City of Kamloops Urban Forest Management Strategy

October 2016

Canada's Tournament Capital

Our corporate mission is...
MAKING KAMLOOPS SHINE

“The best time to plant a tree was 20 years ago.
The second best time is now.”

– Chinese Proverb

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Acknowledgements

City Staff Steering Committee

Greg Houghton, City Arborist, Project Manager
Shawn Cook, Parks Operations Supervisor
Michael Doll, Parks Planning and Sustainability Supervisor

Consultants

Catherine Berris, Project Leader
Bill Gushue, GIS

We would like to thank City staff from all departments and the many members of the community who provided input to this plan.

URBAN systems

Executive Summary

The first Urban Forest Management Plan (UFMP) in Kamloops was prepared in 1997 by City staff, with input from an Urban Forestry Advisory Committee. That plan, which was updated by staff in 2007, was a first step in providing a framework to enable Kamloops to manage the urban forest. Seven years later, there have been significant advances in the tools used for urban forest management, and there are also heightened concerns about the urban forest in relation to the environment and climate change.

The benefits of urban trees are of increasing interest to the community, and there is extensive literature on the environmental, social, health and economic benefits of trees. These include wildlife habitat, improved air quality, temperature moderation, enhanced psychological well-being, reduced infrastructure and energy costs, and higher property values.

This Urban Forest Management Strategy (UFMS) was prepared with input from City staff from multiple departments, the tree industry, and the public. Input from the public was collected at an open house/ workshop and through a web survey.

Two important principles of the UFMS emerged:

- recognition of the urban forest as a tangible asset, which can improve access to infrastructural funding for urban forestry initiatives
- recognizing the urban forest for its broad benefits, e.g., trees belong to everyone, and more trees can make the climate less arid

The whole City of Kamloops has a tree canopy of 12%. New residential developments have a significantly lower tree canopy than developments that are over 20 years old. The City maintains almost 16,000 trees in parks and on boulevards. There is a significant amount of space available for new trees in the city; however, water is the limiting factor. The tree canopy has significant monetary value as calculated by two different software programs.

The UFMS has three goals that are highly supported by the public:

1. Protect, enhance and expand the urban forest.
2. Develop and maintain strong community understanding of and support for the urban forest.
3. Design and manage the urban forest to maximize the environmental, social, health, and economic benefits.

There are 42 recommendations for achieving these goals, falling within the following topics:

- Tree Canopy Profile in the City
- City Strategies, Bylaws, and Plans
- Communication and Awareness
- Environmental Urban Forest Guidelines
- Tree Planting Practices
- City Trees
- Private Property
- Maintenance of Trees
- Monitoring and Enforcement
- Financing
- Staff Resources and Collaboration
- Next Steps

1.0 Introduction

1.1 Context

The first Urban Forest Management Plan (UFMP) in Kamloops was prepared in 1997 by City staff, with input from an Urban Forestry Advisory Committee. That plan, which was updated by staff in 2007, was a first step in providing a framework to enable Kamloops to manage the urban forest. The UFMP introduced a number of programs, standards and specifications based on arboriculture practices (**Appendix A**). Based on the UFMP, the City established a solid program of urban forest management.

Seven years later, there have been significant advances in the tools used for urban forest management, and there are also heightened concerns about the urban forest in relation to the environment and climate change. Kamloops lost 1,100 pine trees in parks and on boulevards to the pine beetle; thousands of trees were lost throughout the City, many in hillside neighbourhoods. The benefits of urban trees are of increasing interest to the community, and the public has an important role to play in providing input to and implementing the plan.

> ***"Urban forestry is the sustained planning, planting, protection, maintenance, and care of trees, forests, green space and related resources in and around cities and communities for economic, environmental, social and public health benefits."***
>
> ***(Canadian Urban Forest Strategy 2004-2006)***

Green infrastructure – the ecological processes, both natural and engineered, that act as the natural infrastructure. It includes ditches, creeks, wetlands, parks, open space, trees, green roofs, gardens, working lands, aquifers and watersheds that supply drinking water. (From: West Coast Environmental Law Research Foundation)

The urban forest is a key element of green infrastructure. Without a healthy urban forest, Kamloops would not achieve its sustainable goals of environmental integrity, social well-being and economic vibrancy.

Some of the City's key plans establish the context for urban growth and sustainability. The Official Community Plan, referred to as KamPlan (2004), identifies the community's vision and guidelines for future growth and development. The plan is based on a desire for a compact, efficient and sustainable community. The City of Kamloops is projected to grow in population from 85,678 residents recorded in 2011 to 100,000 people by 2024. The growth will be achieved through infill and land use intensification combined with greenfield development on relatively undisturbed sites.

KamPlan is accompanied by the Sustainable Kamloops Plan, which delves into sustainability in more detail, outlining strategies to achieve the City's ambitious greenhouse gas target of an overall reduction of 2007 levels by 40% by the year 2020.

1.2 Project Purpose and Objectives

The purpose of this Urban Forest Management Strategy (UFMS) is to provide a comprehensive set of long-term, goal-oriented objectives and actions, supported by the public, which will enhance the urban forest over time. The UFMS will provide a framework within which planning, design, budget and risk management decisions will be made.

The following were the objectives of the project:

- Review current bylaws and practices for managing the urban forest
- Review urban forestry practices in other communities to identify potential options for strengthening bylaws and practices
- Analyze the tree canopy within the City boundary as a whole, and in distinct areas representative of different land uses and ages of development
- Summarize the strengths and challenges related to existing urban forestry bylaws, practices, and public awareness
- Prepare a draft report with options for consideration
- Finalize the Urban Forest Management Strategy

1.3 Process and Methods

The process of preparing the UFMS involved two rounds of stakeholder input:

- Workshops early in the process (May 2014) with City staff (arborists and staff from multiple departments) and stakeholders (tree industry) on the strengths, challenges and potential options for improving urban forest management in Kamloops
- Workshops (March 2015) to obtain input on a draft report with City staff and stakeholders, and a public open house/workshop and web survey to obtain community input

The tree canopy is the "layer of tree leaves, branches and stems that cover the ground when viewed from above".

The workshops early in the process yielded extensive input that was used to prepare the draft UFMS. The analysis and recommendations were based on that input, combined with technical analysis and review of background information and data from other jurisdictions.

The second phase of input involved workshops with tree industry stakeholders (including tree services, nurseries, and landscape architects), City staff from multiple departments, and the community. Approximately 100 people attended these workshops, which included a presentation of the analysis and draft recommendations, and group discussion. A web survey requesting input on the draft goals and recommendations had 105 respondents, about half of whom completed the entire survey (see **Appendix B**).

The web survey responses showed extremely high support for the draft goals and recommendations in general. Most comments reflected on the benefits and values of trees, and the need for robust policies to protect the City's tree canopy. There were also comments on the survey and in the workshops that expressed hesitation about over-regulating, especially in relation to trees on private property. In the workshops, this led to a discussion about the merits of "regulation" versus "education". A phased approach was suggested, rather than beginning with bold regulations.

The following tools were used to determine the extent of the current tree canopy and characteristics and value of the urban forest.

- ITree was used to analyze the tree canopy over the city as a whole and in neighbourhoods and sample sites, as well as to calculate the potentially plantable area. The US Forest Service software iTree Canopy is designed to accurately estimate tree and other cover classes by randomly selecting points on Google Earth imagery for user classification. To reach the desired level of accuracy (± specified % standard error), the user continues to generate data for these random points until the software indicates the standard error has dropped below the user set threshold. The estimates are statistically valid and correct to the time at which the imagery was taken.

- The City's tree inventory of trees on road boulevards and in parks was used to assess species, age, and the canopy cover contribution of City trees.
- The iTree Canopy tool was also used to calculate the benefits provided by the City's urban trees.

1.4 Geographic Setting

The City of Kamloops is a vibrant community set in the Thompson Valley in British Columbia's Southern Interior Region. The original settlement of Kamloops was located in the valley bottom, at the confluence of the North and South Thompson Rivers, and over time it has expanded to extend up the surrounding hillsides. Elevations within the City boundary range from 340 metres near the river to over 1,100 metres on the hillsides (**Figure 1.1**).

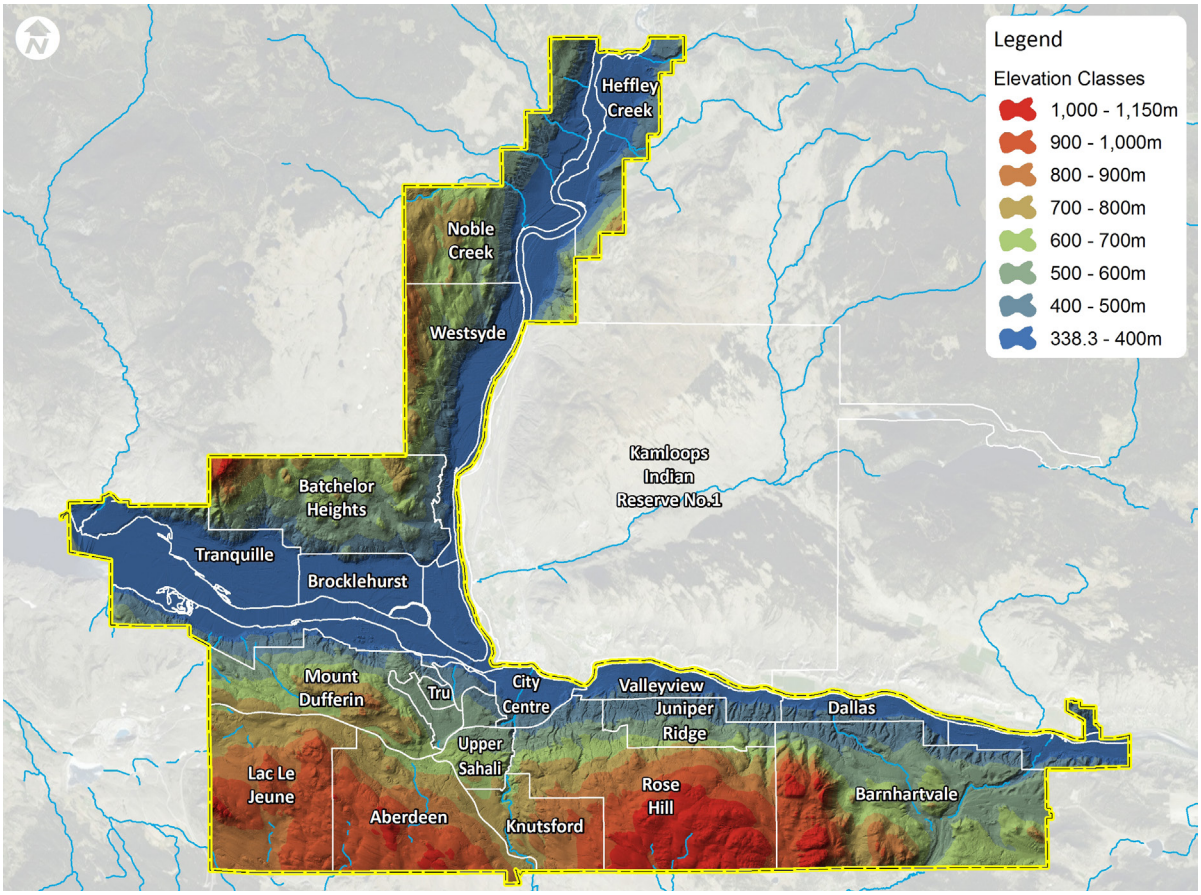


Figure 1.1 Elevation Classes Map
Source: Generated in GIS from Contour Data

The local climate is semi-arid with an average annual precipitation of 217 mm of rain and 75 mm of snow (City of Kamloops web site). Winters are mild and summers are hot and dry. Three of BC's warmest and driest biogeoclimatic zones are found within the City boundary, progressing from the bunch grass zone at lower elevations, through the Ponderosa Pine zone at mid elevations to the Interior Douglas-fir zone at higher elevations and north facing slopes (**Figure 1.2)**.

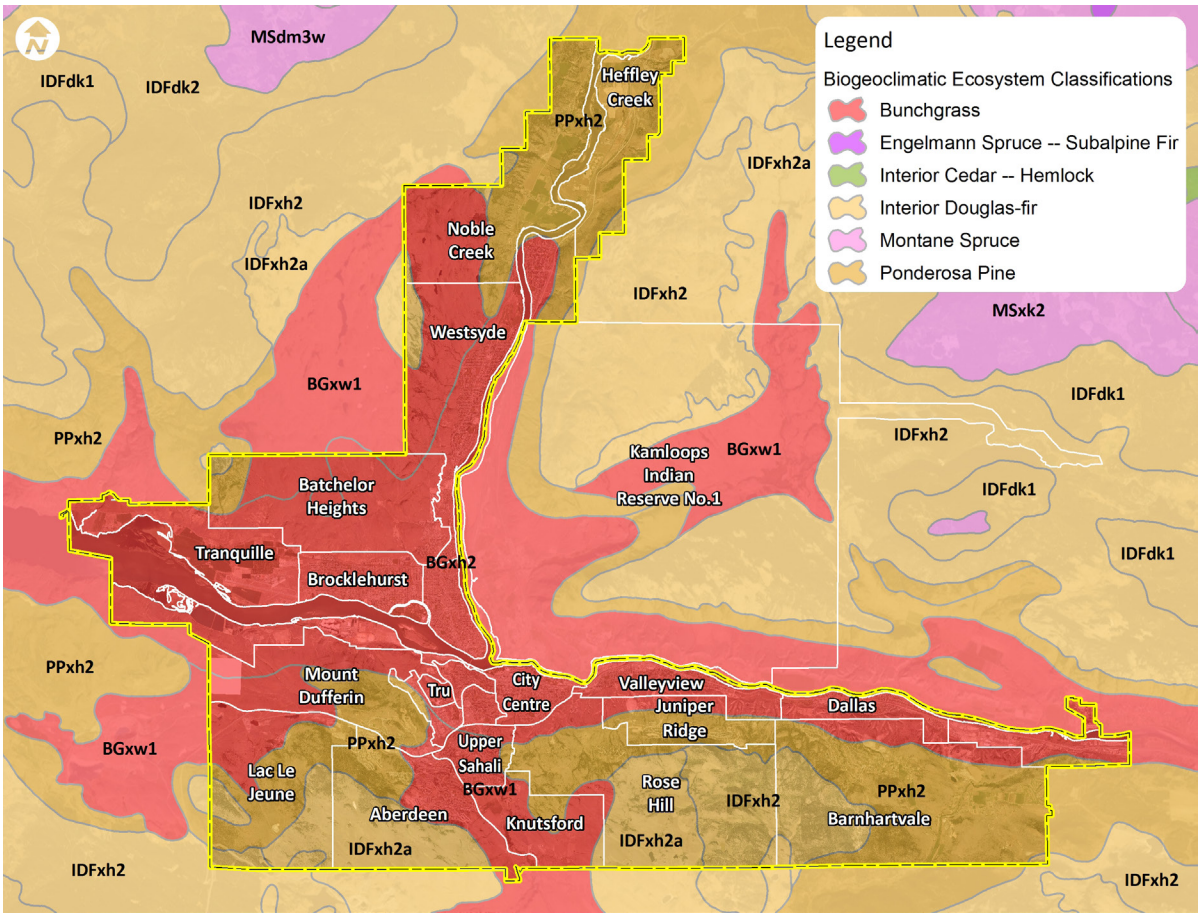


Figure 1.2 Biogeoclimatic Zones Map
Source: Province of BC

Consistent with the variation in elevations, tree hardiness zones in Kamloops range from 3 to 6 (Natural Resources Canada, planthardiness.gc.ca). Naturally occurring tree stands are primarily located in drainage draws and along the river where there is greater access to moisture, and on cooler, north-facing slopes at higher elevations where soil moisture is retained for longer and there is less dessication (evaporation from tree leaves and needles) due to lower temperatures.

"A healthy urban forest is one of the only municipal capital investments that will appreciate in value over time."
1 Source: ICLEI Local Governments for Sustainability

In summary, the biogeoclimatic characteristics of Kamloops are relatively challenging to tree growth, and successful tree establishment is largely dictated by access to sufficient water in the form of soil moisture for root uptake. The selection, siting and survival of trees for urban forestry must be guided by environmental considerations such as soil characteristics, access to water (stormwater, groundwater, and/or irrigation) tree hardiness, and exposure to sun and wind.

1.5 Benefits and Challenges of Urban Trees

Benefits of Trees

Urban forests, in addition to the social and ecological services they provide, are an important tool in reducing greenhouse gas (GHG) emissions in the face of increasing population (Nowak et al. 2013). Trees contribute to the reduction of GHG emissions by reducing energy consumption through passive solar cooling (shade) and by acting as carbon sinks, i.e, storing carbon in woody fibre (Kleerekoper et al. 2012). Protecting and increasing the tree canopy in urban areas and on greenfield sites are important measures that can help to achieve these environmental benefits.

Trees are an indicator of ecological integrity. When trees are large and healthy, they fill important ecological functions and ecosystem services of providing habitat for wildlife, carbon sequestration, micro-climate and hydrological cycle regulation (Ordonez and Duinker 2012). The greater the tree canopy, the more resilient the urban forest ecosystem is towards natural or anthropogenic modifications including climate change (Ordonez and Duinker 2012).

In addition to providing environmental benefits related to water, soil and wildlife, trees absorb carbon and reduce greenhouse gas emissions; this has become one of their most valuable properties in light of global efforts to address climate change. Thriving and well-managed urban forests can also play a significant role in creating livable and sustainable communities that nurture residents and attract and retain businesses. In cities, trees represent one of our primary links to the natural world.

The following lists highlight some of the important environmental, social and economic benefits provided by trees and their associated outcomes:

ENVIRONMENTAL BENEFITS OF TREES

Benefits

- Removal of carbon dioxide and other greenhouse gases from the air
- Mitigation of air, dust, noise, heat and chemical pollution
- Interception of rainwater and reduced runoff
- Increased infiltration in permeable land areas
- Shade for impervious surfaces
- Wildlife corridors and nesting, cover, shelter and food
- Richer ecosystem functions and soil productivity
- Organic products such as fruit, leaves, wood
- Climate change mitigation

Outcomes

- Improved air quality
- Lower levels of pollution
- Improved water quality
- More consistent creek water flows
- Reduced erosion of steep slopes and shorelines
- Increased terrain stability
- Reduction of the “heat island” effect
- Higher biodiversity
- More and healthier wildlife
- Enhanced soil productivity
- Preservation of our natural heritage
- Reduced risk of invasive species
- Fruit for animals and humans, material for wood chips, mulch

SOCIAL AND HEALTH BENEFITS OF TREES

- More desirable environments
- Aesthetics
- Shade and cooling
- Wind diversion and protection
- Reduced exposure of people to UV rays
- Reduced traffic speeds
- Improved air quality (see above)
- Ephemeral qualities
- Support for other vegetation and wildlife
- Reduction of traffic and other noises
- Connections between people and the natural environment
- Performance of design functions – screening, glare reduction
- Heritage

- Higher quality of life
- More social connections
- Sense of place
- More walkable neighbourhoods
- Improved health and physical well-being
- Reduction in skin cancer
- Enhanced psychological well-being
- Reduced stress
- Recreation and education opportunities
- Increased natural sounds
- Stronger sense of community and environmental responsibility
- More comfortable and attractive settings
- Connection with the past

ECONOMIC BENEFITS OF TREES

Benefits

- Attractive and more comfortable commercial areas
- Add aesthetic qualities to property
- Shade and shelter for buildings
- Natural stormwater management
- Green infrastructure
- Improved air quality (see above)
- Shade for paving
- More attractive communities
- Trees with fruits and nuts

Outcomes

- More customers and businesses
- Increased property values
- Reduced energy needs for cooling and heating
- Reduced costs for stormwater treatment and flood control
- Reduced health care costs
- Extended pavement surface life
- Enhanced tourism values
- Urban agriculture opportunity

Challenges Facing Urban Trees

Trees in urban and suburban areas face numerous management challenges. They are exposed to a broad range of human-caused and natural stressors, all of which can be compounded by climate change. The proximity of urban forests to relatively high numbers of people and associated development can considerably increase the level and complexity of the management concerns. These challenges will require adaptive management approaches in the coming decades. The following list identifies some of the most important challenges to tree establishment and their associated outcomes:

CHALLENGES

Stressors

- Expanding development
- Limited soil volumes
- Water shortages
- Salt and chemical exposure
- Soil compaction
- Physical damage from equipment or structures
- Invasive plants
- Vandalism
- Insects and diseases
- Natural catastrophic events such as severe wind, snow, and ice storms
- Air pollution such as ground-level ozone, nitrogen, sulphur dioxide, and hydrogen compounds
- Climate change causing altered and more extreme temperature and precipitation
- Inadequate tree planting methods
- Lack of tree care knowledge
- Substandard tree maintenance and management

Outcomes

- Decreases in forest area
- Increased forest edge mortality
- Fragmentation of forest stands
- Degraded urban forests
- Altered ecosystem structure
- Reduced natural regeneration
- Reduced biodiversity
- Reduced number of trees
- Reduced canopy cover
- Fewer mature trees
- Limited tree growth
- Compromised tree health
- Increased tree hazards
- Inappropriate pruning practices
- Tree mortality
- Reduced ecosystem services
- Use of pesticides
- Poorly pruned trees

Important Principles

Some cities are beginning to recognize and plan urban forests more intensively as green infrastructure and tangible capital assets. Currently, public sector accounting guidelines classify trees along with animals as biological assets, not tangible capital assets. There are several advantages of increasing the asset status of municipal trees that functions as green infrastructure:

- More seamless integration into the City's asset management system
- Better access to infrastructural funding from senior levels of government for urban forestry initiatives
- More effective resource management planning

Two other important principles arose from workshops held during the UFMS process, as follows:

1. Trees belong to everyone. Because of the broad benefits provided by trees to the environment, e.g., to air quality, temperature, and wildlife, it is inappropriate for a property owner to consider that they "own" the trees growing on their land. The more this concept can be appreciated, the easier it will become to manage the urban forest for the benefit of all.

