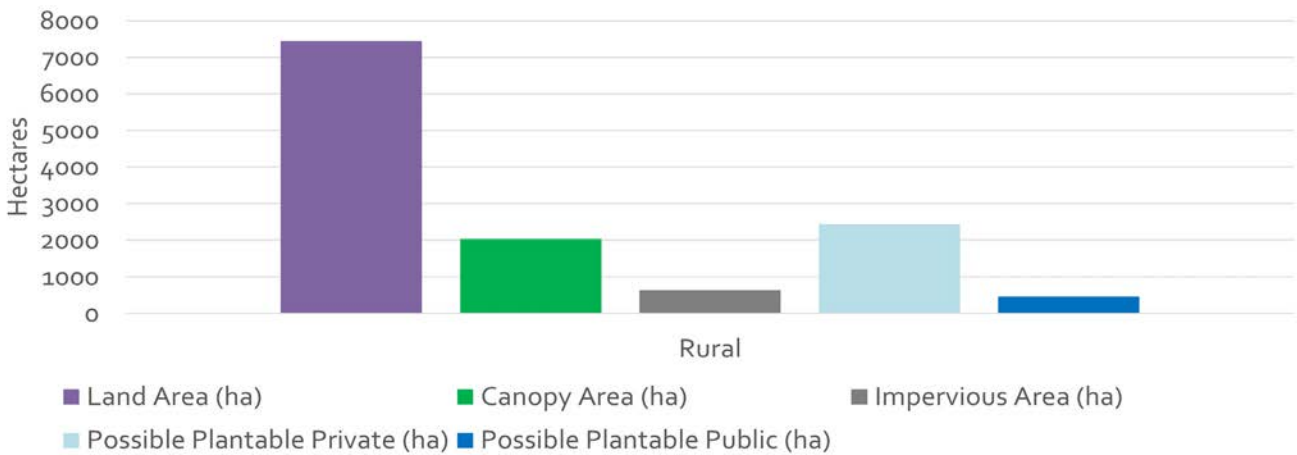


Figure 27. Land cover of the Rural Growth Strategy District (excluding Agricultural Land Reserve).

It is recommended that the City establish separate targets for each Growth Strategy District, rather than for urban and rural areas together. The distinctions are crucial because of the size of Rural lands could obscure changes in canopy in urban areas, making it difficult to track the strategy’s success.

Canopy cover targets for each Growth Strategy District are presented in Table 5. These targets are based on the current canopy (2023) and land cover information, plus estimates of how many "new" trees would be required to meet the targets assuming they can be grown to maturity. Reaching the targets will require significant new investments in tree planting and protection recommended in the Strategy's Action Plan. If the Strategy is fully implemented, targets could be reached by 2050.

Table 5. Growth Strategy District summary: land cover, canopy targets, and planting opportunities.

	Urban Centres	Core Area	Gateway	Suburban	Rural
Land Area (ha)	602	2,507	1,384	1,904	15,380
Impervious Cover (%)	70%	55%	29%	25%	9%
# Inventoried Trees	4,333	10,073	852	6,694	1,326
Pervious Cover (Public) (%)	5%	7%	6%	12%	6%
Pervious Cover (Private) (%)	12%	20%	25%	37%	33%
Canopy Cover outside ALR (2023) (%)	12%	15%	10%	20%	27%
OCP Target to 2040	12%	20%	Combined 25% districts		
Proposed Target to 2050	20%	20%	15%	25%	25%
Primary planting opportunities	Streets, parks, plazas	Streets, parks, private property, parking lots	Streets, parking lots, highway corridor	Streets, parks, private property	Private property
Priority for public street and park tree planting	1 - Highest	2	4	3	5 - Lowest
Priority for private landscape planting	4	1 - Highest	3	2	5 – Lowest

Table 6 provides estimates of the number of net new trees (i.e. trees planted on top of replacement planting) that would be needed to meet the canopy cover targets in each Growth Strategy District. The number assumes that each net new tree can be grown to maturity, and that the average size of trees in the Growth Strategy District is stable over time. Almost 80,000 trees will need to be planted by 2050 across the four urban Growth Strategy Districts — an average planting rate of over 3,100 new trees each year for 25 years. The City currently plants around 250 net new trees per year on public property, while in recent years 600 trees per year have been planted on private property through the NeighbourWoods program. Approximately 1,200 trees per year are planted in natural areas as part of restoration programming (this number is highly variable), although these are frequently smaller seedlings that take longer to contribute urban forest canopy cover. Trees planted through development requirements can help lift the urban forest towards the targets, but often these are replacing trees removed to accommodate new buildings.

Table 6. Summary of current canopy cover, canopy target, and approximate canopy gain and new trees by Growth Strategy District (excluding ALR).

Growth Strategy District	Canopy Cover (2023)	Proposed Target to 2050	Canopy Gain (ha)	New Trees Required**
Urban Centres	12%	20%	28	11,500
Core Area	15%	20%	116	30,000
Suburban	20%	25%	81	23,000
Gateway	10%	15%	51	14,000
Rural	27%	25%	/	/

Although more trees are needed in the Core Area, planting in Urban Areas and the Gateway is expected to pose major challenges in the form of finding suitable planting locations that also confer meaningful benefits for the urban heat island and other ecosystem services. High impervious cover is typical of the commercial, high-density, and industrial land uses found in these Growth Strategy Districts, likely needing tools and programs focused on tree planting in hardscapes.

**Based on average tree canopy size (2023) in each area.



6 WHAT THE FUTURE HOLDS

Kelowna’s urban forest faces a number of challenges, but the City also has opportunities it can leverage to enhance urban forest management. Taking advantage of opportunities will be essential to expanding Kelowna’s urban forest during a period of significant change.

6.5.1 Climate change impacts

Climate change is creating changes within the urban forest. Kelowna’s climate modeling indicates shifts towards hotter, drier summers, milder winters with increased rainfall and reduced snowfall, and a higher likelihood of extreme weather events such as heavy precipitation. While most trees can tolerate some degree of variation, consistent and significant changes in factors like soil moisture and frost days will impact tree and forest health. These impacts may include drought stress, heightened vulnerability to pests and diseases, damage from flooding and wildfires, and diminished tree survival and regeneration in native forests. These issues will intensify as Kelowna’s climate exceeds the conditions local trees can tolerate. Adapting the urban forest requires better tree and nursery supply management and physical modifications to planting environments. Planning and policy adjustments that guide these changes and develop a framework for responsible and proactive monitoring

and maintenance will improve the climate resiliency of the City’s urban forest.

6.5.2 Reconciliation and decolonization

The City recognizes that it is within the traditional, ancestral, unceded territory of the syilx/Okanagan people. The impact of colonization has been a drastically changed landscape – and the creation of an urban forest. The privatization of the landscape and conversion of traditional ecosystems into urban neighbourhoods and agriculture has meant a loss of access to cultural resources and land-based practices. As part of a broader commitment to meaningful reconciliation, the City of Kelowna is working to repair relationships with the syilx/Okanagan people and learn how to integrate syilx values and worldviews into how we manage our responsibilities to the land. Urban forestry, as part of the City’s land management, offers potential avenues for projects and collaborations that can advance this relationship. Staff can learn from Indigenous Ecological Knowledge Holders which species were more common in our community and seek guidance on forest structure and cultural burning practices to re-establish the open grassland-forest ecosystem.

Table 7. Impacts from Climate Projections for the Okanagan Region report (Feb 2020).

	Change in Summer Days Above 30 Degrees	Hottest Day Spring	Hottest Day Summer	Frost Days	Growing Season	Precipitation - Summer	Precipitation All Other Seasons (non-Summer)
Past	24 days	28.3	35.3	102 days	237 days		
2050	Average 32 days (range 19-48)	2.9 degrees warmer (range 2 to 4)	4.4 degrees warmer (range 2 to 6)	53% less (range 63% to 41% less)	44 more days (range 31 to 61 more)	12% less (range 31% less to 4% more)	Ranges from 8% to 13% more depending on season
2080	Average 54 days (range 32 to 78)	4.6 degrees warmer (range 3 to 6)	7.1 degrees warmer (range 5 to 9)	76% less (range 80% to 65% less)	78 more days (range 60 to 93 more)	20% less (range 48% less to 0)	Ranges from 15% to 19% more depending on season

6.5.3 Equity in the urban forest

The urban forest canopy is not distributed so that the people most in need have access to urban forest benefits. A map of the City's inventoried trees shows relatively few are found in lower-income neighbourhoods and neighbourhoods where a high percentage of the population belongs to a visible minority. These areas also happen to be where much of the City's future growth is planned. Building equity in the urban forest is a long-term task that will require sustained investment in new trees and planting sites in under-served areas. The City can continue tracking indicators of social vulnerability and use them to update its planting and program priorities as progress is made.

6.5.4 Development and urbanization

Kelowna has little urban forest canopy in the areas that will be the focus of growth over the next 20 years. Urban Centres have impervious surfaces totalling 70% of their total area, leaving little room for trees. While urbanization has clear sustainability benefits compared to conventional suburban development, effort is needed to ensure urban forest canopy is sustained and increased in urban areas. Kelowna has the opportunity to combine urban development with greening efforts by continuing to improve efforts to integrate green spaces and urban forests into new developments. Development rules can incentivize tree and soil retention or replacement, helping preserve canopy cover or plantable space on private property. The City also needs to invest in planting sites on public property to continue expanding urban forest canopy. With the right policies in place, some of this investment can be supported financially by development through in-kind contributions or contributions to the Tree Fund.



6.5.5 Invasive species and pests

The alteration of native ecosystems due to human activity has introduced invasive species and allowed them to establish in Kelowna's natural environment. These invasive species include noxious weeds, self-seeding tree species, and pests such as fungi and insects that lack natural controls in their new surroundings. Some species were intentionally introduced for economic or cultural reasons, while others arrived accidentally. Invasive species have adverse effects on the urban forest by reducing biodiversity and directly attacking trees, leading to a decline in ecosystem services. Climate change also contributes to the spread of invasive species, as Kelowna's changing environment becomes more hospitable to species from warmer climates. Ongoing monitoring and detection efforts can help prevent and control their impacts, while public participation in stewardship programs plays a crucial role in identifying and eradicating invasive species.



