City of Kelowna Sustainable Urban Forest Strategy

2011 - 2021

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Highlights

Development of the Sustainable Urban Forest Strategy (SUFS) was completed in two Phases. In Phase 1 of the project, Kelowna's urban forests and the integrity of the urban forest canopy were found to be facing significant challenges. Tree canopy is currently being lost at a faster rate than it is accruing due to forest health impacts, low planting survival and development related clearing. Several other past reports and policy documents, notably the Kelowna 2030 - Official Community Plan (OCP), 2007 Urban Forest Effects (UFORE) Analysis and the 2007 Street Tree Resource Analysis (STRATUM) provided critical background information for Phase 2 of the project.

The City of Kelowna is currently achieving an overall 'moderate' score for sustainable urban forest practices, but performing less well with respect to diversity of age and species, and with respect to regional cooperation towards common goals. Past urban forest reports, current policy and the results from public surveys all support that Kelowna's urban forest is providing valuable benefits. It is estimated that the urban forest consists of 3.3 million trees (9,459 of which are street trees (2006)) with a replacement value estimated at $1.1 billion. Canopy cover within the City contributes both qualitative and quantitative environmental, social and economic benefits including energy savings, carbon storage, air quality improvement, extended pavement life, stormwater runoff reduction and aesthetic value (Eastwood *et al.* 2007, City of Kelowna 2007). The 2030 OCP targets a canopy cover of 20% for the City and contains a number of policy objectives that are relevant to the future management of Kelowna's urban forest.

Phase 2 of the SUFS provides the City of Kelowna with a plan to preserve and enhance the existing urban forest tree canopy and meet several 2030 OCP objectives. The canopy cover target of 20% (as defined in the 2030 OCP) is supported by the SUFS, which contains science-based tree canopy estimates and an analysis of plantable space. The current tree canopy across the land base (excluding the ALR) is estimated at 16%. The ALR was excluded because the City has very little regulatory control over the canopy within that land category. Increasing canopy cover to 20% is achievable but will require regulatory control to protect the existing canopy and approximately 315,000 new trees to be planted on both private and public lands. Depending on the location and type of planting, the cost per tree is estimated to range from $70 (current net cost of NeighbourWoods scheme) to $450, (current cost of City Street tree establishment) corresponding to a strategy costing between $22 million and $142 million. While these costs are daunting, the benefit-cost ratio for street trees is estimated to be 3.32 (City of Kelowna 2007), which suggests that this increase in urban forest canopy will provide valuable and cost effective services over the long-term and, with appropriate management, for many generations. Additionally, the strategy is intended to be implemented over a long time period and costs are proposed to be shared between public and private sources.

The SUFS report presents a suite of practical tools and recommendations to help achieve the plan's goals and objectives and the City's 20% canopy cover target. The plan has been developed with input from City staff, regional stakeholders and the public, and builds on documented best management practices from across the globe. The SUFS objectives also have synergies with 2030 OCP policy objectives for development processes, environment, arts, culture and heritage, and social sustainability.

Corporate-wide implementation of the SUFS recommendations will demonstrate a commitment to developing in a sustainable manner and preserving the natural capital that has attracted so many people to the City of Kelowna. Given the ambitious and comprehensive strategy required to meet a 20% canopy cover target for the City, community and corporate buy-in and a long-term commitment to the strategy will be fundamental to its success.

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1 Introduction

Development of the Sustainable Urban Forest Strategy (SUFS) was completed in two Phases. In Phase 1 of the project, Kelowna's urban forests and the integrity of the urban forest canopy were found to be facing significant challenges. The local natural disturbance regimes, which include relatively short return periods of wildfire and insect/disease issues, compromise and shorten the projected life cycle of the urban forest. This creates funding challenges and shortfalls in the environmental goods and services derived. Adding to pressure from local forest disturbance regimes are urbanization, transportation corridor pressures, development pressures and climate change effects, all of which place additional stress on this 1.1billion dollar (Eastwood *et al.* 2007) community asset, and have the potential to compromise its longevity.

During Phase 1, community values were sought by way of a public consultation process. A total of 183 persons completed an on-line or telephone survey. The majority (55.7%) were dissatisfied by too little tree cover in their neighbourhoods, while only one respondent (0.5%) felt that there was too much tree cover in their neighbourhood. The question of whether or not to regulate private tree removals attracted strong comments both 'for' and 'against'. The majority (67.2%) were in favour of stronger regulation. The top three priorities (subject to funding) for the City of Kelowna were identified as:

1. Planting more trees;
2. Managing for insect pests and disease; and,
3. Enhancing forest corridors and greenways.

City staff were in agreement that:

- Tree retention must be a priority for the future development of Kelowna;
- New tree planting requirements must be strengthened in planning policies, notably for parking lots and commercial development; and,
- Regulations and/or incentives would be the appropriate basis for controlling private trees.

In terms of managing forest health, the importance of structural diversity and the potential for reintroducing prescribed fire to natural areas were also raised by City staff.

A review of Urban Forest Strategies and similar policy documents from across Canada, and an example each from the United Kingdom and Australia, indicated that there has to be a firm emphasis on:

- Corporate leadership;
- Regulation (bylaws);

- Equal weighting of green infrastructure and other infrastructure; and,
- Setting climate appropriate tree canopy and other sustainable urban forest strategy goals and objectives.

Overall, the consultation process and policy review suggested that there is an urgent need to improve corporate messaging, inter-departmental communications, and to develop a seamless process to promote viable long-term tree retention and replacement on development sites within the City. To achieve this it is also important to develop the SUFS within the context of larger landscape and existing management plans, such as the Community Wildfire Protection Plan, so that objectives are consistent and potential conflicts are minimized.

Phase 2 of the project has focused on developing a Sustainable Urban Forest Strategy based on 'A Model of Urban Forest Sustainability' (Clark *et al*., 1997) that provides the following definition of a sustainable urban forest:

"The naturally occurring and planted trees in cities which are managed to provide the inhabitants with a continuing level of economic, social, environmental and ecological benefits today and into the future."

The strategy is informed by and incorporates community priorities and concerns, and is an important first step in ensuring that valuable green infrastructure is maintained at or restored to minimum thresholds as the City continues to develop or re-develop in response to population growth.

1.1 Project Objectives and Urban Forest Vision

The urban forest vision outlined for the City requires integrated, ecosystem-based management of Kelowna's urban forest to develop a sustainable and resilient resource that provides multiple benefits to all citizens of the City and complements the biodiversity values of the surrounding natural environment.

This report is intended to provide a comprehensive and innovative ten-year Sustainable Urban Forest Strategy that effectively addresses this vision using the three key components of the Model of Urban Forest Sustainability (Clark *et al*., 1997). The SUFS strategy goals and objectives are outlined below in Table 1.

Table 1. Goals and objectives of the Kelowna Sustainable Urban Forest Strategy.

Goals	Objectives
1. Maintain and enhance the existing vegetation resource	a. Achieve climate-appropriate degree of tree cover community-wide b. Provide an uneven age distribution c. Provide species diversity d. Preserve and manage regional biodiversity e. Maintain the biological integrity of native remnant forests f. Maintain wildlife corridors to and from the City
2. Strengthen the community framework	a. Ensure all City departments and all sectors of the community operate with common goals and objectives

Goals	Objectives
	b. Encourage buy-in and support for City-wide goals by public agencies and large private landowners. c. Encourage the green industry to operate with high professional standards and to commit to city-wide goals. Consider implementing accreditation standards similar to IPM accreditation (Ontario) or Audubon International accreditation for golf courses. d. Establish means for understanding and participation by citizens in urban forest management at the neighbourhood level e. Establish means for all constituencies in the community to interact for the benefit of the urban forest f. Build understanding among the general public of the value of trees to the community g. Provide for cooperation and interaction among neighbouring communities and regional groups
3. Enhance the City's resource management approach	a. Develop and implement a management plan for trees on public and private property b. Provide adequate funding to implement a City-wide management plan c. Employ or train adequate staff to implement a City-wide management plan d. Develop methods to collect information about the urban forest on a routine basis e. Enhance protection for existing trees f. Provide guidelines and specifications for species use g. Adopt and adhere to professional standards for tree care h. Maximise public safety with respect to trees i. Create a closed loop recycling system for tree waste and water

2 City of Kelowna Current Performance

Performance indicators used to assess Kelowna's performance against the Clark *et al*., (1997) model have indicated that the City of Kelowna is currently achieving an overall 'moderate' score for sustainable urban forest practices, but performing less well with respect to diversity of age and species, and with respect to regional cooperation towards common goals (B.A. Blackwell & Associates 2010). It is estimated that the urban forest consists of 3.3 million trees (9,459 of which are street trees (2006)) with a replacement value estimated at $1.1 billion. Canopy cover within the City contributes both qualitative and quantitative environmental, social and economic benefits including energy savings, carbon storage, air quality improvement, extended pavement life, stormwater runoff reduction and aesthetic value (Eastwood *et al.* 2007, City of Kelowna 2007). The benefit-cost ratio of Kelowna's current urban forest is estimated at 3.32 (City of Kelowna 2007).

2.1 Existing Management of the Vegetation Resource

Canopy Cover

Tree canopy is currently being lost at a faster rate than it is accruing due to forest health impacts, low planting survival and development-related clearing. Parking lots and new subdivision developments with large house footprints were noted to have far fewer trees than older neighbourhoods. The Hillside Development Guidelines somewhat address these issues but do not provide specific targets or techniques for maintaining or recruiting canopy cover. Tree removals are regulated in bylaw on lands within a Natural Environment/Hazardous Condition Development Permit Area.

The forest health issues associated with the mountain pine beetle, Douglas-fir tussock moth and other forest health factor infestations will likely cause ongoing canopy losses over the life of this plan. While the City has implemented robust forest health strategies on their lands, there is still a possibility for pest populations to build-up and vector from adjacent lands privately held.

In terms of new plantings, the current rate of removals exceeds new plantings that survive. Poor species selection, planting practices, inadequate soil conditions, and competition from other vegetation such as irrigated turf reduce the survival rate of new plantings. In addition, trees planted or retained post-development appear to be disappearing due to a lack of post-development protection through regulatory controls.

Without changes to existing policies and regulations, it is expected that the existing canopy cover of urban forest will decline. The Kelowna 2030 - Official Community Plan (Bylaw 10500), hereafter referred to as the '2030 OCP' has set a canopy cover target of 20%.

Age Class Distribution

Current age class distribution across the City is skewed towards trees less than 30 years old. Existing, established young trees will provide additional canopy gain over time but not enough gain to prevent a net loss in the absence of substantial new plantings.

There is presently little to no regulation regarding the retention of mature and veteran trees on private land and, notably, on development sites. Loss of mature and veteran trees may also be related to a shortage of readily-available and low cost commercial tree risk assessment and management skills in the City.

Species Mix

Species diversity across the City is currently low and heavily skewed towards ponderosa pine, Douglas-fir, Norway maple, green ash and honey locust. This inventory profile means that the urban forest could be at risk of catastrophic tree loss through pest, disease or climate change effects. It should be recognized that the hot, dry climate is a limiting factor in improving species diversity in the urban forests of Kelowna.

Native Vegetation

In the absence of appropriate policies and regulations a substantial portion of the existing urban forest on private lands, particularly on hillsides, is vulnerable to clearing as development progresses across the community, with the effect that biological communities become fragmented or eradicated. Natural vegetation is protected and managed on City and publicly owned lands through existing management strategies (*Kelowna 2030* - Official Community Plan Bylaw No. 10500, Linear Park Master Plan [Catherine Berris Associates 2009], individual park management plans and Central Okanagan Biodiversity Strategy [currently under development]).

Attempts to promote biodiversity on golf courses and in urban parks have sometimes been challenged by public misconceptions that wildlife areas necessarily present fire hazards; fuel treatments in natural areas can both meet wildlife needs and reduce wildfire risk when properly designed and implemented.

2.2 Existing Community Framework for Urban Forest Management

Public Agency Cooperation

Cooperation among agencies is currently variable with some agencies providing showcase examples of good canopy cover on their properties and others demonstrating very low tree retention rates. Community health linkages between a healthy population and a healthy urban forest canopy are well documented (Kuo2001), however often budgets are the limiting factor in taking forward a greening strategy for public facilities. The recent economic downturn has provided examples where the green infrastructure section of facility budgets are the first to be cut, leaving empty landscaping beds or the provision of minimal landscaping with turf grass and a few scattered trees.

Involvement of Large Private and Institutional Landowners

Engagement with urban forest management is extremely variable among landowners. Golf courses and park departments (Regional and Provincial) are actively engaged in management. Other land managers are, for the most part, not yet engaged in the management of this valuable resource.

Green Industry Cooperation

The green industry includes plant nurseries, arborists, tree-work industry, landscape architects and similar ventures. Currently, there are no explicit policies regarding professional standards or minimum requirements for the green industry so it is predominantly self-regulating. The City does have landscape and irrigation standards

specified within the Water Regulation Bylaw, which limits water use and therefore provides incentive to plant more drought tolerant species. In addition, the City provides tree planting guides to encourage choosing the right tree for the right location (Figure 1).

Figure 1. Innovative new street designs emphasize the need for "right tree right place" and optimize tree canopy opportunities (Abbott Street, Kelowna, in summer 2011).

Neighbourhood Action

The existing "NeighbourWoods Program" provides substantially discounted trees to public participants is an excellent initiative that has potential for delivering many aspects of public education about urban forest management. Within the City of Kelowna there are already neighbourhood 'action groups' for certain neighbourhoods. However, there are opportunities to increase neighbourhood action in order to encourage planting on private land.

While one focus of SUFS is recruiting tree canopy cover, a recent change in green waste pickup has placed additional pressure on residents with large deciduous trees in their landscapes. This could sway neighbourhoods in favour of tree removal or species substitution where leaf drop from private and public trees places a heavy burden on seniors or homeowners without the means to transport large volumes of leaves to a composting facility. In many Kelowna neighbourhoods a conversion to coniferous species would be undesirable due to the increased fuel hazards associated with these species.

Citizen-government-business Interaction

Currently, these interactions are limited and occur informally in relation to the urban forest resource.

General Awareness of Trees as a Community Resource

Based on the survey results from Phase 1, there is a strong understanding among the community about the value of trees. However, the City's underlying policies allow or guide many new developments to emphasise small lot sizes and large home footprints resulting in very limited plantable space and sparse tree canopy in these areas.

Initiatives such as Arbor Day and similar arboreal promotions can have a significant and lasting effect on community pride, maintaining open lines of communication between staff and the community and providing an invaluable opportunity for periodic updates, introducing new themes and youth engagement. However, these events can be the first to be set-aside when funding or staff priorities are focused elsewhere.

Regional Cooperation

Existing cooperation with Regional District of Central Okanagan is informal but currently very good. However, there is an identified need to add the goals and objectives of the SUFS to a working group agenda and to expand regional cooperation to new groups.