2. More trees can make the climate less arid. Although the semi-arid climate in Kamloops is a limiting factor to the establishment of trees, more trees can change the climate, as can fewer trees. Recognition of this fact can increase the motivation and interest in increasing the tree canopy in the City.

TD Green Streets is the flagship program of Tree Canada and the only nationally-based municipal forestry innovation program. Since 1994, more than 458 municipalities, including Kamloops, have received Green Streets funding. TD Green Streets encourages and supports the adoption of leading-edge practices in municipal forestry including:

- Innovative urban forest planning
- Single tree and forest stand innovation demonstration projects
- Policy and best management practices workshops
- Outreach and educational activities on innovative practices including arboricultural practices
- Innovative management tools to protect and maintain the urban forest
- Innovative urban design which showcases "green infrastructure"
- Innovative planting techniques

TD Green Streets is sponsored by TD Friends of the Environment Foundation.

2.0 Understanding The Urban Forest

2.1 Urban Forest Management

Urban Forest Health

A healthy urban forest has the following characteristics, in addition to an extensive tree canopy:

- a good distribution of age classes so that younger trees are constantly replacing their older counterparts
- species diversity, including diversity in tree size and growth rates to provide a structural mix of both tree sizes and life spans
- healthy trees planted in conditions that will support long-term success

As a tree grows and matures, it requires greater soil volume, nutrients and water to support its life functions. In natural environments, those tree species that are most suited to a site's ecological conditions become established and will compete with other trees for available growing space and resources. The urban environment poses unique challenges for tree establishment. Although the genetic and physical characteristics of a particular species determine a tree's potential size, its growth is often limited by restrictions placed on it by urban infrastructure.

Spaces for productive root growth are limited by underground services (e.g., sewers, gas pipelines) and by very compacted soils. Space above ground may be limited by overhead wires or street lighting requirements. Impervious surfaces— roads, sidewalks and compacted soils—make it hard for water to reach the root system. Trees can be damaged by bikes being chained to them, people carving their initials, mowers bumping them, and inappropriate pruning.

Working to protect the health and longevity of trees is a good investment, as trees that make it to their middle and later years bring greater benefits. It also reduces the need for costly and frequent tree replacement.

A diversity of tree species enhances the resilience of the urban forest and also contributes to the overall biodiversity of the city's landscape. A good guideline is to have no more than 10% of the forest comprised of one species, 20% of one genus, and 30% from one family (Santamour 2002). From a green infrastructure perspective, small ornamental tree species provide significantly less benefit than larger trees in terms of rainwater management, carbon sequestration, climate buffering, energy conservation, and cleansing of air and water resources.

Growing Conditions

Trees require a sufficient volume of healthy soil in order to reach their potential size and lifespan. This can be a challenge in urban environments, where many trees fail to reach a productive size and die prematurely. In these cases, the time and expense associated with planting and tree care is largely wasted. In addition, many benefits are lost if the tree never reaches a mature size. Current best practices for planting trees in urban conditions include the use of engineered planting vaults with large, contiguous volumes of soil, continuous trenching for planting multiple trees in boulevards, use of modular soil cells, and porous pavement. **Figure 2.1** shows the amount of growing medium recommended in relation to tree size. The BC Landscape Standard recommends an area of 100 square metres with a depth of 600 mm of growing medium for a standard tree. Both of these guidelines are based on loam soil with good drainage and adequate rainfall.

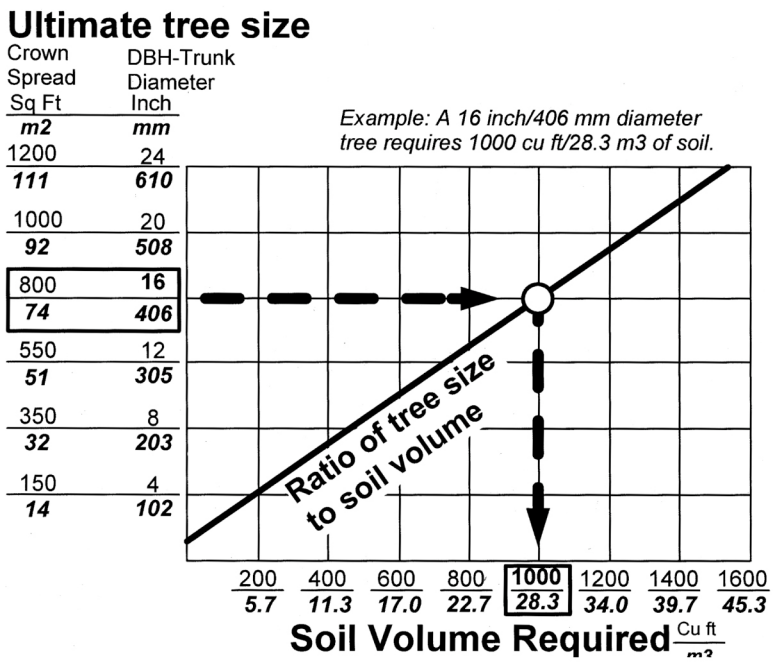


Figure 2.1 Tree Size to Soil Volume Relationships
Source: James Urban, 2008

Climate Change

Changes to local weather patterns associated with climate change have an adverse impact on some trees—particularly those susceptible to drought, higher temperatures or high winds. The following are the potential impacts of climate change in Kamloops, according to the Plan2Adapt website, supplemented with local knowledge:

- increases in temperature
- increase in frost-free days, minor increase in rainfall through more intense storm events, and a significant reduction in snowfall and snow pack leading to a shift in the hydrologic regime
- longer dry season and increased possibility of drought and wildfires
- reduced summer stream flow and lower ground water table
- high probability of flooding , erosion, debris flow and landslides (major rivers to small creeks) during severe rain storm events

This will change the trees species that are adaptable to the climate over time. Enhancing growing sites to retain more soil moisture (such as increasing growing medium volume, enhancing growing medium texture, and mulching) can increase the range of species that can be supported, as can green infrastructure practices, such as rain gardens, bioswales or underground rainwater detention cisterns. Tree selection and pruning for wind tolerance are also adaptive practices.

The challenge is not only how to adapt the urban forest so that it will thrive in future climates, but also how to use the urban forest as a tool in adapting communities to those different climates.

Opportunities include providing greater summer shading (to protect residents from heat and UV light and reduce the heat island effect), and exploiting the potential of the urban forest to enhance rainwater management and reduce the load on City stormwater infrastructure during intense rainstorm events.

The Fraser Basin Council, Government of Canada and Province of BC (2010) published a guide to help B.C. communities to better use the capacity of their urban forests in adapting to climate change. Best practices include the following:

- Placing groves of large-leaved trees and shrubs upwind of heat island areas, so that evapo-transpiration from the vegetation will cool and moisten air that blows into the 'hot spots'
- Planting green roofs and green walls, which help to cool the air through evapo-transpiration of plants
- Shading large areas of asphalt (e.g., parking lots), which reduces polluting emissions from cars, extends the life of the asphalt, and provides a more pleasant environment for parking
- Planting evergreen species where managing stormwater is a prime concern, to maximize water uptake during rains
- Helping water to soak into the ground, through rain gardens (especially with trees) or large planted areas around trees
- Reducing windfall risks by ensuring that trees are windfirm
- Selecting tree species that are adapted to anticipated climate conditions

Balancing Benefits with Water Use in Semi-Arid Regions

In semi-arid climates of western North America, roughly one-third of residential water is consumed outside, most of which is lost to evapotranspiration. A study in Los Angeles found that adding trees to turfgrass lawns reduced water demand from irrigation (Litvask et al. 2014). Adding tree structure acts as a mechanism to reduce evapotranspiration losses from incoming solar radiation and wind. In experimental testing, turfgrass under trees had the lowest surface temperatures and was the most beneficial for surface cooling when compared with unshaded turfgrass, turfgrass shaded by fabric mesh, and concrete under trees. Trees do not require additional irrigation when planted on adequately watered turfgrass. Furthermore, trees are less susceptible to seasonal water stress since they are more efficient at accessing runoff and groundwater than turfgrass.

Pests and Diseases

Globalization and climate change increase the risk of potentially catastrophic outbreaks of exotic pests and diseases (Anderson et al. 2004). Early Detection and Rapid Response (EDRR) protocols, Integrated Pest Management (IPM), and networking with risk management agencies are the primary management tools. Some of the most common pests in Kamloops include aphids, leafrollers, cherry fruit flies, tent caterpillars and fall webworms, tomato hornworms, and powdery mildew. Beavers have also posed significant challenges. Management involves monitoring, determine a tolerance level, cultural action, and where necessary, physical and mechanical action, biological and lower-risk control products, and higher-risk chemical control products (City of Kamloops brochure).

Species Selection

Tree species have specific characteristics that make them more or less suitable to particular site conditions in natural and urban areas. Aesthetic appeal has historically been a primary consideration when selecting street trees. Colour, form, canopy size, and year round visual appeal of trees contribute significantly to overall urban design and the livability of our cities.

The physiological requirements of a tree species and the site's ecological conditions are equally important. Trees grow at a relatively slow rate and can live for many decades. There are multiple factors related to the tree and the site that need to be considered when selecting species. The distribution and diversity of species also affect the risk of potential disease and insect outbreaks. Fruit-bearing potential is becoming more important as urban agriculture expands; however, clean-up costs must be evaluated.

Many of the ecological benefits attributed to trees generally correlate with their size. Larger trees intercept more water, sequester more carbon, block more wind and provide more shade.

A tree's ability to adapt to current and changing conditions will determine its long- term viability on a site, in addition to influencing the type of management actions required to maintain it. Hardy tree species that are able to withstand the unique conditions found within the city (exposure to pollution, vehicles, confined growing spaces, etc.) will generally be more resilient over time. This reduces costs associated with maintenance and replacement of trees. Selecting tree species that can respond positively to future climate change is also advantageous.

Asgarzadeh et al. (2014) suggest that urban forest planners should select tree species based on parameters unique to their community. For example, in Salt Lake City, Utah trees are selected based on parameters of drought resistance, as well as tolerance to freezing, soil alkalinity, and local disease. In semi-arid climates with challenging environmental limitations, local tree species can significantly contribute to the success of a project.

Conflicts within Road Rights-of-Way

Road rights-of-way accommodate an abundance of infrastructure, above and below ground, such as roads and sidewalks, curbs and gutters, stormwater and sewer infrastructure, underground utilities (including water, hydro, cable, telephone, fibre-optics, and natural gas), street furniture (benches, bike racks, planters), street lighting and traffic lights, overhead power lines, and trees, turf and associated irrigation. Boulevard trees sometimes conflict with this infrastructure.

Maintaining, replacing or adding new services or infrastructure to these boulevard environments, once trees have matured, is a complex, delicate and often expensive procedure. In addition, catch basins, sight lines, sidewalks and driveway let-downs must be maintained from the impacts of tree roots and litter. In times of heavy rainfall, blocked drains can result in water that backs up, flooding roads or even basements. Tree roots can grow into sewer and storm drains, cracking pipes and requiring costly replacement. Roots can lift and damage sidewalks, making travel harder for people with mobility challenges and incurring cost to repair and replace the damage.

These conflicts with trees represent a significant operational and budgetary challenge for City staff. While these conflicts may never be resolved entirely, there are opportunities to reduce the conflicts during planning, design, construction and maintenance stages.

Public Safety

Trees can have impacts on public safety as a result of hazardous trees. Poorly lit, densely vegetated areas can also be a concern if they encroach too close to or block sightlines to residences, pathways, playgrounds or other public and private areas where security of person and property is a concern. Crime Prevention Through Environmental Design (CPTED) guidelines can assist communities in reducing these risks. If overdone, however, the landscape can become denuded or unnecessarily sterilized. Best practices to retain trees and promote safety include the following:

- Provide a visual separation between a low shrub or groundcover layer and the bottom tier of tree branches
- Set heavily vegetated areas back from buildings
- Install adequate landscape lighting along major paths
- Manage and prune vegetation on a regular cycle

Private Nuisances Associated with Trees

Some trees can be a nuisance to residents. They may block views, drip sap onto vehicles, damage sidewalks and driveways, encroach onto buildings, drop needles into air conditioning units and pools, and cause a mess when fruit or leaves clog drains. They may also block sunlight, limiting opportunities for solar panels or growing flower or vegetable gardens. In some cases, unresolved nuisances can lead to disputes between neighbours, or between residents and the City. In most cases, good judgement and knowledge can help to resolve tree conflicts. Kamloops' bylaws prohibit public tree removal based on perceptions of nuisance.

Invasive Plants

Invasive species are another threat to natural areas and biodiversity management within the City. Invasive plants are often the first to colonize disturbed areas following wildfire or human disturbance associated with development. Invasive plants can out-compete native vegetation and have a significant detrimental effect on efforts to reforest plantable space. In Kamloops, several species of trees are considered invasive; these include Tree of Heaven (Ailanthus altissima), Siberian Elm (Ulmus pumila), Russian Olive (Elaeagus angustolia), Manitoba Maple (Acer negundo), and Black Locust (Robinia pseudoacacia).

It is important that the public, the development industry and the tree industry are aware of the unique invasive plant challenges in Kamloops so they can participate in prevention, eradication and control of these species. The situation here is different from many other communities where invasive weeds pose the greatest challenges.

Maintenance

The unique conditions and values associated with the urban environment require that trees be managed throughout all of their life stages, which can be expensive. This expense can be significantly reduced by fostering healthy trees with sound architecture when they are smaller and relatively inexpensive to maintain. Long term and regular maintenance will improve tree health and reduce mortality rates.

These measures can also serve to protect public safety and prevent damage to infrastructure, buildings, vehicles and other values associated with urban streetscapes. Street trees generally require more intensive management due to their proximity to roads, buildings and other infrastructure such as utility lines. Street trees also suffer significantly more damage and mortality, and therefore require more maintenance and replacement.

Park trees often have high aesthetic, cultural or historic values and require sensitivity to these values. Trees in natural areas generally do not require the same level of maintenance due to reduced exposure to human agents and isolation from infrastructure.

Tree maintenance practices include the following general tasks:

- Monitoring and assessment of tree health
- Tree protection
- Tree removals, replacement and succession planting
- Pest and disease control
- Hazard tree and risk assessment
- Tree risk abatement
- Pruning, watering and weeding
- Growing medium management
- Infrastructure design
- Recycling of organic debris

Greenwaste pickup is also an important element of tree care and management, particularly where there are proposals for a substantial increase in the number of trees within the City. There is limited organic waste collection in the City now.

Collaboration

Collaborative efforts among adjacent municipalities and regional groups can greatly enhance urban forest management. Stakeholders include adjacent jurisdictions, the Thompson Nicola Regional District, Thompson River First Nations, senior levels of government (forestry, environment, resource management, planning), the Invasive Plant Council of BC, Canadian Food Inspection Agency, water irrigation and improvement districts, and Thompson River watershed groups.
The Integrated Pest Management Council of Canada currently provides an Integrated Pest Management Accreditation Program in Ontario for golf courses and the public works sector. This type of accreditation could be replicated in BC and would help to better address the Douglas-fir tussock moth and other plant health care issues currently affecting the urban forests of Kamloops.

Tree Industry

The tree industry includes plant nurseries, garden centres, arborists, foresters, tree workers, landscape architects, landscape designers and similar ventures. In certain jurisdictions municipalities have moved toward creating and maintaining lists of professional service providers that meet or exceed a set of minimum standards such as the following:

- Commercial, general liability insurance
- Errors and omissions insurance
- Current business license
- Proven track record of reports and submissions meeting or exceeding City requirements
- Professional membership/certification and in good standing with professional association/accrediting body
- WorkSafe BC coverage/Safe Certified

Some cities also work with umbrella organizations for each industry sector (such as the International Society of Arboriculture - ISA, BC Landscape and Nursery Association - BCLNA) to encourage their local members to train their staff and adhere to industry standards and best management practices. City staff can facilitate this process by hosting education sessions for tree industry professionals and also by further developing standards related to landscape design and construction.

2.2 *The Urban Forest in Kamloops*

Tree Canopy – All Trees

The tree canopy was analyzed in a number of different ways. The first analysis is a comparison of the tree canopy for the whole city and the tree canopy for the developed portion of the city (**Figure 2.2**). The whole city, including natural areas, has a tree canopy of 12%. The developed portion of the city has a tree canopy of 11.6%. This illustrates that the urban tree canopy is only slightly less than the tree canopy for this area in its relatively natural, recognizing that the tree canopy has declined significantly, especially in the natural area, as a result of the pine beetle.

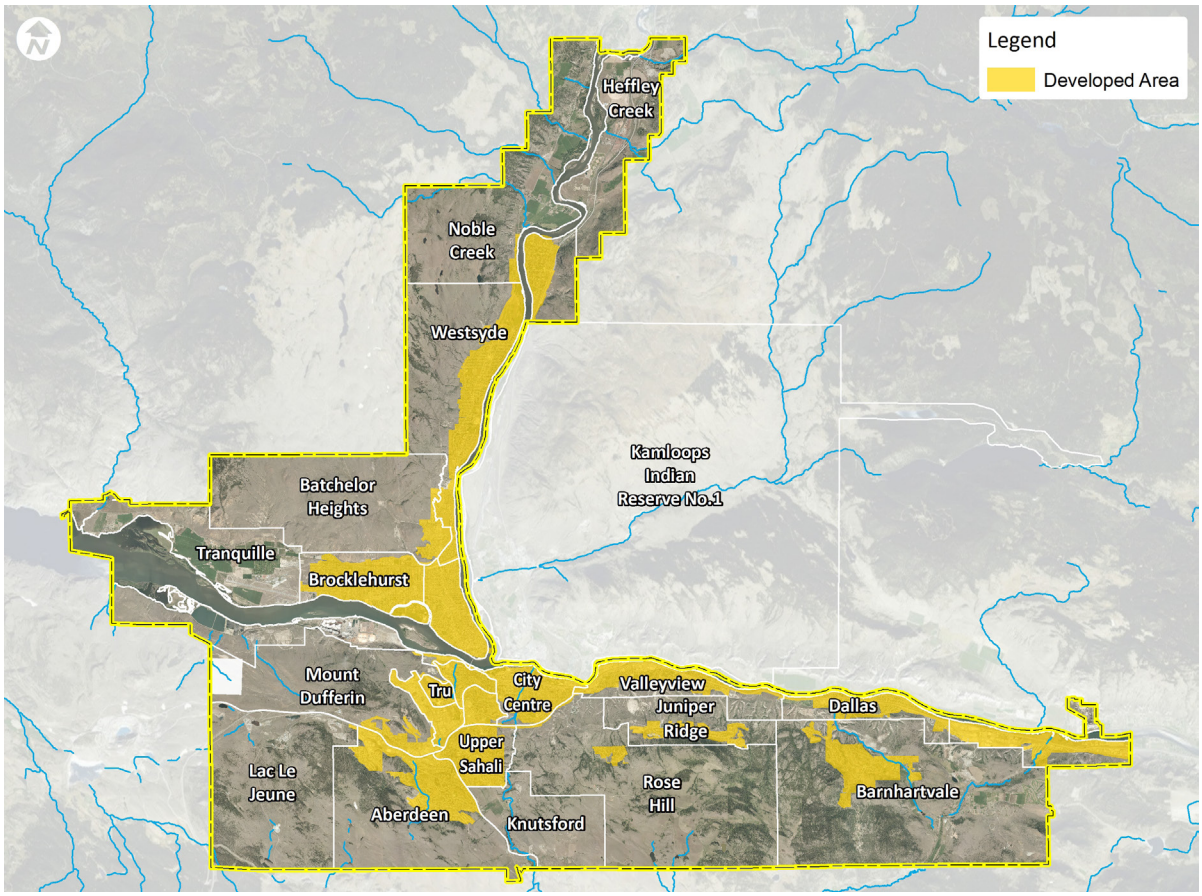


Figure 2.2: Developed Portion of City Map
Source: GIS Cadastral Data and Air Photo Interpretation

Analysis of sample sites was used to identify tree canopy information for different land uses and ages of development. **Appendix C** shows a map and tree canopy data for the sample sites. The sample site data was used to generate the average tree canopy for generalized zoning categories (**Figure 2.3**).