6.5.6 Better asset management

Trees and forests on City-managed property are not currently integrated into the City's asset management systems. This is primarily due to the difficulty of quantifying the value of trees and the limitations of traditional accounting frameworks in capturing natural assets that appreciate over time. There are also technological gaps in how tree assets are inventoried and tracked. The City's management budgets for trees and forests will likely need to grow over time as new trees are added to the inventory in urban areas, and climate change increases both demand for trees and the impacts on forest health. Asset management approaches would help to identify the life-cycle costs

of maintaining urban forest assets, and inform future budgets to ensure they are maintained at a consistent standard.

6.5.7 Water scarcity and limitations

Kelowna's climate is semi-arid and becoming drier over time. Many trees already struggle to access sufficient moisture from the soil during the growing season. Lengthier periods without rainfall and higher temperatures will increase evapotranspiration from soils, exacerbating the impacts of drought. Despite outdoor watering being infrequent for five months each year, over half of the Okanagan Valley's annual household water usage is attributed to outdoor landscaping. Paradoxically, increasing tree canopy cover could aid the City in achieving water conservation goals by providing shade that reduces evapotranspiration from thirsty grasses and turf. Choosing the right species for the right place means selecting more drought tolerant tree species or native riparian species, such as water birch or cottonwood, adapted to take advantage of high water tables.

6.5.8 More wildfire

Kelowna is in a wildfire dependent ecosystem. However, wildfire can also pose a major threat to communities and the urban forest itself. Wildfires of high severity are increasingly frequent in British Columbia, driven by past forest management practices, fire suppression, forest health issues like pine and fir beetles, climate change, and human-caused ignitions. Kelowna seeks to manage the risk of wildfire to the community through implementing its Community Wildfire Resiliency Plan, which includes recommended actions to reduce fuel accumulation in natural areas and improve home building and landscaping in the wildland-urban interface. Urban forest management can support wildfire mitigation efforts by promoting ecosystem health in natural areas (including where appropriate reintroduction of fire as an ecosystem management tool) and fire-conscious landscaping in proximity to homes and business in the interface.



6.5.9 Growing awareness

Through the engagement process, many community members indicated they valued trees and forests and shared ideas and aspirations for improving urban forest management. Kelowna's stewardship and outreach programs are essential tools for generating broader public acceptance and awareness of urban forest management. Since the majority of plantable areas in Kelowna are on private property, programs like NeighbourWoods play a crucial role in fostering community buy-in, providing educational resources on tree planting and maintenance, and creating opportunities to educate the public about the City's other initiatives and tree protection regulations.



7 SHAPING THE VISION & PRINCIPLES

7.1 What we heard: public engagement

The first phase of public engagement for the Sustainable Urban Forest Strategy took place in November and December 2022. The City sought input on a long-term vision to guide urban forest management through an online survey, online mapping tool, and online public open house and a workshop with interested and affected organizations. The second phase of engagement took place in the Spring of 2024 and sought input on the draft SUFS through an online survey, in-person open houses, and a virtual open house. Over 800 people participated in engagement opportunities throughout the project, almost all of whom live in Kelowna.

7.1.1 Imagining the future

Participants value the climate change resilience, ecological, and environmental benefits provided by the urban forest more than other benefits. People believe large and mature trees are an important feature of the urban forest, and that the City and residents play roles in increasing urban forest canopy through more street tree planting and better tree protection to conserve a healthy mix of native and climate-suitable species. People want to ensure Kelowna's future urban forest continues to support native species and biodiversity, even as it adapts to climate change.

In your words: Kelowna's urban forest in 2040

"A tree in every yard [...] Fruit and nut trees in public spaces, helping feed the community. Education modules in schools about trees and gardening, with practical experience to involve youth."

"Lots of trees on every block, trees well placed for safety and appropriate distances from buildings to avoid structural damage. Fewer "weed" trees that cause problems, fewer cedars and intensive water-use trees."

"Every road in the city would have healthy, mature trees (native to area or supporting local bird and other wildlife) shading the sidewalks and roadways"

Survey participants value treed parks and greenspaces for their recreational benefits and the habitat connections they provide between natural areas.

Outside of parks and natural areas, residential areas with many large or older trees are highly valued. An estimated 80 per cent of participants stated they live on a street with no large trees, while 72 per cent of participants would prefer to live on a street with large trees, such as in Figure 28. Residents believe Urban Centres are the most important place for tree planting, followed closely by the Core Area. Rural areas outside the Permanent Growth Boundary were ranked as the lowest priority for tree planting.

In Phase 2 of engagement, a majority of survey respondents (78 per cent) agreed with the proposed vision statement informed by community input during Phase 1. Similar levels of support were shown for proposed canopy cover targets. Open-ended comments received during this phase expressed concern about the trade-offs between the urban forest and wildfires, water scarcity, housing supply, and the cost to citizens as barriers to imagining the future. The draft SUFS was amended to extend discussion on conflicting management priorities for the City.

In your words: Canopy cover targets and draft vision

"An increase in trees on public property equals an increase in costs ultimately borne by the citizens. From maintenance to replacement to management and so on. Somewhere the costs need to be paid for. Residents/individuals ultimately pay for that."

"I think the strategy needs to start without delay. The downtown core is so hot and windy, it is reverting to a desert. Shrubs can do wonders too. All plants remove carbon and beautify the area as well as provide habitat for birds. More trees in the parks!"



Figure 28. 72% of survey respondents would prefer to live on a street with large trees, such as in this image.

7.1.2 Priorities for management

Engagement participants were asked during Phase 1 to prioritize ideas for City and private property to support the urban forest. On City property, several actions are seen as high priority, including constructing new planting spaces for trees, improving species selection and climate suitability to reduce irrigation, and improving engineering standards for soils to support street trees. On private property, there is broad support for adjusting development regulations to require more tree planting, improving engineering standards for tree planting and selection, and continuing to offer incentive programs like NeighbourWoods to encourage tree planting on private land, and requiring more detailed arboricultural information during development processes (Figure 29). Supporters outnumbered those opposed to expanded tree protection on private property and allowing variances to development to incentivize tree protection during both engagement phases.

During phase 2 engagement, survey respondents were asked to prioritize strategies for implementation. While engagement showed majority support for all strategies, support was strongest for strategies to protect, connect, and expand the urban forest.

7.1.3 Stewarding the urban forest

Respondents during both engagement phases showed interest in contributing to urban forest stewardship, and were most likely to plant pollinator-friendly native plants, maintain trees on their property, and plant one or more trees on their property. The results indicate many people have higher interest in caring for trees on their own property; however there is also general support for more public education and stewardship opportunities on City lands.

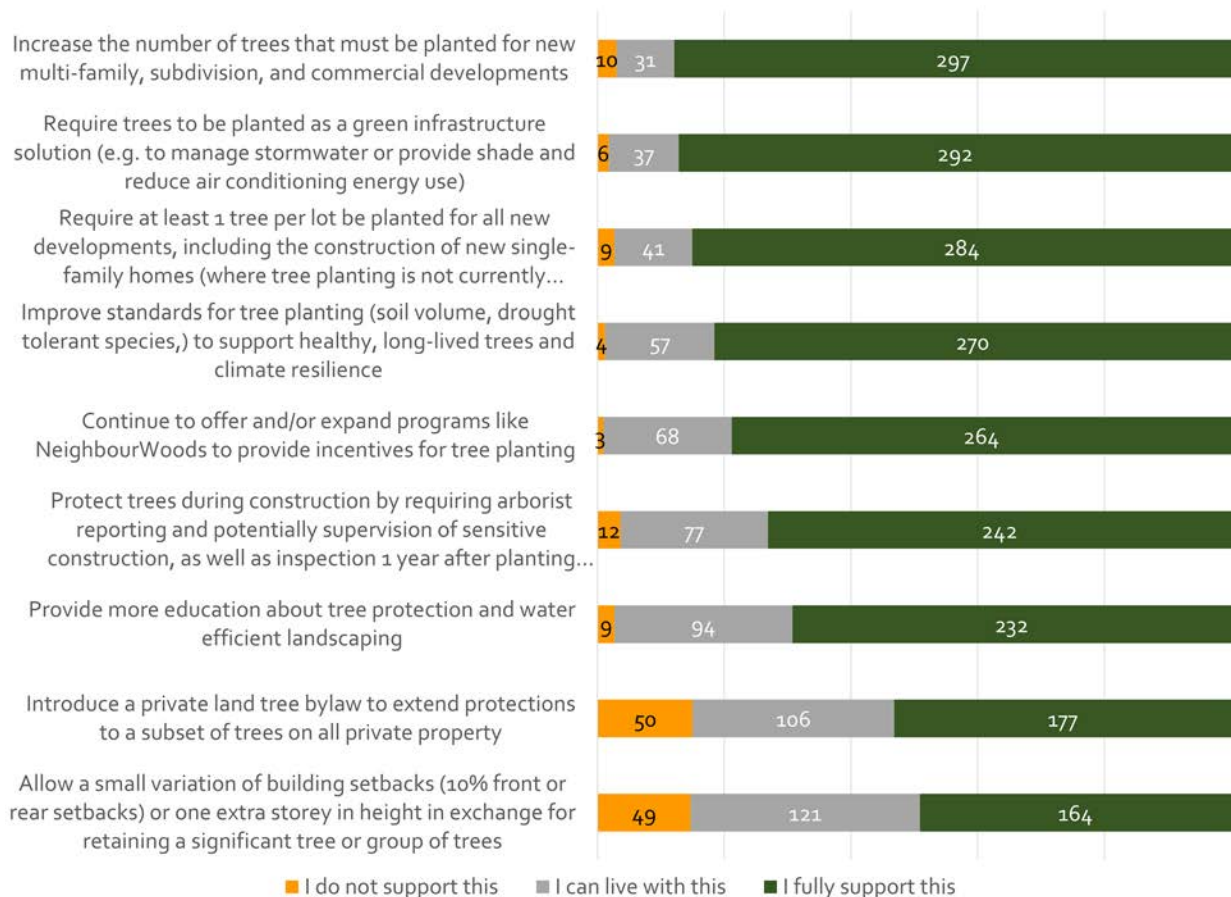


Figure 29. Levels of support for actions to improve the urban forest on private property, from Phase 1 of engagement.