2.3 Existing Resource Management Approach for the City of Kelowna

Management Plans

This will be Kelowna's first comprehensive Urban Forest Strategy. The 2030 OCP defines the community vision for Kelowna and is the guiding document for planning to 2030, binding Council and staff decisions. The SUFS is consistent with and directly addresses numerous policy objectives of the 2030 OCP including:

- Chapter 05 – Development Process:
    - Objective 5.1 Ensure new development is consistent with 2003 OCP goals, Policy 1.
    - Objective 5.2 Develop sustainably, Policy 2.
    - Objective 5.8 Achieve high quality urban design, Policy 2.
    - Objectives 5.10 Ensure opportunities are available for greater use of active transportation and transit to: improve community health; reduce greenhouse gas emissions; and increase resilience in the face of higher energy prices, Policy 3.
    - Objective 5.13 Increase local food production, Policy 2.
    - Objective 5.36 Ensure subdivisions are consistent with sustainability goals, Policy 1, Policy 3.
- Chapter 06 – Environment:

- Objective 6.1 Protect and enhance Kelowna's biodiversity, Policy 1, Policy 2.
- Objective 6.2 Improve energy efficiency and reduce community greenhouse gas emissions, Policy 1
- Objective 6.3 Maintain and enhance Kelowna's natural resources, Policy 1, Policy 2.

- Chapter 09 – Arts, Culture and Heritage:
  - Objective 9.2 Identify and conserve heritage resources, Policy 1, Policy 2, Policy 3
- Chapter 10 – Social Sustainability
  - Objective 10.1 Promote social well-being and quality of life by providing facilities and services for all community members, Policy 1
  - Objective 10.2 Increase community engagement, Policy 1

The Kelowna Community Greenhouse Gas Emissions Inventory and Projections Report (City of Kelowna 2009) contained recommended targets for emission reduction strategies related to the urban tree canopy, recommending the planting of strategically placed trees to shade/shelter buildings and reduce energy consumption, and these are embedded in the 2030 OCP. SUFS, while not committing to the three year tree planting assumptions precisely, is still consistent with the proposed greenhouse gas emission reduction strategy (Table 2).

Table 2. Emission reduction strategies – carbon sequestration (source: City of Kelowna 2009).

Tree Sequestration of CO_2e	Degree of Implementation	Total Reduction $CO_2e(t)$
2020 Tree Canopy $CO_2e(t)$ sequestered	Current tree canopy	6500
Plant mature trees	If specific varieties of trees are planted in 2009/10 it is possible to have additional "Healthy Trees" in the 2020 tree canopy.	N/A
Plant young trees	Assumes that for the next three years we plant 10,000 trees annually and that they are of a variety that has a rapid growth rate.	200
Plant trees to shade buildings	Assumes that of 30,000 new trees planted, 10,000 will be strategically placed to ensure wind and sun protection to buildings	50
Total potential emissions being sequestered		6,750

Funding

Existing initiatives are funded as part of the annual City budget cycle and through available grants from organizations such as UBCM and Tree Canada Foundation.

Staffing

The current staffing compliment at the City of Kelowna is well trained and possesses the necessary expertise and experience to perform their current functions.

Assessment Tools

The City has completed plots as part of the UFORE Report (Eastwood *et al.* 2007) and has a street tree inventory.

Protection of Existing Trees

The *Community Charter* [SBC 2003], c 26, Part 8 provides municipalities with regulatory authority in a number of areas of local interest including those which promote ecologically responsible development and show a commitment to environment, economic, cultural and social stewardship.

On City or publicly managed lands, a number of relevant management initiatives are already in place including:

- Stand management protocols (subject to budget cycle funding);
- Invasive Pest Management Program (subject to budget cycle funding);
- Tree risk management (subject to budget cycle funding);
- Wildfire hazard fuel reduction treatments (subject to budget cycle funding);
- Veteran tree management in formal parks (subject to budget cycle funding);
- Strategic policy to limit further habitat fragmentation and degradation ingrained in 2030 OCP;
- Linear Park Master Plan to manage greenways and individual park management plans; and,
- Central Okanagan Biodiversity Strategy (under development) to address enhancing native habitat and managing ecosystems to mimic natural processes wherever possible.

On private lands the following policies relate to tree resource management:

- *Kelowna 2030* - Official Community Plan Bylaw No. 10500;
- Hillside Development Guidelines;
- Bylaw No. 8041 A Bylaw to Regulate the Removal of Protected Trees in Natural Environment/Hazardous Condition Development Permit Areas;
- Boulevard Maintenance Bylaw 5708-84 and Road Right of Way Landscaping (Council Policy 16);
- Nuisance Trees and Shrubs Bylaw 6469-89;
- Municipal Properties Tree Bylaw 8042;

- Landscape Buffer Standards;
- Sustainability Checklist for Commercial and Multi-unit Developments; and,
- Schedule 4 of Bylaw 7900 Design Standards.

These policies and bylaws provide for some protection and enhancement of tree canopy cover but are not preventing the overall net loss of tree canopy.

Species and Site Selection

The City currently provides tree planting guides on their website, which suggest site considerations and tree selection.

Tree Care Standards

Formal tree care standards are not in place.

Citizen Safety

Currently Parks Services have in place a well established tree risk management program for City property, which includes the following basic procedures:

1. Recording and responding to complaints from staff, the public and outside agencies about potential tree hazards;
2. Timely inspection of subject trees and recording the certified tree risk assessor's findings;
3. Timely mitigation of hazards which have been identified in step 2, work carried out by trained City of Kelowna staff or independent contractors hired for these purposes; and,
4. Timely response to, investigation of any claims brought forward as a result of damages suffered associated with tree failure.

Recycling and Water Conservation

The Regional Compost Facility recycles green waste material for the City. Grey water recycling is not used at this time. The City's Water Regulation Bylaw No. 10480 regulates the use of water within the City and incorporates measures for water conservation in landscape irrigation.

3 The Urban Forest Strategy

3.1 Definition of Kelowna's Urban Forest

Kelowna's urban forests are made up of all trees, groups of trees and forests that exist on public and private lands within the limits of the City of Kelowna municipal boundary. The flora and fauna associated with naturally occurring forest ecosystems, or wildland, are also included because they are critical to long-term ecosystem integrity.

Beyond the challenges trees face growing in a wildland setting urban trees face harsh conditions that can be detrimental to their health and integrity. Soil compaction, air pollution, drought, habitat fragmentation, sunscald, root damage and the problems associated with new forest edges are just some of the issues. Climate change, forest insects and wildfire add yet another layer of complexity to the management regime for both urban and wildland trees in Kelowna.

3.1.1 Geographically Defined Land Categories

For the purpose of developing this SUFS, land categories have been defined to reflect both natural conditions and administrative boundaries. A large portion of land inside the City boundary is within the Agricultural Land Reserve (ALR). This area has been delineated and excluded from overall canopy cover estimates and canopy cover targets because the City has essentially no control over increases or decreases in canopy cover on ALR land; including it when measuring progress on cover targets could undermine City efforts to increase canopy cover.

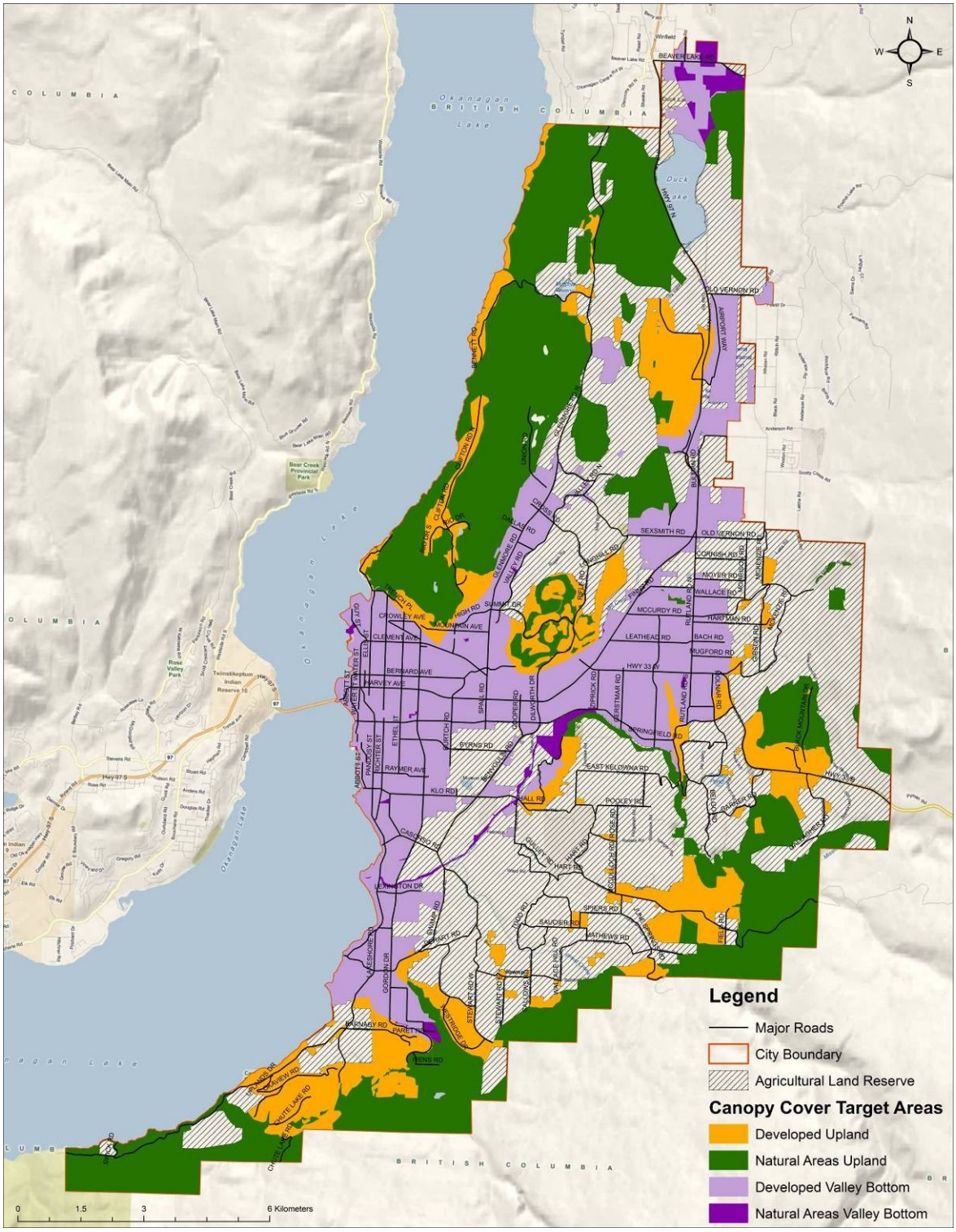
In the areas outside the ALR, delineation was made based on whether land was developed or natural areas. The rationale for this was that opportunities to increase canopy cover would be different in developed versus natural areas because of different management approaches on urban versus natural landscapes and different opportunities for plantable space.

A further delineation of developed and natural areas was based on approximate valley bottom and hillside boundaries. The rationale for this delineation is based on broad differences in soil nutrient and moisture regimes that affect a site's natural carrying capacity for vegetation. In this case, a site's carrying capacity refers to the maximum density of climate appropriate trees and shrubs that can be sustained indefinitely given the availability of nutrients, moisture and other necessities from the local environment. In Kelowna, the valley bottom has a higher carrying capacity than hillsides because soil nutrient regimes and soil moisture regimes are, in general, more favourable for tree growth. A sustainable land use model is therefore based on the concept of ensuring that tree and shrub populations do not exceed a threshold beyond which regular watering and fertilization would be required; thus avoiding placing excessive demands on the land base and risking environmental degradation. Natural ecosystems in a healthy state can provide the baseline tree densities from which we can model sustainable land use in urban forest ecosystems.

In total, 5 categories were defined (see Map 1 and example in Figure 2):

1. Natural Areas Upland;
2. Developed Areas Upland;
3. Natural Areas Valley Bottom;
4. Developed Areas Valley Bottom; and,
5. Agricultural Land Reserve.

Figure 2. Example of landscape delineation (does not show Natural Areas Valley Bottom or ALR).



Map 1. Geographically defined land categories.

3.1.2 Current Tree Canopy Analysis by Land Category

The US Forest Service software iTree Canopy[1] was used to analyse the status of current tree canopy and to identify the availability of plantable space. The tool is designed to accurately estimate tree and other cover classes by randomly laying points on to Google Earth imagery for user classification. To reach the desired level of accuracy (± specified % standard error) the user continues to generate random points for classification 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. Shapefiles for each defined land category were used to generate the cover estimates.

Natural Areas Upland

Table 3. Cover class estimates for Natural Areas Upland derived in iTree Canopy.

Cover Class	% Cover
Tree canopy	23.0 ±1.99
Native grassland	52.4 ±2.35
Non-plantable grassland/rocky outcrops	10.7 ±1.46
Impervious surface	9.7 ±1.40
Water	0.2 ±0.22
Total	100%

Figure 3. An example of natural area upland. Trees marked with an x are recent mortality from the pine beetle epidemic - note that dead trees are not counted as part of the canopy cover.

[1] http://www.itreetools.org/canopy/index.php

Developed Areas Upland

Table 4. Cover class estimates for Developed Areas Upland derived in iTree Canopy.

Cover Class	% Cover
Tree canopy	13.4 ±1.90
Shrubs/hedges	2.8 ±0.93
Turf grass	16.8 ±2.09
Native grassland	19.0 ±2.19
Impervious surface	48.0 ±2.79
Total	100%

Figure 4. Modern hillside development illustrating the lack of tree retention and limited plantable space

Valley Bottom Natural Areas

Table 5. Cover class estimates for Valley Bottom Natural Areas derived in iTree Canopy.

Cover Class	% Cover
Tree canopy	25.2 ±1.94
Native grassland	42.9 ±2.21
Shrubs	4.4 ±0.91
Impervious surface	16.6 ±1.66
Water	10.9 ±1.39
Total	100%

Figure 5. An RDCO education facility set in valley bottom natural parkland

Valley Bottom Developed Areas

Table 6. Cover class estimates for Valley Bottom Developed Areas derived in iTree Canopy.

Cover Class	% Cover
Tree canopy	9.00 ±1.65
Shrub/hedge	3.7 ±1.09
Turf grass	15.3 ±2.08
Non-plantable grass	14.3 ±2.02
Impervious surface	57.7 ±2.85
Total	100%

Figure 6. Maple Street viewed from north to south (current tree canopy cover is 24%).

Agricultural Land Reserve

Table 7. Cover class estimates for the Agricultural Land Reserve derived in iTree Canopy.

Cover Class	% Cover
Tree canopy	9.1 ±1.28
Vines	8.1 ±1.22
Cultivated crops	6.6 ±1.10
Managed grassland	66.5 ±2.10
Impervious surface	9.7 ±1.32
Total	100%

Tree canopy in this land category is currently assessed at 9% with the majority of these trees either being orchard trees or native and ornamental species occupying field perimeters, riparian buffers and residential shade trees, therefore unless these existing treed areas are expanded tree canopy is not expected to increase over the term of this strategy, in fact it could decline if land is sold for development or alternate land uses prevail. There appears to be a trend toward many orchards being converted to vines and micro tree technology, moving away from the traditional fruit tree orchard industry. Given the lack of control the City has over urban forest within the ALR, this land category is excluded from the overall canopy estimate and future canopy targets.

3.1.3 Canopy Cover Summary and Estimate of Existing "Plantable" Space

1) Table 8 summarizes the canopy cover estimates by land category (excluding ALR). It is estimated that current canopy cover within the City boundary (excluding ALR) is 16% +/- 2%.