Neighbourhood	General Zoning	Canopy %	Canopy (ha)	Area (ha)	Average Age	Age Code
Juniper Ridge	SF RES	15.8%	4.0	25.5	33	Older
City Centre	TF RES	14.2%	2.4	16.9	38	Older
Juniper Ridge	SF RES	11.9%	3.1	26.2	22	Older
North Shore	TF RES	11.0%	4.7	42.7	45	Older
Juniper Ridge	SF RES	6.6%	1.1	16.9	4	Newer
Aberdeen	MF RES	6.2%	1.1	18.2	19	Newer
City Centre	CBD	4.2%	0.8	19.5	38	Older
Lower Sahali	COMMERCIAL	3.8%	1.2	32.4	22	Older
Mount Dufferin	COMMERCIAL	3.4%	0.6	18.6	14	Newer
Aberdeen	SF RES	3.4%	0.6	18.3	15	Newer
Mount Dufferin	SF RES	2.8%	0.3	8.9	8	Newer
Southgate	INDUSTRIAL	2.2%	1.7	79.1	17	Newer

Figure 2.3: Tree Canopy per Land Use
Source: Analysis of Sample Sites

Key: SF RES (single family residential), TF RES (two family residential), MF RES (multi family residential),CBD (central business district). Age code relates to **Figure 2.4**.

For the land uses where the tree canopy varies with the age of the development, **Figure 2.4** illustrates the variation for single family and multi/two family residential development based on an average of the tree canopy for the relevant sample sites. Newer developments are generally less than 20 years old. The limited space and conditions under which trees are planted suggest that the canopy in new developments will never obtain the coverage of the older neighbourhoods.

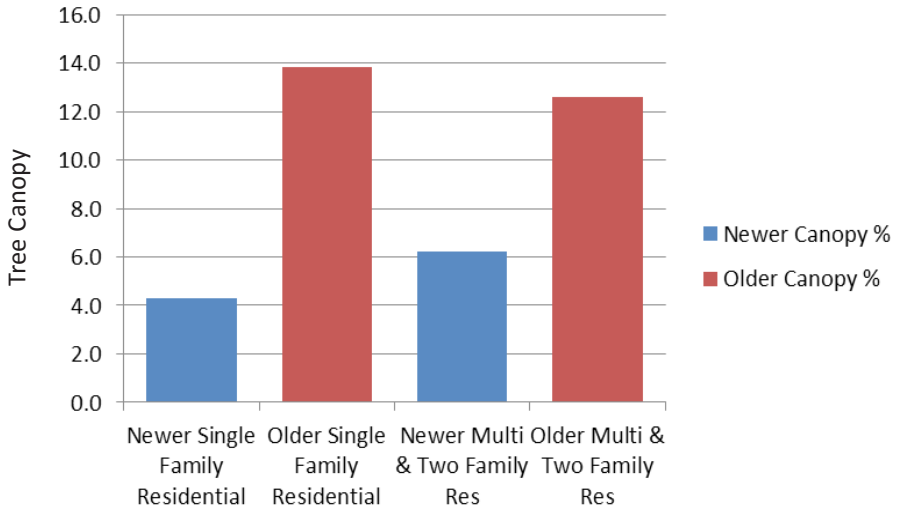


Figure 2.4: Average Tree Canopy per Age of Residential Development
Source: Analysis of Sample Sites

Tree Canopy – City Trees

Some analysis was also conducted on the distribution and tree canopy of City trees (**Figure 2.5**).

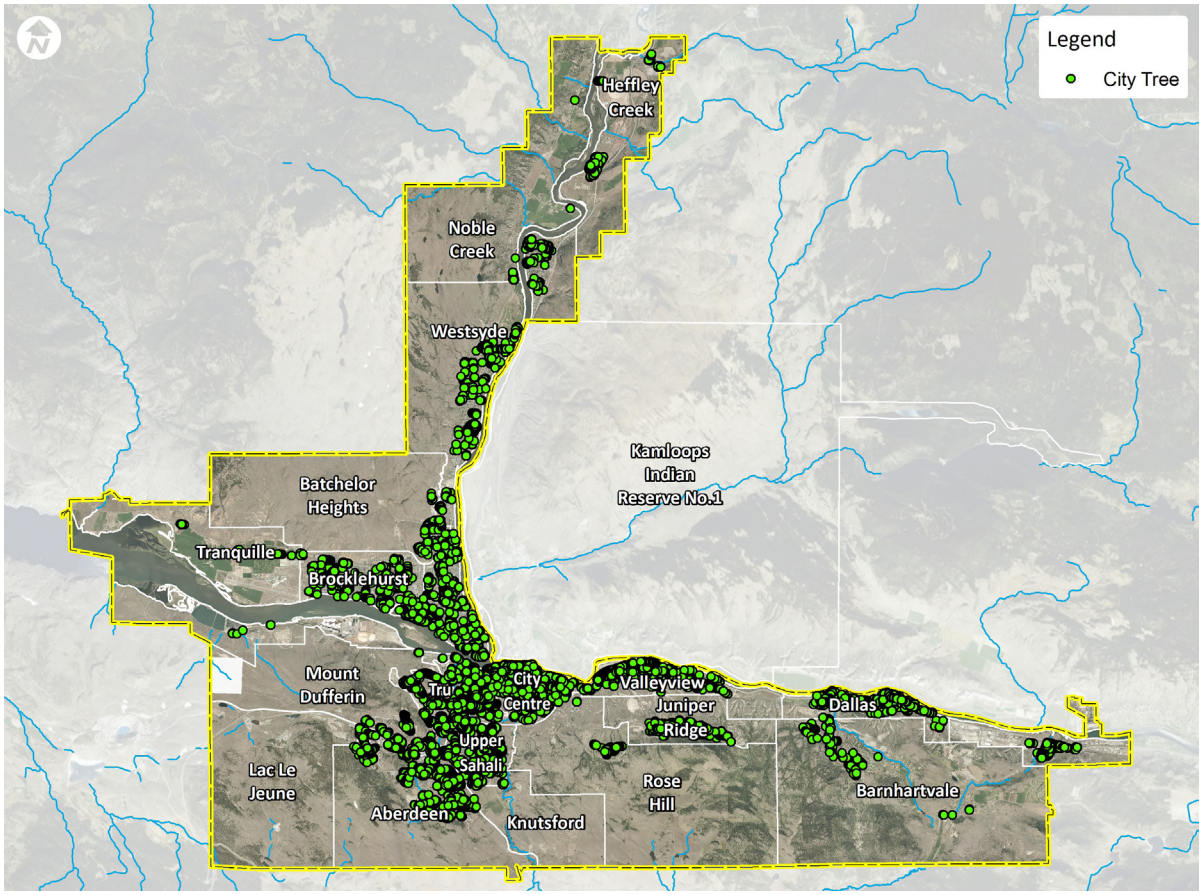


Figure 2.5: Map of City Trees
Source: City Tree Inventory

The City has 15,858 trees located in parks and on boulevards. Using the crown diameter to calculate the canopy for each tree, **Figure 2.6** illustrates the tree canopy within each neighbourhood that is provided by City trees. City Centre has by far the greatest canopy contribution by City trees, likely due to the large amount of park space and streets with mature trees.

Neighbourhoods	Canopy %	# of Trees
City Centre	3.5%	3,119
West End	1.7%	572
North Shore	1.6%	1,889
Lower Sahali	1.4%	549
Upper Sahali	0.9%	1,247
Dallas	0.7%	884
Southgate	0.7%	754
Valleyview	0.5%	714
Batchelor Heights	0.5%	217
Rose Hill	0.4%	147
Brocklehurst	0.4%	825
Juniper Ridge	0.4%	439
Westsyde	0.4%	938
Aberdeen	0.4%	1,485
Mission Flats	0.3%	111
Campbell Creek	0.3%	480
Mount Dufferin	0.3%	455
Tru	0.2%	185
Noble Creek	0.2%	28
Rayleigh	0.2%	150
Barnhartvale	0.2%	254
Heffley Creek	0.0%	354
Knutsford	0.0%	0
Lac Le Jeune	0.0%	0
Tranquille	0.0%	62
Total	0.8%	15,858

Figure 2.6: City Tree Canopy by Neighbourhood
Source: City Tree Inventory

There are around 200 species of City trees in Kamloops. **Figure 2.6** illustrates the dominant species by genus. The only genus with a distribution above 10% is maple (25%), but there are many different species of maple in the City.

Dominant Species	Count	%Total
Maple	2,636	17%
Pine	1,722	11%
Crabapple	1,542	10%
Spruce	1,437	9%
Ash	982	6%
Linden	941	6%
Other	6,325	41%

Figure 2.6: City Tree Species Distribution
Source: City Tree Inventory

Planting dates are provided for about 25% of the City's trees. This data is insufficient to conduct an analysis of age class distribution.

Plantable Area

An analysis was conducted to determine the extent to which Kamloops has potential locations for new trees. A calculation of potentially plantable areas was conducted for the developed portions of Kamloops using the i-Tree tool. Plantable areas were determined to be locations without any of the following characteristics:

- Paved surfaces (roads, sidewalks, driveways, parking lots)
- Buildings
- Compacted areas of sand or gravel (e.g., industrial sites)
- Areas too close to buildings, road edges, or rail rights-of-way
- Small / narrow areas between buildings
- Areas conflicting with overhead power lines or fence lines
- Areas covered by already existing vegetation
- Golf course fairways, sports fields, and trail surfaces
- Cliff faces

The plantable area was determined to be 22.1% of 1,000 sample points within the developed area. The plantable area would cover 1,225 ha within the developed area of 5,545 ha. Assuming a 6m diameter tree canopy (covering 28.3 m2), this analysis shows a theoretical potential for 433,532 trees on private and public land. Realistically, a lack of irrigation is the primary limiting factor to planting trees in most of these locations. However, the analysis does indicate the potential for a significant amount of tree planting if irrigation could be provided.

2.3 Valuation of the Urban Forest

Numerous studies have focused on measuring the economic values attributed to the benefits of trees and the services they provide. However, affixing a dollar amount to the services provided by trees can be challenging. Values such as biodiversity, community health and spiritual happiness are difficult to quantify. Also, most current indices do not account for the benefits and liabilities associated with risk and public safety. Regardless, current valuations have clearly demonstrated the economic benefits attributed to trees and the significant returns on investment in urban forest management. **Figure 2.7** illustrates the economic benefits of all of the trees in Kamloops (based on the tree canopy) in terms of pollutant removal.

A second tree valuation analysis was conducted of City trees only. Based on the City's tree inventory as of December 2014, and using the iTree Streets software module, the value of the City's street and park trees is $6,749,715. This is lower than expected because some of the City tree sizes have not been updated since they were planted.

Abbr.	Benefit Description	Value	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$333.22	±28.53	3.93 T	±0.34
NO2	Nitrogen Dioxide removed annually	$573.67	±49.13	21.43 T	±1.84
O3	Ozone removed annually	$29,875.78	±2,558.41	213.44 T	±18.28
PM2.5	Particulate Matter less than 2.5 microns removed annually	$61,758.71	±5,288.70	10.37 T	±0.89
SO2	Sulfur Dioxide removed annually	$100.27	±8.59	13.51 T	±1.16
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$21,689.05	±1,857.34	71.50 T	±6.12
CO2seq	Carbon Dioxide sequestered annually in trees	$841,549.20	±72,065.97	43,460.96 T	±3,721.77
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$21,218,076.81	±1,817,007.54	1,095,786.15 T	±93,837.52

i-Tree Canopy Annual Tree Benefit Estimates based on these values in lbs/acre/yr and $/T/yr: CO 0.902 @ $85.08 | NO2 4.917 @ $26.86 | O3 48.968 @ $140.47 | PM2.5 2.379 @ $5,975.67 | SO2 3.098 @ $7.45 | PM10 16.403 @ $304.43 | CO2seq 9,970.817 @ $19.43 | CO2stor is a total biomass amount of 251,395.359 @ $19.43*

Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

Figure 2.7: Economic Benefits of Trees in Kamloops
Source: iTree Analysis

Generally, the economic value of an individual tree increases in relationship to its size. Large trees provide proportionally much higher net value and they have a greater aesthetic and spiritual impact on the community (Schroeder et al., 2009). This should be considered when removing and compensating for large trees.

Many cities, upon being convinced of the benefits, cost savings and return on investment associated with the urban forest, have invested significant amounts of money into tree management programs such as planting, maintenance and public education. There are numerous studies that show the significant gains achieved through these programs (http://depts.washington.edu/hhwb/).

2.4 Bylaws, Programs and Practices

Local governments are responsible for managing growth and development within their boundaries. This includes development approvals, infrastructure planning and operations, engineering and public works, emergency response, recreational and park services, and protection of hazardous and/or environmentally sensitive lands. Municipalities also have the power to enact local bylaws to support these directives. Through these responsibilities, the City has a significant amount of authority over the management of the urban forest.

The following are the existing bylaws, programs and practices applicable to urban forest management in Kamloops. These are presented from the broadest to the most detailed.

Community Charter, ss. 8(3) (c),50-52,73(1)(c); Local Government Act, s.923

Under the Community Charter, municipalities have relatively broad powers related to tree regulation. They may use bylaws to establish licensing and permitting requirements for tree-cutting, and they may also impose requirements with respect to tree planting, provided that the requirements do not prevent uses or density permitted under the zoning bylaw, unless compensation is provided. For example, a municipality might decide that a development permit over a certain value triggers the requirement to plant a certain number of trees on that property.

KamPlan OCP, 2004

The management of trees and their associated ecosystems are integrally linked to the OCP, as it is critical to plan, regulate, protect and enhance the urban forest in order to address climate changes issues and ensure healthy green infrastructure.

Urban Environment Policy

"The City will continue its involvement in tree protection/tree planting initiatives, paying particular attention to encouraging new development to provide a better balance by designing around trees, and to recognize the importance of street trees in an urban environment."

Development Permit Area (DPA) Guidelines

Tree protection and tree planting, along streets and/or in landscape areas, are mentioned in some of the specific DPAs, including Mount Dufferin, Dallas Commercial Core, Campbell Creek Industrial Park, McGill Corridor, Notre Dame Drive, Sahali Commercial Area, and Orchards Walk.

The Multiple Family DPA states "Opportunities should be considered to carefully locate buildings around significant on-site trees or tree clusters, existing vegetation, or other important natural features that could be preserved to reinforce a 'green' image and provide a natural and visual amenity." "In boulevard areas, street trees are encouraged."

Parks Master Plan, 2013

The Parks Master Plan emphasizes the importance of nature in the City, including natural parks and trees in the urban setting.

Recommendation

"Preserve existing trees in new developments, work with Planning on ways to increase the requirements for tree planting and tree replacement in new development, review and update the Urban Forest Management Plan, and consolidate and enhance the portions of existing bylaws that relate to trees."

Sustainable Kamloops Plan, 2010

The Sustainable Kamloops Plan (SKP) promotes local food security through the use of edible plants in landscapes, including fruit trees instead of decorative softwoods. It also encourages using tools such as incentive programs and regulations for the retention of existing trees, and planting of new trees, within current and future development areas.

Tree Protection Bylaw 24-35

This bylaw protects existing trees by requiring tree cutting permits for tree removal or damage to trees. There are various exemptions, which include trees less than 5 metres in height or less than 10 cm in diameter, as well as trees on private parcels less than 2 hectares in size and trees on land undergoing development. The bylaw also outlines conditions for denying a permit, and a requirement to replace and maintain a tree in the same location (with security deposit).

Parks Regulation Bylaw 35-66

This bylaw designates a short list of trees on public property as "significant trees", outlines responsibilities for maintaining City trees (including hazard trees), and includes guidelines for the protection of boulevard trees.

Construction on Road Rights-of Way Bylaw 24-23 and Traffic Bylaw 23-30

These bylaws prohibit damage to and regulate tree removal on road R-O-Ws, and regulate trimming of trees over sidewalks and roads, respectively.

Other Bylaws and Policies

The following bylaws and policies also include provisions that relate to trees:

- Council Policy EDS-8 – Development in Urban / Wildland Interface Hazard Area
- Subdivision Control Bylaw No. 4-33
- Zoning Bylaw No. 5-1-2001, Division 53
- Riparian Areas Regulation Development Permit Area Bylaw No. 5-1-2273
- Watercourses Regulation Bylaw No. 17-6
- Neighbourhood Plans – City Centre, North Shore
- Airshed Management Plan (requires review and update of the Tree Protection Bylaw)
- Agriculture Area Plan
- Council Policy PRS-8 - Tree and Vegetation Removal

Best Management Practices for Kamloops Municipal Urban Forest

This document, prepared by City staff based on practices in other communities, outlines practices for the following tasks:

- Tree inspection cycle
- Tree ownership identification and guidelines for maintenance responsibility
- Tree inventory
- Tree work order history
- Street tree planting
- Recommended street trees
- Street tree protection
- Pruning cycle and standard

Tree Policy for the management of trees on City property, December 2011 (DRAFT)

This document was prepared by City staff based on practices in other communities. Though not officially adopted, it has served as a guide for tree management. The policy outlines practices for the following tasks:

- Protection of City Trees: Preservation of trees is a priority wherever conditions permit. Trees on city property are the responsibility of the City. No other person may plant, remove, prune or affect the health of a tree on City property without written permission from the City. Provisions regarding jointly owned trees are found in Council Policy PRS-8.
- Refusal to Remove Trees: Trees will not be removed for enhancing view corridors, reducing shade, or reducing litter from trees. Trees will not be removed where there is contradiction to the federal Fisheries Act and the British Columbia Wildlife Act.
- Tree Removal Criteria: Trees will be considered for removal if criteria are met that relate to public safety, surrounding trees, aesthetic value, City plans and operations.
- Hazard Trees: Trees on City property that have been assessed to be a hazard will be removed at the City's expense. The cost of removal of a joint ownership hazard tree will be shared in proportion to the amount of the tree trunk situated on each property.

- Tree Cutting Permit Application Process: Obtain written consent of the surrounding property owners; submit a Tree Cutting Permit Application; pay fee; bear cost of the tree removal by a certified arborist; supply and install replacement trees.
- Maintenance: Proper pruning and pest management will be completed by City staff or approved contractors.
- Damage of Property or Services: Claims of damage to private property from City trees must be requested in writing to the City. The City is not responsible for damage from nuisance tree roots.
- Tree Planting: Planting ratio of replacement trees to removed trees should be 2:1. Planting must meet standards outlined in City's Tree Planting Specifications. Follow processes for public to apply to plant trees on City boulevards and plant commemorative trees. (Boulevard Tree Program – residents can choose to have a tree planted in the boulevard in front of their house.)
- Trees Impacted by Development: Retain significant, privately owned trees wherever possible; augment with additional trees where appropriate. Development applications requiring Council approval must give consideration to the retention of significant trees.

Tree Planting Programs

The following programs are available to assist homeowners with planting trees on private property or the boulevard:

- Tree Coupons providing a $20 discount for planting trees on private land are distributed in April and May at Arbor Day, and at City Hall and the Public Works Centre
- Boulevard Tree Planting Program allows neighbourhoods to apply for trees to be planted on their street if homeowners agree to be responsible for irrigating them; the City will provide the tree and perform regular maintenance under its urban forestry program
- Kamloops Community Forest is a Communities in Bloom Legacy Project where people can plant a tree in the Kamloops Community Forest in memoriam for a person or event
- Aspen Tree Replanting Program involves the City providing aspen trees to qualified homeowners for planting on City properties immediately bordering individual private properties, if they agree to irrigate and care for trees to restore visual screening where trees were lost to pine beetle infestation or wildfire protection

2.5 *Comparisons with Other Jurisdiction*

Several municipalities were selected for comparison in terms of urban forest plans, bylaws, policies and practices. The municipalities were selected either because they are known to have progressive practices, or because they are in similar climatic zones. **Appendix D** provides a summary of the practices in these communities, as well as their operations practices and costs. **Figure 2.9** provides some comparative data on tree canopies.