Community participation supports Kelowna's urban forest

Whether through tree planting on private property supported by NeighbourWoods, calls for service to the City regarding trees and vegetation in parks, or watering trees through the Water Me initiative, Kelowna's community is already a key part of maintaining and enhancing the urban forest in the community. The Water Me program organized by Parks Services helps maintain healthy trees in areas where irrigation cannot be installed, such as beaches on Okanagan Lake. The "Water Me" signs, posted near trees on public property, invite volunteers and visitors to water trees to help them establish. Volunteers are invited to visit the tree when they can to provide supplemental watering during the summer growing season, easing the demand on Parks staff for this service.

A white rectangular sign with rounded corners, hanging from a blue string. The sign features the text "Water ME" in a large, bold, dark green font, with a blue water drop icon next to the "E". Below this, there is a small illustration of a green tree growing from a log. The sign is placed on a sandy beach with large grey rocks and a young tree in the background. The background also shows a body of water and distant hills under a clear blue sky.

**Water
ME**

Help prevent
erosion. These rocks
and trees
keep the beach
in place.

Please contact Parks
250 469-8503
for more info

City of



7.1.4 Perceived barriers and opportunities

Engagement participants were satisfied with the current urban forest management program's storm and debris clean up (emergency response), tree pruning, and hazardous tree removal. Participants are dissatisfied with public education around the value and care of trees, tree protection standards and policies, and tree planting.

Participants see space limitations, existing trees, and strata/landlord permissions as being major barriers to planting trees on private property. Incentives for tree planting would be knowing which species are suitable for current and future climate, having space to plant, and having someone to call for help in selecting the appropriate tree species or to provide planting guidance. There is wide interest in partnering broadly with Indigenous peoples to advance mutually beneficial urban forest management, engaging with schools and tree nurseries, and improving communication with residents about urban forestry services and opportunities to volunteer.

Your ideas: How should the urban forest be managed?

"Monitor trees on City-owned land in order to detect problems before they become bigger."

"Weed around young trees to reduce water competition, involving the community."

"Plant more indigenous species, and plant more edible fruit trees to feed the homeless and folks using the foodbank."

"Implement a dollar value per tree species and size that would be considered in the overall cost when determining the worth and viability of future development."

"Engage the community in tree planting and learning about nature. Implement a communications strategy targeting tourists so they take care of our land too. Partner with Okanagan Nation Alliance for Indigenous-led initiatives; we have to learn from the land keepers."

"More trees planted where they have died or been damaged in parks. More trees to provide shade along the lake; it is too darn hot to be in the full sun for very long."

"There is a tremendous opportunity for the planting of more street trees, though it seems making sure soil volumes and water access needs to be designed before trees are planted. Protection needs greater priority."

"Hire skilled arborists. Make sure the companies pruning and caring for trees are properly skilled and educated."

"Accelerate the effort. Trees take a long time to grow. We should be investing the money and time to do more now!"

"Public education of citizens and business owners is critical to build and maintain support for growing out the urban forest. The shade value of trees is becoming increasingly important but seems to be dismissed by many."

"Trees should be protected. 10 years ago our neighbours removed 12 large trees from their property to the south. It changed everything for us: our lawn required more irrigation and our house and theirs were much hotter in the summer."

"Private property is a challenge. How much can private landowners be limited in what they use their land for?"

7.2 The Vision

In consideration of Kelowna's urban forest context, management, challenges, and opportunities, and what we heard, the Sustainable Urban Forest Strategy is guided by the following vision:

Kelowna's urban forest will continue to expand, connecting our green urban centres to our natural areas. Our urban forest will be managed to be a healthy, safe and viable nature-based solution that improves our livability and helps our community mitigate and adapt to a changing climate.

7.2.1 Context on the Vision

The urban forest is a network of diverse and interconnected tree canopies in streets, parks, backyards, and natural areas that provide clean air, shade, wildlife habitat, and myriad of benefits accessible to everyone who lives, works, and visits Kelowna. The urban forest consists of all trees, forests, plants, soils and associated ecosystem components located within the City, and is an integral part of Kelowna's

natural systems and green infrastructure. Trees and forests contribute to the resilience of our community to a changing climate, and the livability of our urban environments. We manage our urban forest using best practices in protection, planting, and maintenance, supported by a robust network of community partners who work together to expand and enhance the urban forest.



7.3 Principles

Eight core principles underpin the strategy and guide the City's urban forest management efforts:

Principle 1: Take action on climate change

Connections between the urban forest and climate resilience are clear, and urban forest management will improve Kelowna's climate resilience.

Principle 2: *Protect and restore our environment*

The urban forest is a reserve of biodiversity and can connect habitats and natural areas into larger, more viable ecosystems.

Principle 3: *Incorporate equity*

The urban forest provides ecosystem services and benefits public health, improving the lives of people who have access. There is a higher need for urban forest ecosystem services in socially vulnerable communities, particularly those exposed to extreme heat.

Principle 4: *Right tree, right place, right function*

The right tree in the right place will maximize the benefits, minimize risks and avoid unnecessary costs.

Principle 5: *Maintain healthy and safe trees*

Healthy trees have longer lives, cost less to manage, and produce more ecosystem services.

Principle 6: *Monitor, learn, and innovate*

Urban forests are dynamic, as are the cities and climate in which they grow. Monitoring change, learning from implementation by innovating will help to improve management through time.

Principle 7: *Work together*

Kelowna's urban forest is a community resource managed by many actors. Only by working together can urban forest management achieve the Vision for the Sustainable Urban Forest Strategy

Principle 8: *Support reconciliation*

Kelowna's place on unceded territory makes it imperative to improve the recognition of Indigenous people and land management through urban forestry.

8 GOALS, STRATEGIES, ACTIONS

The Action Plan to achieve the Vision is built around four Goals, 10 Strategies, and 64 Actions.

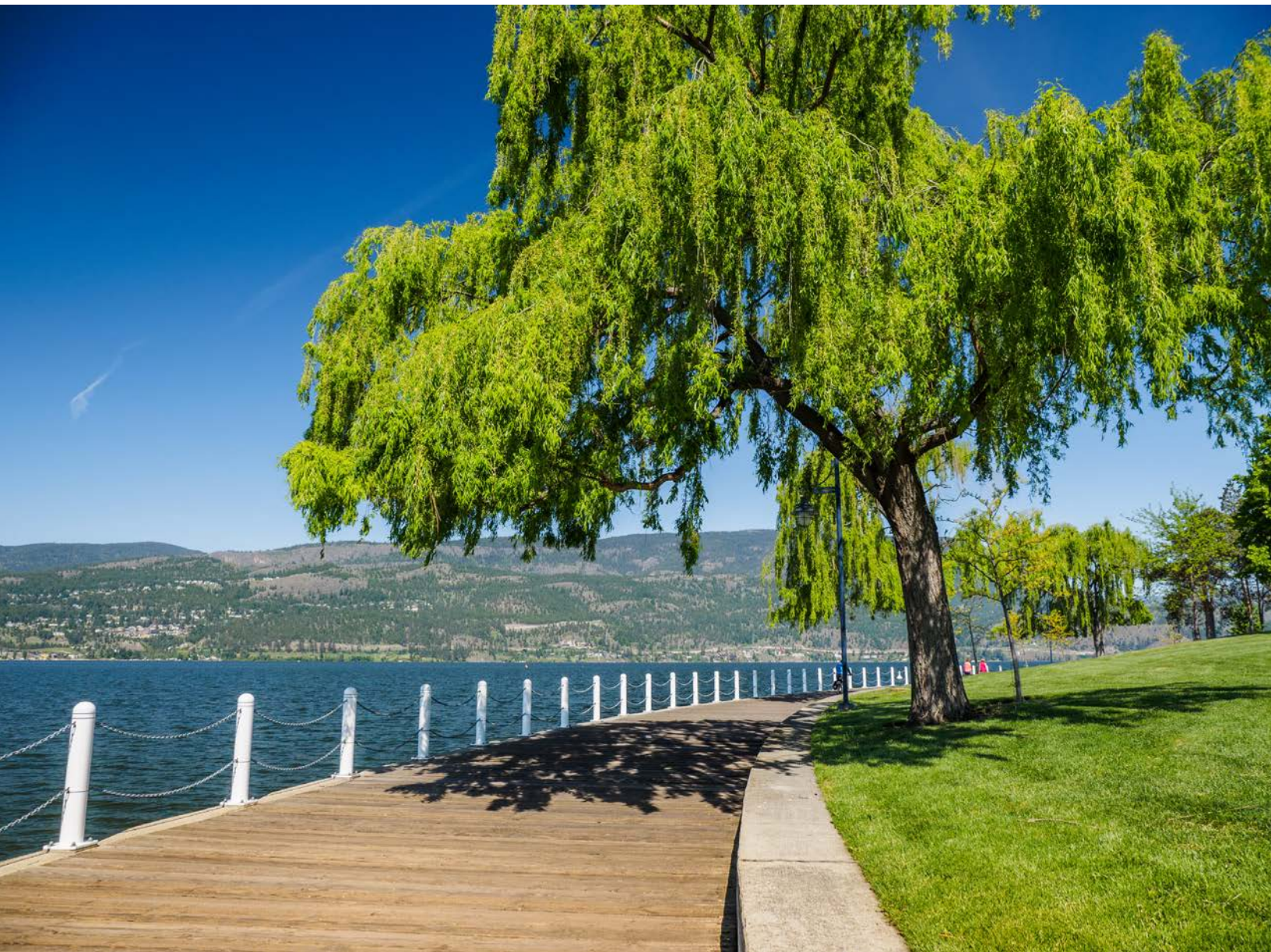
Goals A goal represents the City's aspiration for a key theme of urban forest management. They are strategic directions.