2) Existing plantable space has been estimated wherever there are viable planting areas that contain sufficient soil volumes to support ornamental or native tree species. Plantable space for each land category was estimated according to the decision criteria below and the results are presented in Table 8An expansive grass area (excluding managed turf) would be considered plantable for large shade trees with minimum 5 m spacing.

3) Table 8. The decision criteria used for the iTree Canopy analysis, assuming an ocular estimate of sufficient soil volume, were:

4) A narrow strip between buildings:

   a) Less than or equal to 3 m x 3 m = not plantable

   b) Greater than 3 m x 3 m = plantable for columnar ornamental trees

5) A median or landscape bed:

   a) Less than 10 m from an intersection = not plantable

   b) 10 m or more from and intersection, go to 3)

6) A median or landscape bed, or street boulevard planting area:

   a) Larger than 3 m x 3 m but less than 5 m x 5 m = plantable for columnar ornamental trees.

   b) 5 m x 5 m or larger = plantable for large shade tree.

7) An expansive grass area (excluding managed turf) would be considered plantable for large shade trees with minimum 5 m spacing.

Table 8. Estimates of current tree canopy cover and plantable space within +/- 2% in defined land categories.

Land Category	Total Land Area (ha)	Current Tree Canopy (+/-2 %)	Estimated Plantable Space (+/- 2%)	Estimated Plantable Space Expressed in Hectares (ha)
Natural Areas Upland	5,867	23	Nil	Nil
Developed Areas Upland	2,684	13	8	215
Natural Areas Valley Bottom	193	25	10	19
Developed Areas Valley Bottom	4,608	9	9	415
Totals	**13,352**	**16%***	**5%***	**649**

***Area weighted sum**.

3.2 Managing Vegetation Resources within the Urban Forest

3.2.1 Tree Canopy Cover Targets by Land Category

Canopy targets (Table 9) are intended to be climate appropriate, achievable and set both for the number of street trees and the canopy coverage over the land-base, including residential, commercial, industrial, natural and semi-natural areas. Targets for the number of trees are approximate because planting density and canopy sizes will vary. Canopy cover as measured in iTree Canopy will provide the measurable indicator for the canopy cover target.

Table 9. Canopy cover targets within +/- 2% and number of new trees by land category.

Land Category	Total Land Area (ha)	Canopy Cover Target (+/- 2%)	Estimated Number of New Trees (approx.)+
Natural Areas Upland	5,867	23	Nil
Developed Areas Upland	2,684	21	107,500
Natural Areas Valley Bottom	193	35	Nil
Developed Areas Valley Bottom	4,608	18	207,500
Totals	**13,352**	**21%***	**315,000**

***Area weighted sum**.

+ Numbers of trees are based on the assumption that at maturity the average tree (native and ornamental) will provide a 6 metre diameter live crown (19.64m^2). Proportionally increasing the number of trees planted that will develop a larger canopy spread will result in a reduction of the overall number of trees required to achieve the canopy goal targets. However the plantable space available in developed areas will be the overall limiting factor.

This strategy aims to provide achievable canopy cover targets based in science. The Biogeoclimatic Ecosystem Classification (BEC) has been used as a reference for the canopy cover targets in valley bottom versus upland areas. To be sustainable in natural areas, canopy cover should not be allowed to exceed that of the healthy natural ecosite it most closely resembles; so that established green infrastructure (trees and shrubs) are not over-reliant on irrigation and other maintenance. These results support the 2030 OCP canopy cover target of 20% (within the range of standard error of the estimate); therefore a 20% canopy cover target will also be used for the SUFS goal.

Despite the specific targets by land category listed in Table 9, professional judgement, best practices and constraints will result in variable density across each land category. In other words, the canopy target cannot and should not be evenly distributed across the land category but should be site appropriate with less treed and more treed areas resulting in an overall canopy cover that meets the targets in Table 9.

In addition to the projected canopy gains referred to above and discussed below, it is important to bear in mind that existing established young trees are providing additional canopy gain over time. Tree canopy will be lost through mortality and development over the period of this plan therefore it will be important to monitor gains or losses periodically to derive a measure of strategy performance and determine whether further interventions are required to meet canopy targets. While it is possible to model the future canopy gain from young trees at given periodic intervals based on relative crown growth over time, this modelling work is currently outside the scope of this project.

Natural Areas Upland

The Natural Areas Upland target is unchanged from status quo at 23%. The vast majority of natural areas upland occurs within the ponderosa pine very dry hot variant (PP xh1) of the Biogeoclimatic Ecosystem Classification system. The PP xh1 and xh1a (grassland phase) is the driest forested zone in the province. It is characterized by a mosaic of open grasslands and open ponderosa pine or Douglas-fir stands, with little to no shrub cover (Lloyd *et al*., 1990). The herb layer is dominated by bluebunch wheatgrass and lesser amounts of arrow-leaved balsamroot, Idaho fescue and timber milk-vetch. Drier forested sites support very low-density (~150 stems per ha) pine stands. Wetter sites include low-moderate density Douglas-fir (~300 - 500 stems per ha) and trembling aspen with a more developed understory shrub layer (Lloyd *et al.*, 1990). These low stand densities are primarily driven by annual water deficits, limited soil depth and nutrient availability. Historic air photo interpretation also indicates that some grassland and open forest in these areas have grown in over the last few decades. Retaining the canopy cover target at the status-quo level is intended both to allow for replanting of severely impacted wildfire or mountain pine beetle areas, while also continuing to allow for open forest ecosystem restoration and fuel hazard reduction treatments in stands that are considered outside the range of natural variability for tree density.

The area in this category is likely to decrease as future development shifts area in to Developed Areas Upland. This could either increase or decrease the canopy cover % depending on whether development occurs on grassland or forested areas. Monitoring the canopy over time will assist in determining whether action (planting or ecosystem restoration) needs to be taken in order to meet canopy targets and maintain a diversity of habitat types in Natural

Areas Upland. Because of the large size of this area and the extent that is forested, this category contributes the most to the City's existing canopy cover (10% of the weighted sum) and it is therefore very important to maintain the existing canopy cover in Natural Areas Upland.

Developed Areas Upland

The Developed Areas Upland appears to have expanded quite rapidly over recent years, often with limited or nil tree retention or planting and housing lots with maximum building envelope footprints. This development trend has led to a steady depletion of tree canopy in the affected areas. Current tree canopy is in the range of 13% representing a loss of more than 10% from the natural state. In addition, it appears that there has been a reduction of almost 30% in native grassland area. The 13% canopy estimate reflects both those developments designed to incorporate tree and forest retention (which perform well in terms of canopy cover) and those developments that have not retained trees or forest areas and are therefore performing well below the assessed average. Plantable space opportunities are concentrated in those areas that are underperforming and planting potential appears to be limited to street boulevards and private property yard space, which is more limited because it is often encumbered by retaining walls and other infrastructure.

It is anticipated that a significant tree canopy recovery could be achieved in the City-owned plantable space through a targeted street tree planting program, and on private property through an expanded NeighbourWoods initiative. Transfer of new land area into this category from the Natural Areas Upland could positively impact canopy cover in this category if new developments retain an appropriate number of mature trees, while being sensitive to the Wildfire Development Permit Guidelines. Conversely, transfer of treeless areas could have the opposite effect and this would have to be mitigated by new plantings. While Developed Areas Upland only contributes approximately 3% to the City's current overall canopy cover estimate, it will gain area and influence as development expands and it is therefore important to reverse the current trend of canopy depletion.

Natural Areas Valley Bottom

Despite comparatively good soil fertility and moisture availability compared to upland sites, at 25% current tree canopy cover in this category is lower than initially expected. However, this is in part due to the high percentage (42%) of grass areas that currently exist in the Winfield area polygons. These are undeveloped areas that were likely cleared at some point in the past and have since been left unmanaged. Given that much of the estimated plantable space occurs on private land, increasing canopy cover may not be easily achieved until these areas transfer into the Developed Areas Valley Bottom category and could therefore trigger regulatory control.

The anticipated future transfer of the privately owned grass dominated areas into the Valley Bottom Developed land category would automatically result in an increased canopy cover % in the remaining Natural Areas Valley Bottom without any direct afforestation. This is because the remaining areas predominantly consist of well treed parkland. Overall, an increase of 10% canopy cover could be targeted for Natural Areas Valley Bottom areas but only 192 ha falls within this category; therefore a 10% increase in Natural Areas Valley Bottom only translates into a 0.5% increase in the City-wide target. Given that Natural Areas Valley Bottom outside the ALR are essentially

remnant wildland, their small contribution to the overall canopy goal and the likely future increase in canopy cover in this category as open grassed areas are moved in to Developed Areas Valley Bottom, canopy recruitment through new plantings or active intervention is not a priority for this land category.

Developed Areas Valley Bottom

Current tree canopy at 9% is considered to be lower than the natural carrying capacity of the valley bottom. While much of the area is developed with impervious surfaces such as large buildings, opportunities to both increase plantable space and canopy cover do exist. The current target increase in this category is 9% (to total 18%) based on existing plantable space. In our analysis, tree canopy was noticeably absent on many school grounds and commercial properties. In addition boulevard street tree canopy appears to be contributing only 3% (City of Kelowna 2007) and many tree planting opportunities were evident. By contrast several older established residential areas (for example, Maple & Abbott streets), support almost 24% tree canopy, and these streets were repeatedly raised during the public survey for having a desirable balance of residential housing and valuable shade tree canopy.

Through a variety of methods including a targeted street tree planting program, the expanded NeighbourWoods initiative or other incentives and a policy/regulatory framework, short-term tree canopy gains in the order of 9% could be achieved primarily on or around university, school grounds, parks and sports fields/facilities, private homes and City streets. While these short-term gains are based on available plantable space, additional plantable space could be created in the long-term through a regulatory/policy framework that drives future redevelopments to provide landscaping beds in street medians, parking lots, commercial properties and on re-configured streets similar in design to Abbott Street and Houghton Road. The Developed Areas Valley Bottom currently contributes 3% to the overall canopy cover for the City. However, reaching the 18% cover target would bring that contribution to 6%, which is the largest gain in any category and therefore a major focus of the strategy.

3.2.2 Age-distribution of Trees in the Community

The current urban forest is characterized by an uneven age distribution but it is skewed towards trees younger than 30 years (Figure 7). It can be assumed that, over the next ten years, most trees will be left to grow towards maturity. However, invasive species (e.g., Siberian elm) or those not well suited to the climate (e.g., Norway maple suffers from sunscald) may be targeted for premature removal and replacement. Due to the small number of trees involved, these removals are unlikely to have a meaningful impact on the overall age distribution of the urban forest.

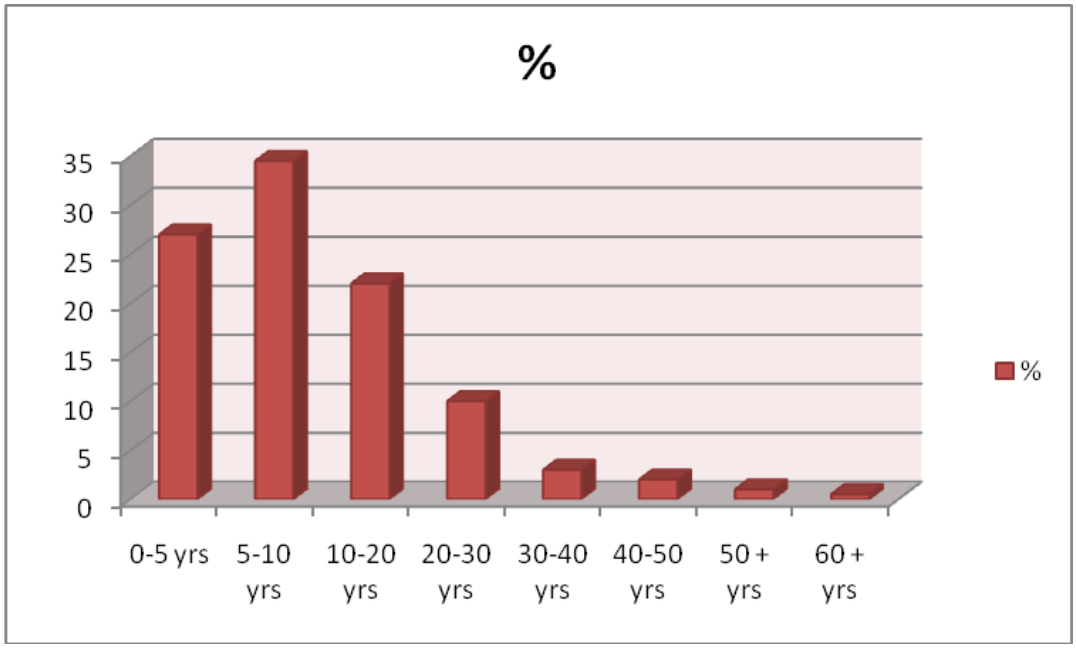


Figure 7. Current age class distribution utilizing data provided in UFORE report (Eastwood *et al.* 2007)

Private property greening opportunities

Presently, there is little to no attempt to retain mature and over-mature trees on private property through regulatory control, education or incentives. Without retention and management of a representative proportion of veteran trees it is not possible to have a truly sustainable urban forest with age-diversity. The higher costs to private individuals for maintaining a veteran tree may be a disincentive; however the City has the expertise to potentially educate individual landowners on veteran tree management. Protection of veteran trees is considered a key element of the SUFS strategy to prevent further erosion of age-diversity within the existing urban forest.

The protection or replacement of young trees planted on new development sites will also require enforceable regulatory controls to ensure they survive and thrive over the long-term; where properties pass, often repeatedly, to new owners the enforcement of an original, approved landscaping (tree planting) requirement can be particularly challenging unless supported by a regulatory framework.

Public property greening opportunities

Targeted street tree and parkland planting should be continued to assist with the recruitment of age class diversity. New developments should be required to plant street trees on what becomes public land, as well as retain and plant new trees on private lands. Delays in planting street trees required through the development approval process should not be allowed beyond the subsequent seasonal planting window, not only do these delays affect annual canopy goals but they also affect community confidence (see resident letter in Appendix 1). A seamless handover system is required to facilitate transfer of responsibility from Development Services (responsible for getting the developer to plant the trees) to Parks Services (responsible for their future management) to inform Parks Services staff of the location, species and planting date (year), and thereby enable prompt updating of the street tree GIS inventory. This regular updating of the tree inventory will be essential to effectively plan and prioritise all aspects of future street tree management, as well as providing baseline data for monitoring and measuring success.

All land jurisdictions

In the short-term, on both public and private lands a robust tree planting strategy based on the targets outlined in Table 9 will be required to build-up a baseline urban forest population to meet future canopy goals. This will, in the short-term, further skew the age distribution towards young trees; however significant canopy losses associated with rapid development, wildfire and forest health issues over the last decade have necessitated this planting biased approach to achieve canopy targets. There are limited options to restructure the age class profile of the existing tree population. However, once the baseline urban forest population has been established and the canopy goal target is on track to recovery or achieved by land use category, more emphasis can then be placed on phased timing for new plantings to help diversify the overall age class distribution in the long-term.