Municipality	Existing Tree Canopy	Target Tree Canopy	Arid or Semi Arid
Kamloops	12%	20%	√
Kelowna	16%	20%	√
Calgary	7% (2007)	20%	√
Vancouver	18%		
Denver	19.7%		√
Surrey	27%	40%	
Victoria	18%	Pending	
Los Angeles	11%		√

Figure 2.9 Municipal Tree Canopy Comparisons
Source: Internet and phone calls

An interesting comparison is also the recommended tree canopy for arid regions, per American Forests [1] (**Figure 2.10**). The analysis for Kamloops did not generate data for these categories specifically.

Average tree cover for all zones	25%
Suburban residential zones	35%
Urban residential zones	18%
Central business	9%

Figure 2.10 Recommended Tree Canopy for Arid Regions
Source: see footnote

1 This information was cited from a 2007 report by American Forests called "Setting Urban Tree Canopy Goals", which no longer seems to be available online. Urban Forests recommends a tree canopy of 40% for non-arid regions of the US.

The following are some of the recommendations from other jurisdictions gleaned from the case studies. Some of these are being applied in Kamloops through a variety of mechanisms:

Protecting Large Trees - Due to the fact that large, healthy, long-lived trees provide the greatest structural values (based on the tree itself) and functional values (based on services the tree provides), the most effective strategy for increasing average tree size and tree canopy is to preserve and manage existing trees in the City. The following are some specific recommendations for protecting and maintaining the existing tree canopy:

- Strengthen tree maintenance and protection programs, with a particular focus on maintaining and preserving large trees.
- Examine causes of tree mortality and develop strategies for minimizing loss of new and existing tree canopy.
- Conduct regular aerial and ground monitoring to track tree canopy development and forest condition over time.

Planting New Trees - Significant planting rates are required, especially for jurisdictions wanting to increase their tree canopy. The following are some sample recommendations:

- Increase tree planting rates on public lands, including trees where possible in all City capital works projects.
- Identify and prioritize locations for planting new trees.
- Identify opportunities for increasing tree planting and stewardship on private property.
- Ensure adequate funding for establishment maintenance and watering of new trees.

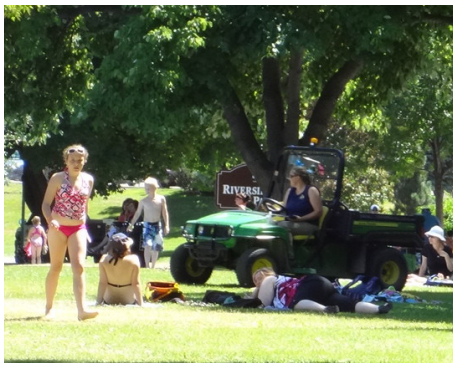
Improve Regulations and Enforcement – Many jurisdictions have been working on strengthening bylaws and their enforcement. The following are some sample recommendations:

- Establish a designated Tree Protection Bylaw that pertains to all trees on private land of 8 cm caliper and over.
    - Require two for one tree replacement.
    - Require a security deposit for the replacement trees and their maintenance.
    - Where a tree cannot be replaced on the property, require cash in lieu, with the money going towards the planting of City trees.

- Engage a landscape architect or other professional with horticulture and planting design expertise to review all development applications that involve tree removal.

- Establish maintenance requirements and processes (e.g. pruning).
- Strengthen requirements for tree replacement and tree planting in zoning and other bylaws.
- Include requirements to protect existing trees and to plant new trees in zoning, subdivision and other policy documents.
- Develop and enforce a bylaw requiring significant numbers of trees in parking lots.
- Develop procedures for ensuring that tree protection and management bylaws are enforced.

Integration at Multiple Levels – Integrating urban forestry with other initiatives and among staff can improve tree protection and enhancement of the urban forest:



- Establish tree canopy targets for the City as a whole, and for specific land uses and neighbourhoods.
- Improve coordination among City departments with respect to planting and management of trees.
- Integrate urban forestry activities with environmental/ecosystem management, invasive species management, CPTED, and other related initiatives.
- Collaborate with regional governments, neighbouring municipalities, tree industry, corporate sector, educational institutions, stewardship groups and others on initiatives related to the urban forest.

Public Role - The public can play a very significant role in protection and enhancement of urban trees. The following are some sample recommendations:

- Provide information to the public on the importance and benefits of trees.
- Establish a stewardship program in which volunteers help to maintain trees.
- Develop incentive programs for tree planting on private property.

2.6 Summary Analysis

The following is a summary of some of the strengths and challenges related to the urban forest in Kamloops, based on input from stakeholders and City staff:

STRENGTHS	CHALLENGES
Existing Trees	
• Park trees, especially in older parks, and nature parks	• Tree canopy is not well established in all locations
• Good variety of trees in the City by species, young and old trees	• Not enough trees in middle age ranges
• Established and diverse trees in older neighbourhoods	• Newer neighbourhoods often have significantly less tree canopy, new trees take a long time to grow
• Trees in commercial areas add character, comfort	• Expensive to plant and establish trees in commercial areas
• Hardiness zones range from 3 to 6, variations in elevation and microclimate too – allows for diverse species	• Range of hardiness zones, variety of conditions and the dry climate make it more challenging to select and establish appropriate trees, especially for the public
• City has made efforts to establish boulevard trees	• Trees planted near roads sometimes do poorly
• Nicola Street has great canopy, popular street	• Many streets lack a good tree canopy
• Edible trees can be a food source	• Edible trees can require more maintenance and be messy
• ReLeaf program involved planting of 20,000 trees in 4 years	• Pine beetle caused heavy tree losses; tree planting focuses on deciduous trees and many smaller varieties
• Fruit trees contribute to food security and are enjoyed by residents	• Fruit trees can attract bears, get contaminated by pests if near untreated trees, and litter hard surfaces
• The City is integrating invasive species management into its Integrated Pest Management system.	• Environmental change, climate, pests, disease, invasive plants, and wildfire hazard are threats to trees
• There are some significant trees on school sites.	• There could be more trees on school sites. School District does not have many arborists or tree care specialists in relation to the number of trees on school sites.
• Trees in natural areas or on steep slopes help to reduce erosion.	• During major storms in the winter of 2014/2015, there was more erosion on slopes with fewer trees.

STRENGTHS	CHALLENGES
City Bylaws, Programs and Practices	
• Significant policy context for tree canopy	• Council is often split on tree topics, little support for increasing cost to taxpayers
• Kamloops has a number of bylaws and practices to protect and enhance the tree canopy	• Bylaws are out of date, not as strong as they could be
• City sometimes leads by example, e.g., trees on new roads	• City doesn't always follow through on tree planting
• Incentives can work better than enforcement and the City has a number of these, e.g., tree coupons, Arbor Day/ Week, memorial/dedication program	• Challenges with implementation and enforcement, trees are sometimes removed after development is approved
• Kamloops identifies significant trees	• Kamloops needs to identify more significant trees
• Fleetwood Avenue project with curves and infiltration areas is a showpiece for other locations	• Boulevard Tree Program is not actively promoted, depends on support of a majority of home owners on a block, is a reactive rather than a proactive approach, residents sometimes try to care for trees, e.g., pruning
• Boulevard Tree Program exists and has been used to plant trees	• There is no policy or bylaw specific to boulevard trees; Landscape Guidelines require review and update
• Planning Department encourages trees in development projects, e.g., through Development Permit process	• Review of landscape plans by City staff is inconsistent and does not specifically include consideration of the urban forest
• Landscape plans are required for development projects	• No standards for urban tree planting, e.g., Silva cell planting on Lorne Street failed because irrigation system was not working, method is very expensive
• City has list of tree species for planting under powerlines	• Overhead powerlines on one side of most streets limit planting options; some trees under powerlines have been pruned drastically
• Sample project on Rockcress Drive – developer planned utilities to allow for trees on both sides of streets	• Underground services and sidewalks in new developments typically don't allow space for trees, little interest in making roads wider
• Tree Protection Bylaw 24-35 requires tree cutting permits for tree removal or damage	• Tree removal petition does not require the resident to pay for the value of the tree

STRENGTHS	CHALLENGES
• There may be grants available for tree planting	• Bylaw 24-35 has a variety of exemptions that are too extensive, e.g., lots under 2 ha
• There may be opportunities to reconsider regulations such as setbacks to increase space for trees	• City has not spent much effort seeking grants for tree planting
• Most departments are aware of tree policies and practices	• Development regulations, e.g., zoning, have not been reviewed in relation to space for trees
	• Interdepartmental awareness and coordination could be improved, e.g., responsibilities for removal, payment, maintenance
Practices on Private Land	
• Some residents appreciate trees and retain and plant them	• Planting of the wrong tree in the wrong place - elevation, soil, space, power lines, etc.
	• Area has poor native soils, poor quality growing medium is sometimes sold
• Some developers and residents plant trees properly	• Proper planting methods are not always used on development projects and private land, e.g., too deep, burlap/cages on, lack of root pruning, not enough or poor quality growing medium
• Some residents take care of their trees	• Water and irrigation systems are expensive (especially with water metering), likely a deterrent to public wanting trees; some residents do not care for and damage trees, e.g., topping
Community Awareness	
• Public is quite aware of the importance of trees, partly resulting from City efforts, newspaper articles, programs with children, etc.	• Some residents have other priorities
• Some residents appreciate trees	• Some residents perceive trees as a nuisance, impact on views
• Some developers appreciate the value of trees	• Some developers do not recognize the value of trees
• Industry knowledge is increasing	• Some industry members and retailers still provide inappropriate advice to the public
• Pesticide bylaw exists	• Confusion around pesticide bylaw by public and retailers

STRENGTHS	CHALLENGES
• City has brochure on species selection	• Perception by some that there is not enough information made available to the public on appropriate tree species, proper tree planting and tree care
• City runs Arbor Day, involves schools in Arbor Day/Arbor Week plantings, and has booths at Home Show, Farmers Markets, etc.	• Poor attendance at Arbor Day
• City distributes 500 tree coupons annually	• 70 % of tree coupons are used
• Operations and Maintenance	
• City does a good job planting and maintaining trees – high standards	• Tree replacement and tree maintenance are expensive, tree damage from within Parks, e.g., mowing, weed-eating
• When a new tree is planted, City provides a door hanger requesting resident to water tree	• Newly planted trees do not generally get sufficient water, despite notification
• Passionate and knowledgeable staff, 5 arborists	• Not enough staff or time to achieve desired standard, keeping passionate staff can be a challenge
	• Perceived or real liability issues for City
	• Significant effort is required to clear tree debris from sidewalks, drains and other features
	• Other common challenges, e.g., allergies, Bear Aware, invasive species, pests (e.g., budworm)

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3.0 Urban Forest Management Recommendations

3.1 Goals

The following are proposed goals of the Urban Forest Management Strategy:

1. Protect, enhance and expand the urban forest.
2. Develop and maintain strong community understanding of and support for the urban forest.
3. Design and manage the urban forest to maximize the environmental, social, health, and economic benefits.

3.2 Objectives and Recommendations

The proposed objectives and recommendations of the Urban Forest Management Strategy are listed here. Many of the recommendations are ongoing tasks already undertaken by the City, but they are listed in the UFMS for emphasis. Because the City is already pursuing actions that comply with many of these recommendations, "continue to" is not included at the front of any of the recommendations. It is understood that many of these action items are already in process. The proposed objectives and recommendations of the Urban Forest Management Strategy are as follows:

Tree Canopy Profile in the City

1. Raise the profile and importance of the tree canopy by establishing a series of tree canopy targets.

    a. Establish an overall tree canopy target of 20% for the City and link or incorporate this into higher level plans such as the Sustainable Kamloops Plan and the Kamplan OCP.

    b. Set tree canopy targets for City trees, including separate targets for boulevard and park trees.

    c. Set tree canopy targets for new development land uses (zoning categories), using actual site plans of proposed developments to establish achievable targets.

    d. Adopt tree canopy targets for Neighbourhood Plans, including an analysis of the existing tree canopy as part of the planning process.

    e. Set a tree canopy target for parking lots, except where there is industrial use.

2. Consider the tree canopy targets noted above in all City efforts related to the protection of and planting of trees on public and private land.

City Strategies, Bylaws, and Plans

3. Update existing bylaws to strengthen policies related to the urban forest.

    a. Strengthen protection of existing trees in all bylaws related to new development, including OCP and DP Landscape Design Guidelines.

    b. Review tree planting requirements in the Zoning Bylaw and the Subdivision and Development Bylaw; investigate opportunities to increase building setbacks and landscape areas within zoning designations to support an increased tree canopy.

c. Review Development Permit (DP) guidelines to increase consideration of tree planting, e.g., energy-conserving locations, contribution to form and character, new DP guidelines for six-storey buildings, tree canopy in all parking lots.

d. Strengthen the Tree Protection Bylaw, e.g., reduce the number of exemptions, apply it to all trees over a certain size, require two for one replacement or cash in lieu, include a security deposit for planting and maintenance, etc.

e. When residents petition for tree removal, require them to pay for the appraised value of the tree and a replacement tree in the same or another location.

f. Increase fines for cutting trees without a permit.

g. Strengthen requirements related to watering boulevard trees.

4. Update existing standards and practices in relation to the urban forest.

   a. Review design standards to look at allowing space for trees along both sides of the road, considering the placement of utilities and reducing the required width of roads where possible as part of this process.

   b. Implement more street trees on both sides of roads in new development and on road construction projects, including maximum spacings related to tree sizes.

   c. Encourage more trees in all development projects.

   d. Establish criteria for significant trees and add more trees to the inventory based on those criteria.

5. Adopt the City's Tree Policy that is currently a draft, and continue to manage trees in accordance with the policy.

6. Integrate and make the recommendations of all relevant City documents consistent in relation to the tree canopy and the urban forest.

7. Improve the development review process, e.g., more comprehensive and professional review by the City of landscape plans in relation to trees.

Environmental Urban Forest Guidelines

8. Encourage connectivity between areas of natural habitat through strategic greenway and neighbourhood urban forest enhancement initiatives.

9. Manage trees for their environmental values, e.g., do not permit tree clearing during bird nesting season.

10. Manage trees to reduce the risk of loss from pest or disease outbreaks, wildfire, and climate change.

11. Discourage the removal of any public or private tree during the bird nesting season.

Tree Planting Practices

12. Adopt appropriate management practices for tree planting, and incorporate these into all relevant policies and plans, addressing all trees in the City.

    a. Explore alternatives to tree removal prior to deciding to remove existing trees.

    b. Plan for a diverse age range and species diversity in the street and park tree populations, and within large development projects, as ways to adapt to climate change and other threats.

    c. Select tree sizes (at maturity) based on the space available, selecting the largest-statured tree possible in every situation, ensuring that there will be adequate root, root crown and canopy space for each tree's long-term sustainability.

    d. Prepare design guidelines for tree planting and species selection that address topics such as urban form, views, visual screening, habitat and ecological values, adaptation to climate change, pest and disease resistance, rooting characteristics, water requirements, growth rates, succession over time, maintenance requirements, and energy savings throughout the year.

    e. Encourage absorbent landscaped areas under trees to support higher rates of infiltration of stem flow and other rainwater flow from trees.

    f. Incorporate into City practices and bylaws the standards and specifications that provide optimal growing environments for trees to support their health and future adaptation to climate change. Some of the key requirements include: good quality growing medium, sufficient quantity of growing medium, sufficient depth of growing medium, 2 metre (minimum 1.5 metre) diameter mulched tree wells in lawn areas, good drainage, no soil compaction over tree root zones (of existing or future

trees), and the use of methods such as structural soils (or Silva cells) under urban paved areas where the permeable surface area is small.

g. In all work related to tree canopy targets, consider appropriate tree locations and species as a higher priority than the number of stems, placing an emphasis on the "right tree in the right place".

City Trees

13. Increase tree planting in existing and new parks, other City facilities (e.g., libraries, police and fire stations), and road allowances to achieve the established tree canopy targets.

14. Consider succession, or the next generation of trees, in tree planting on City land.

15. Continue a vigorous street tree replacement program, selecting species and locations to maximize species and age diversity, be adaptable to existing and future conditions and climates, minimize nuisance and risk, minimize maintenance costs, and maximize green infrastructure and other benefits.

16. Consider the planting of fruit and nut trees on City land (parks or roads) where residents request them, and where residents or stewardship groups are willing to help care for the trees and harvest the fruit.

17. Make use of opportunities to incorporate multiple functions into public spaces, e.g., transforming greenways into productive ecosystem corridors with an enhanced tree canopy as well as attractive active transportation corridors for multiple modes.

18. Promote trees as tools to retain customers in commercial districts.

Private Property

19. Encourage private land owners to protect and maintain existing trees, to increase tree planting, and to reduce tree removal.

    a. Expand the use of promotional programs and incentives to increase awareness of the benefits of tree planting and ongoing tree care on private property, and to increase the number of trees planted and/or retained on private property where no development or redevelopment is anticipated. (see Communication and Awareness). For example, consider reduced water charges for residents who water City trees.

    b. Encourage better planting and maintenance of trees (see Tree Planting Practices and Maintenance of Trees).

The following are some typical priorities for selecting a tree:

- Prefer site-suitable tree species that are underrepresented in the landscape.
- Increase species diversity to ensure that no non-native species occupies greater than 10% of street/park tree inventory.
- Prefer native species where site elements are appropriate.
- Prefer the largest species feasible for the growing space.
- Select pest-resistant trees.
- Increase planting of coniferous trees.
- Select trees that offer the more benefits while using the least amount of water.

c. Encourage the planting of fruit and nut trees, among other species, on private property where residents will care for the trees and harvest the fruit and nuts.

20. Partner with private and non-City government institutions (e.g., schools, health care) to encourage more tree planting on their sites.

21. Consider a pilot project to encourage homeowners to 'host' public trees on their front yards in areas where there is no space for planting in the boulevard due to conflicts between street trees and underground services and infrastructure in the boulevard.

22. Consider a tree "hot line" that residents can call regarding trees.

    a. Provide access to tree advice, and site visits if warranted, through the hot line.

Maintenance of Trees

23. Adopt and adhere to professional standards for tree care, and encourage private land owners to follow these practices as well.

    a. Proactively maintain trees with cost-effective, regular and comprehensive maintenance activities to sustain the trees.

    b. Water trees to sustain and nurture plant growth to achieve healthy mature size.

    c. Prune trees regularly to industry specifications to promote tree health and longevity.

    d. Maintain soil quality and fertilization to sustain the vigour of trees.

    e. Monitor and assess the health of trees on a regular basis to optimize the life cycle of trees and to address public safety with respect to trees.

    f. Replace dead trees within one year to optimize the benefits derived from trees.

    g. Develop and implement initiatives to better ensure the protection of trees during landscape maintenance operations, e.g., equipment selection, moving setbacks.

24. Implement measures that could enhance maintenance of trees.

    a. Expand existing programs to encourage residents to water trees.

    b. Explore alternative water sources for watering trees, such as cisterns or non-potable, unmetered water for irrigation from wells on large development sites.

c. Explore the possibility of including provisions for tree maintenance in subdivision and development agreements.

25. Maintain the biological integrity of native remnant trees and forests in natural areas.

    a. Take on a leadership role and work with others on the management of invasive species in natural areas, especially where they pose threats to the urban forest.

26. Use the products of the urban forest.

    a. Recycle waste materials.

    b. Consider a green waste pick-up service.

Monitoring and Enforcement

27. Increase monitoring and enforcement related to tree management and planting in private developments, especially related to protection of existing trees, the quality and quantity of growing medium for new trees, and maintenance procedures.

28. Monitor the results of the implementing bylaw requirements on private land and refine strategies for minimizing the loss of pre-development and newly planted trees.

Communication and Awareness

29. Undertake a communication strategy with Council, staff, industry and the public to raise awareness about the values and benefits of the urban forest, and to provide information on ways to increase the tree canopy.

    a. Reach out to industry, developers, engineers and other development consultants, property management companies and others and direct them to the web page.

    b. Distribute urban forest information widely, e.g., news releases, planning documents, social media, etc., with links to the web page.

    c. Conduct annual workshops with the tree industry and design professionals to provide information on the City's urban forest and tree canopy efforts, and to encourage and support an increased tree canopy.

    d. Add information on the urban forest in "Did you Know?" clips on the City's website and phone lines.

    e. Develop and promote a walking tour and "app" of "significant trees".

f. Consider distributing more tree coupons to account for the 30% that are not used.

g. Provide information to real estate agents about the values of trees and their potential effects on property value, and work with the real estate industry on the inclusion of tree value in property assessments.

30. Prepare a web page related to urban forest information and initiatives on the City's website.

    a. Include information on the values and benefits, City policies and programs, tree selection guide, and recommended management practices for planting and maintenance, updating and elaborating upon information currently in the Kamloops Tree Guide brochure.

    b. Update the web page regularly with seasonal information, case studies and new information.

    c. Include technical information suitable for industry and developers, e.g., tree topping, species selection in relation to multiple factors, pesticides, root pruning, growing medium quality and quantity, maintenance program.