Strategies A strategy is a plan of action to achieve a goal or part of a goal.

Actions An action is something the City can do to implement a strategy.

This chapter provides an overview of what the City will need to do to implement the Sustainable Urban Forest Strategy, focusing on goals and their related strategies.

For detailed actions, see the Action Plan (Chapter 9).



Goal 1: Protect, connect, and expand the urban forest

Increasing canopy cover in the City can address inequity, climate change impacts, and safeguard ecosystem services.

Kelowna must expand its urban canopy to meet the needs of current and future residents. Enhancing the urban forest involves both planting new trees and preserving what already exists.

Kelowna's current canopy cover is estimated at approximately 22% (excluding ALR lands), which is a reflection of the semi-arid, grassland environment and urban planting trends. Urban areas typically have less than 20% coverage, with a few areas being almost devoid of tree cover. This means that Kelowna's canopy is not concentrated where most people live and work.

Low canopy in urban areas reduces ecosystem services and increases the fragmentation of surrounding natural habitats. As climate change leads to higher summer temperatures, urban areas will require more trees to provide cooling benefits. Moreover, urban

planting with irrigation may help counter the loss of forest cover in natural areas due to drought, fire, or a transition to grassland due to climate change.

Strategies under this goal will reshape the City's policy and planning to preserve trees, promote tree planting, and protect natural areas.

Strategy 1: Strengthen policy, planning, and implementation to protect, connect, and expand tree canopy

Kelowna will work to fill policy gaps and improve recognition of trees in project planning and execution. This strategy proposes revising City bylaws to increase tree planting through development, subdivision, and servicing, as well as strengthening tree bylaws for public and private property. This strategy also recommends considering how trees are addressed internally by City staff during the design and planning of capital projects to ensure new trees are added and to reduce avoidable loss of City-owned trees.

Case study: City of North Vancouver’s minor development variance permit

The City of North Vancouver has updated their Development Procedures Bylaw to allow for minor variances from its Official Community Plan and the Zoning Bylaw to allow for tree retention. The bylaw specifies the scope, criteria, and procedures of applying for the minor development variance permit. One of the criteria allows a reduction of the minimum required parking space for vehicles and bicycles to retain mature on-site trees and ensure adequate soil volume to support tree health. The bylaw also allows the delegation of Council powers to city staff to issue Development Permits and Minor Development Variance Permits, as well as require security from permit applicants for retained trees.

Case study: Campbell River’s street tree structural soil breakouts and soil channel standard.

Street trees are an important component of the urban forest, but they are often subject to challenging conditions such as compacted soil, inadequate soil volume, and limited permeability. The City of Campbell River integrates tree planting details in its Subdivision and Development Service Bylaw. Details such as the depth and location of structural soil breakout by street landscape areas are specified with the intention to expand growing space for trees and other vegetation along streets, by connecting soil volumes with permeable area on private property through soil channels and structural soil breakout zones. These measures will help enhance the growing conditions for street trees and promote their overall health and longevity.

Case study: City of Guelph’s Tree Compensation approach

The City of Guelph’s Tree Technical Manual outlines rules and steps for protecting, planting, and maintaining trees during development and construction on public and private properties. The Technical Manual includes compensation requirements for removals or damage of regulated trees (defined by its tree bylaw), as well

as compensation approaches (e.g., applicability and calculation methods). Four compensation approaches are provided – aggregate caliper approach, area based canopy approach, mass planting approach, and cash-in-lieu approach:

1. Aggregate caliper formula: applies when compensation is to be provided in the form of on-site or off-site tree establishment. The total diameter at breast height (DBH) of trees that need to be replaced shall be replaced in whole by an equivalent caliper of replacement trees.
2. Area based canopy compensation: may be applied for on-site compensation of removed plantation communities outside of the Natural Heritage System. This method is typically used for densely treed communities that are difficult to inventory. The compensation required is determined by the area of the plantation community and applying a factor of one tree for every 10 m². A mass planting approach may also be required.
3. Mass planting approach: allows planting shrubs and herbaceous species, in addition to trees, to support on-site tree establishment and ecological restoration goals. The number of plants required is based on the equivalent wholesale value of the proportion of required compensation tree plantings from the compensation method used (aggregate caliper or area based canopy compensation). The mass planting approach is not intended to fully replace tree compensation but to provide flexibility in achieving restoration and management goals relating to Significant Natural Areas, Natural Areas, and Wildlife Crossings.
4. Cash-in-lieu for tree establishment: applies when development makes it impossible to replant vegetation on the site. The City may ask for money compensation as a permit condition according to the Tree Bylaw. This money will be used for tree planting and naturalization projects that align with the goals and objectives of the natural heritage system and support the tree canopy.

Strategy 2: Expand the urban forest equitably in urban and core areas

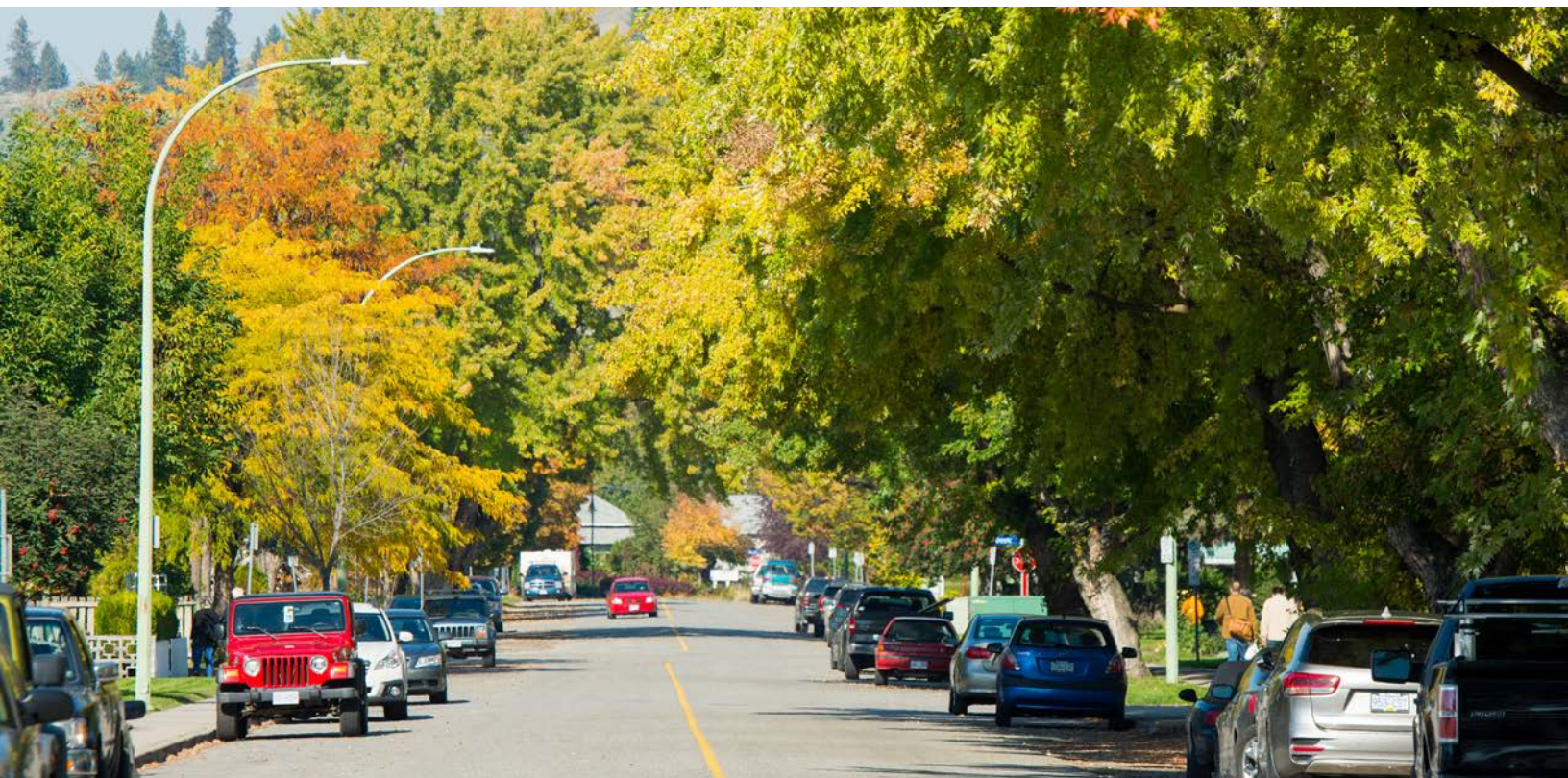
Kelowna will direct tree planting to low equity areas as a priority, guided by enhanced planting design and installation and better tracking of planting sites. This strategy seeks to leverage the available public space in Urban Centres and the Core Area so that its suitability for trees is conserved or enhanced and planting site occupancy increases on City property. The strategy also seeks to expand the NeighbourWoods program to increase tree planting on private property in low equity areas.

Strategy 3: Improve the quality and suitability of trees being planted for the site and climate requirements

Across all planting programs, Kelowna will apply the principle of right tree, right place. This strategy invests in Kelowna's tree nursery and seeks regional partnerships to expand buying power and potentially enable Okanagan communities to access more genetically appropriate stock and species for urban tree planting and natural restoration. The City can also guide better tree selection by reviewing its species lists used for capital projects and development to integrate lists into a single guide that reflects current climate adaptation considerations.

Case study: Landscape Incentives in the Toronto Green Standard

The City of Toronto has established its sustainable design requirements for new private and City-owned developments, known as the Toronto Green Standard. Initially introduced in 2005 as a voluntary standard, it now offers a combination of mandatory and voluntary elements, with higher tiers of performance eligible for development charge refunds. The Toronto Green Standard encourages environmentally sound and sustainable designs and practices. One of the focuses is to increase the urban forest. It 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.