3.2.3 Species Mix

Species diversity in the urban forest is currently low and skewed heavily towards ponderosa pine (24%) and Douglas-fir (33%) in natural areas (57% of total) and Norway maple (19%), green ash (20%) and honey locust (19%) in the current street tree population (58% of total). This low-diversity species profile means that the urban forest could be at risk from catastrophic tree loss through pest, disease or climate change effects. It is suggested that the City should diversify the street tree population and aim towards having 10 or more species represented at 10% or less across the population (not applicable to the natural forests). It should be recognized that the local climate regime is an important limiting factor in improving species diversity in the urban forests of Kelowna and that only a fairly narrow species profile may be achieved in the natural areas. By contrast a broader range of ornamental species is available for planting on streets, boulevards and in residential neighbourhoods; however, for new plantings to be truly sustainable, species selection must focus on long-lived, climatically adapted and low maintenance species. Strengthening the tree bylaw, development policies and adopting a sound ecosystem based approach will increase the probability of success.

A certain degree of experimentation will be necessary to demonstrate whether or not certain new species are climate appropriate and will be suitable to help diversify the species profile in ornamental and shade tree plantings.

Expansion of the existing arboretum would be an excellent demonstration project to advocate the need for species diversity throughout the urban forest and for residents to learn more about the broad spectrum of available species, their growth characteristics and site suitability. Appendix 2 includes a number of species which according to their hardiness zone range, moisture and soil requirements should thrive in the City of Kelowna; these lists are offered to help expand the species diversity in the arboretum and across the street and ornamental tree population.

3.2.4 Species which should not be grown in Kelowna

All ornamental cherry species are prohibited in the Okanagan by the Little Cherry Control Regulation, the following control methods are taken as an excerpt from the Ministry of Agriculture website[2].

"Little Cherry Disease can be controlled by following the guidelines below. If you suspect little cherry, please contact your field advisor, or the Ministry of Agriculture plant pathologist in Kelowna.

1. *Do not grow or import ornamental Japanese flowering cherries, as these trees are often symptomless carriers of the little cherry virus. The Little Cherry Control Regulation prohibits the sale or growth of flowering cherries in the Okanagan, Similkameen and Creston valleys.*

Eliminate cherry seedlings in and near the orchard, as they can be symptomless carriers. Wild Prunus emarginata (bitter cherry), which is common in the Creston area, may also harbour the little cherry virus".

Apple, crabapple, pear and quince trees are prohibited from planting on city property by Council policy in order to help prevent the breeding and spread of codling moth and to support the Sterile Insect Release program. Callery pear (*Pyrus calleryana*) is an exception since the codling moth has not been found to breed in the tiny "fruits".

3.2.5 Native Vegetation

In the absence of appropriate policies and regulations on private land, a substantial portion of the existing urban forest could be denuded as development progresses, particularly on to land currently classified in the Natural Areas Upland land category, with the effect that biological communities become fragmented or at risk.

The City's Linear Parks Master Plan and subdivision permitting process should be used to ensure that wildlife corridors and connectivity between natural areas are maintained as development continues. Where the focus of a linear park is as a wildlife corridor, it may not be appropriate to establish trails in certain areas, or may be necessary to fence areas off to public and off-leash dog access. Provision for suitable wildlife habitat is essential to parks planning, with advice provided by a qualified professional whenever any semi-natural or natural land is subject to a land-use change, including provision of new trails. A further consideration is the need for secondary routes for emergency access given Kelowna's extensive wildland urban interface; this need must be balanced with wildlife

[2] http://www.agf.gov.bc.ca/cropprot/tfipm/lcv.htm

habitat considerations to prevent greenways from propagating fuel hazards and acting as corridors to bring wildfire in to developed areas. As previously stated, fuel hazard reduction and maintaining wildlife values are not mutually exclusive in most cases.

Three reports currently guide and inform City decision making where it is related to protecting natural biodiversity and to maximise natural area habitat values and connectivity across the landscape, thereby reducing fragmentation and unnecessary habitat destruction.

1. The Sensitive Ecosystem Inventory (SEI) (Iverson 2008)
2. Sensitive Habitat Inventory and Mapping (SHIM) (Ecoscape Environmental Consultants 2007)
3. Wetland Inventory Classification, Evaluation and Mapping (WIM) (Ecoscape Environmental Consultants 2009)

The Central Okanagan Biodiversity Strategy will provide further guidance for biodiversity management when completed.

Invasive species are another threat to natural areas and biodiversity management within the City. A broad spectrum of invasive plant species occur within the Kelowna municipal boundary (Scott and Robbins 2006) including Purple loostrife (*Lythrum salicaria*) and Japanese knotweed (*Fallopia japonica*), both of which are provincially listed as noxious weeds under the B.C. Weed Control Act (RSBC 1996). Invasive plants are often the first to colonise disturbed areas following wildfire or human disturbance associated with development. Invasive plants will also out-compete native vegetation and can have a significant detrimental effect on efforts to reforest plantable space. In addition to the risk of on-site competition and environmental degradation that invasive plants pose, there is also inevitable competition for funding between tree planting and invasive plant/noxious weed control initiatives. It is therefore important that tree planting, wildfire fuel management and ecosystem restoration initiatives also include provision for invasive plant prevention, eradication and control.

Consideration should be given to prescribed burning as a method for protecting city infrastructure from uncontrolled wildfire and promoting biodiversity through the restoration of ecosystems degraded by fire exclusion or forest health impacts. Prescribed burning is a technique that can be used to mimic natural wildfire disturbance in fire-dependant ecosystems. Although its use can be somewhat controversial in areas close to communities such as the Wildland Urban Interface because of smoke and escape risks, when properly implemented this technique can be cost effective and achieves numerous positive dry forest ecosystem restoration objectives including but not limited to: reduction of surface fuel loading, promotion of natural tree and understory regeneration, assisting with control of invasive plants, restoring or maintaining grasslands and open forest structure, and restoring natural processes. Limited and strategic use of this technique to restore natural processes and ecosystem function will in turn help maintain a healthy tree canopy and reduce wildfire severity, thereby protecting overall ecosystem integrity.

3.3 A Community Framework for Urban Forest Management

An integrated community framework will facilitate community-wide participation, buy-in and support for the SUFS. This will require comprehensive communication between all parties who directly and indirectly influence the urban forest including, but not limited to, City departments, public agencies, large private and institutional landowners, the general public, green industry, business and community organizations. Communication strategies may consist of working groups, facilitated workshops, public open houses, media/published documentation, urban forestry events or information dissemination through City permitting processes with the goal of achieving:

- Improved inter-agency understanding, buy-in and cooperation;
- Education outreach opportunities for City staff;
- Professional networking and opportunities for shared knowledge and resource capacity building;
- Collaborative funding opportunities; and,
- Consistent SUFS public messaging across all relevant agencies.

3.3.1 Public Agency Cooperation

The canopy analysis completed for this strategy revealed that school grounds in particular are significantly under performing in terms of their tree canopy potential. As identified in Phase 1, this can have serious implications for energy consumption, community and individual health as well as longevity of infrastructure (Blackwell & Associates 2010). In similar climate regimes it appears that asphalt and concrete paving may benefit from the shade of trees, this in-turn has the potential to reduce re-paving costs, avoid pavement distress and reduce the urban heat island effect (McPherson and Muchnick 2005). By contrast the majority of Regional District of Central Okanagan (RDCO) and some City recreation facilities and City parks are providing showcase examples of the benefits of incorporating outdoor recreation activities, shade trees (Figure 8) and optimizing the values associated with sustainable management of green infrastructure.

Linkages between a healthy human population and a healthy urban forest canopy are well documented (Kuo 2001); however budgets are often inadequate for greening public facilities. The recent economic downturn has provided many examples of instances where the green infrastructure section of facility budgets are the first to be cut, leaving empty landscaping beds or the provision of minimal landscaping with turf grass and a few trees.

Given the quantified values and benefits provided by the urban forest, it is appropriate to provide a greater budget emphasis on the establishment and maintenance of green infrastructure. Based on the level of community support registered during the consultation and public open house phases of strategy development, it is recommended that the City initiate a working group that includes City departments that manage major facilities (e.g., Kelowna Airport, the H2O Centre etc.), the RDCO, School District No. 23, and the Interior Health Authority, to explore greening opportunities and funding challenges across public facilities. Based on the relative 'greening' of facilities, disparities

appear to exist between the priority different public agencies place on green infrastructure; therefore sharing the STRATUM (City of Kelowna 2007) and UFORE (Eastwood *et al.* 2007) reports could improve common understanding of the net benefits of trees in the landscape. Additionally, avoided future healthcare costs associated with treatment of human diseases (such as asthma, skin cancer) and energy cost savings for buildings are two prime examples of the benefits of strategically planted trees that may persuade decision makers to place a higher priority for green infrastructure investment within their respective organizations.

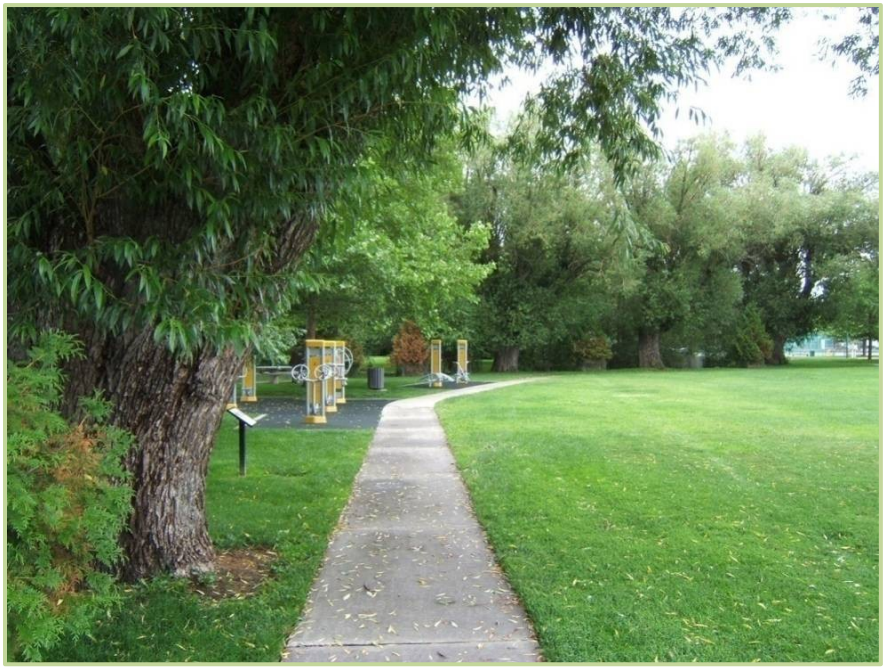


Figure 8. Example of the integration of public facilities in an area with the benefit of shade trees (Parkinson Recreation Centre). Concept and design by Lorna Rowland, City of Kelowna.

3.3.2 Involvement of Large Private and Institutional Land Owners

Schools, hospitals, golf courses, university, colleges, and other large landowners could have a significant impact on the overall success of the SUFS. The public agencies discussed in the previous section manage large amounts of land within the City. Additionally, institutions such as the University of British Columbia (UBC) Okanagan and Okanagan Community College have large landholdings, and several golf courses are located within the City boundary.

Three golf courses were represented at a facilitated stakeholder workshop completed as part of this strategy and all reported maintaining mature tree cover as a high priority (some are spending large amounts of money to protect trees against mountain pine beetle). Several golf courses are also moving towards Audubon International[3] certification which fosters the principles of sustainable land and resource management, protecting biodiversity and wildlife habitat, as well as minimizing potentially harmful impacts of golf course operations.

The facilitated stakeholder workshop completed while developing this strategy provided an opportunity for golf course land managers to share information with City and Regional land managers that was beneficial for establishing where there were common objectives. Given the success of this format and the low level of time

[3] http://acspgolf.audubonintemational.org/

commitment required, it is recommended as a method for engaging private and institutional land owners in the SUFS.

Given that public agency involvement has been proposed through a working group, facilitated workshops would be targeted at large landowners not represented in the working group and would include City representation to provide continuity between the workshops and the working group. Facilitated workshops can be used to identify common objectives, build collaborative working relationships, improve information sharing and ensure that there is consistent SUFS messaging occurs across all land ownership profiles. Workshop outcomes can be used to inform staff and Council of SUFS priorities as they apply to these lands. The level of tree loss associated with recent development at some of these institutions, such as the UBC Okanagan campus, suggests that there are valuable greening opportunities on these lands that will contribute significantly to achieving the City's overall canopy goals.

3.3.3 Green Industry Cooperation

The green industry includes plant nurseries, arborists, foresters, the tree-work industry, landscape architects and similar ventures. Minimum standards for all such ventures should be set by the City before any service can be provided to or accepted by the City. In certain jurisdictions municipalities have moved toward creating and maintaining lists of professional service providers which meet or exceed a set of minimum standards such as:

- Commercial, general liability insurance;
- Errors and omissions insurance;
- Maintaining a 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; and,
- WorkSafe BC coverage/Safe Certified.

City of Kelowna staff will continue to work with umbrella organisations for each industry sector (such as ISA, BCLNA) to encourage their local members to train their staff and adhere to industry standards and best management practices. City staff will continue to help facilitate this process by hosting education sessions for green industry professionals and also by further developing standards related to landscape design and construction. Many of these construction standards are already developed but are generally only used on city contracted jobs.

The City should give consideration to adopting standards, guidelines and communication strategies for each sector of the green industry, to encourage each sector to embrace the goals and objectives of this strategy and to standardize professional practices across each industry.

The tree nursery and garden centre industry has responsibility for the sale of appropriate species as influenced by Kelowna's existing recommended tree list. However, Alberta markets do strongly influence what is available for sale in Kelowna. Once SUFS objectives have been communicated to relevant organisations and stakeholders, specific market opportunities and lists of appropriate plant materials could be identified. For example, a nursery supplier may be able to alter their production to produce smaller or larger stock and a different range of species to meet future demand from the City and other stakeholders. This information could be coordinated through a collaborative agreement to feedback the results of the preferred species/size of plant material supplied in the NeighbourWoods program as well as City of Kelowna street tree planting initiatives.

The landscape contracting sector provides advice to clients including species choice, irrigation installation and maintenance, annual pruning regimes and pest management; therefore buy-in from this sector will heavily influence SUFS implementation. Similar to the tree contractors sector, it will be desirable to develop an accreditation standard for companies to achieve, similar to IPM and the Audubon International accreditation which some local golf courses are working toward.

Landscape architects serve a broad spectrum of clients from residential homeowners to developers and large institutional landowners such as UBC Okanagan therefore they have a great deal of influence on new plantings. It is suggested that the City develop a facilitated workshop for the landscape architects to achieve SUFS objectives by encouraging these professionals to specify the correct species profile for each development site, to reduce watering demands, develop species diversity, and influence the nursery industry in the supply and sale of climate appropriate species to their clients.

Figure 9. Inappropriate pruning/topping practices can be all too common in the urban setting emphasising the need for green industry training and accreditation standards (Accent Inn, Kelowna, summer 2011).