31. Continue to support and expand stewardship programs that involve volunteers in planting and maintaining trees.

32. Explore opportunities to establish an Arboretum of trees and shrubs in the City, with potential locations including Thompson Rivers University, Waterfront Park, or another existing or new park.

33. When a large or significant tree requires removal due to health issues or hazards, provide information to the public on the reasons for the removal.

34. Consider unique ways to increase community awareness of and involvement in tree protection and care.

    a. Consider a tree canopy competition among neighbourhoods.

    b. Consider a backyard tree inventory as a community project, similar to the bird count.

    c. Consider a tree retention program in older neighbourhoods, involving residents in identifying important trees to be retained.

    d. Consider ways to increase attendance at Arbor Day, e.g., bonfire with free food (s'mores, hotdogs?), more activities for children.

Financing

35. Stress the fact that, as for other critical City infrastructure, long-term investment in the urban forest should be tied to increases in City revenue, so that the urban forest grows along with the population.

36. Provide and seek adequate resources for urban forest planning, management and stewardship.

    a. Strive to identify sustainable funding to plant trees on existing streets, and in existing and new parks, to achieve tree canopy targets.

    b. Provide adequate funding to achieve appropriate maintenance practices that will ensure the sustainability of trees, on the principle that each new tree added to the City's inventory should be matched by an associated increase in the operating fund to maintain trees.

    c. Identify sustainable budget sources for replacing dead park and street trees.

    d. Explore potential corporate sponsorships for community initiatives related to the urban forest.

    e. Work with other municipalities to have the public component of the urban forest recognized as a tangible capital asset within the Public Sector Accounting Handbook.

    f. Seek funding from organizations such as Tree Canada, TD Green Streets and the Evergreen Foundation.

    g. Staff Resources and Collaboration

37. Increase the City's staff resources so they can better plan and manage the City's trees and encourage improved management of trees on private property.

    a. Increase financial support for ongoing training programs to keep staff current with new practices.

38. Improve coordination among City departments with respect to protection, planting and management of the urban forest.

39. Encourage the Integrated Pest Management Council of Canada to provide an Integrated Pest Management Accreditation Program in BC for the public works sector.

40. Collaborate with other government, academic and stakeholder groups on items of mutual interest with respect to the urban forest.

    a. Collaborate with Thompson Rivers University (TRU) on research and data collection projects related to the urban forest.

    b. Work with BC Hydro on options for tree planting and tree management in relation to powerlines.

    c. Contact major industries in Kamloops to identify their potential interest in participating in tree planting as mitigation for air quality impacts.

Next Steps

41. Continue to measure and evaluate the tree canopy, and revise strategies as required.

    a. Update the sizes of City trees and redo the valuation based on that information (Section 2.3).

    b. Evaluate the tree canopy and its values every three years using measures similar to those in this Strategy.

    c. Review the results associated with the application of strategies, bylaws, plans and standards as they are modified over time.

    d. Identify and implement adaptive strategies based on the evaluations.

42. Generate new tools for understanding and managing trees.

    a. Commit resources to understanding the implications of climate change relative to the City's trees and methods for proactively adapting to the change.

    b. Develop a comprehensive tree technical manual that is used to modify bylaws and standards.

    c. Evaluate alternate tree procurement processes, supporting local businesses where feasible.

43. Plant 4,000 trees over the next 20 years.

Once the recommendations are confirmed, the relative priority, phasing and cost of each recommendation will be identified here.

4.0 Implementation Plan

This section lists all of the recommendations, along with their relative priority, proposed phasing, relative cost, and potential impacts on operating costs. The following is a key to these items:

Priority

- Rating from 1 to 3, 1 being most important, based on input from the community and City staff

Phasing

- Work that is ongoing now and into the future
- Short - 1 to 3 years
- Med - 4 to 6 years
- Long 7 to 10 years

Relative Cost or Cost/Year

- N/A - part of everyday work
- Low - under $20,000
- Moderate $20,000 to $50,000
- High - over $50,000

Increase in Operating Costs

✓ Implementation will result in a need to increase operating costs

	Objectives and Recommendations (summarized)	Priority	Phasing	Relative Cost or Cost/ Year	Increase in Operating Costs
Tree Canopy Profile in the City					
1	Raise the profile and importance of the tree canopy by establishing a series of tree canopy targets	1			
	a. Establish an overall tree canopy target of 20%for the City and incorporate into other plans	1	Short	Low	
	b. Set tree canopy targets for City trees	1	Short	Low	√
	c. Set tree canopy targets for new development land uses	2	Medium	Low	
	d. Adopt tree canopy targets for Neighbourhood Plans	2	Medium	Low	
	e. Set a tree canopy target for parking lots	2	Medium	Low	
2	Consider the tree canopy targets noted above in all City efforts	1	Ongoing	N/A	
City Strategies, Bylaws, and Plans					
3	Update existing bylaws to strengthen policies related to the urban forest	1			
	a. Strengthen protection of existing trees in all bylaws related to new development	1	Short	Low	
	b. Review tree planting requirements in the Zoning Bylaw and the Subdivision and Development Bylaw	1	Short	Low	
	c. Review Development Permit (DP) guidelines to increase consideration of tree planting	1	Short	Low	
	d. When residents petition for tree removal, require payment for the appraised value of the tree and a replacement tree	1	Short	Low	
	e. Increase fines for cutting trees without a permit	1	Short	Low	
	f. Strengthen requirements related to watering boulevard trees	1	Short	Low	
4	Update existing standards and practices in relation to the urban forest	1			
	a. Review design standards to look at allowing space for trees along both sides of the road	1	Short	Low	√
	b. Implement more street trees on both sides of roads in new development and road projects	1	Short	Low	√
	c. Encourage more trees in all development projects	1	Short	Low	√
	d. Establish criteria for significant trees and add more trees to the inventory based on those criteria	1	Short	Low	
5	Adopt the City's Tree Policy that is currently a draft	1	Short	N/A	
6	Integrate and make the recommendations of all relevant City documents consistent	1	Ongoing	Low	
7	Improve the development review process of landscape plans in relation to trees	1	Short	Low	
Environmental Urban Forest Guidelines					
8	Encourage connectivity between areas of natural habitat	1	Ongoing	N/A	
9	Manage trees for their environmental values	1	Ongoing	N/A	
10	Manage trees to reduce the risk of loss from pest or disease, wildfire, etc.	1	Ongoing	Moderate	√
11	Discourage the removal of any public or private tree during the bird nesting season.	1	Ongoing	N/A	

Objectives and Recommendations (summarized)		Priority	Phasing	Relative Cost or Cost/ Year	Increase in Operating Costs
Tree Planting Practices					
12	Adopt appropriate management practices for all tree planting, and incorporate these into all relevant policies and plans	1	Ongoing	Low	
	a. Explore alternatives to tree removal prior to deciding to remove existing trees	1	Ongoing	N/A	
	b. Plan for a diverse age range and species diversity	1	Ongoing	N/A	
	c. Select the largest-statured tree sizes based on the space available	1	Ongoing	N/A	
	d. Prepare design guidelines for tree planting and species selection	1	Short	Low	
	e. Encourage absorbent landscaped areas under trees	1	Ongoing	N/A	
	f. Incorporate into City practices and bylaws the standards and specifications that provide optimal growing environments for trees and future adaptation to climate change	1	Ongoing	Low	
	g. In all work related to tree canopy targets, consider appropriate tree locations and species as a higher priority than the number of stems	1	Ongoing	N/A	
Environmental Urban Forest Guidelines					
13	Increase tree planting in existing and new parks, other City facilities, and road allowances	1	Ongoing	Moderate	√
14	Consider succession, or the next generation of trees, in tree planting on City land	1	Ongoing	N/A	
15	Continue a vigorous street tree replacement program	1	Ongoing	$$	
16	Consider the planting of fruit and nut trees on City land with conditions	1	Ongoing	N/A	
17	Make use of opportunities to incorporate multiple functions into public space	1	Ongoing	N/A	
18	Promote trees as tools to retain customers in commercial districts	1	Ongoing	N/A	
Private Property					
19	Encourage private land owners to protect and maintain existing trees, to increase tree planting, and to reduce tree removal	1	Ongoing	N/A	
	a. Expand the use of promotional programs and incentives	1	Ongoing	Low	
	b. Encourage better planting and maintenance of trees	1	Ongoing	N/A	
	c. Encourage the planting of fruit and nut trees, among other species, on private property sith conditions	1	Ongoing	N/A	
20	Partner with private and non-City government institutions to encourage more tree planting on their sites	1	Ongoing	N/A	
21	Consider a pilot project to encourage homeowners to 'host' public trees on their front yards in areas where there is no space for planting in the boulevard	2	Medium	N/A	
22	Consider a tree "hot line" that residents can call regarding trees	3	Long	Moderate	
	a. Provide access to tree advice, and site visits if warranted, through the hot line	3	Ongoing	N/A	
Maintenance of Trees					
23	Adopt and adhere to professional standards for tree care, and encourage private land owners to follow these practices as well	1	Ongoing	N/A	√
	a. Proactively maintain trees with cost-effective, regular and comprehensive maintenance	1	Ongoing	Low	√
	b. Water trees to sustain and nurture plant growth to achieve healthy mature size	1	Ongoing	Low	√
	c. Prune trees regularly to industry specifications to promote tree health and longevity	1	Ongoing	Low	√
	d. Maintain soil quality and fertilization to sustain the vigour of trees	1	Ongoing	Low	
	e. Monitor and assess the health of trees to optimize the life cycle of trees and to address public safety	1	Ongoing	Low	√

Objectives and Recommendations (summarized)		Priority	Phasing	Relative Cost or Cost/ Year	Increase in Operating Costs
	f. Replace dead trees within one year to optimize the benefits derived from trees	1	Ongoing	Low	√
	g. Develop and implement initiatives to better protect trees during landscape maintenance	1	Ongoing	N/A	√
24	Implement measures that could enhance maintenance of trees	1	Ongoing	Low	
	a. Expand existing programs to encourage residents to water trees.	1	Ongoing	N/A	
	b. Explore alternative water sources for watering trees	2	Medium	Moderate	
	c. Explore the possibility of including provisions for tree maintenance in subdivision and development agreements	2	Medium	Low	
25	Maintain the biological integrity of native remnant trees and forests in natural areas	1	Ongoing	Low	
	a. Take on a leadership role and work with others on the management of invasive species	1	Ongoing	Low	√
26	Use the products of the urban forest.	2	Medium		
	a. Recycle waste materials	2	Medium	Moderate	√
	b. Consider a green waste pick-up service	2	Medium	High	√
Monitoring and Enforcement					
27	Increase monitoring and enforcement related to tree management and planting in private developments	1	Short	Moderate	√
28	Monitor the results of implementing bylaw requirements on private land and refine strategies for minimizing the loss of pre-development and newly planted trees	2	Ongoing	Moderate	√
Communication and Awareness					
29	Undertake a communication strategy with Council, staff, industry and the public	1	Short	Moderate	
	a. Reach out to industry and others and direct them to the web page	1	Ongoing	N/A	
	b. Distribute urban forest information widely	1	Ongoing	Low	
	c. Conduct annual workshops with the tree industry and design professionals	2	Medium	Low	
	d. Add information on the urban forest in “Did you Know?” clips	1	Ongoing	Low	
	e. Develop and promote a walking tour and “app” of “significant trees”	2	Medium	Moderate	
	f. Consider distributing more tree coupons to account for the 30% that are not used	1	Short	N/A	
	g. Provide information to real estate agents about the values of trees and their potential effects on property value	2	Medium	N/A	
30	Prepare a web page related to urban forest information and initiatives	1	Short		
	a. Include information on the values and benefits, City policies and programs, tree selection guide, etc.	1	Ongoing	Low	
	b. Update the web page regularly with new information	1	Ongoing	Low	
	c. Include technical information suitable for industry and developers	1	Ongoing	Low	
31	Continue to support and expand stewardship programs that involve volunteers in planting and maintaining trees	1	Ongoing	N/A	
32	Explore opportunities to establish an Arboretum of trees and shrubs in the City	1	Ongoing	N/A	
33	When a large or significant tree requires removal, provide information to the public on the reasons	1	Ongoing	N/A	
34	Consider unique ways to increase community awareness of and involvement in tree protection and care	1	Ongoing	Low	
	a. Consider a tree canopy competition among neighbourhoods	1	Ongoing	Low	

Objectives and Recommendations (summarized)		Priority	Phasing	Relative Cost or Cost/ Year	Increase in Operating Costs
	b. Consider a backyard tree inventory as a community project, similar to the bird count	2	Medium	Low	
	c. Consider a tree retention program in older neighbourhoods, involving residents in identifying important trees to be retained	2	Medium	Low	
	d. Consider ways to increase attendance at Arbor Day	1	Ongoing	Low	
Finance					
35	Stress the fact that long-term investment in the urban forest should be tied to increases in City revenue and population growth	1	Ongoing	N/A	
36	Provide and seek adequate resources for urban forest planning, management and stewardship	1	Ongoing	Moderate	
	a. Strive to identify sustainable funding to plant trees on City land to achieve tree canopy targets	1	Ongoing	Low	
	b. Provide adequate funding to achieve appropriate maintenance practices that will ensure the sustainability of trees	1	Ongoing	Low	√
	c. Identify sustainable budget sources for replacing dead park and street trees	1	Ongoing	Low	
	d. Explore potential corporate sponsorships for urban forest initiatives	2	Medium	N/A	
	e. Work with other municipalities to have the public component of the urban forest recognized as a tangible capital asset within the Public Sector Accounting Handbook.	2	Medium	Low	
	f. Seek funding from organizations such as Tree Canada, TD Green Streets and the Evergreen Foundation	1	Ongoing	N/A	
Staff Resources and Collaboration					
37	Increase the City's staff resources	1	Ongoing	High	
	a. Increase financial support for ongoing training programs to keep staff current with new practices.	1	Ongoing	Moderate	
38	Improve coordination among City departments with respect management of the urban forest	1	Ongoing	N/A	
39	Encourage an Integrated Pest Management Accreditation Program in BC for the public works sector	1	Medium	N/A	
40	Collaborate with other government, academic and stakeholder groups on items of mutual interest with respect to the urban forest	1	Ongoing	N/A	
	a. Collaborate with Thompson Rivers University (TRU) on research and data collection	1	Ongoing	N/A	
	b. Work with BC Hydro on options for tree planting and tree management near powerlines	1	Ongoing	N/A	
	c. Contact major industries in Kamloops re tree planting as mitigation for air quality impacts	1	Ongoing	N/A	
Next Steps					
41	Continue to measure and evaluate the tree canopy, and revise strategies as required	1	Ongoing	Moderate	
	a. Update the sizes of City trees and redo the valuation based on that information	2	Medium	Moderate	
	b. Evaluate the tree canopy and its values every three years using measures similar to those in this Strategy	2	Ongoing	Low	
	c. Review the results associated with the application of strategies, bylaws, plans and standards as they are modified over time	1	Ongoing	Low	
	d. Identify and implement adaptive strategies based on the evaluations	1	Ongoing	Low	
42	Generate new tools for understanding and managing trees	2			
	a. Commit resources to understanding the implications of climate change	1	Ongoing	Low	
	b. Develop a comprehensive tree technical manual that is used to modify bylaws and standards	2	Medium	Moderate	
	c. Evaluate alternate tree procurement processes, supporting local businesses where feasible	1	ongoing	Low	
43	Plant 4,000 trees over the next 20 years	1	ongoing	High	√

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Appendix A: Kamloops Urban Forest Management Plan Summary

Objectives

The following are the objectives and recommendations of the City's 2006-2007 Urban Forest Management Plan:

- To formulate the philosophy, guidelines, criteria, and standards for a sustainable urban forest
- To review the City's policies and programs related to tree planting, maintenance, replacement and removal, and recommend potential changes
- To develop or update planting and maintenance procedures and incorporate them into a manual intended to ensure the best care of the urban forest
- To establish guidelines for the prioritization of work needs and service requests
- To review the current procedures for handling service requests and recommend potential changes
- To formulate Urban Forest Management guidelines addressing issues such as the responsibility of the City, the public, and developers for planting and maintaining trees
- To review the role of the City in ensuring that it is provided with suitable stock for the urban forest and recommend potential changes that will benefit the tendering requirements
- To review the current urban forestry public participation and education programs and recommend potential improvements

Recommendations

- Implement a set of standards for purchasing and accepting plant material
- Develop a planting standard and specifications for all trees/shrubs planted on City property
- Develop training program for Urban Forestry staff
- Adopt ANSI a300 pruning standards as City woody plant maintenance standards.
- Develop a tree maintenance policy and procedures manual which may include the following
  - Pruning standards
  - Public request procedure regarding tree removal
  - Tree protection
  - Request for Service response standards
- Liaison with interdepartmental agencies advocating proper tree placement in urban developments
- Develop a Storm Response Plan
- Develop a Community Wildfire Protection Plan
- Develop a new Significant Tree Strategy
- Increase funding to urban forestry programs to be proactive in the management of our Urban Forest
- Develop an Urban Forestry education program
- Ensure the development and maintenance of the computerized tree inventory system
- Develop and implement a Master Tree Planting Strategy

Appendix B: Web Survey Summary

Introduction

The City of Kamloops is preparing a new Urban Forest Management Strategy (UFMS) in recognition of the significant benefits provided by trees in the City. Previous Urban Forest Management Plans had been prepared in 1997 and 2007.

A draft UFMS was prepared, with information on the City's trees and their values, existing tree management policies and practices, comparisons with other jurisdictions, and proposed goals, objectives, and recommendations. The City sought input from Kamloops residents on the draft UFMS during an open house/workshop on March 4, 2015 and through an online survey – also made available in hardcopy format.

The survey was open to the public for one month, ending March 20, 2015. There were 146 surveys filled in, and 53% of those respondents completed the entire survey. The following is a summary of the input received through the community survey.

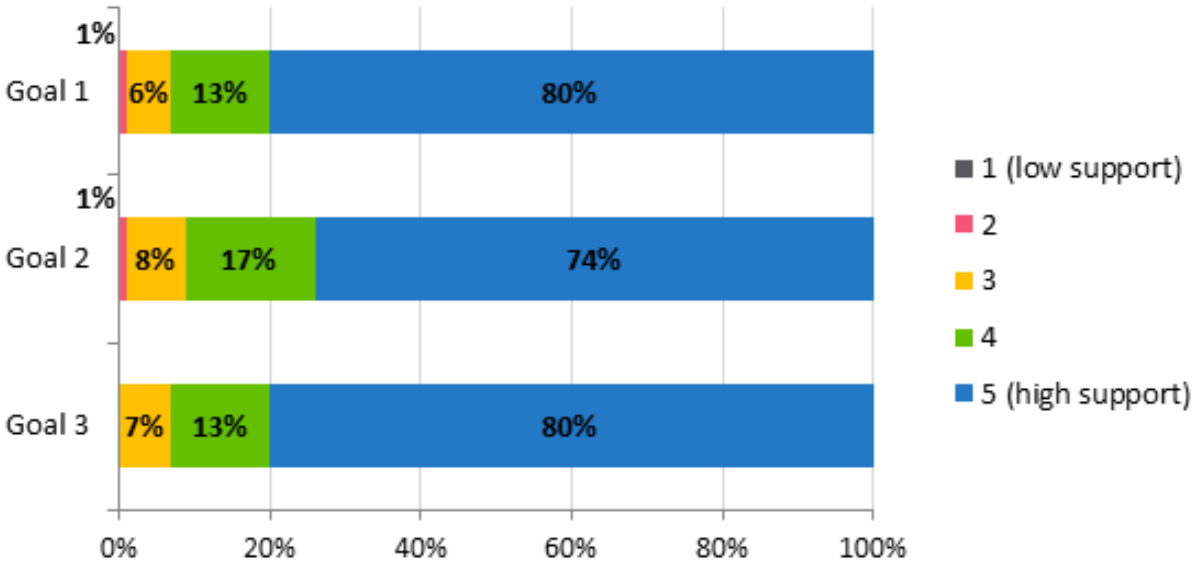
›repared a draft Urban Forest Management Strategy (UFMS) in recognition of the trem
gy provides information on the City's trees and their values, existing tree managemen
isdictions. The City would like input from the community on the proposed goals, objec
this questionnaire.

Urban Forest Management Goals

Respondents were asked to rate their level of support for the following goals on a scale of 1 (low support) to 5 (high support):

- Goal 1: Protect, enhance and expand the urban forest
- Goal 2: Develop and maintain strong community understanding of and support for the urban forest
- Goal 3: Design and manage the urban forest to maximize the environmental, social, health, and economic benefits.