Case study: Assisted migration trials and seedlot selection tool

Assisted migration is the process of facilitating plant genomes travel in step with suitable climates in order to rematch trees and plants to ecological conditions, maintain habitat for native species, and migrate naturally across fragmented human landscapes. This process typically involves transferring seeds or seedlings within their current species range or just outside of it. The Seedlot Selection Tool, jointly created by the US Forest Service, Oregon State University, and the Conservation Biology Institute, is a GIS-based program to help land managers implement assisted migration trails of common native species in western North America. This tool allows users to select their planting

site location, and set management parameters such as the target species and future climate scenarios. Based on user's input, the tool produces a map showing locations of the appropriate seed sources or planting sites.

Figure 30 shows that the best Ponderosa pine seedstock for planting in Kelowna by the 2050s will come from interior of southern Washington, Oregon, and California under a moderate warming scenario (RCP 4.5), based on climate similarity analysis with a 1961-1990 baseline. The Province of British Columbia is developing a similar tool for use with the Climate-Based Seed Transfer system now being trialed.

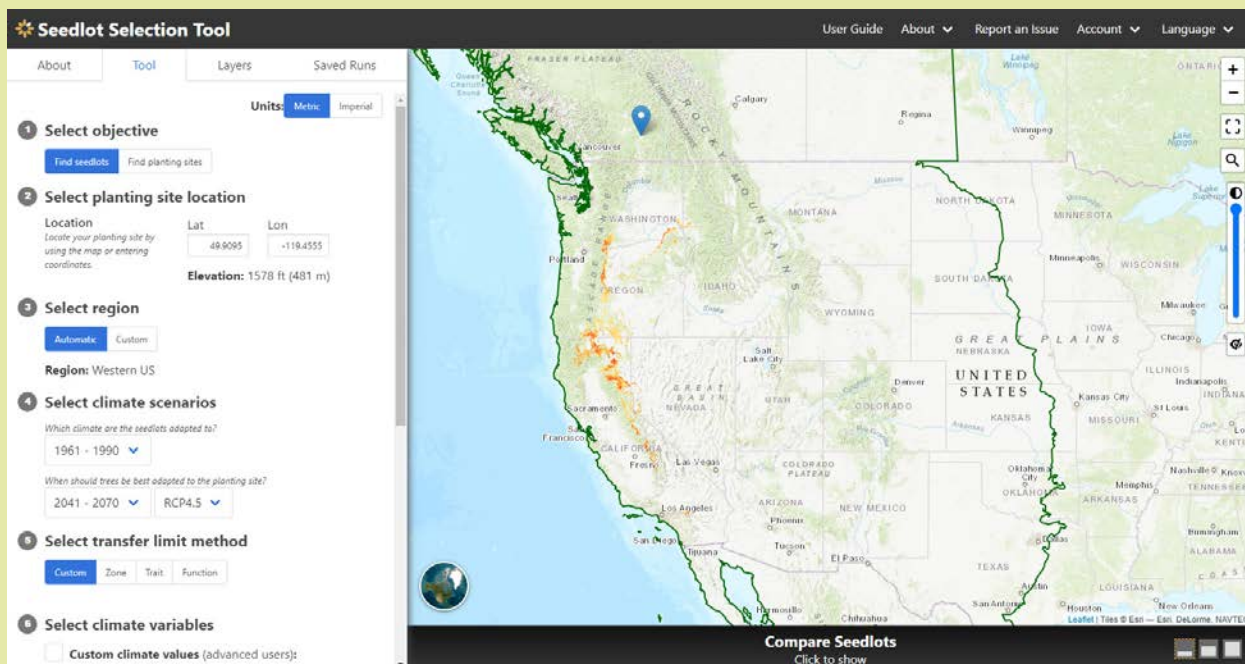


Figure 30. Seedstock selection tool with Ponderosa Pine selected.

Goal 2: Maintain a healthy, safe, and viable urban forest

Shifting the City's urban forest management towards best practices can prolong asset life and reduce the overall costs of management.

Kelowna needs to improve asset management of trees and forests to maximize urban forest value and decrease financial and public safety risks. Shifting urban forest management towards best practices requires re-evaluating service level targets and ensuring the Parks Division has the resources needed to implement the Sustainable Urban Forest Strategy. Kelowna's management of the urban forest has improved since 2011, when the first Sustainable Urban Forest Strategy was prepared. But continuing improvement is part of adaptive management, which recognizes the city's context is changing in terms of climate, landscape, and overall demand for urban forest ecosystem services.

This goal will establish the City as a tree-leader in the community, the Okanagan, and the province. Key to this goal are the principles of asset management: that urban forestry should seek to maximize the length of time trees live in healthy maturity as a strategy to reduce overall costs of management. This means improving documentation of work standards and priorities to aid decision making, as well as adjusting service level targets to provide enhanced care where needed. A well-managed and diverse forest helps reduce the risk of catastrophic loss of urban forest cover and associated benefits.

Strategy 4: Clarify City procedures and standards to improve efficiency and manage risk

Kelowna will document work processes and priorities to provide better service and improve reporting on service level targets. This strategy includes ensuring all subsurface green infrastructure installations are inventoried and marked physically in a visible surface location, but also new written guidance to establish how the City carries out urban forest management functions. The strategy will address the lack of a formal tree risk management policy which establishes clear inspection guidelines for different asset classes to promote public safety. Lastly, urban forest operational practices will be reviewed to find opportunities for more efficient maintenance.

Strategy 5: Transition from reactive to proactive maintenance of City trees

Kelowna will connect the public tree asset inventory and work order systems to improve tracking and budgeting while adjusting service level targets to provide better care. Service level targets currently in use can be specified for asset classes to improve operational efficiency and target maintenance where it is most needed. This strategy also seeks to improve the life cycle planning of urban forest assets, including the use of waste wood.

Strategy 6: Ensure resourcing is sufficient to deliver levels of service that maximize urban forest benefits

Kelowna will adopt fiscally responsible plans to provide enhanced urban forest management, using the budgeting process to adequately fund plan implementation. This strategy calls for the City to examine the staffing impacts of full implementation, which may require new roles in both urban forest operations and for plan review. Additionally, a framework for funding management obligations is needed that relates tree planting and enhanced service level targets to the operational budget for urban forestry. The City should look to external funding sources like the 2 Billion Trees Program, Canada Summer Jobs wage subsidies, or other grant programs as they become available to support urban forest management.

Goal 3: Involve people and organizations in urban forest management

Building partnerships with volunteers, local experts, institutions, and advancing reconciliation with Indigenous Peoples, will strengthen the urban forest.

Kelowna needs to partner with many individuals, organizations, and Indigenous peoples to sustain the urban forest. The City is directly responsible for only the 15% of the urban forest canopy that falls on City-owned property, with most of the urban forest being managed and maintained by others. Moreover, the urban forest is a boundary-crossing ecosystem providing value to every resident and visitor. This goal recognizes the dual purpose of building relationships between urban forest management and the broader community: first, it will help improve public awareness of the urban forest and management challenges in particular; second, it is the primary way the Sustainable Urban Forest Strategy can connect city-wide goals with actions affecting trees on private property. The goal also reflects on how colonial land management has diverted Kelowna's forest ecosystems from their path under Indigenous land management and aims to build dialogue with syilx/Okanagan people on how urban forestry can meet cultural needs and be strengthened by a continuing relationship.

Recent history during the COVID-19 pandemic and engagement for the Sustainable Urban Forest Strategy show that people desire more connections with the

natural environment for health and well-being benefits. Inviting people from many backgrounds to contribute ideas, time, and opportunities to volunteer for the benefit of the urban forest is at once a tool to satisfy this demand while improving equity, climate resiliency, and building transparency around urban forest management. This goal also envisions a city where the urban forest and successes in urban forest management are widely celebrated and acknowledged by the City and by community members.

Strategy 7: Improve awareness of and participation in urban forest management

Kelowna will expand its programs to offer more opportunities for the public to contribute to urban forest management. This strategy explores how the City can build partnerships with individuals to support tree planting and ecological restoration on public and private property, local practitioners and arboricultural industry to promote good standards of care, institutions to access new tree planting opportunities, incentives for tree protection on private property, and transparent reporting to encourage the public to interact with the City's urban forestry data. Actions should be guided by a Communications and Engagement Plan for the urban forest which identifies program priorities, leverages existing connections and relationships, and considers resourcing requirements for selected programs.

Case study: Saanich's Partnership Tree Program

The Saanich Partnership Tree Program invites private property owners to request boulevard tree planting in front of their homes. The District of Saanich is responsible for planting and maintaining the tree during its establishment. Homeowners can submit an application to indicate their preferred planting locations and tree species (from a given tree list), as well as tree care responsibilities they would like to sign up for, such as watering young trees from May to October for a minimum of five years. Since 2016, this program has added between 60 and 75 trees per year to Saanich's streets.

Case study: Victoria, Tree City of the World

The City of Victoria has received the recognition of Tree Cities of the World. The Tree Cities of the World Program is a joint effort by the Arbor Day Foundation and the UN Food and Agriculture Organization to recognize cities and towns for their success in urban forest management. Victoria manages approximately 150,000 trees. Guided by the City's Urban Forest Master Plan, the City proactively inspects and maintains its public trees, engages citizens in tree planting activities, requires a new "Tree Minimum" for private properties, and incentivizes tree retention and planting through its new Stormwater Utility Tax.

Strategy 8: Build relationships with syilx/Okanagan communities, First Nations Governments and Indigenous peoples through urban forest management

As part of a broader commitment to meaningful reconciliation, the City is working to repair relationships with the syilx/Okanagan people and learn how to integrate syilx values and worldviews into how we manage our responsibilities to the land, including urban forests.

Case study: ÁTOL, NEUEL Memorandum of Understanding between WSÁNEĆ Leadership Council and District of Saanich

WSÁNEĆ Leadership Council (WLC) and District of Saanich formalized a memorandum of understanding, ÁTOL, NEUEL (“Respecting One Another”) in December 2021. The MOU represents a commitment by WLC and Saanich to develop a strong and fair government-to-government relationship based on respect, cooperation, and partnership to address shared interests and priorities. The memorandum built on the rich dialogue that took place during the Cordova Bay local area planning process and addresses core themes, including parks management, economic development opportunities, and environmental concerns.