The tree-work industry, arborists and foresters have great influence over the number of trees removed on private land and as such can heavily influence the future loss of tree canopy. To minimize unnecessary tree canopy loss it is suggested that the City facilitate a training and, possibly, an accreditation process for tree contractors, arborists and foresters who are willing to embrace the principles of this strategy so that they will advise their clients about the benefits of maintaining and

increasing tree canopy on their land and explore creative ways to achieve their clients objectives without unnecessary tree canopy loss. Judicious pruning (Figure 9) can often achieve the desired objectives without removal of trees, likewise management of veteran trees and integrated pest management (IPM) are both mechanisms which can preserve and enhance trees in the landscape over the long-term. 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 mountain pine beetle, Douglas-fir tussock moth and other plant health care issues currently affecting the urban forests of Kelowna. Additionally, conveying information about revised and new bylaw and policy direction will be critical to both compliance and buy-in for meeting SUFS objectives. Workshop training subject matter should include but not be limited to:

- Changes to regulatory framework, additions/amendments to existing bylaws and policies;
- Professional report standards (minimum content), canopy goals and professional sign-off;
- Successful tree retention techniques and standards for development sites;
- Best management practices and standards for tree retention, removal and replacement plans and reports;
- IPM best management practices and relevance to maintaining and enhancing veteran trees and protecting vulnerable species from known pest profiles; and,
- City of Kelowna expectations for supervision and tree management plans on development sites.

3.3.4 Neighbourhood Action

Public education and outreach will be important methods for implementing the Sustainable Urban Forest Strategy. Applying the principle *"the steady rain soaks in",* a comprehensive and multi-phase communication strategy will be needed to build community acceptance and understanding about the goals and objectives of this strategy, and any changes to regulatory controls or budget expenditures that arise from implementation. A possible approach includes:

- Launching the SUFS in a series of dedicated open houses or with other City outreach events;
- Creating a URL such as Kelowna.ca/trees for the public to access SUFS implementation updates, annual progress reports on implementation to achieve targets for canopy cover and posting links to the page or announcements on other high traffic City web pages; Media bulletins, magnet campaigns or information sheets reminding citizens to schedule tree-work in the appropriate seasons (*e.g.,* tree planting to occur in the dormant season, tree pruning to avoid winter damage or pest entry to wounds, tree removal to avoid the bird nesting season and forest health management);

- Approaching action groups to help roll out the strategy to their members. Citizens among *each* neighbourhood may be encouraged to form a local shade or heritage tree committee, this style of public involvement can bring substantial benefits to the City for in-kind work, spreading the word and encouraging community pride, similar to the existing "Adopt a Street" initiative.

- Corporate sponsorship for community initiatives is an increasing trend with organisations such as Telus, TD Canada Trust and BC hydro getting involved throughout the Province to help communities take action on environmental issues for which competition for funding from the regular tax revenue stream can prove challenging.

- The NeighbourWoods and ArborDay initiatives are existing methods through which neighbourhood tree planting is encouraged and supported. Neighbourhoods that are currently underperforming in terms of tree canopy should be the focus for a new tree planting campaign on private property, this is often best initiated through strategically focused street tree planting initiatives which result in better understanding of the benefits of trees, community pride and can be a catalyst for local private property initiatives. It is therefore recommended that the NeighbourWoods campaign change location, moving to a different neighbourhood each year.

- Greenwaste pickup is an important element of tree care and management, particularly for a strategy that is proposing a substantial increase in the number of trees within the City. Recent limitations to greenwaste pickup were raised as a concern by residents with large deciduous trees in their landscapes because of challenges for leaf disposal. Limited greenwaste pick-up, specifically related to leaf pickup in the fall, places a substantial disposal burden on residents and may act as a disincentive to new deciduous plantings or maintaining existing trees as supported in this strategy. Limited pick-up currently has the greatest impact in well treed neighbourhoods where cleaning up leaf drop from private and public trees is managed by homeowners. Seniors and homeowners without the means to transport large volumes of leaves to a composting facility are likely most affected. The City may need to review this recent policy change to ensure the outcomes are not contrary to the overall goals and objectives of the Urban Forest Strategy.

3.3.5 Citizen-government-business Interaction

The benefits of shade trees for retail outlets and shopping malls are obviously recognized by some commercial operators and quantified in UFORE (Eastwood et al. 2007) and STRATUM (City of Kelowna 2007) reports therefore communication of these studies could provide a valuable forum for spreading the word and enhancing tree canopy across the relevant land categories (e.g. commercial shopping malls, business areas). As SUFS implementation moves toward regulatory changes that will impact commercial spaces, outreach through public communication initiatives and specific to the business community will foster positive interactions between citizen-government-business. It would be beneficial to facilitate workshops with business representatives prior to finalising and implementing regulatory changes that will alter the canopy cover around commercial developments (e.g., malls, sidewalk cafes, car parks). Presentations to the Kelowna Chamber of Commerce about the value of trees and

opportunities for businesses to participate in new plantings through sponsorship or volunteerism will build a greater understanding of the value of the urban forest and reduce potential conflicts now and in the future.

3.3.6 General Awareness of Trees as a Community Resource

Phase 1 of the strategy indicated that there was a strong understanding among individual members of the community about the value of trees (B.A. Blackwell & Associates 2010). However, it is also a priority to ensure that there is broader corporate and organizational understanding of the urban forest. Initiatives such as the SUFS are opportunities to better inform elected members of Council regarding the public interest in and support for the urban forest.

Figure 10. Shade and other values of trees are recognised by patrons who utilize car parks and facilities but are not always recognized as an asset by commercial and facility operators.

Initiatives such as Arbor Day and similar arboreal promotions can have a significant and lasting effect on community pride, maintaining open lines of communication between staff and the community and building youth engagement. The potential for these events should never be under-estimated but sadly they are often the first to be set-aside when funding or staff priorities are focused elsewhere. As already discussed in this section, a comprehensive and long-term communication strategy will be essential to raising community-wide knowledge, understanding and consensus for this strategy. Success will be indicated when requests for service from residents switches from a focus of complaints about City trees to requests for new tree plantings and support for the urban forestry department.

Traditional new development style in Kelowna has tended to harbour the philosophy *"*that a tree should not stand in the way of good design". Given the development preference for large building envelopes on small lots, without appropriate regulatory controls the majority of the development community may prefer to remove all trees and start with a clean slate. However, when one considers that a retained mature tree can remove approximately 65 times more pollution than a small tree (Nowak *et al.* 2000) the benefits to the community are obvious. If the SUFS can improve general awareness of the value of the urban forest through communication and regulation, then the preference for development style may shift towards a more urban forest friendly design.

Figure 11. A mature tree can provide a day's oxygen for a family of four like the Zarr family seen here at the Ben Lee Park (Rutland) June 29th 2011.

3.3.7 Regional Cooperation

Since biological and environmental interests, as well as pests and disease, do not respect regional boundaries, collaborative effort among adjacent municipalities and regional groups will greatly enhance this strategy. There is a need to identify relevant regional stakeholders and to include them in a working group to explore common goals and interests including forest health, wildfire issues, tree canopy goals, green waste composting, water conservation and closed loop recycling. It is likely appropriate to bring regional stakeholders and public agency stakeholders together in a working group given that most public agencies operate regionally.

Stakeholders other than those already identified as public agencies will likely include, but are not limited to, the Invasive Plant Council of BC, Canadian Food Inspection Agency, BC Parks, water irrigation and improvement districts, Okanagan First Nations governments and the Okanagan Basin Water Board.

3.4 A Resource Management Approach for the City of Kelowna

The resource management section is where the "rubber hits the road" and City staff and other agencies/landowners are making operational decisions in the management of tree resources. In the City of Kelowna, many of the elements discussed in this section have already been partially implemented and therefore only require fine tuning. Other elements that have been overlooked or set aside due to lack of funding are also proposed in this section.

3.4.1 SUFS Implementation Plan

This Sustainable Urban Forest Strategy provides all of the necessary components and structure for a comprehensive implementation plan, the scope of which will be defined based on Council adoption of the specific recommendations. This SUFS can be best defined as a continuum of objectives divided into three key goals, along with criteria and performance indicators designed to measure success of the overall plan.

Sustainable Urban Forest Strategy implementation continuum

"The combination of programmes and the emphasis placed on each component initiative will dictate the degree of success in the implementation of this strategy"

Following adoption of the SUFS, an implementation plan will be required to move recommendations forward. A staff implementation committee would ideally be put in place to:

- Champion the cause;
- Provide interdepartmental liaison;
- Leverage resource capacity;
- Prioritise areas for planting;

- Set annual targets; and,
- Define the monitoring plan.

It is recommended that the city stakeholder SUFS implementation committee be formed immediately following Council endorsement of the overall SUF strategy and definition of council adopted recommendations and priorities.

3.4.2 Funding

Based on the canopy cover analysis presented in Section 3.2, Kelowna both needs to protect the existing canopy and plant approximately 315,000 new trees to reach a future canopy goal of 20%. This canopy target is consistent with the 20% target set in Objective 6.3, Policy 1 of the 2030 OCP. The estimated cost to establish 315,000 new trees is estimated to be in the range of $22 million and $142 million. This cost estimate is based on an average per tree cost (to plant and establish) of $70 (NeighbourWoods) to $450 (street trees). These approximate costs reflect a realistic present day cost for purchasing a 4-6 cm calliper ornamental shade tree, machine time and City staff labour for planting, soil amendment, watering and ongoing maintenance costs for the establishment phase (usually 3 years). Based on the 2007 UFORE report (Eastwood *et al.* 2007) actual replacement costs range from $200/tree to $2,700/tree (Douglas-fir $210, ponderosa pine $300, London plane $750 and Norway maple $2700). The civic costs associated with preserving the existing canopy should primarily be achievable within the City's current operating budgets; however, there could be an additional resource requirement for bylaw enforcement and permit administration (typically cost neutral).

Achieving the SUFS canopy cover target through new plantings will require funding beyond that which can currently be allocated in the City's annual budget. There are several funding models available to raise the funds needed to establish and manage new plantings; these include increasing property tax, a tax on tree removals, some form of developer contribution and a new home buyer contribution. Additionally, grants and sponsorship opportunities could supplement any City derived revenue stream.

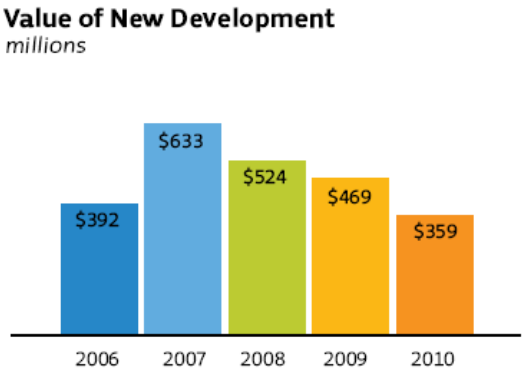


Figure 12. Estimated value of new developments from 2006 – 2010 (City of Kelowna 2010).

Given that new developments are where much of the new planting work will be focused, and development is where much of the deforestation occurs it may be appropriate to focus on either a developer contribution or new home buyer contribution to fund a major tree planting program. Kelowna is one of the fastest growing cities in North America with new development averaging 1,125 new housing starts per annum since 2006 (City of Kelowna 2010). The average annual value of new development is $475 million (City of Kelowna 2010) and Figure 12 shows annual data for the five year period up to 2010.

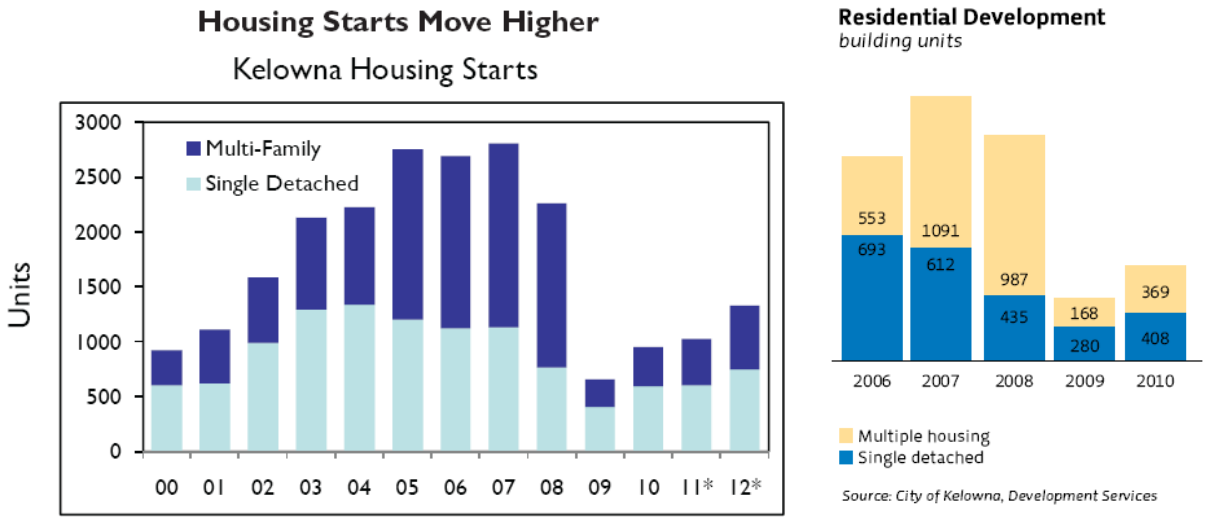


Figure 13. Left: CMHC housing starts *CMHC forecast (CMCH 2011), right: Residential development units with number of units identified by housing type (City of Kelowna 2010).

While there was a significant drop in new home starts in 2009 (Figure 13), 2010 home starts were back up to 957 and the Canada Mortgage and Housing Corporation projects that home starts will increase above 1,000 in 2011 and 2012 (Figure 13) (CMHC 2011). The 2030 OCP projects annual floor space development of:

- Industrial space at approximately 25,650 m^2 per year.
- Commercial space at approximately 13,975 m^2 per year[4] (including redeveloped areas).
- Institutional space at approximately 26,500 m^2 per year.

Figure 14. Lack of tree canopy in an industrial area (foreground) contrasted by a well treed residential area (background).

[4] 55.9 ha estimated as need by 2030 with a 0.5 floor area ratio, therefore annual area calculated based on 27.95 ha divided by 20 years (length of projection).

If we assume that housing starts continue at a similar rate as the average since 2006 (1,125) and use the commercial, industrial and institutional space projections from the 2030 OCP, then we can use this as a baseline for estimating a potential revenue stream associated with new development. Two potential options to fund tree planting and maintenance are investigated as follows:

1) A $450 tree fee for each new unit paid either by each new home purchaser or the developer as a contribution to a 'Green Kelowna Canopy Fund' (excluding commercial, industrial and institutional due to uncertainty in number of units).

2) A $4.50[5] per square meter of the building footprint/site coverage at ground levels paid by developers collected either through the Development Cost Charges Bylaw No. 10515 or another mechanism but transferring directly in to a 'Green Kelowna Canopy Fund'.

Therefore, Option 1 would raise approximately $506,250 in annual revenue assuming 1,125 new housing starts each year, plus an unknown amount contributed by new commercial, industrial and institutional units.

Option 2 is more difficult to estimate for housing starts given that we do not currently have access to data on the average building footprint at ground level for new house starts in Kelowna, though this data could be calculated by the City. If we use a conservative estimate[6] of housing starts averaging 314m^2 building envelope/site coverage per unit then Option 2 would generate $1,589,625 per year assuming 1,125 new housing starts. Commercial, industrial and institutional land would generate $297,563. Therefore, total annual revenue for Option 2 would be $1,887,188.

These options are presented for discussion purposes only and estimates need to be refined based on accurate data and accounting methods approved by the City. The City will need to determine the details of an appropriate method for funding the SUFs as part of its implementation plan.