Each of the goals received strong support from respondents, with none of the goals receiving any ratings lower than two. The graph below shows the responses for each of the three goals.



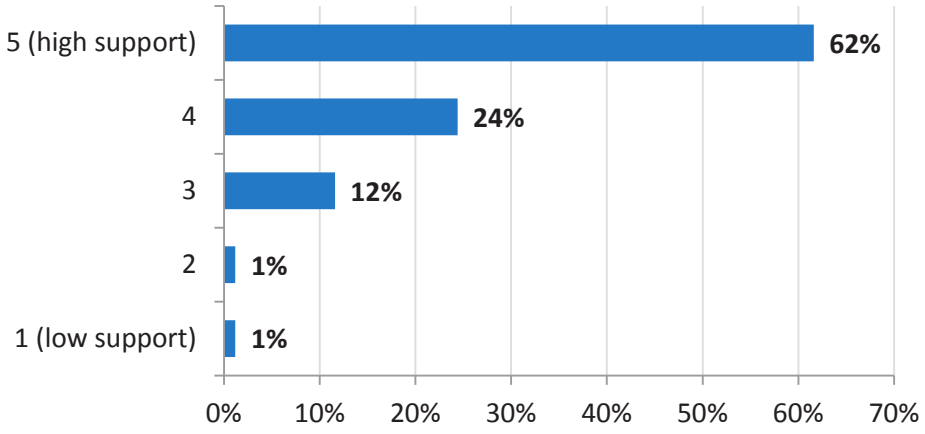
Respondents were asked to provide comments to help explain their level of support for the three goals. Fifty-one (51) comments were provided with the majority of respondents providing an explanation for why trees are important to them and the value they provide. Other comments cited a need for better protection and maintenance of trees, in particular when maintenance is required around hydro lines. A number of comments also expressed need for increased public and developer education in this area.

Objectives and Recommendations

Respondents were provided with a summary of proposed objectives and recommendations and asked to rate their support for each from 1 (low support) to 5 (high support).

Tree Canopy Profile in the City

1. Raise the profile and importance of the tree canopy through high-level City plans and strategies.
    - Establish tree canopy targets.



Respondents were asked to provide comments to help explain their rating, with 27 responses given. Many comments cited the important role trees play, including providing shade and enhancing the beauty of a street. Two respondents expressed concerns over trees in new developments, either being removed or not being planted. The need to increase public awareness and education was also cited within the comments provided.

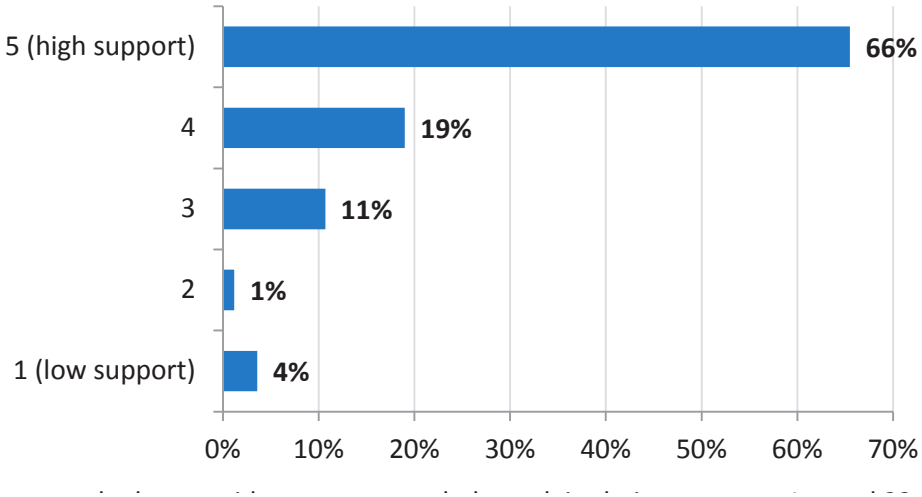
City Strategies, Bylaws, and Plans

2. Integrate the recommendations of all relevant City documents in relation to the urban forest.

3. Update existing bylaws to strengthen policies related to the urban forest.
    - Increase tree planting requirements in new developments.
    - Update the Tree Protection Bylaw.
    - When residents petition for tree removal, require them to pay for the value of the tree and a replacement tree in another location.

4. Update existing standards and practices in relation to the urban forest.
    - Increase the number of street trees along roads.
    - Expand the number of “significant trees” identified as such.

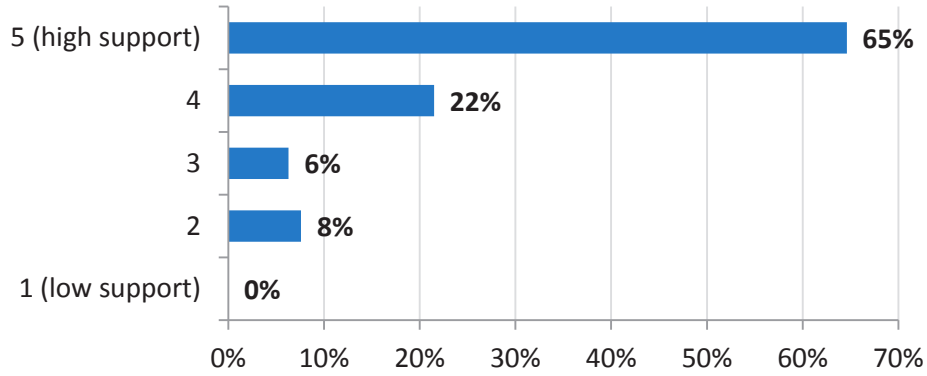
5. Improve the development review process in relation to trees.



Respondents were asked to provide comments to help explain their responses. In total 32 comments were provided. Many of the comments were in support of tree planting requirements for new developments as well as general support for measures that protect trees. However, a number of respondents were opposed to requiring residents who petition for tree removal pay for the value of the tree removed.

Communication and Awareness

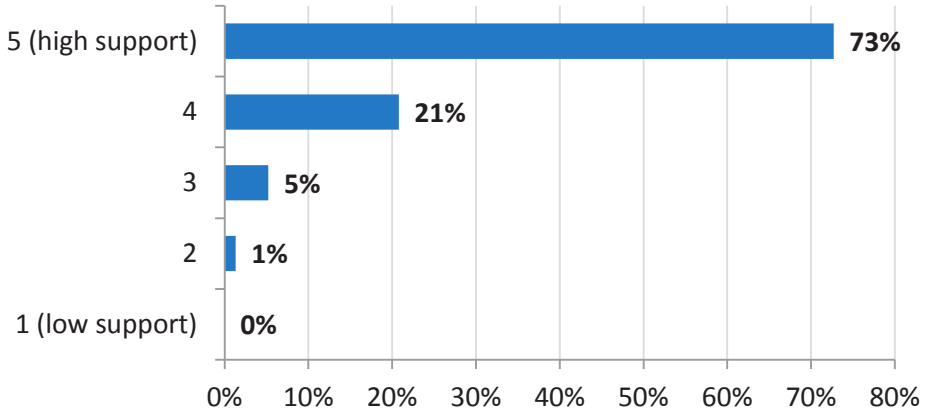
1. Undertake a communication strategy to raise awareness about the values and benefits of the urban forest.
2. Prepare a web page related to urban forest information and initiatives on the City's website.
3. Continue to support and expand stewardship programs that involve volunteers in planting and maintaining trees.
4. Explore opportunities to establish an Arboretum of trees and shrubs in the City.
5. Label "significant trees" with a plaque near the tree.
6. When a large or significant tree requires removal due to health issues or hazards, provide information to the public on the reasons for the removal.



Respondents were asked to provide comments to help explain their rating, with 20 responses given. A number of comments were in support of the Communication and Awareness objectives; however a handful of respondents expressed concerns over labelling “significant trees” with a plaque, siting vandalism or clutter in the landscape. Other comments recommended the use of a web page to share information with the public, in particular the reasons for tree removal.

General Urban Forest Guidelines

1. Encourage connectivity between areas of natural habitat through strategic greenway and neighbourhood urban forest enhancement initiatives.
2. Manage trees for their environmental values.
3. Manage trees to reduce the risk of loss from pest or disease outbreaks, wildfire, and climate change.

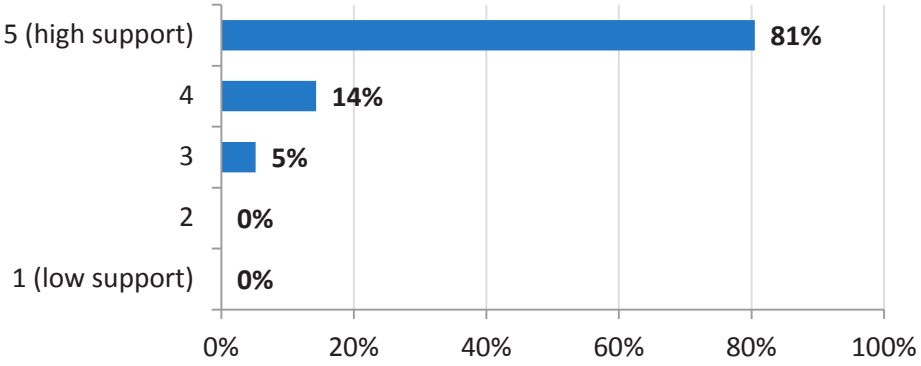


Respondents were asked to provide comments to help explain their responses, and 17 comments were provided. These included support for increasing connectivity between areas, the need to address non-native and invasive species, and support for protecting against pests and diseases.

Tree Planting Practices

1. Adopt appropriate practices for tree planting, and incorporate these into all relevant policies and plans.

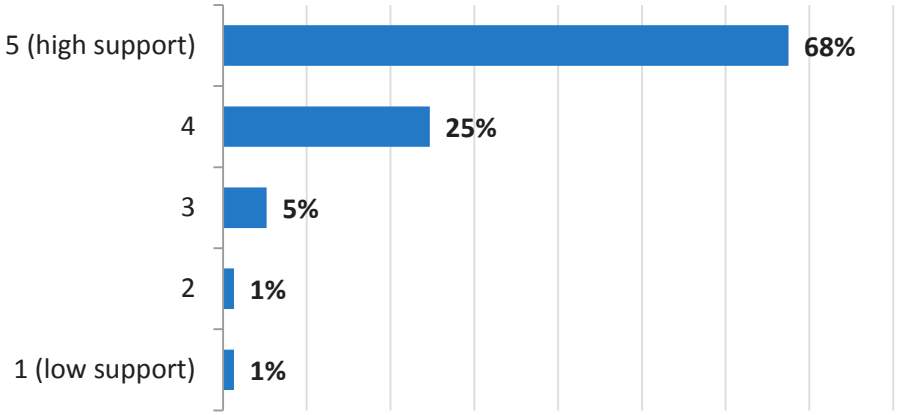
    - Plan for a diverse age range and species diversity in the street and park tree populations, select the "right tree for the right place", and prepare design guidelines for tree planting and species selection.



Respondents were asked to provide comments to help explain their rating, with 24 responses given. Eight of those comments were in support of planting the right tree in the right place. Comments also highlighted the importance of planning and design, as well as education and support for the public.

City Trees

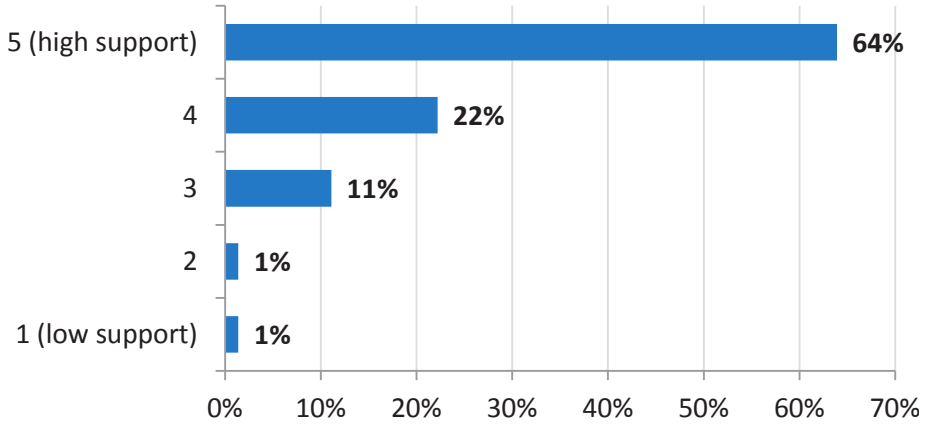
1. Increase tree planting in existing and new parks, other City facilities (e.g., libraries, police and fire stations), and road allowances.
2. Continue a vigorous street tree replacement program.
3. Consider the planting of fruit and nut trees on City land.
4. Promote trees as tools to retain customers in commercial districts.



Respondents were asked to provide comments to help explain their responses, and 29 comments were provided. Fifteen of those responses cited concerns over the planting of fruit and nut trees on City land. The concerns varied, but many were centered on the level of maintenance involved with fruit and nut trees and the notion that these types of trees may attract wildlife such as bears. In addition to the concerns around fruit and nut trees, five comments were provided in support of this recommendation.

Private Property

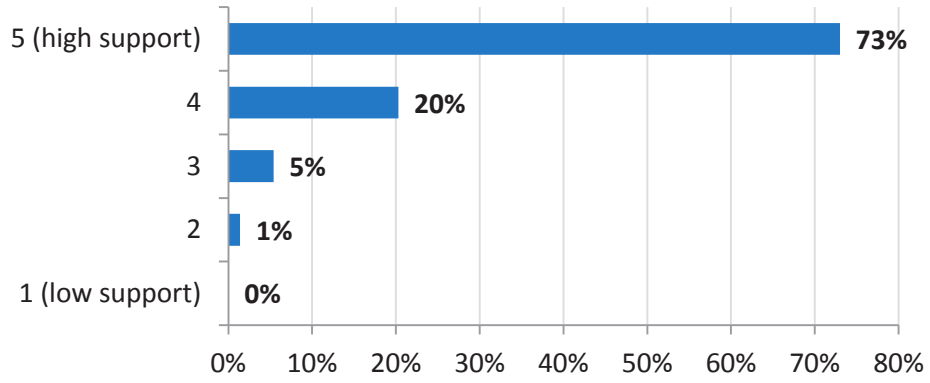
1. Encourage private land owners to protect and maintain existing trees, to increase tree planting, and to reduce tree removal.
2. Partner with private and non-City government institutions to encourage more tree planting.
3. Consider a pilot project to encourage homeowners to 'host' public trees on their front yards.



Respondents were asked to provide comments to help explain their rating, with 24 responses given. A number of the comments were in support of a pilot project to encourage homeowners to 'host' public trees. Other comments included suggestions around implementing incentives for homeowners to maintain trees/shrubs on their property and increasing education and resources for homeowners with regard to maintenance of trees.

Maintenance of Trees

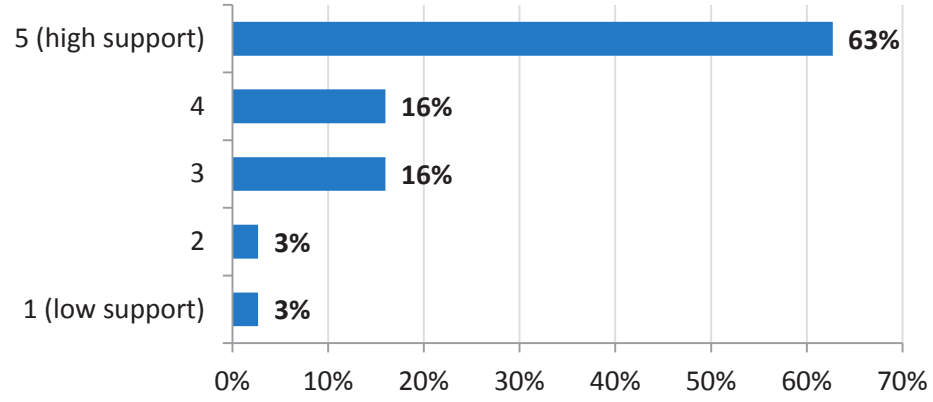
1. Adopt and adhere to professional standards for tree care, and encourage private land owners to follow these practices as well.
2. Implement measures that could enhance maintenance of trees.
3. Maintain the biological integrity of native remnant trees and forests in natural areas.
4. Use the products of the urban forest.



Respondents were asked to provide comments to help explain their responses, and 15 comments were provided. These included concerns about the costs to homeowners, specifically with regard to metered water, and the need to increase public awareness and education in this area.

Monitoring and Enforcement

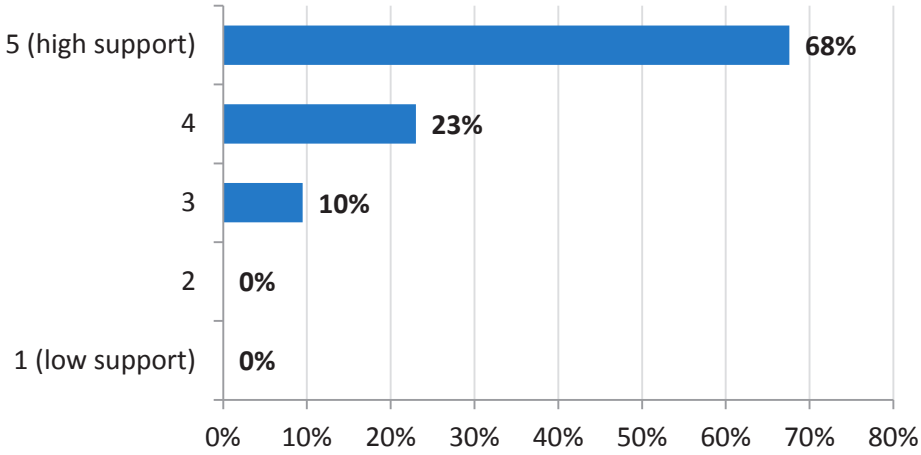
1. Increase monitoring and enforcement related to tree management and planting in private developments.
2. Monitor the results of implementing bylaw requirements on private land and refine strategies for minimizing the loss of pre-development and newly planted trees.



Respondents were asked to provide comments to help explain their rating, with 14 responses given. The comments were varied, but included specific suggestions for how to address monitoring and enforcement as well as comments against monitoring and enforcement on private lands. One comment highlighted the need to address occurrences of newly planted trees being stolen.

Financing

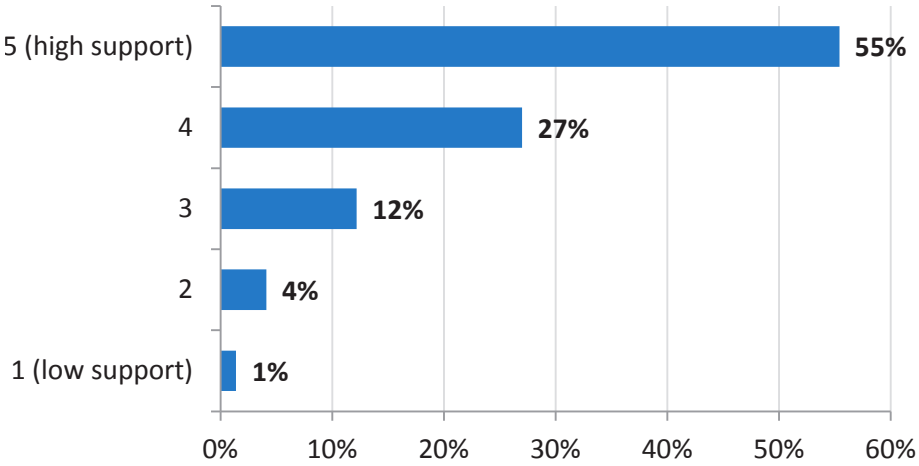
1. Provide and seek adequate resources for urban forest planning, management and stewardship.



Respondents were asked to provide comments to help explain their responses, and 10 comments were provided. These included statements about the cost involved as well as suggestions to increase public awareness and education around maintenance.

Staff Resources and Coordination

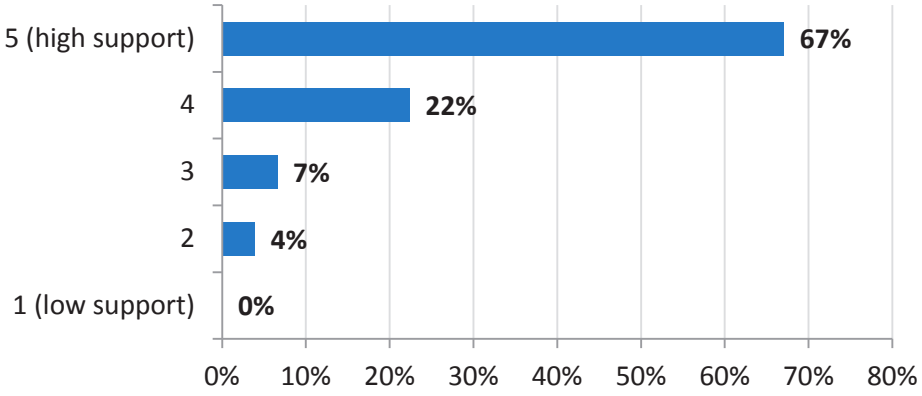
1. Increase the City's staff resources and training.
2. Improve coordination among City departments with respect to the urban forest.
3. Collaborate with other government and stakeholder groups.