Goal 4: Monitor and innovate to achieve our urban forest vision

Monitoring progress will let us celebrate successes, learn from failures, and adapt to change.

Kelowna needs to track its assets and programs to enable adaptive management of the urban forest. The urban forest changes over time in response to management, factors in the environment, climate change, and the growth of the city. Keeping abreast of change means investing in how records are kept, how data is linked to other data, and how new information is incorporated into tree and forest management. Tracking canopy cover is just one part of a successful urban forest monitoring program. Other key indicators of urban forest sustainability include the rate of tree mortality, tree failure, and the status of pests and pathogens.

Since the urban forest responds to environmental stress, the pace of climate change makes it important for the City to trial new approaches to dryland forestry. Excessive drought and heat expands areas with significant annual soil moisture deficits that could pose challenges for various tree species across Kelowna. This includes the city’s valuable natural areas which currently harbour a substantial reserve of urban forest canopy. While the course of ecological change is uncertain, now is the time to organize and experiment. Since the issue is regional, Kelowna should seek to involve other municipalities, regional districts, the Province, and First Nations in a coordinated effort to address the potential loss of trees from drought impacts and other compounding effects.

Strategy 9: Monitor change, report, and adapt management to new information

Kelowna will improve tracking of tree mortality and removal so that it can compare mortality factors across sites and removal rates against the rate of replacement. A monitoring framework for the city is based on annual reporting on tree mortality, replacement ratios, and classes of forest pest and pathogen plus five-year monitoring of the urban forest canopy using LiDAR surveys (or another future accurate technology). The City’s data can be displayed through an online urban forest dashboard that brings together inventory and monitoring data for the public while offering back-end tools to urban forest managers that can connect the monitoring program to operational planning and budgeting.

Strategy 10: Trial innovative approaches to dryland urban forestry

Kelowna will explore ways to promote urban forest health in dry environments, including through selection of drought-adapted species and stock selection, installation of novel green infrastructure that conserves soil moisture like tree cocoons or bioinfiltration tree pits, and consider regulatory approaches to incentivize better water management like stormwater utility tax credits for tree canopy or carbon offsets that could be used to support tree planting and preservation. The City will also monitor outcomes from novel approaches and collaborate with the regional community to encourage knowledge sharing about successes and failures.

Case study: Green Infrastructure technologies for water conservation

The changing climate and densification of urban environments have necessitated new methods for planting trees and providing adequate growing space. Green infrastructure techniques can facilitate tree growth in urban areas, and they require low maintenance and are self-sustaining. Examples of green infrastructure for trees include the use of structural soils, bioswales, soil cells, and stormwater retention ponds or tanks. Structural soils, a mix of mineral and organic matter, allow for root growth while meeting engineering requirements. Soil cells, consisting of a modular system of “cells” filled with soil and placed under pavement, are deployed in higher-density areas to reduce soil compaction and increase soil volume for trees that are otherwise very limited. Bioswales and stormwater retention facilities can be incorporated into street design for passive irrigation and other ecosystem benefits like stormwater filtration. Bio-infiltration tree pits are compact bioretention systems that capture and filter the first flush of stormwater runoff with soil media within the tree pits, before releasing it into the sewer system. In some cases, multiple green infrastructure designs can be combined for optimal results. For example, the City of Stockholm has developed several models that integrate structural soil, biochar macadam, and rainwater gutter with aeration well that allows stormwater and gas exchange for improved tree health and stormwater management outcomes.

Case study: Soil amendments, biochar, & carbon

Soil amendments include conventional organic and inorganic fertilizers and mulches, as well as emerging applications like soil bacteria, mycorrhizal fungi inocula, and biochar. These amendments improve soil aeration, nutrients, and moisture retention. Soil amendments are being increasingly tested for their effectiveness. In Ontario, the City of Burlington is testing whether fungal and bacterial soil additives can improve transplant health. Other experiments have demonstrated good tree growth and long-term carbon sequestration benefits with the use of biochar. An increasing number of cities are implementing soil amendments for tree and plant health. For example, the City of Stockholm has introduced “Stockholm Model” planting bed designs that integrate the use of locally produced biochar to improve the growing space for trees.

9 ACTION & MONITORING PLANS

The Action Plan sets a 10-year road map for Kelowna's urban forest, identifying when work should start on each Action. The plan also assigns responsibility, estimated cost or budget impact, ease of implementation, and – importantly – the level of impact the action has on meeting its overall goal. The Monitoring Plan identifies performance indicators to track implementation progress.

9.1 Action Plan

The Action Plan includes 64 actions in total, 32 of which can be implemented using existing resources. It recommends the implementation of 25 actions in the short-term, 16 in the medium-term, and 9 in the long-term, while 14 actions will need to be ongoing during the Strategy's implementation.

Timeframe:

- Ongoing: actions that need to be addressed throughout the life of the plan
- Short 1-3 years – Implementation high impact, low cost
- Moderate 4-6 years – Implementation high impact, moderate cost
- Long – Implementation moderate impact or difficult to do, or can wait relative to other priorities

Responsibility:

- List of department(s) responsible for implementation

Cost:

- \$ - In staff time or already budgeted through another process
- \$\$ - <\$20,000
- \$\$\$ - \$20 - \$100,000
- \$\$\$\$ - > \$100,000 or new staff

Ease of doing:

- **Easy** – Change can be made by staff in one department, or would be part of a planned update process, or only involves exploring options
- **Moderate** – Change can be made with some support from other departments, is a moderate departure from current practice, and may require Council approval
- **Difficult** – Change requires extensive collaboration with other departments, would be a significant departure from current practice, and may require Council approval
- Dependency – will get implemented with another task

Impact on goal:

- **High** – Goal cannot be achieved without this action
- **Moderate** – Goal would be harder to achieve without this action
- **Low** – Is worth doing but goal could largely be achieved without the action