An annual budget breakdown for both Option 1 and 2 is presented in Table 10. This breakdown includes a tree subsidy that refers to the NeighbourWoods model, where the City purchases a number of trees and then provides them at a 70% discount to private landowners. The budget table utilizes some of the revenue collected from Option 1 and 2 to run such a program. There is a significant short-fall in the funding model for tree planting on private land and on institutional land. Funding for new plantings on private and institutional land should generally come from the land owner/manager and be encouraged through education, regulation and incentives like the NeighbourWoods program, which planted 1,000 trees on private property in 2010.

[5] To reach a canopy cover target of approximately 20% (2030 OCP target), every hectare requires approximately 100 trees (assuming a shade canopy of 20 m^2 per tree). At $450/tree the cost of that calculates out to $60,000/ha, and broken down further, to $4.50/$m^2$. Alternatively, this can be expressed as $1.37/$ft^2$.

[6] Estimate based on 57% of new homes having a building footprint of 400m^2 and 43% of new house starts having a footprint of 200m^2.

The results shown in Table 10 indicate that significant funding is required over the long-term to meet the proposed canopy goal of 20%. The funding options discussed thus far primarily apply to planting on City land, which accounts for less than half of the total number of trees that need to be planted in order to meet SUFS objectives. Even when funded at $1.6 million per year, the planting program on City lands alone would take an estimated 26 years to complete. It is important to note that these estimates are coarse and do not detail costs such as ArborDay, an expanded arboretum, biodiversity initiatives or communication materials that could be funded from this source, therefore years to complete are approximate. Additionally, estimates do not factor in any net loss of the existing canopy and assume that appropriate regulation and enforcement policies are in place to prevent further reduction in the existing canopy due to development. Canopy losses due to forest health or wildfire could be significant over time and these will have to be addressed through monitoring and subsequent adjustment of planting strategies and time frames for meeting the canopy cover target.

Table 10. Annual budget breakdown for two potential funding model options.

Landowner/ Agent	Existing Funding Source (Annual)		Option 1 (Annual)		Option 2 (Annual)		Estimated Resource Cost (Annual)		Total number of trees required to reach 21% (+/-) canopy cover	Number of years to meet target Option 1	Number of years to meet target Option 2
	$	No. Of Trees Planted[i]	$	No. Of Trees Planted *	$	No. Of Trees Planted*	Dedicated Arborist and Bylaw Enforcement Officer	Parks Staff for Planting and Maintenance			
City of Kelowna (parks, streets, public facilities)	$50,000 annual capital budget	1,000	296,250	658	1,257,225	2,794	$70,000 (subtracted from Option funding)	$100,000 Option 2 only (4 summer positions)	100,000	60	26
Private Land Residential (single and multi-family)			Tree subsidy[‡] $140,000	2,000	Tree subsidy[‡] $140,000	2,000			73,000	37	37
Large Private Commercial/ Industrial /Institutional			Tree subsidy $0	0	Tree subsidy[x] $22,400	320			142,000	∞	444

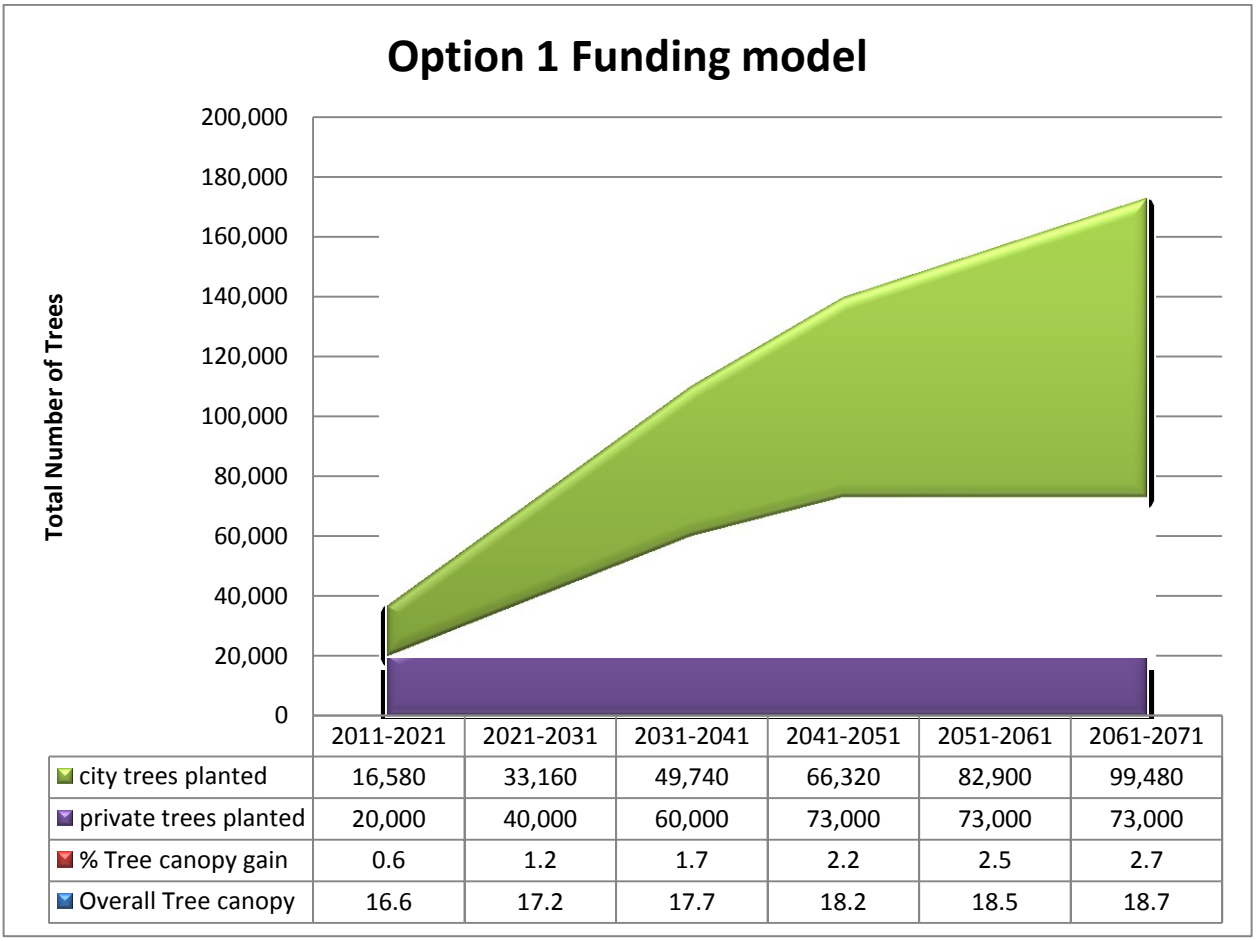
[i] Estimate cost of City planting natives in parkland at $50/tree.

* $450/tree for City managed street trees, $70/tree for privately managed trees.

[‡] Based on anticipated resident uptake of 2,000 trees per year.

[x] 16% of resident amount based on proportional contribution to total tree fund used in this example.

Figure 15 shows the projected canopy gain over time based on the Option 1 funding model (as described in Table 10). Using just the plantings associated with the City plantings and private trees planted through the NeighbourWoods program, the canopy cover would increase to 18.7% by 2071 (60 years from now). The target for planting on private residential land would be met in 37 years. The additional 1.3% canopy cover required to meet targets would need to come from large private commercial, industrial and institutional landowners planting 142,000 trees.

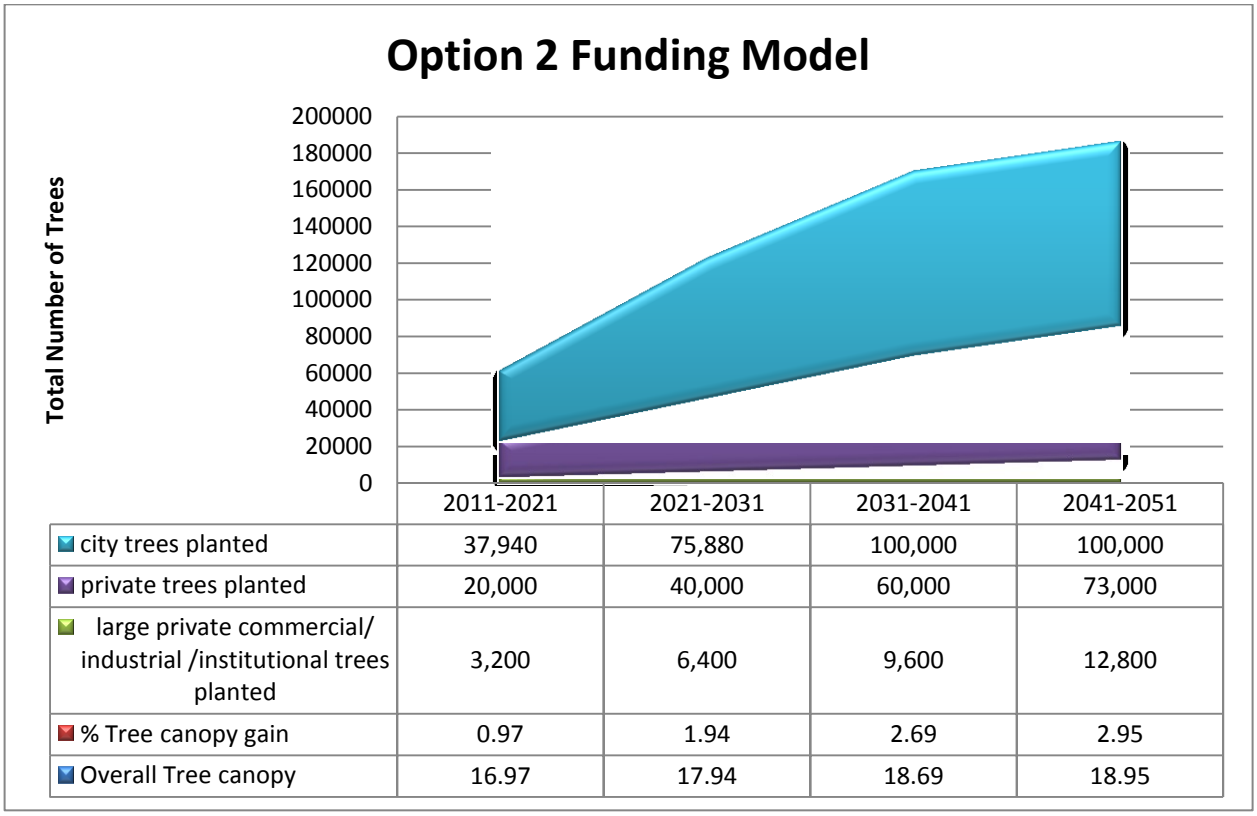


	2011-2021	2021-2031	2031-2041	2041-2051	2051-2061	2061-2071
city trees planted	16,580	33,160	49,740	66,320	82,900	99,480
private trees planted	20,000	40,000	60,000	73,000	73,000	73,000
% Tree canopy gain	0.6	1.2	1.7	2.2	2.5	2.7
Overall Tree canopy	16.6	17.2	17.7	18.2	18.5	18.7

Figure 15. Option 1 Funding Model graphed with cumulative totals shows the City of Kelowna would achieve a canopy cover of 18.7% by 2071 (assumes no planting by large private and institutional landowners).

Figure 16 shows the projected canopy gain over time based on the Option 2 funding model (as described in Table 10). Using plantings associated with the City plantings, private trees planted through the NeighbourWoods program, and a small number of trees planted on large private commercial, insustrial and institutional lands through a similar program, the canopy cover would increase to 18.95% by 2051. The City plantings would be completed in 26 years and the private residential plantings would be completed in 37 years. The additional 1.05% canopy cover required to meet targets would need to come from plantings on by large private and institutional

landowners; if plantings on these lands continued at the rate of 320 per year (Table 10), it would take another 400 years to meet a 20% canoy cover target.



	2011-2021	2021-2031	2031-2041	2041-2051
city trees planted	37,940	75,880	100,000	100,000
private trees planted	20,000	40,000	60,000	73,000
large private commercial/ industrial /institutional trees planted	3,200	6,400	9,600	12,800
% Tree canopy gain	0.97	1.94	2.69	2.95
Overall Tree canopy	16.97	17.94	18.69	18.95

Figure 16. Option 2 Funding Model graphed with cumulative totals shows the City of Kelowna would achieve a canopy cover of 18.95% by 2051 (assuming very limited planting by large private and institutional landowners such as UBC Okanagan).

Because 45% of the trees needed to meet the City's canopy cover target must be planted on commercial, industrial and institutional lands, a large portion of funding for the SUFS will need to be provided from private or grant sources. This will require a multi-pronged approach that utilizes education and regulation at the municipal level to encourage or require landowners to fund tree planting during development and redevelopment, and through accessing funding from available grants. Grants will be available from a variety of sources and a list of current potential grant opportunities is provided in Table 11. City staff should continue to pursue and promote opportunities for grants. Many grants are available only to community groups, schools or non-profit organisations; the City's role should be to ensure that local clubs, schools and non-profit organisations are informed of the availability of those grants as they emerge. This could be achieved by linking active grant opportunities to the City website.

Table 11. Potential grant and funding sources for greening.

Name	Value ($)	Principle area of focus	Website	Kelowna already participates
Evergreen/Molson Canadian Red Leaf project	Trees planted	Urban parks	www.redleafproject.ca	
Toyota Evergreen Learning Grounds	$500-$3500	Schools	www.evergreen.ca	
Evergreen Common Grounds	$500-$3500	Public spaces from pre-planning to implementation	www.evergreen.ca	
TD Green Streets, Tree Canada	Up to $15,000 matching funds	School yards, community gardens, tree planting	www.treecanada.ca	Yes 2011
Walmart –Evergreen Green Grants	Up to $10000	Community-based greening of urban areas	www.evergreen.ca	
Canadian Tire Community Environment Award	Unspecified	Schools, non-profit, community groups	www.candiantire.ca	
BC Hydro	Project based	Right species right place	www.bchydro.com	
Mountain Equipment Coop	Unspecified	Non-profits and community group tree planting and environmental improvements	www.mec.ca	
Telus Mobility	Project based	Community volunteering	www.telus.com	
Rogers	Project based	Community volunteering	www.rogers.com	
Home Depot/Evergreen: The Rebuilding Nature Grant Program	$1000 or $3000 or $12000 plus $2000 gift cards	School yards, community gardens, tree planting	www.evergreen.ca	
Environment Canada EcoAction Community Funding	Project based	Non-profits and community group environmental improvements	www.ec.gc.ca	

Sponsorship opportunities offering some form of public recognition for a monetary contribution are another funding option to pay for management activities such as weeding, scrub clearance, site clean-up, or for tree planting on private or public sites. Special events such as Arbor Day, Maple Leaf Day and Earth Day offer annual opportunities to achieve targeted activities that may attract sponsorship. It is also possible that future funding opportunities will exist through carbon offsets; however, so much uncertainty exists around how carbon accounting will be applied to urban forests that it is not recommended this be pursued as a current option.