Respondents were asked to provide comments to help explain their rating, with 21 responses given. The comments were varied but touched on concerns/questions around the cost involved in achieving the objectives, suggestions to leverage volunteer and other outside resources, such as foresters/ arborists, and the need to increase training and improve coordination for City staff.

Next Steps

1. Continue to measure and evaluate the tree canopy, and revise strategies as required.
2. Generate new tools for understanding and managing trees, e.g., the implications of climate change.

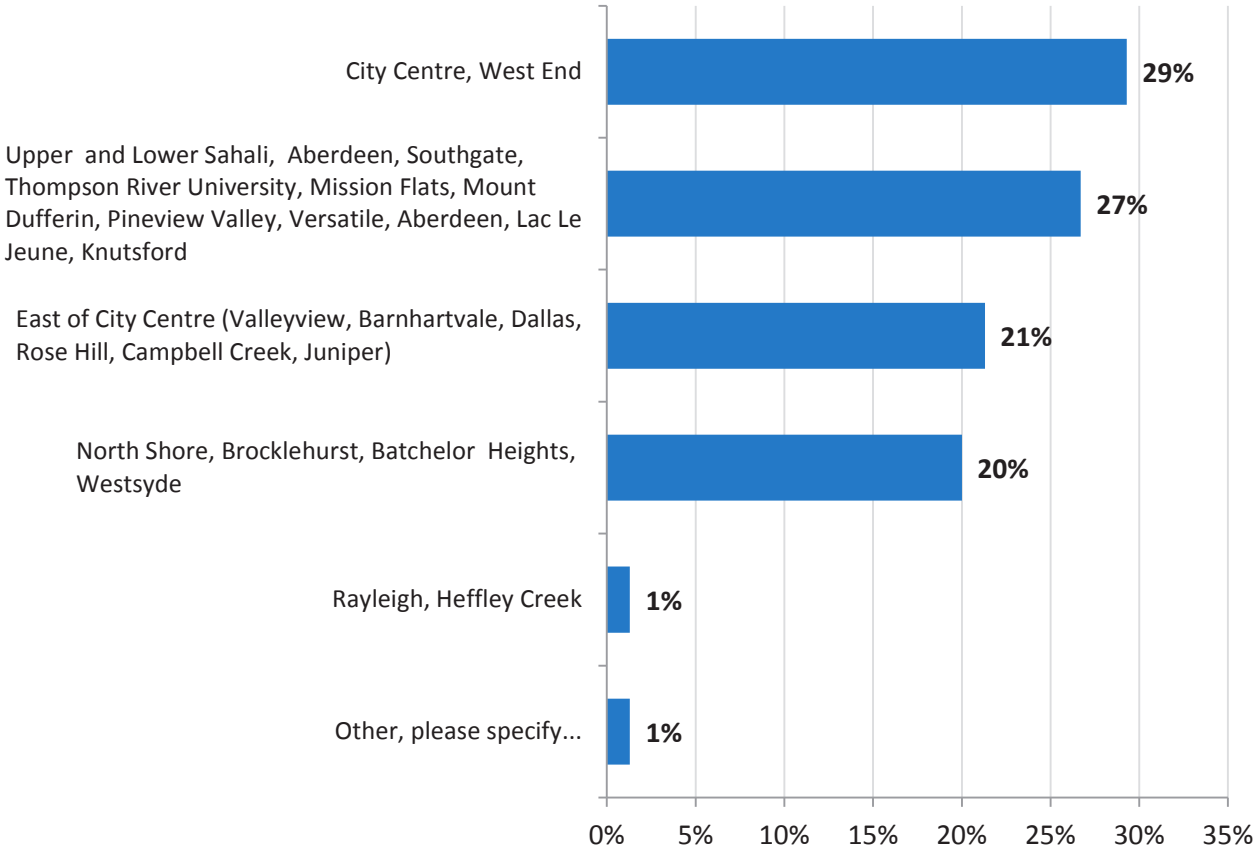


Respondents were asked to provide comments to help explain their responses, and nine comments were provided. These included remarks highlighting the importance of measuring outcomes and planning for climate change. One comment suggested increasing targets in this area, while another suggested partnering with researchers or institutes in this area to achieve the Next Steps objectives.

Demographics

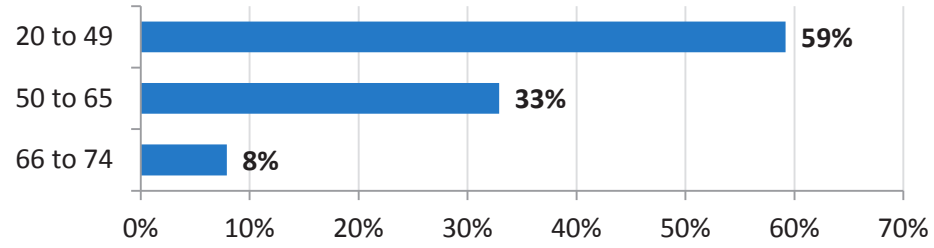
Area of Residence

Respondents were asked to indicate which area of the City they live in. The results show a fairly balanced representation from each of the areas listed, with the exception of the Rayleigh/Heffley Creek area. The graph below illustrates where survey respondents live. One respondent indicated living in an "other" area, specifically the Kamloops Indian Reserve.



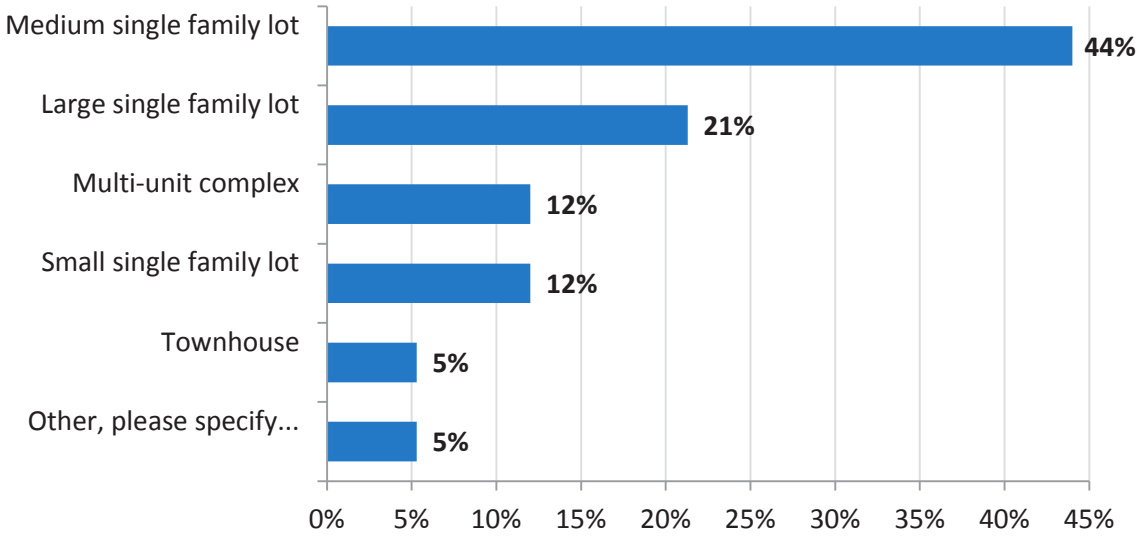
Age Bracket

Respondents were asked to provide their age bracket, with the majority of respondents in the 20 to 49 year old range. None of the survey participants were under 20 or older than 74.

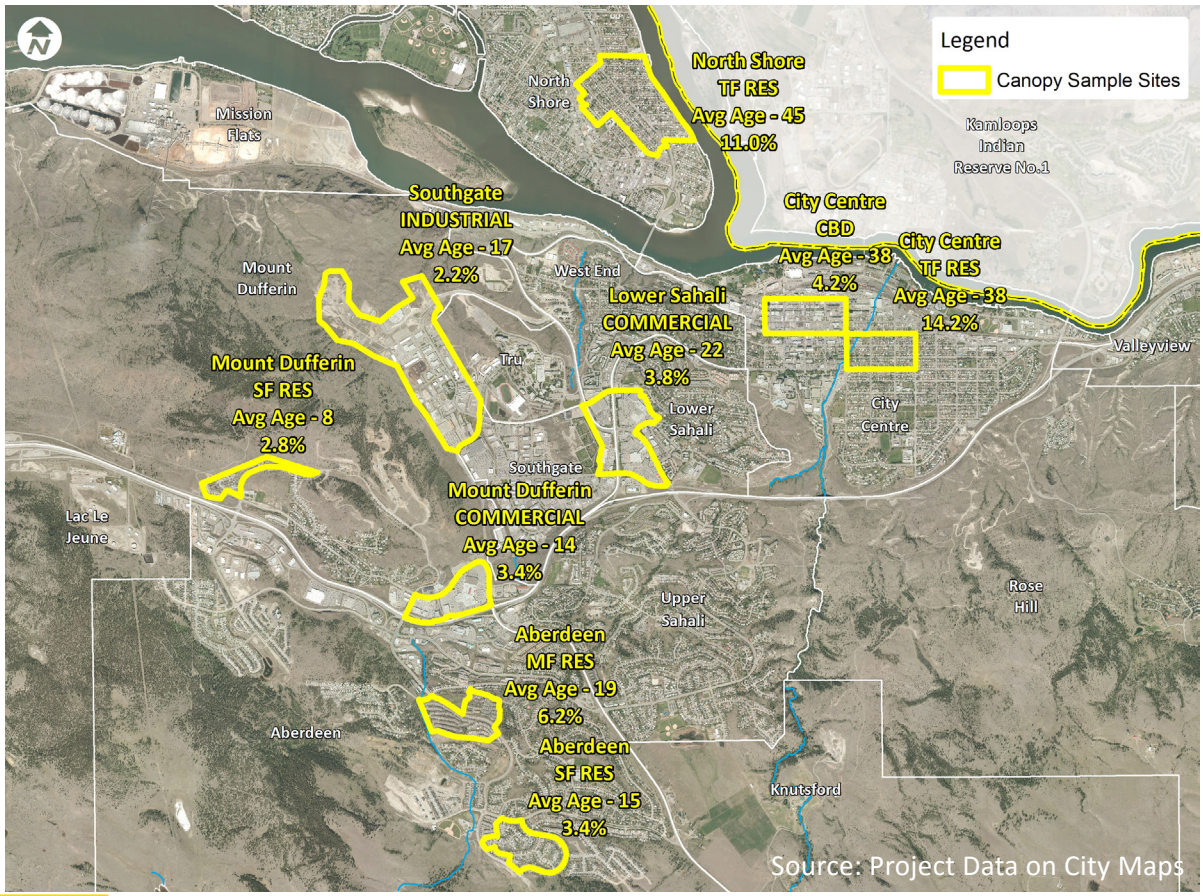


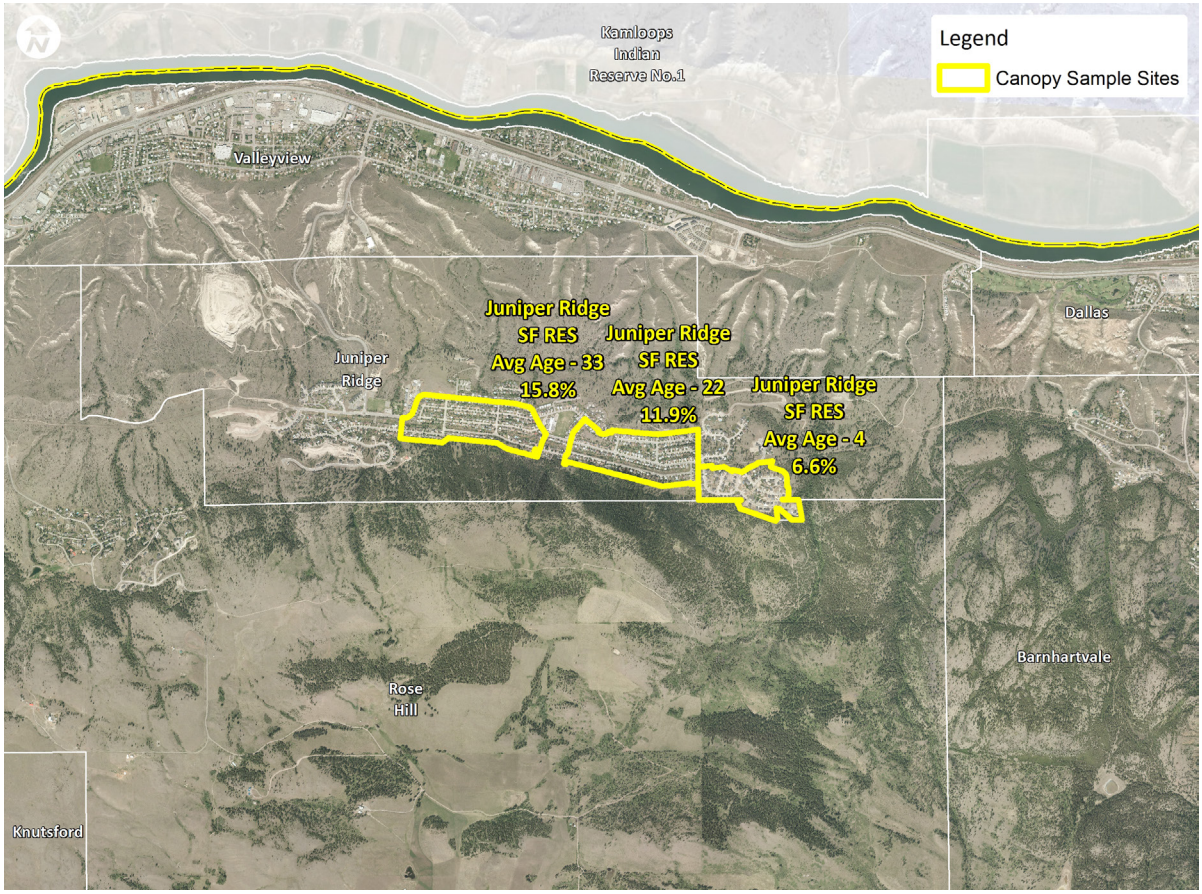
Housing

Participants were also asked to indicate the type of housing they currently reside in from a list of six options, including medium or large single family lot, multi-unit complex, and townhouse. The graph below illustrates the type of housing lived in by the survey respondents.



Appendix C: Sample Sites




Legend
Canopy Sample Sites
Kamloops Indian Reserve No.1
Valleyview
Juniper Ridge
Juniper Ridge SF RES Avg Age - 33 15.8%
Juniper Ridge SF RES Avg Age - 22 11.9%
Juniper Ridge SF RES Avg Age - 4 6.6%
Dallas
Barnhartvale
Rose Hill
Knutsford

Appendix D: Comparison Communities

Urban Forestry Summary

This section provides a summary of urban forestry information, tools and practices in other municipalities. These were selected for their similar size, comparable climate and/or innovative practices.

Calgary, Alberta

With its dry climate and tree canopy cover of 7%, Calgary is challenged to manage its urban trees. The Calgary Open Space Plan (2003) established the City's vision and policies for sustainable forestry practices to maintain the health and density of its existing canopy and facilitate additional planning to keep up with city growth and meet environmental targets. As recommended by this Plan, the City established the Parks Urban Forest Strategic Plan in 2007, which set a vision of Calgary's urban forest as "a sustainable asset contributing to the environmental, social, and economic wellbeing of current and future generations". This 2007 Plan identified 15 guiding principles within three topic areas:

- Achieve and Maintain Healthy Trees – Ensure the health of individual trees and shrubs and emphasize the overall health of the entire tree population. The urban forest asset must be managed by best practices that optimize tree health coupled with a detailed understanding of a tree's lifecycle. The urban forest must be cared for through a planned routine maintenance program. The sustainability of the forest is achieved through inspection of tree health and structure, preservation of trees during development and redevelopment, selection of a diversity of proper species, ages and sites, and ensuring the quality of planting stock.

- Collaborate with the Community – A shared vision and support of the community is critical for creating and maintaining a sustainable urban forest on both public and private land. The City of Calgary recognizes it must build links, partnerships, and education programs that engage the public and other stakeholders in the stewardship and management of trees on public land. Since many urban trees are on private property, the actions of residents, commercial enterprises, and institutions are key influencers of urban forest sustainability.

- Resource to Manage and Measure the Asset –The final critical element of a sustainable urban forest is adequate resources for the required tasks. Resources such as funding, skilled work forces in both the private and public sector, technical expertise, and an effective regulatory framework are necessary. It is also essential to measure and monitor change in the urban forest and provide the ability to adapt or adjust the program based on the evaluation and results. Essential tools required to "do the job right" include operational and strategic plans, skills, technology, standards, and performance measures.

In the area of community collaboration, Calgary has some innovative programs including:

- Gardening and tree care tips on its website,

- Planting Incentive Program (PIP) in which the City will match 50 percent of the cost of a new tree to be planted on City-owned residential property in Calgary such as boulevards and streets. Residents help choose the species and location of the tree, and once approved, the City will do all of the planning, digging and planting required.

- The NeighbourWoods program for tree stewardship.

In 2003, the City of Calgary established the Tree Protection Bylaw 23M2003, which requires the authorization of the General Manager of Parks to plant, remove, cut, move (etc.) a tree growing on City-owned land. Though this bylaw does not apply to trees on private land, developers are required to present a Tree Protection Plan if construction activities will come within six metres of a public tree growing in the road right of way.

Kelowna, BC

Despite its dry climate and susceptibility to forest fires, recent canopy coverage estimates from 2012 suggest that the City of Kelowna has an urban tree canopy of 16%. As outlined in its Sustainable Urban Forest Strategy (2011-2012), Kelowna has set a target for 20% urban forest coverage by 2030 under the guidance of three broad goals and associated objectives:

- Maintain and Enhance the Existing Vegetation Resource – The City of Kelowna has set objectives to promote species and tree age diversity to enhance the resiliency of its urban forest. The City also aims to preserve the biodiversity and integrity of native remnant forests and wildlife corridors surrounding the City.

- Strengthen the Community Framework – The City of Kelowna recognizes the critical importance that community awareness and action can play to support the maintenance and enhancement of Kelowna's urban forest. The City has established a framework to encourage buy-in and support for City urban forest goals from actors in public agencies, large private land owners and green industry. The City has also proposed methods to build community awareness about the importance of the City's urban forest and about opportunities for citizens to participate in urban forest management at the neighbourhood level.

Recommended initiatives to encourage community stewardship include:

- Providing urban forest grants for preserving trees on public or private land
- Facilitating sponsorship opportunities or monetary contributions to pay for community-led tree management and awareness initiatives

- Enhance the City's Resource Management Approach – The Sustainable Urban Forest Strategy also sets the preconditions for the development and implementation of an Urban Forest Management Plan for trees on both public and private property. The Strategy calls for a Plan that will provide guidelines and specifications for species use and that will delineate a framework for adhering to professional tree care standards and for routine urban forest information collection.

Additional recommendations for the implementation and financing of urban forest management initiatives include the establishment of a 'Green Kelowna Fund' to raise money for sustainability commitments outlined in the Kelowna Community Greenhouse Gas Emissions Inventory and Projections Report and 2030 OCP. Other initiatives proposed in the Strategy include further study on the feasibility of grey water recycling for tree and landscape irrigation and the development of a Planting Strategy to guide planting of climate-appropriate species.
The City of Kelowna also enforces a number of bylaws designed to protect trees on public and private land. Among these bylaws, the Tree Protection Bylaw No. 8041 requires a permit for the removal of trees in the "Tree Cutting Permit Areas' as defined by the City's Official Community Plan. The Municipal Properties Tree Bylaw No.8042 provides regulations for the control and management of trees located on city-owned properties.

Surrey, BC

Surrey has a comprehensive urban forest management policy framework, with tree management objectives integrated within the City's Sustainability Charter (2008), Parks, Recreation and Culture Strategic Plan (2008), and recent OCP (2014). The City has a target tree canopy of 40% by 2058. The Surrey OCP sets objectives to preserve and expand the existing urban forest by increasing the number of mature and native tree species across the City and by promoting the planting trees along major roads, medians, boulevards and parking lots.