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1-3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
Strategy 1: Strengthen policy, planning and implementation to protect, connect and expand tree canopy					
1. Require no-disturbance covenants (including tree covenants) to be submitted in a GIS file format, in order to have an inventory of the location of covenant areas.	Short	Information Services Development Planning	High	Easy	\$
2. Coordinate implementation of the SUFS with other related strategies such as the Climate Resilient Kelowna Strategy, Water Security and Responsibility Plan, Parks Master Plan, etc.	Ongoing	Parks Services Parks Planning Utility Services Climate Action & Environmental Stewardship	High	Moderate	\$
3. Revise canopy cover targets in the OCP, informed by the SUFS, to reflect goals for each Growth Strategy District due to the diverse challenges and opportunities in each.	Short	Parks Services Long Range Planning	High	Moderate	\$
4. Update the Zoning Bylaw 12375 to increase landscape island areas in parking lots to support sufficient tree soil volumes and assess impact of Zoning Bylaw changes for tree planting requirements to determine if minimum tree requirements can be increased for parking lots.	Short	Development Planning	High	Moderate	\$
5. Delegate minor variances to staff if mature on-site trees are being retained and covenanted. (Example: City of North Van Minor development variance permit).	Short	Development Planning	High	Moderate	\$
6. Develop a terms of reference for landscape plans to ensure tree protection areas and surveyed tree locations are included. ToR should also require identification of any public trees within 15 meters of the property line that will invoke Municipal Properties Tree Bylaw 8042.	Short	Development Planning	High	Moderate	\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
<p>7. Update Subdivision and Servicing Bylaw 7900, to:</p> <ul style="list-style-type: none"> a. Have soil volumes consistent with the Zoning Bylaw. b. Reinforce standard drawings for road cross-sections to separate trees and utility infrastructure, including standards where pavement/parking is reduced as necessary to support tree planting. c. Establish minimum boulevard soil volumes such as the following examples (unless using suspended pavement). <ul style="list-style-type: none"> • 1.5 m width for small trees on 8 m spacing (12m³ soil in a trench). • 1.8 m width for medium trees on 10 m spacing (18m³ soil in a trench). • 2.0 m width for larger trees on 12-15 m spacing (25 - 30 m³ soil in a trench). d. Reference a City tree planting, watering, and maintenance manual to ensure the right tree in the right place (see action 15). Examples include: Campbell River structural soil breakout, soil channel standard, RDNO standards, Surrey road sections. e. Consider requiring that any new installations of trees and tree friendly infrastructure (e.g. soil cells, pervious pavement, etc.) on public land be inventoried and uploaded into the City's GIS systems. 	Short	Bylaw 7900 Working Group Development Engineering Development Planning Parks Services Integrated Transportation and Information Services	High	Moderate	\$
<p>8. Establish an interdepartmental referral process to ensure that permit applications and capital infrastructure projects that could impact City trees or provide opportunities to expand tree canopy coverage are circulated to Urban Forestry in the initial planning & design stages to adhere to the following sequence of management actions for tree loss: avoid, mitigate, then compensate.</p>	Short	Development Planning Parks Services Infrastructure Delivery Infrastructure Operations Integrated Transportation Utility Services	High	Moderate	\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
9. Establish an inter-departmental working group to meet regularly to discuss progress and barriers to implementing the strategy, and explore opportunities to integrate implementation with other programs.	Short	Parks Services	High	Moderate	\$
10. Update Tree Protection Bylaw 8041 to: a. Expand the protected trees definition to include retained trees identified in a Development Permit. b. Update the hazardous tree definitions to be consistent with TRAQ (as per the International Society of Arboriculture).	Medium	Development Planning Climate Action & Environmental Stewardship	High	Moderate	\$\$
11. Investigate opportunities to collaborate with other organizations on the development and implementation of a natural environment management strategy to inform natural asset policy, future natural area land acquisitions, and updates to land use planning tools (e.g. covenant policy for environmentally sensitive areas (ESAs), riparian management area (RMA) widths, etc.).	Long	Capital Planning & Asset Management Climate Action & Environment Development Planning Parks Services	High	Moderate	\$\$\$
12. Update the Municipal Properties Tree Bylaw 8042 to include an equitable compensation approach for natural areas based on OCP Policy 14.5.7 no net loss of terrestrial habitat (example: Guelph tree technical manual Section 5).	Short	Parks Services	High	Moderate	\$\$\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1-3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
<p>13. Develop guidelines to support good planting practices and site design through a Landscape Plan Terms of Reference including:</p> <ul style="list-style-type: none"> a. Tree guidelines to clarify soil depths, proper installation and maintenance (example: Guelph tree technical manual Section 7). b. Tree protection plan for any trees to be retained. c. Tree protection guidelines for qualified professionals developing Tree Protection Plans that describe how to work around trees and what is needed in an arborist report and tree protection plan (example: Guelph tree technical manual Section 4). d. Guidelines for the use of suspended pavement systems (e.g., soil cells) to hold soil volume when open landscape areas are not large enough to hold the soil volume required per tree. e. Requiring a landscaping design that is climate resilient, FireSmart and biodiversity friendly. 	Short	Development Planning Parks Services Climate Action & Environmental Stewardship	Moderate	Easy	\$\$\$
<p>14. Amend the Institutional Development Permit Guidelines to strengthen the role of institutional lands as a leader in tree canopy expansion.</p>	Medium	Development Planning Parks Services Long Range Planning Climate Action & Environmental Stewardship	Moderate	Moderate	\$\$
<p>15. Develop a tree planting, watering, and maintenance manual that references City of Kelowna's Urban Tree Guide to support the right tree in the right place.</p>	Short	Bylaw 7900 working group Development Engineering Development Planning Parks Services	Moderate	Moderate	\$\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1-3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
16. Develop a Landscape Standards Bylaw coordinated with Bylaw 7900 and Zoning Bylaw Landscape Requirements to support enforcement of the tree planting, watering and maintenance manual.	Short	Bylaw 7900 working group Development Engineering Development Planning Parks Services	Moderate	Moderate	\$\$
17. Consider expanding Tree Protection Bylaw 8041 to require a permit for tree removal outside of natural environment areas and/or those trees identified in a development permit as a way of tracking the rate of removals on private land. Consider automatic approvals, automated systems and new tree incentives to streamline the process.	Long	Development Planning Parks Services Climate Action & Environmental Stewardship	Moderate	Moderate	\$\$\$
Strategy 2: Expand the urban forest equitably in urban and core areas					
18. For public areas, identify, prioritize and plant locations with: <ul style="list-style-type: none"> a. Low tree equity (as per Figure 18 and 19). b. 'Vacant' boulevard planting sites. c. Locations to retrofit trees or pervious surfaces into under used or redundant streets. d. Trees in poor condition that will require replacement in the next 10 years. e. Park or open space locations for additional landscape tree planting. f. Project sponsorship or neighbourhood participation. g. Restoration of natural areas. 	Ongoing	Parks Services Integrated Transportation	High	Easy	\$
19. Through urban centre and/or neighbourhood planning processes, require trees to be included as a requirement in the plans to improve tree canopy coverage in high vulnerability and low tree equity areas as identified in Figure 18 and Figure 19.	Ongoing	Long Range Planning Parks Services Climate Action & Environmental Stewardship	High	Easy	\$
20. Expand existing annual tree planting program by developing a 10-year urban tree planting strategy for priority planting areas (as identified in Action 18), funded in part from the Tree Reserve Fund.	Short	Parks Services	High	Moderate	\$\$\$\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
21. Formalize and expand the City's partnership tree program whereby residents of existing homes can request a City tree be planted in front of their property (if conditions are suitable), in exchange for input on species choice and watering support.	Short	Parks Services	Moderate	Easy	\$\$
22. Pursue funding opportunities through the capital budgeting process or external grant programs as they become available to fund street tree planting and maintenance in urban centres and the Core Area. Prioritize funding for trees in low equity parts of these areas as defined by Figure 18 and 19.	Ongoing	Capital Planning & Asset Management Partnership Office Parks Services Climate Action and Environmental Stewardship	Moderate	Moderate	\$
23. Expand the NeighbourWoods program to: a. Have more trees offered b. Target high vulnerability and low equity areas as outlined on Figure 18 and Figure 19. c. Investigate partnerships on institutional, commercial, industrial and multi-family properties and/or with other community organizations.	Short	Parks Services Communications	Moderate	Moderate	\$\$
Strategy 3: Improve the quality and suitability of trees being planted for the site and climate requirements					
24. Continue to update the City of Kelowna's Urban Tree Selection list to reflect current climate adaptation considerations, cultural and/or environmental factors.	Short	Parks Services	High	Easy	\$
25. Expand the City's bareroot nursery to improve establishment success, stock quality and reduce costs.	Short	Parks Services	High	Easy	\$\$

Goal 1: Protect, connect and expand the urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
26. Explore approaches to procuring tree planting stock that would enable the City to influence the species, genetic material, quality, and suitability for Kelowna's future climate, including regional buying groups or entering a services agreement with a local nursery for a longer timeframe (e.g. five years).	Short	Parks Services	High	Moderate	\$
Goal 2: Maintain a healthy, safe and viable urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
Strategy 4: Clarify City procedures and standards to improve efficiency and manage risk					
27. Develop a standard operating procedures document and distribute to City departments and affected organizations (e.g. Fortis) to create a common response to infrastructure conflicts, risk inspection, storm response, biomass utilization, etc.	Short	Parks Services	High	Moderate	\$
28. Formalize, update and implement public lands tree risk management policies to establish inspection guidelines, mitigation thresholds and actions, and responsibilities for tree risk assessments.	Short	Parks Services Risk Management	High	Moderate	\$
29. Continue and expand wildfire fuel mitigation in public spaces as outlined in the Community Wildfire Resiliency Plan to reduce wildfire risk as well as improve forest health.	Ongoing	Parks Service	Moderate	Easy	\$\$\$\$
Strategy 5: Transition from reactive to proactive maintenance of City trees					
30. Review levels of service for urban tree assets, including shifting to a 5-year tree pruning and inventory update cycle for inventoried street trees and a 10-year cycle for landscaped park trees, or a higher frequency where areas or species require regular clearance pruning.	Medium	Capital Planning & Asset Management Parks Services	High	Easy	\$\$\$

Goal 2: Maintain a healthy, safe and viable urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
31. Review operational practices and recommend changes to maximize tree life expectancy, minimize maintenance requirements, and reduce the carbon footprint of urban forest operations (e.g., opportunities to reduce mowing, correct planting practices, increasing soil depth, or unnecessary tree staking etc.).	Medium	Parks Services	High	Moderate	\$
32. Establish average life expectancies for urban tree assets (residential street trees, urban centre street trees, park trees etc) to inform life cycle costing and replacement schedules for asset management planning.	Medium	Capital Planning & Asset Management Parks Services	High	Moderate	\$
33. Integrate field-based urban tree inventory and work order systems into asset management to track lifecycle costs, service levels, renewal timeframes, and vulnerabilities to better inform urban forest management budgeting and decision-making.	Medium	Capital Planning & Asset Management Parks Services	High	Moderate	\$\$\$
34. Develop an urban wood utilization plan* that defines the best utilization of urban wood categories and develops a process for wood utilization that supports carbon storage by directing waste wood to its highest and best use.	Long	Parks Services Climate Action & Environmental Stewardship Solid Waste	Moderate	Moderate	\$\$\$
Strategy 6: Ensure resourcing is sufficient to deliver levels of service that maximize urban forest benefits					
35. Update the tree reserve fund policy to support a wider range of tree planting and supportive tree activities .	Short	Financial Services Parks Services	High	Easy	\$

* An urban wood utilization plan is a strategy to manage and maximize the use of wood from urban trees that have been removed due to reasons such as storm damage, disease, or old age. The plan focuses on promoting sustainable practices for the collection, processing, and utilization of urban wood to maximize its value and minimize waste and store the carbon for longer. The goal of an urban wood utilization plan is to reduce the amount of wood waste generated from urban tree removals by diverting wood from landfills and promoting the use of wood products in local communities. The plan outlines strategies for salvaging wood, such as milling, drying, and storing, and identifies potential uses for wood products.

Goal 2: Maintain a healthy, safe and viable urban forest	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
36. Develop an annual budget allocation amount per new tree, and per linear kilometer of trail or forest edge, that accounts for the increase in annual maintenance costs and supports desired service levels throughout the asset lifecycle. Review and align current operating budgets to the cost per tree, and prepare contingency budget plans for managing a major pest outbreak or recovery from a natural disturbance event.	Medium	Parks Services Capital Planning & Asset Management Financial Services	High	Moderate	\$
37. Apply for funding for tree planting, such as the 2 Billion Trees Program or other grant programs as they become available to support a stewardship program for more planting on private and public land.	Ongoing	Parks Services Partnership Office	High	Moderate	\$
38. Consider Sustainable Forest Initiative certification through the Urban and Community Standard.	Long	Parks Services	Moderate	Moderate	\$
39. Examining staffing levels and consider hiring new role(s) to: a. Address gaps in capacity to implement the Sustainable Urban Forest Strategy. b. Enforce developer obligations as they relate to landscape and boulevard requirements. c. Employ students and youth over the summer period to provide natural area stewardship capacity, update tree inventory information and complete other projects as needed (consider accessing external funding for student hires).	Ongoing	Development Engineering Development Planning Parks Services	High	Moderate	\$\$\$\$

Goal 3: Involve people and organizations in urban forest management	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
Strategy 7: Improve awareness of and participation in urban forest management					
40. Offer education and stewardship opportunities internally to City staff as a means of increasing their awareness, advocacy, and understanding of urban forestry in their daily work.	Short	Climate Action & Environment Development Planning Parks Services	High	Easy	\$