The cost of the urban forest is justified by the dollar value of the benefits provided by trees and this understanding must be communicated to the public, business groups and successive City Councils to maintain an ongoing funding commitment. After the new canopy is established, there will be an ongoing cost associated with the maintenance of a larger urban forest resource. As detailed in STRATUM (City of Kelowna 2007), for each dollar spent on the establishment of new urban forest trees in the City of Kelowna a return on investment cost/benefit ratio of 3:1 can be expected and as such “new canopy” investment could be offset against energy savings and similar quantifiable benefits provided by the urban forest.

3.4.3 Staffing

The current staffing complement at the City of Kelowna are well trained and possess the necessary expertise and experience to perform their current functions. Training shortfalls and necessary upgrades can therefore be assessed on an as-needs basis as strategy implementation moves forward.

3.4.4 Assessment Tools

Monitoring canopy cover and other variables over time will help demonstrate if the SUFS is successful. A GIS based database that may be accessed and queried by authorised staff will be essential, and should be capable of recording data in various formats, such as details of annual NeighbourWoods participants, tree cutting permits, as well as site history, what land use type (section 3.1.1) a site most closely resembles, canopy cover targets and so on. Methods of assessment may include field assessment and GPS data collection, remote sensing using i-Tree canopy application or its equivalent, periodic surveys (which may include the plots defined in UFORE [Eastwood *et al.* 2007]), street tree inventory, veteran tree survey, and mapped forest health and natural disturbance events.

The USFS i-Tree canopy software is readily available to City of Kelowna staff and can be accessed on-line therefore no proprietary software is required to update the canopy goal section of this strategy. In addition this application only requires minimal GIS staff support to create shapefiles for the chosen areas to be assessed. It is anticipated that this application will be continually refined by the developers and as long as it is used in accordance with the technical guidance provided it is entirely possible to produce statistically valid tree canopy and related analyses in a cost effective manner.

3.4.5 Protection of Existing Trees

The *Community Charter* SBC 2003 provides municipalities with regulatory authority in a number of areas of local interest including those which promote ecologically responsible development and show a commitment to environment, economic, cultural and social stewardship. In order to meet the goals and objectives of this strategy, a number of modifications to existing bylaws and policies are suggested to better protect trees, minimize habitat loss, improve energy efficiency of buildings, conserve water, protect biodiversity, reduce impervious surfaces, protect watercourses, riparian areas, species at risk and environmentally sensitive areas.

The policy changes recommended below and provided in Appendix 3 are for demonstration and discussion purposes, and are not intended to be applied 'as is'. The key intent of any policy and bylaw change is to give the City the ability to monitor and regulate tree removals that occur within the City boundary so that activities on private land do not jeopardize the canopy cover target and the positive environmental, social and economic benefits it will provide to the City.

Recommended Policy and Bylaw changes summarized as follows:

- Addition to existing Bylaw No. 8041 to provide for protection, preservation and replacement of trees on real property (excluding the Agricultural Land Reserve) which requires a development, development variance, rezoning, subdivision or building permit.

- Addition to Bylaw No. 8041 to regulate the retention and or replacement of minimum tree density/canopy cover in accordance with the land type (Table 4) on real property (excluding the Agricultural Land Reserve) which requires a development, development variance, rezoning, subdivision or building permit.
- Addition to Bylaw No. 8041 to provide a schedule of permit fees, based on number of trees to be removed/replaced or lot size, increased permit fees for larger lots or large numbers of trees proposed for removal to reflect salary recovery for staff time/resources and administration of permits.
- Addition to Bylaw No. 8041 to provide for a section for prohibitions (damage, removals, unauthorized cutting) as well as a section defining enforcement measures to be implemented as a result of bylaw infractions.
- Addition to Bylaw No. 8041 to protect heritage trees throughout the community, including the Heritage trees identified in the Heritage Trees of Kelowna - Rutland Sector and Inner City Inventories.
- Additions and amendments to the Hillside Development Standards to reflect proposed changes to Bylaw No. 8041 regarding the protection, preservation and replacement of trees to achieve minimum tree density/canopy cover in accordance with the land type (Table 4).
- Addition to the Sustainability checklist to include requirements for Tree retention/management plans and retention or replacement of minimum tree density/canopy in accordance with the land type categories (Table 4).
- Amendments to relevant sections (7) of Consolidated Zoning Bylaw No. 8000 and other relevant City of Kelowna regulations to cross reference with the aforementioned Bylaw/policy changes including protection, preservation and replacement of trees to achieve minimum tree density/canopy cover.
- Amendments to the Subdivision, Development and Servicing Bylaw No. 7900 to accommodate the requirement for payment into a 'Green Kelowna Canopy Fund' as described in section 3.4.2.

Proposed amendments to existing policies are contained in Appendix 3 and are intended to provide baseline content to help guide and streamline the proposed policy and bylaw changes.

3.4.6 Creating a Vision for Street Tree Planting

Understanding the role of street tree planting is vital in order to achieve the greatest value for this commitment of resources. In understanding what it is the community wish to achieve in planting a boulevard or median, we can evaluate performance, and therefore improve the resource of street trees. Coupled with this understanding are realistic expectations regarding the impact a street tree may have. A row of newly planted trees cannot transform an inhospitable street. It is, however, a step in that transformation, if the appropriate tree is planted in the appropriate manner, in the appropriate situation.

How successful a street tree may be in fulfilling its role is dependent upon the planting situation. For example, a tree planted on a road in a forest setting will have considerably less initial impact than a tree planted in an open situation. In the City of Kelowna, there are numerous situations where street trees have been, or could be, used to help emphasise the local context. For example, prefer planting pine or columnar deciduous species in a forest context leading in to native pine or Douglas-fir forest, or plant flowering ornamentals in a civic place. These situations have been categorized as prototypes from which the City of Kelowna may wish to develop a more coordinated response to tree planting.

List of Prototypical Street Tree Applications:

1. Forest Context (Arterial or Collector Road)
2. Forest Context (Local Road)
3. Open Context (Arterial or Collector Road)
4. Open Context (Local Road)
5. Civic Places
6. Civic Places (Gateways)
7. Commercial Streets
8. Commercial Villages
9. Medians
10. Industrial (Existing)
11. Industrial (New / Business Park)

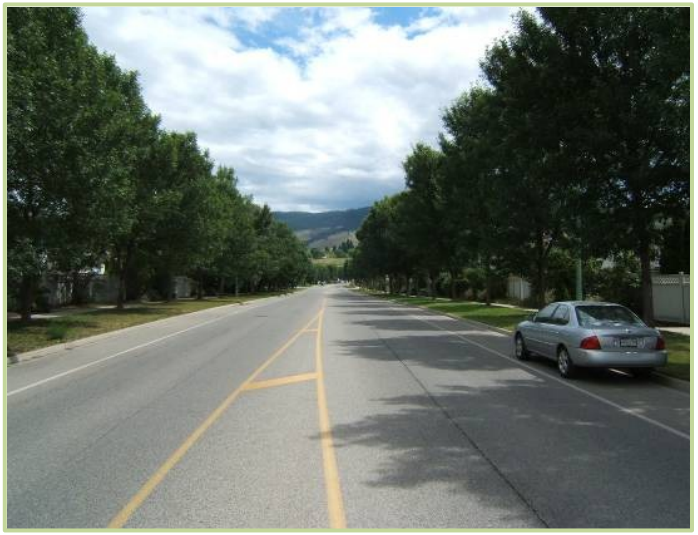


Figure 17. open context collector road.

In addition to the quantifiable environmental goods and services that street trees provide they provide a number of community benefits which are less easy to communicate. The following benefits should be factored in to the development of a comprehensive street tree management plan

Provide scale

The position, size, form and number of street trees can modify the scale relationships of roadways, buildings, and the streetscape. This is significant in determining the quality and appeal of the urban landscape. Also, the street tree can serve to modify the scale relationship of a person to the built environment, thereby creating a more comfortable pedestrian experience along busy commuter streets.

Recognize and celebrate the City's forest and agriculture traditions

The City's tradition of communities set within a forest and amongst agricultural land holdings is easily recognized by visitors to the City of Kelowna. With increased growth and development, measures should be implemented to preserve this link with tradition. While street trees are not a substitute for the natural forest or the landscapes associated with local agricultural activities, they do serve as a link between suburbia and these traditional land use types. A combination of retention of native forest trees and planting of ornamental street trees can help transition between land-uses and provide a link to these traditions.

Define City image or sense of community

Street trees are a preferred and remembered element of areas. They serve to distinguish certain streets and areas from others, particularly when there is diversity in the planting of trees. They also serve to mark certain places as being special within a community. Heritage trees and avenues of maple trees such as those found on Maple Street provide good examples of this concept.

Figure 18. Bernard Avenue easily recognisable by its mature treed landscape

Provide Directional Information

The form, colour and size of trees, as well as the pattern of their planting can be used to give people visual clues in finding their way. While such clues may be subtle, they can be quite powerful and effective. When combined with other means to give direction, street trees help to make urban areas easier to comprehend, and therefore make such areas more comfortable, enjoyable and safe. Rows of uniform trees, groupings of feature trees, or a landmark tree can be used to draw attention, and attract people to choose certain routes.

Celebration

Street trees can be effectively used to celebrate seasons and commemorate significant events, places or persons. In the City of Kelowna, maple trees with their spectacular fall colour may be an example of a street tree chosen to celebrate that particular season.

Figure 19. Glenmore Drive, a busy commuter road and green gateway into the City

3.4.7 Species and Site Selection

When considering the number of trees necessary to achieve the proposed "new canopy" the following choices regarding suitable growth characteristics should be taken into consideration:

- Compact ornamental trees are intended for areas of the urban environment where overhead conflicts (buildings, overhead power-lines, transportation infrastructure) may limit overall crown spread at maturity.

- Large growing species are suitable for parks and single family residential development sites, or unencumbered boulevard locations that do not present overhead or soil volume constraints.

Street trees with compact growth characteristics will contribute less canopy area than large growing species. Significantly fewer trees would need to be planted if they are characterized by large spreading canopies, therefore planting large long-lived species wherever they are suited to the planting site will reduce the overall burden of new tree planting required to recover canopy goals to desired levels.

Often in an urban setting compact or columnar trees that do not require rigorous pruning regimes and avoid potential conflicts with business frontage exposure are planted preferentially. While business frontage exposure is a relevant consideration, selection of trees that will grow above the frontage means that the impact will be temporary. With this in mind a healthy balance of large and small growing, and aesthetically diverse trees can introduce both structural and aesthetic diversity into formal street tree populations that could otherwise become uniform and uninteresting.

The following table provides some examples of the size differentials amongst commonly planted trees in the City of Kelowna:

Table 12. Examples of size differentials in commonly planted trees.

Species	Mature height (metres)	Mature crown diameter of open grown specimen (metres)
Coniferous		
*Ponderosa pine	25 - 30m	5 - 7m
*Douglas-fir	30 - 40m	6 - 8m
Norway spruce	25 - 30m	5 - 7m
Deciduous		
London plane	25 - 35m	15 - 25m
Red Maple	15 - 20m	8 - 12m
Little leaf linden	20 - 28m	10 - 15m
**Green ash	18 - 26m	10 - 18m
**Norway maple	12 - 15m	8 - 12m
**Honey locust	15 - 25m	8 - 12m
Cottonwood	20 - 28m	6 - 10m
Aspen	18 - 25m	4 - 6m

* Most common species in natural areas (Eastwood *et al.* 2007).

**Most common species in street tree inventory (City of Kelowna 2007).

Maintenance requirements are a key consideration for species and site selection. The proximity of planting to other infrastructure such as overhead power lines, buildings and roads is important. Ensuring species selections are appropriate non-allergenic species is a priority for school playgrounds and residential streets. Short-height trees or

shrubs would be suitable under power lines (BC Hydro guidelines), while narrow, upright trees are suited to streets with frequent high-sided vehicles passing by.

Kelowna is within Plant Hardiness Zone 6a to 5a in the valley bottom, and 5a to 3a in the upland. An adaptive management approach to species selection and approval will be required. The species suggested in this strategy are anticipated to perform acceptably but have not all been field tested, therefore monitoring will be required as the SUFS proceeds. The species list (Appendix 2) should be adapted as new knowledge is gained from in the field observations and public feedback.

3.4.8 Tree-Care Standards

An integral component of the sustainable urban forest strategy will be the implementation of City-wide tree care standards, which will both level the playing field and expand the potential for successful tree management, retention and new planting survival.

The American National Standards Institute[7] provide a comprehensive set of tree care standards which are accepted throughout the industry and are being continually updated, therefore will be current at the date of purchase. Inevitably over the life of a long-term strategy industry best practices will change and it is therefore prudent that best management practices referenced are always current and up to date for the reader. For these reasons the current relevant ANSI A300 tree care standards are recommended and listed as follows:

- ANSI A300 Part 1 (Pruning)-2001
- ANSI A300 Part 2 (Fertilization)-2004
- ANSI A300 Part 3 (Supplemental Support Systems)-2006
- ANSI A300 Part 4 (Lightning Protection Systems)-2008
- ANSI A300 Part 5 (Management during construction, land use, and site planning)-2005
- ANSI A300 Part 6 (Transplanting)-2005
- ANSI A300 Part 7 (Integrated Vegetation Management)-2006

3.4.9 Citizen Safety

Research, consultation and development of this strategy has not identified any potential for improvements to the City's current approach, therefore no specific recommendations are made on this subject.

Strategy performance and monitoring criteria that arise from the implementation of this strategy are however anticipated to help future risk management functions by providing tree risk managers with up to date information

[7] http://www.ansi.org/

on current tree health, mortality and observed defects. In addition, maintenance of a central database for the urban forest resources may also assist staff in planning and implementing proactive risk management programmes.

3.4.10 Recycling and Water Conservation

Tree waste must be recycled except when contaminated by weeds, chemicals or other harmful material. Given the hot, dry climate the use of chipped tree waste as organic mulch in Kelowna can present a modest fire risk but this characteristic may be limited by a composting phase first to reduce adverse soil nitrate reducing effects from an imbalance of C:N ratios in fresh material and then managed to remain in a damp state.

Likewise chips arising from land clearing activities should be utilized for bioenergy initiatives, there is potential for the City to help coordinate a collaborative effort in this respect and potentially generate revenue, reduce energy bills for heating or at the very least help facilitate responsible utilization. In the past, chips generated from larger pine beetle logging operations have been utilized by Tolko (bioenergy to generate electricity) or to produce Ogogrow compost.

Wherever possible, tree wood of a merchantable size should be cut and salvaged for subsequent use by local artisans, carpenters or firewood merchants and, to encourage small business, consideration should be given to offering this for nominal sums or for free, and in an equitable manner. Salvage value for logs should be considered, although the market for local native species, particularly ponderosa pine, is not favourable. Leaf composting techniques can provide excellent soil amendment and nutrients for newly planted trees and, given the deciduous species component in the urban forest, it is essential that effective means are developed for collection, composting and redistribution.

Xeriscaping and resultant water conservation has great potential to both reduce water demand throughout the City and allow homeowners to plant and maintain sustainable garden landscapes, there is a demonstration garden at the H2O facility at Mission Recreation Park and a well established non-profit Okanagan Xeriscape Association providing education and outreach and bi-annual gardening classes, additional demonstration gardens and other resources are listed on their website www.okanaganxeriscape.org.