The "Surrey Tree Protection Bylaw, 2006 No. 16100" is one of the most progressive tree protection bylaws in BC. The bylaw regulates and prohibits the cutting, removal and damage of trees, the setting of fees and issuance of permits for the same, the requirement for replacement trees, and of security for their provision and maintenance. Under the bylaw, if trees are to be removed, replacement trees are required at a rate of two trees planted for every one tree removed. When trees are unable to be planted on site, cash in lieu is received by the City of Surrey. This money is held in the Green City Fund, some of which is used for park tree planting and special projects by the Planning, Parks and Engineering Departments.

Surrey has undertaken two studies of its urban forest in order to obtain an understanding of existing conditions and trends. These studies provide an overview of the tree canopy across the City, and a focused review of the tree canopy on the City's parks and road corridors, respectively. The two studies include complementary recommendations for protection and enhancement of the City's tree canopy.
The City's tree canopy study found that the canopy was 33% in 2001 and 30% in 2009. A new tree cover analysis (conducted in 2014) indicates that the canopy was 27.7% in 2013. Projections of the tree canopy based on land use change indicate that the tree canopy will continue to decline without changes in bylaws and practices.

The study of City trees recommends the following tree canopy targets (% of City covered) for land managed by the City based on an analysis of space available, tree species and projected tree canopies by tree size:

Park forested natural areas	7.5%
Park shade trees	1.3%
Street trees	4.0%
Total tree canopy from City land	12.8%

(Read table as: 7.5% of the City will be covered by the canopy of forested natural areas in parks, etc.)

Victoria, BC

The City of Victoria OCP (2012) sets a vision and objectives for the enhancement of its urban forest, including trees on both public and private land. Currently, 18% of the City of Victoria is well or heavily treed and targets for the future expansion of the canopy has been identified as an important action item recommended in the City's Urban Forest Master Plan (2013). The Urban Forest Master Plan presents four broad goals for urban forest preservation:

- Develop and Maintain Strong Community-wide Support for the Urban Forest – The Plan emphasizes the importance of community awareness and stewardship for urban forest management by encouraging school and youth programs, leading outreach to local businesses and residents about tree value and maintenance, and providing incentives for tree retention and planting on private property. The Plan also highlights the importance of partnership with senior levels of government, utilities and the corporate sector as a means of accessing sustainable funding. Collaboration with neighbouring communities is also encouraged to create inter-jurisdictional tree preservation strategies and initiatives.
- Protect, enhance and expand Victoria's urban forest – The Plan outlines approaches to establish an urban forest that is designed for longevity and resilience to threats such as climate change and pests. Approaches will include establishing canopy cover targets for public and private lands and implementing the 5-Year Municipal Forestry Plan and other supportive bylaws and policies.
- Design and manage the urban forest to achieve objectives for watershed health, biodiversity, and the conservation of sensitive ecosystems – The Plan seeks to leverage the cumulative and integrated benefits of a healthy urban forest through initiatives such as mapping and preserving sensitive ecological habitats.
- Maximize community benefits from the urban forest in all neighbourhoods – Through the strategic planning of green infrastructure to maximize community and ecological benefits of trees such as enhanced real estate values, community recreation opportunities, rainwater management, shading for energy conservation, carbon sequestration and habitat preservation.

The City of Victoria also established the Tree Preservation Bylaw No. 05-106 to regulate the cutting, removal and replacement of trees on both public and private land.

Canmore, Alberta

In 2011, the Town of Canmore adopted the Urban Forest Management Plan (UFMP) as a guiding document for managing its urban forests. This Plan includes an inventory of urban forest coverage across the Town's ten neighbourhoods. The UFMP also identifies key risks and hazards to tree health across Town, including disease, invasive plants and mountain pine beetle-infestation, and proposes management strategies for mitigation and response.

The UFMP makes a number of recommendations for updating the existing urban forestry policy framework based on best practices across Canada. These recommendations include building upon the Town's Tree Cutting on Town Property Policy (2007) to include a more comprehensive evaluation of tree health and protection that considers storm events as well. The UFMP also recommends that Heritage Tree Designation and Tree Protection programs be established to pertain to trees on both public and private property.

Los Angeles, California

In a semi-arid climate, Los Angeles currently has around 6 million trees contributing to 11.1% tree canopy cover with an additional 13.8% shrub cover (Nowak et al. 2010). With rapid population growth and human development, the City recognized the need to conserve urban trees and ecosystem functions and prepared guidelines in the Urban Forest Program. Los Angeles is currently heavily investing in increasing urban canopy cover through its Million Trees LA initiative with the objectives of improving air and water quality, alleviating water shortages, cooling urban heat islands, and reducing local flooding (McPherson et al.2010). In Los Angeles, the average benefit per tree averaged $1,000 for low density residential use (McPherson et al.2010). The following are some specific benefits:

- Air Pollution Removal –Poor air quality is associated with human health problems and reduced visibility. Trees and shrubs remove approximately 4,500 tons of pollutants per year valuated at $32.4 million per year.
- Energy Use in Buildings—Trees reduce energy consumption by shading buildings, providing evaporative cooling, and blocking winter winds. Trees in Los Angeles are estimated to reduce energy costs from residential buildings by $10.2 million dollars annually, with an additional $73,000 savings per year in reduced carbon released by fossil-fuel power plants.

Annual energy savings due to trees near residential buildings

	Heating	Cooling	Total
MBTU[a]	-293,500	n/a	-293,500
MWH[b]	-16,800	96,400	79,600
Carbon avoided (t)	-6,393.34	9,920	3,527

[a]Million British Thermal Units
[b]Megawatt-hour

Annual savings[c] (U.S. $) in residential energy expenditures during heating and cooling seasons

	Heating	Cooling	Total
MBTU[a]	-3,410,000	n/a	-3,410,000
MWH[b]	-2,874,000	16,467,000	13,593,000
Carbon avoided	-132,700	205,700	73,000

[a]Million British Thermal Units
[b]Megawatt-hour
[c]Based on 2007 and 2010 energy costs from Los Angeles[17]

USDA 2010

Tree Operations and Maintenance Practices and Costs

Kamloops staff were interested in more detailed information on operations and maintenance practices and costs in some of the comparison communities. This data is outlined on the table below:

	Kelowna	Vancouver	Denver	Kamloops
Urban Forest				
Do you have an urban tree inventory?	Yes	Yes	Yes	yes
If so, how many trees do you have?	~ 22,000 street trees	~ 143,000 street trees	~ 115,000 street trees	~ 16,000
What is your existing tree canopy?	13-16%	17%	19.7%	12%
Do you have a tree canopy target and if so, what is it?	20-25%	Maintain 17%	18%	20%
Practices				
What are your cycles for boulevard, park and other trees throughout your City for the following:	Largely reactive in approach, known hazard trees receive majority of attention	Three types of inspection: windshield (drive-by) – once per year to identify work needed; service request – calls from 311 inspected within 2 business days; monitors – previously identified hazard or have installed hardware, thoroughly inspected once per year.	The City is responsible for inspecting all trees, but work is paid for by property owner. The City does not maintain public ROW trees, these are the responsibility of adjacent land owner.	A 4 to 6 year pruning cycle for most boulevard trees, and a 5 to 10 year cycle for park trees. There is a young tree pruning program on a 2 year pruning cycle.
Complete tree inventory inspection?	Every 8-9 years (target – 7)	All trees visited at least once every 8 years.	All high canopy trees at least once a year. All low canopy trees at least once every 2 years. (Some inspectors are faster and inspect all trees every year)	A visual inspection of trees during pruning, but no regular inspection program.

	Kelowna	Vancouver	Denver	Kamloops
Pruning?	Work performed when hazard identified, otherwise driven by customer complaint and known hazards.	Currently on minimum 8 year cycle, exact frequency of each tree depends on location and type of tree.	The responsibility of property owner. If on private property the City sends notice. If work not done, City sends contractor to do work and a bill to property owner.	A 4 to 6 year pruning cycle for most boulevard trees, and a 5 to 10 year cycle for park trees. There is a young tree pruning program on a 2 year pruning cycle.
Do you have a program for planting trees and if so, what is it?	Trees lost to development or natural causes are replaced, new planting of trees is required for development projects.	1990 Street Tree Management Plan had 20 year target of raising street tree inventory to 70% stocking levels. Goal was reached early and now expanding the stock. Pending update to management plan will include strategy for public and private lands.	City plants trees with help of volunteers in parks. City partners with a volunteer organization that encourages plantings in public ROW's. The City modestly funds this program that operates a street tree distribution program. New planting of trees is required for development projects.	There is a boulevard tree planting program that is done upon request from the residents of a city block. Replacement program for trees that are removed from parks and boulevards.
Do you have an invasive tree species control program and if so, who implements it?	Invasive tree management is done in-house during winter season by summer rough-cut mowers, especially in boulevards and laneways.	Not really an issue. If tree is inappropriate either due to size or damage it will be removed and replaced on case by case basis.	There are not many invasive trees in the City and so not actively managed on private properties. Some invasive tree management is performed along riparian corridors. Parks are actively managed.	Invasive tree species are done in-house in late summer into fall working on boulevards, medians and lanes. This is a very effective control program.

	Kelowna	Vancouver	Denver	Kamloops
Human Resources				
How many urban forestry employees do you have?	17	57 (plus vacancies)	26 (hiring 5 FT for 2015)	5 ISA Certified Arborists
What are their responsibilities?	6 arborists, 6 other work related, 1 urban forest health tech, 1 arborist foreman, 3 equipment operators	Urban Forest section admin staff consists of City arborist, arboricultural technician, integrated pest management coordinator, section clerk. Operations staff split into 2 groups; each group has superintendent, subforeman, inspector, several arborists, pruners and ops workers.	1 head forester, 15 care and maintenance workers, 7 code enforcement inspectors, 3 admin support and special project (i.e., climate adaptation, planning)	1 crew leader of arboriculture and 2 crews of 2 arborists plus gardeners and labourers available to help when needed.
What is their level of training and education?	ISA certification, 2 year diploma (horticulture or arboriculture), pesticide applicators license, Tree Risk Assessment Qualification (TRAQ) training license, class-3 driver's license	Many staff are either ISA certified or have diplomas/ certification in arboriculture. Other certifications include Hydro certification (PSSP), faller certifications (non-silviculture), arbormaster training, ITA certification for the CUA and HortEd BC for arborist technician (ground persons) climbing arborists and/ or field arborist (journeymen). Those who apply pesticides (not many) hold applicator license.	Operations supervisors – Commercial Driver's License (CDL), chemical applicators license. Tree trimmers – CDL and ISA certification. Code enforcers no longer require ISA certification (though all but one has it, and that one is registered consulting arborist). All but 2 supervisors have Bachelor's degree.	ISA Certification, diploma in horticulture or forestry, pesticide applicator license, TRAQ. All are able to climb and operate equipment.

	Kelowna	Vancouver	Denver	Kamloops
Equipment				
How many chippers do you have?	1 behind each truck (x2), 1 in the yard, 1 backup (=4)	12	1 (most chipping work done by contractors with own equipment)	3
Budgets				
What is the budget for the operational side of urban forestry in your City?	$1-$1.5 million	$4-$4.5 million	Forestry Field Operations: Total - $1,912,033 *Labor - 1,260,892 *Supplies/ Materials/ Professional services - $272,479 * Equip. Maint - $378,657 (for Operations, Admin and Inspections) Forestry Admin / Inspection: Total - $837,743 *Labor - $507,047 *Supplies / Materials/ Professional services - $330,696	$500,000
Do you contract out any work, and if so:	Most work done in-house	No	Contractors are employed by City occasionally.	Yes
What do you contract out, e.g., pruning, removals, planting?	Some pruning contracted out during high demand	n/a	If notified property owners do not complete required maintenance, work is contracted out. Some parkway work is contracted out.	Planting , some removals and utility powerline pruning
What is your budget for contract work?		n/a	~ $200,000	~$30,000

	Kelowna	Vancouver	Denver	Kamloops
What is your capital budget for equipment and tree purchases?	Department pays hourly into fleet department that allows equipment replacement every 10 years – anything extra comes out of annual budget i.e. tree purchases, extra equipment etc. (~ 40,000)	$300,000-$500,000 annually	Equipment budget varies by year $250k - $400k depending on needed purchases (very expensive big rig equipment, i.e., log loaders) Tree purchases made through Capital Improvement Plan - $150k annually	$75,000 per year for tree purchases. Equipment is based on usage that goes into fleet department for future replacements.
Additional Info				
	The City of Kelowna recently conducted two tree investigations – UFORE and STRATUM. The report findings detail both the urban street trees and the surrounding lands that constitute the City's forest.	The City of Vancouver is currently updating their Urban Forest Management Plan. The previous plan was completed in 1990. The updated plan is intended to be put before Council in order to convince them that the canopy of an urban forest is more important than the stem count.	Recently initiated a survey of all trees in public ROW's. The City is a member of Tree City Use (Arbor Day Foundation) and has annual reporting that details urban forestry work. Recent survey by US Forest Service calculated 2.2 million trees in the City (total). Municipal numbers show 77,000 trees in parks.	City is in the process of updating the Urban Forest Management Plan, reviewing existing bylaws, policies, best management practices and procedures. Planning to do an complete update of tree inventory – DBH, Height, Spread
Contact				
	Blair Stewart 250.469.8843 bstewart@ kelowna.ca	Sophie Deseureault 604.257.8589 sophie. dessureault@ vancouver.ca	Sara Davis sara.davis@ denvergov.org	Shawn Cook 250.828.3695 scook@kamloops. ca

Glossary

Adaptive Management: A systematic process for continuously improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for the purpose of learning.

Available Growing Space: The space above and below ground that is available to grow and sustain trees and shrubs. This encompasses not only the physical space but the resources required by the trees and shrubs. Available growing space can be considered areas of “soft surface” with a soil depth of at least 60 cm and no physical impediments to crown growth.

Biodiversity: The variability among living organisms—animals, plants, their habitats and their genes—from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part. This includes diversity within species, between species, and of ecosystems.

Biogeoclimatic Zones: Zones of similar biological geological and climatic features classified under British Columbia’s Biogeoclimatic Ecosystem Classification System.

Canopy Cover: The proportion of land area occupied by tree crowns when visualized from above. It is the two-dimension horizontal extent of the combined canopies of all trees within a given land area. Carbon Sequestration: Amount of carbon removed annually by trees.

Carbon Storage: Carbon currently held within tree tissue (roots, stems, and branches).

Certified Arborist: A person who maintains his or her certification through the International Society of Arboriculture and/or the American Society of Consulting Arborists as a competent practitioner of the art and science of arboriculture.

CPTED (Crime Prevention Through Environmental Design): This is a multi-disciplinary approach to deterring criminal behavior through environmental design; strategies rely upon the ability to influence offender decisions that precede criminal acts.
Ecological Function: The ecological and evolutionary processes, such as energy flow, genetic transmission, migration and mutation, disturbance, and nutrient cycling, which sustain or modify ecosystems over time.

Ecosystem: A community of plants, animals, insects and micro-organisms that are linked by energy and nutrient flows and live, feed, reproduce and interact with each other and with the physical environment. Ecosystems have no fixed boundaries; a single lake, a watershed, or an entire region could be considered an ecosystem.

Ecosystem Services: This term is used to describe the processes of nature needed to support the health and survival of humans. Ecological services are required and used by all living organisms, but the term typically refers to their direct value (quantified or not) to humans. Ecosystem services include processes such as air and water purification, flood and drought mitigation, waste detoxification and decomposition, pollination of crops and other vegetation, carbon storage and sequestration, and maintenance of biodiversity. Less tangible services that have also been associated with natural areas and green spaces include the provision of mental health and spiritual well-being.

Evapotranspiration: The combined process of water evaporation and plant transpiration, whereby liquid water is converted into water vapour. The process of evapotranspiration is beneficial in urban areas for its cooling effects.

Family: For plants, the family includes plants with many botanical features in common and is the highest classification normally used. Modern botanical classification assigns a type plant to each family, which has the distinguishing characteristics of this group of plants, and names the family after this plant.

Genus: For plants, the genus is the taxonomic group containing one or more species. For example, all maples are part of the genus called “Acer” and their Latin or scientific names reflect this (e.g. Sugar maple is called Acer saccharum, while Black maple is called Acer nigrum).
Green Infrastructure: A concept originating in the mid-1990s that highlights the contributions made by natural areas to providing important municipal services that would cost money to replace. These include stormwater management, filtration of air pollution and provision of shade.

Green space: Any vegetated land including bodies of water, whether public or private, within or adjoining an urban area.

Greenways: A city-wide network of corridors situated on streets, along shoreline areas, and in natural corridors that link parks, employment districts, urban villages and other destinations along routes. Most greenways support active transportation by including pathways and bikeways.

Habitat: The place or type of site where an organism or population naturally occurs.

Hazardous Tree: A tree or tree part that is considered, by a certified Arborist, to present a hazard to the safety of persons or to the public or to private property due to its location, condition, health or other circumstances.

Heritage Tree: A tree that is considered worthy of preserving for the enjoyment and learning of present and future generations because of its importance through generations or from past societies.

Infrastructure: The physical capital and associated services considered basic and necessary to the functioning of an urban area. These include such things as sanitary sewers, treatment plants, and water pipelines and distribution/collection systems; roads, signals, sidewalks and other components of the transportation system including transit vehicles, ferries and airports; solid waste management facilities including transfer stations and landfills; and, energy supply and distribution systems including hydroelectric and natural gas transmission and distribution systems. More generally, infrastructure can refer to other tangible public and private assets necessary to support the development of a modern urban settlement, such as hospitals, schools and recreation facilities.
Integrated Pest Management (IPM): An environmentally responsible and economically practical method of controlling pest populations incorporating a variety of cultural, biological and chemical methods to efficiently manage pest populations while lowering dependence on chemical means of control.

Invasive Species: A plant, animal or pathogen that has been introduced to an environment where it is not native and may become a nuisance through rapid spread and increase in numbers, often to the detriment of native species.

Municipal forestry: The sustainable care, planning and long-term development of that portion of the urban forest located on public lands.

Native Species: A species that occurs naturally in a given geographic region that may be present in a given region only through natural processes and with no required human intervention.
Natural Area(s): In Canada, natural areas are those that fulfil one or more of the following criteria.

1. They are natural or near natural in character and relatively undisturbed or else in the process of recovery from human disturbance.
2. They are significant regional habitats for either typical or endangered plant or animal species.
3. They encompass one or more regionally characteristic or rare natural ecosystems.
4. They contain typical or unusual geological formations or archaeological sites.
5. They exhibit diverse scenery or other natural physiographic features of scientific, educational, aesthetic, or cultural value.

Natural Parks: Natural park areas are defined as park spaces that are relatively undisturbed and contain a high percentage of native species, providing habitats for a diversity of native wildlife. They are natural or near natural in character, or are in the process of recovery from human disturbance. These natural areas may represent or contain fragments of regionally typical ecosystems; and they may contain habitat for endangered plant and animal species. They help maintain a diversity of living organisms through the conservation of wild genetic resources.

Official Community Plan: Under the Local Government Act, a general statement of the broad objectives and policies of the local government respecting the form and character of existing and proposed land use and servicing requirements in the area covered by the plan.

Open space: Land that provides outdoor space for unstructured or structured leisure activities, recreation, ecological habitat, cultural events or aesthetic enjoyment that is publicly accessible.
Park: Land held by the City of Kamloops that provides outdoor space for unstructured or structured leisure activities, recreation, ecological habitat, cultural events, or aesthetic enjoyment, not including land within street rights-of-way.

Rainwater management: A management approach that concentrates on conserving rainwater as a resource at the point of infiltration using best management practices collectively referred to as green infrastructure.

Right-of-Way: A portion of land granted through an easement or other legal mechanism for transportation purposes, such as for a rail line, highway or roadway. A right-of-way is reserved for the purposes of maintenance or expansion of existing services. Rights-of-way may also be granted to utility companies to permit the laying of utilities such as electric power transmission lines (hydro wires) or natural gas pipelines.
Riparian Area: Sites that are adjacent to and associated with a natural water body.

Stormwater: The water that originates during precipitation events. Stormwater that does not soak into the ground becomes surface runoff, which either flows directly into surface waterways or is channeled into storm sewers, which eventually discharge to surface waters.

Street Trees: Municipally owned trees, typically found within the road right-of-way along roadsides and in boulevards, tree planters (pits) and front yards.

Sustainability: The ability of all species to live within the means of one planet and share resources equitably.

Urban Forest: All trees, shrubs and understory plants, as well as the soils that sustain them, located on public and private property within a given jurisdiction. This includes trees in natural areas as well as trees in more manicured settings such as parks, yards and boulevards.

Urban forestry: The sustainable care, planning and long-term development of the urban forest and its associated ecosystems at multiple scales, including the site, neighbourhood, watershed and city.

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