Goal 3: Involve people and organizations in urban forest management	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
<p>4.1. Develop a communication and engagement plan, and associated resourcing requirements to guide the development of materials and stewardship programming, and include consideration of:</p> <ul style="list-style-type: none"> a. Developing a plan that supports multiple departments’ objectives for public education about urban forestry, wildfire, biodiversity and climate adaptation b. Existing programs that could support implementation, offered by RDCO and non-profit organizations c. Establishing formal partnerships with the stewardship sector and community groups to pursue grants and increase tree planting, tree care and community science activity d. Engaging equity seeking groups to understand barriers and opportunities for accessing urban forest benefits e. Supporting tree planting in neighbourhoods with low tree equity f. Encouraging FireSmart, and planting for biodiversity and climate adaptation g. Engagement with School District 23 to develop urban forest relevant curriculum, and to identify champion teachers and classrooms for future tree planting and natural restoration events h. Annual urban forest walks to improve people’s access to and understanding of Kelowna’s urban and park trees and forests i. Educational materials for the public and local nurseries that direct people to the City’s species selection tools and increase awareness about species to avoid due to invasiveness or forest health concerns such as fireblight, lilac borer and emerald ash borer j. Opportunities for private sector organizations to provide staff or funds for stewardship as part of their corporate social responsibility programs k. Educational materials for property management companies and stratas to aid in the management of larger boulevard landscape areas including trees. Model after other successful City programs to protect public infrastructure, such as Cross Connection Control annual notifications. 	<p>Medium</p>	<p>Climate Action & Environment Communications Parks Services Utility Services Kelowna Fire Department</p>	<p>High</p>	<p>Easy</p>	<p>\$\$\$</p>

Goal 3: Involve people and organizations in urban forest management	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
42. Explore the potential for the City to provide water incentives or grants to residents who plant and maintain trees on private land, or who offer to water a 'partnership tree' in the boulevard for the first three years.	Long	Financial Services Parks Services Climate Action & Environmental Stewardship Partnership Office Utility Services	High	Moderate	\$\$\$
43. Pursue and maintain Tree Cities of the World status.	Long	Parks Services	Moderate	Easy	\$
44. When offering Qualified Water Efficient Landscaper (QWEL) courses integrate information on Kelowna's tree bylaws, tree protection standards, FireSmart, and best practices for urban forest management into training.	Medium	Climate Action & Environmental Stewardship Parks Services Utility Services Kelowna Fire Department	Moderate	Easy	\$
45. Update the City's website to include information about the implementation of the Sustainable Urban Forest Strategy update.	Short	Communications Parks Services Climate Action & Environmental Stewardship	Moderate	Easy	\$
46. Develop a regional network of urban forestry professionals including municipal staff, nurseries, consulting professionals and academics to share knowledge and work together to solve key issues, such as limitations in nursery stock or emerging forest health concerns.	Short	Parks Services	Moderate	Easy	\$
47. Establish working relationship with the Ministry of Transportation to increase tree planting in highway corridors.	Ongoing	Integrated Transportation Parks Services Roadways	Moderate	Moderate	\$

Goal 3: Involve people and organizations in urban forest management	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
48. Increase engagement with Interior Health, School District 23, UBC Okanagan, FortisBC and other organizations for maintenance (e.g. pruning standards), protection and enhancement of Kelowna's urban forest canopy.	Ongoing	Development Engineering Development Planning Parks Services Climate Action & Environmental Stewardship	Moderate	Moderate	\$
49. Investigate options to require Qualified Water Efficient Landscaper (QWEL) certification for business licensing of tree services, landscaping, and irrigation companies.	Medium	Business Licensing Development Planning Climate Action & Environmental Stewardship	Moderate	Moderate	\$\$\$
50. Explore the potential for the City to fund grants to support maintenance of large, mature trees on private property.	Long	Financial Services Parks Services Climate Action & Environmental Stewardship Partnership Office	Moderate	Moderate	\$\$\$
Strategy 8: Build relationships with syilx/Okanagan communities, First Nations Governments and Indigenous peoples through urban forest management					
51. Engage and/or partner with the syilx/Okanagan people to: a. Develop species lists and/or planting sites that are culturally appropriate and consider climate adaptation b. Work towards respecting Indigenous knowledge and practices in urban forest programs, policy and operations	Ongoing	Cultural Services Parks Services Climate Action & Environmental Stewardship	High	Moderate	\$\$\$

Goal 4: Monitor and innovate to achieve our urban forest vision	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
Strategy 9: Monitor change, report and adapt management to new information					
52. Continue to monitor the urban forest for different classes of pests and pathogens and update the City's Integrated Pest Management Plan as needed to respond to emerging pests and pathogens in a timely manner.	Ongoing	Parks Services	High	Easy	\$
53. Monitor City tree mortality and failure rates, and where there are repeat issues develop management responses.	Ongoing	Parks Services	High	Easy	\$\$
54. Explore partnering with Okanagan College, UBCO and other post-secondary institutions to open opportunities for applied internships, summer student positions, or limited student research projects to support stewardship and monitoring including: <ul style="list-style-type: none"> a. Assessing NeighbourWoods planting and survival b. Assessing private landscape (visible from street) permit outcomes for planting and survival c. Creating and updating inventories d. Restoration areas weeding, planting and watering e. Supporting stewardship programming and outreach 	Short	Parks Services	High	Easy	\$\$
55. Reassess canopy cover every two to five years using LiDAR or other accurate methods as technology advances. Examine canopy cover on private versus public lands to evaluate the need for more stringent regulations for tree removals.	Ongoing	Parks Services	High	Easy	\$\$\$
56. Develop an internal automated urban forest dashboard to track City metrics such as new and replacement tree planting rates, tree removals, trees pruned, tree permits issued, service request volume and response times, and operational costs.	Medium	Information Services Parks Services	High	Moderate	\$\$
57. At the time of re-assessing canopy coverage (see action 55), update the urban forest report card to evaluate program performance. Investigate options to collaborate with syilx Nation to obtain their perspective and direction on the report card.	Short	Climate Action & Environment Parks Services	High	Moderate	\$
58. Review and update the Sustainable Urban Forest Strategy every 10 years.	Long	Climate Action & Environment Long Range Planning Parks Services	High	Moderate	\$\$\$

Goal 4: Monitor and innovate to achieve our urban forest vision	Timeframe Short 1- 3 yrs Med 4-6 yrs Long 7-10 yrs	Responsibility	Impact on Goal	Ease of Doing	Cost
Strategy 10: Trial innovative approaches to dryland urban forestry					
59. Trial planting smaller stock in boulevards (outside high traffic areas) and compare cost and establishment success relative to planting larger stock.	Medium	Parks Services	High	Easy	\$
60. In partnership with syilx/Okanagan people, regional local governments, land managers, and local nurseries, develop planting trials: a. For native species seedstock originating from similar elevation areas in the Okanagan Valley south of Kelowna and in the Similkameen Valley south of Keremeos, b. Disease and pest resistant cultivars of urban trees, and c. Non-invasive species adapted to warmer, drier climate conditions	Medium	Parks Services	High	Moderate	\$\$
61. Explore the potential for stormwater harvesting and detention on private land (designed to meet source control targets), or in-street/park to be used for landscape irrigation to improve drought resilience, lower vegetation flammability (higher plant/soil moisture content), and reduce demand on potable water, considering whether new approaches can be incorporated in BL 7900 (form a standard) or incentivized to accelerate uptake.	Ongoing	Bylaw 7900 working group Development Engineering Utility Services Climate Action & Environmental Stewardship	High	Moderate	\$\$
62. Trial emerging practices to enhance forests such as planting into biodegradable 'tree cocoons' that retain water, soil amendments such as biochar, and the Miyawaki mini forests method.	Medium	Parks Services	High	Moderate	\$\$\$
63. Trial technologies for passive water infiltration into landscape areas on public land, such as curb cuts, biofiltration tree pits, Stockholm planting beds , trench drains, perforated pipe distribution, in areas that are moisture receiving (e.g, downslope or lowland areas), and monitor outcomes.	Long	Utility Services Park Services Climate Action & Environmental Stewardship	High	Difficult	\$\$\$
64. Continue to explore options to apply regulatory approaches or new tools as they become available, such as stormwater utilities, climate action development permit areas, and carbon offsets, that could be used to provide incentives to plant trees to achieve stormwater and climate action.	Ongoing	Utility Services Climate Action & Environmental Stewardship	Moderate	Easy	\$

9.2 Monitoring Plan

The Sustainable Urban Forest Strategy sets the canopy cover targets for Growth Strategy Districts. Table 8 provides additional performance indicators to guide implementation and help measure progress towards achieving the Strategy's goals.

Table 8. Targets and performance indicators monitoring

Targets + Performance indicators	Measure	Frequency	Method
Targets			
Percent Canopy Cover in Urban Centres	20%	2-5 years	LiDAR tree canopy data
Percent Canopy Cover in Core Area	20%	2-5 years	LiDAR tree canopy data
Percent Canopy Cover in Gateway	15%	2-5 years	LiDAR tree canopy data
Percent Canopy Cover in Suburban	25%	2-5 years	LiDAR tree canopy data
Percent Canopy Cover in Rural	25%	2-5 years	LiDAR tree canopy data
Performance indicators			
Percent canopy cover in equity priority areas	Increasing	2-5 years	LiDAR tree canopy data
New (non-replacement) tree planting annual rate (all programs) 5-year rolling average	3,100+	Annually	Tree planting records (all programs)
Documented replacement ratio for every public and private tree removal (where the bylaw applies)	1:1 or higher	Annually	Tree permit records and tree inventory
Percent of new subsurface green infrastructure inventoried in asset management system and provided a visible marker	100%	Annually	Work history; asset management records
Budget per new tree per linear kilometer of trail or forest edge	Based on service level	Annually	Budget, tree inventory
Young tree mortality (first five years)	<1.5%	Annually	Tree inventory
Pruning cycle: inventoried street trees	5 year cycle	Annually	Tree inventory; work history
Pruning cycle: inventoried park trees	10 year cycle	Annually	Tree inventory; work history
Species diversity ("10-20-30 Rule") for publicly owned trees	No species >10%, No genus >20%, No family >30%	Annually	Tree inventory
Community satisfaction/awareness of urban forestry	>50% satisfied, all services	5 years	Community survey

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