In 2007 The City of Kelowna Council endorsed seven initiatives that form the City of Kelowna Water Sustainability Action Plan. This document is intended to improve the sustainable use of water throughout the community. The fundamental principles of this Sustainable Urban Forest Strategy recommends that; only climate adapted (drought tolerant) trees are planted in the City, that planting techniques, tree care standards and the density of trees across the landscape are maintained in careful balance with the natural carrying capacity of the various land types. In essence therefore this strategy compliments the City of Kelowna Water Sustainability Action Plan as endorsed by Council.

4 Monitoring Performance

The following table proposes measurement methods, performance indicators and targets for monitoring SUFS objectives. These are proposed only and should be refined by City staff during the development of a SUFS implementation strategy.

Goals	Objectives	Measurement Method	Performance Indicators, Targets and Frequency
1. Maintain and enhance the existing vegetation resource	a. Achieve climate-appropriate degree of tree cover community-wide	iTree Canopy Software and GIS Inventory	Analysis every five years to determine: % Canopy in Developed Valley Bottom % Canopy in Developed Upland Projected canopy increase from young trees **Target canopy cover increase of 0.1% per year**
	b. Provide an uneven age distribution	GIS Inventory	Analysis every five years to provide indication of how skewed the age distribution is from a normal distribution curve **Long-term Target: By 2030 >10% representation in each 10 Year age class (0-5, 5-10, etc.)**
	c. Provide species diversity	GIS Inventory	Analysis every five years to compare species diversity. Natural areas will always exhibit narrow species diversity. Street/ornamental tree populations will provide greater opportunity for range of diversity **Target: By 2030 at least ten species should represent more than 50% of street tree population (3 species at present)**
	d. Preserve and managing regional biodiversity	GIS Inventory	Every five years, number of hectares treated for invasive plant species control or wildfire fuel management and ecosystem restoration **Target 25 ha/ 5 years (pending land availability)** **Plus no net loss of SEI land-base**
	e. Maintain the biological integrity of native remnant forests	GIS Inventory	Every five years, number of hectares treated for invasive plant species control or wildfire fuel management and ecosystem restoration **Target 25 ha/ 5 years (pending land availability)**
	f. Maintain wildlife corridors to and from the City	Wildlife study (new report)	Wildlife study to observe and document wildlife movement through the community, identify current and potential conflicts and recommend corridor development. **Target to be established based on study outcomes**

Goals	Objectives	Measurement Method	Performance Indicators, Targets and Frequency
2. Strengthen the community framework	a. Ensure all City departments and all sectors of the community operate with common goals and objectives	Qualitative review by Implementation team	Terms of reference for this annual review may include but are not limited to the following items: Regular SUFS Implementation Team Meetings Process for interdepartmental liaison Green infrastructure funded on civic sites NeighbourWoods program operating Bylaw protecting existing canopy and requiring new planting New bylaw enforced Bylaw protecting heritage trees Water conservation in the summer Greenwaste recycling in the fall Tree cutting permits issued during the bird nesting season
	b. Encourage buy-in to City-wide goals by public agencies and large private landowners.	GIS Inventory	Annual review Number of trees planted around large public facilities and institutions such as UBC Okanagan **Target > 2,000 per year** **1 regional working group meeting hosted per year** **1 facilitated workshop with large area landowner**s every 2 years.
	c. Encourage the green industry to operate with high professional standards and to commit to city-wide goals.	Attendance count and survey	Every five years Number of organizations that have attended workshops **Target 10-15/5 years** Survey nurseries/garden centres regarding tree species supplied **Target >2 from each preferred coniferous or deciduous category in Appendix 2**
	d. Establish means for understanding and participation by citizens in urban forest management at the neighbourhood level	Bylaw infractions NeighbourWoods participation count	Annual review *Number of bylaw infractions. **Target: < 50/year** Uptake for NeighbourWoods program **Target >2,000 trees/year**
	e. Establish means for all constituencies in the community to interact for the benefit of the urban forest	Attendance, feedback and heritage tree counts	Annual review Hits on SUFS website **Target 1,000/year** Attendance at SUFS open house (if applicable) **Target 25-50 per open house** Attendance at business stakeholder workshops (if applicable) **Target 10-15** Number of trees added to heritage tree inventory **Target 10/year**
	f. Build understanding among	Public Survey	Every five years

Goals	Objectives	Measurement Method	Performance Indicators, Targets and Frequency
	the general public of the value of trees to the community		Assess public support and awareness for SUFS in survey questions **Target >60% positive response**
	g. Provide for cooperation and interaction among neighbouring communities and regional groups	Regional stakeholder survey	Every five years Assess regional stakeholder support for SUFS in survey questions **Target >60% positive response**

Goals	Objectives	Measurement Method	Performance Indicators, Targets and Frequency
3. Enhance the City's management approach	a. Develop and implement an SUFS implementation plan for trees on public and private property	Qualitiative review	Annual review by the SUFS implementation to assess plan progress. **I**mplementation targets should be set annually.
	b. Provide adequate funding to implement a City-wide SUFS implementation plan	Qualitiative review	Annual report including but not limited to the following initiatives: Kelowna Green Canopy Fund status Annual planting target met NeighbourWoods program funded New bylaw enforced
	c. Employ or train adequate staff to implement a City-wide SUFS implementation plan	Qualitiative review	Annual review by the SUFS implementation team New bylaw enforcement issues and opportunities
	d. Develop methods to collect information about the urban forest on a routine basis	GIS database	Every five years the following items should be reviewed and updated: iTree Canopy analysis Complete GPS data for new trees added in to GIS database Forest health and disturbance mapping added in to GIS database
	e. Enhance protection for existing trees	Tree permits count	Annual review Number of tree permits applied for **Target: *Reducing trend for removal permit applications, increased trend for pruning permits**
	f. Provide guidelines and specifications for species use	Website and inquiry count	Hits on SUFS website **Target 1,000/year** Phone calls or emails **Target: 400/year**
	g. Adopt and adhere to professional standards for tree care	Qualitative review	Annual review by SUFS Implementation Team to assess performance of professional standards. Establish a target planting survival rate as a quantitative measure.
	h. Maximise public safety with respect to trees	Incident/service request count	Number of service requests for unsafe trees **Target: *Reducing trend from present statistics**

Goals	Objectives	Measurement Method	Performance Indicators, Targets and Frequency
			Number of tree incidents **Target: *Reducing trend from present statistics**
	i. Create a closed loop recycling system for tree waste and water	Complaint count and water usage	Number of complaints regarding greenwaste pickup **Target: *Reducing trend from present statistics** Irrigation water usage **Target: Link to water conservation Plan**

*Current statistics unknown, but annual analysis using RFS system should be practical for monitoring purposes

5 Recommendations

Recommendation	Time Frame/ Frequency
1) The City of Kelowna should consider forming a 'SUFS Implementation Team' composed of City staff from relevant departments to develop and coordinate a formal implementation plan based on the recommendations contained herein that are adopted or supported by Council. Within the plan:	2011 -Term of strategy
a) Develop a vision for street tree planting and champion SUFS implementation.	Year 1-3
b) Provide a process for interdepartmental liaison and to leverage resource capacity.	Year 1-3
c) Develop a planting strategy that prioritizes areas for planting and sets annual planting targets.	Annual
d) Define the monitoring plan.	Year 1-3
2) The City of Kelowna should consider developing a funding model that generates revenue for a 'Green Kelowna Fund' as discussed in Section 3.4.2. It is vital to the success of this strategy, the achievement of stated objectives in the 2030 OCP and the recommendations outlined in the Kelowna Community Greenhouse Gas Emissions Inventory and Projections Report that the chosen funding model raise substantial and ongoing funds in the medium term in order to reach a 20% canopy cover target. While the required funding levels will decrease once planting targets have been achieved, ongoing funding above current budget levels will be required in order to meet the increased maintenance obligation of the new urban forest. Specifically, the funding model should:	2013 - Term of strategy
a) Fund annual tree plantings that are consistent with meeting the 20% canopy cover target and priorities outlined in Section 3.2.1.	Begin year 3-5 then Annually
b) Provide budgets for tree planting around the H2O Centre and other civic facilities where the provision of green infrastructure has been included in the design principles but not implemented due to funding shortfalls. Seek grant funding	Year 3-5
c) Provide budgets for tree celebrations such as Arbor Day. Seek grant funding	Year 3-5
d) Fund the NeighbourWoods program to promote planting of trees on private property. Seek grant funding	Year 3-5
e) Fund an arboretum expansion program to trial new species and demonstrate to the public, green industry and other stakeholders the variety of climate appropriate species available for planting across the Kelowna land base (all land types should be represented). Seek grant funding	Year 3 -7
f) Partially fund new street designs similar to Abbott and Houghton Street that provide more plantable space on streets and boulevards and thereby increase opportunities for tree canopy recruitment.	Annual
g) Fund initiatives such as invasive plant species control, wildfire fuel management and ecosystem restoration to maintain and restore biodiversity values in natural areas.	Annual

Recommendation	Time Frame/ Frequency
3) The City of Kelowna should continue to pursue and promote opportunities for urban forest grants that can be applied to either public or private land. Many grants are available only to community groups, schools or non-profit organisations. The City's role should be to ensure that local clubs and non-profit organisations are informed of the availability of those grants as they emerge. This could be achieved by linking active grant opportunities to the City website.	Annual
4) The City of Kelowna should consider providing or facilitating sponsorship opportunities offering some form of public recognition for a monetary contribution to pay for management activities such as weeding, scrub clearance, site clean-up, or for tree planting on private or public sites. Special events such as Arbor Day, Maple Leaf Day and Earth Day offer annual opportunities to achieve targeted activities that may attract sponsorship.	Annual
5) The City of Kelowna should consider implementing a planting strategy that:	
a) Uses a prototypical street tree strategy to provide coherence to the City's street tree vision.	Year 2-5
b) Targets new plantings in developed areas that are currently underperforming in terms of canopy cover (existing City of Kelowna initiative).	Term of strategy
c) Focuses on new plantings of long-lived, climatically adapted and low maintenance species in both developed and natural areas (existing City of Kelowna initiative).	Term of strategy
i) Promote use of drought tolerant rain garden design, xeriscaping and climate appropriate species (existing City of Kelowna initiative).	Term of strategy
ii) In developed areas, take an adaptive management approach to species selection to help diversify the species profile in ornamental and shade tree plantings. Consider expanding the arboretum as a demonstration project. Appendix 2 provides potentially suitable species. Target having 10 or more species represented at 10% or less across the urban forest (not applicable to natural areas).	Term of strategy
iii) In natural areas, increase diversity where possible by planting a mix of native species that are suitable for the site.	Term of strategy
iv) Select new plantings appropriate to site conditions and maximizing canopy. Compact ornamental trees are intended for urban areas where overhead conflicts (buildings, overhead power-lines, transportation infrastructure) may limit overall crown spread at maturity. Large growing species are suitable for parks and single family residential development sites, or unencumbered boulevard locations that do not present overhead or soil volume constraints (existing City of Kelowna initiative).	Term of strategy
d) Increases canopy cover in and around formal turf grass areas in City parks and encourages new park designs that increase treed areas within City parks.	Year 3-10
e) Supports phased tree planting/replacement initiatives to develop a more normal age distribution in the long-term. Once the baseline urban forest population has been established and the canopy goal target is on track to recovery, more emphasis can then be placed on phased timing for new plantings to help diversify the overall age class distribution	Term of strategy

Recommendation	Time Frame/ Frequency
in the long-term.	
f) Incorporates the NeighbourWoods program or similar initiative to promote tree planting on private land. (Existing City of Kelowna initiative) Staff recognize the potential to expand this initiative with more days/planting activities.	Annual
6) The City of Kelowna should consider adopting and implementing bylaw and policy changes as outlined in section 3.4.5 and Appendix 3 to: There will be a need to customize these changes to ensure that they are not too onerous for Single Family Development and similar small-scale developments. A tree management plan should be required for new subdivisions and other significant developments and projects	Timing to be determined by implementation team
a) Provide protection for the existing urban forest canopy, require and enforce new plantings as part of the development permitting process and reduce the potential for more canopy depletion during the period of this strategy.	Year 1-3
b) Enable enforcement of existing and new regulations to concentrate efforts on replacement of cleared or dead trees, maintenance of newly planted trees and the provision of increased urban forest canopy within all new developments.	Year 1-3
c) Enable a schedule of permit fees, based on number of trees to be removed/replaced and a section for prohibitions (damage, removals, unauthorized cutting) as well as a section defining enforcement measures to be implemented as a result of bylaw infractions. Utilize these funds to pay for enforcement and new plantings.	Year 1-3
d) Update the existing heritage tree inventory and include a section for the protection of heritage trees in the Tree Bylaw No. 8041. Encourage neighbourhood associations, special interest groups and the public to nominate new candidate heritage trees and adopt a formal process (heritage tree committee) for review before approval by Council.	Year 5-10
e) Ensure that plantings on new development sites are completed within a reasonable and seasonal time frame.	Term of strategy
f) Develop a system to transfer responsibility from Development Services (responsible for getting the developer to plant the trees) to Parks Services (responsible for their future management) to inform Parks staff of the location, species and planting date (year), and thereby enable prompt updating of the street tree GIS inventory to bring those trees in to the maintenance program (system to enable this is already under development by City of Kelowna staff).	Year 1-3
g) Re-evaluate policies requiring parking lots to plant one tree for every 10 spaces. Best management practices indicate that one large bed with trees rather than isolated islands may provide greater benefits.	Year 1-3
h) Develop policy to prevent the use of 'concrete coffins' for new street tree and car park plantings. Expand the testing and use of innovative methods of accommodating trees in locations with limited rooting capacity that will allow air and water to reach the roots and prevent soil compaction (e.g., structural soils, Silva cells, underground guying etc.).	Year 1-3

Recommendation	Time Frame/ Frequency
i) Re-evaluate the green waste pickup policy in order to foster community buy-in to the substantial increase in the number of trees within the City required to meet SUFS goals. Recent limitations to green waste pickup were raised as a concern by residents because of the increased burden associated with leaf disposal from both City and private trees.	Year 5-10
j) Implement policy amendments to reduce water consumption associated with planted trees, if irrigation is installed to ensure successful establishment of new City trees, the irrigation should be reduced incrementally in the second growing season and turned off by year three (this initiative is already under development).	Term of strategy
7) Develop and implement a comprehensive communication strategy for SUFS. Specifically:	Term of strategy
a) Ensure that all City departments participate in the development of this communication strategy so that SUFS initiatives are coordinated across departments and can be rolled out smoothly in the appropriate season (e.g., green-waste recycling in the fall, water conservation during the summer months, tree cutting permit to avoid the bird nesting season etc.).	Term of strategy
b) Initiate a working group that includes multi-site land managers and regional stakeholders such as the RDCO, School District No. 23, Recreation & Cultural Services Department, the Interior Health Authority, the Invasive Plant Council of BC, Canadian Food Inspection Agency, BC Parks, water irrigation and improvement districts, Okanagan First Nations governments and the Okanagan Basin Water Board to share information, identify common objectives, build collaborative working relationships, explore greening opportunities, and address funding challenges across the region. A range of regional issues are relevant to SUFS implementation and the focus of this working group including canopy cover targets, forest health management, wildfire management, biodiversity management, green waste composting, water conservation and closed loop recycling (staff recommend that the RDCO may be the best vehicle for this initiative, integrate with regional growth strategy).	Term of strategy
c) Facilitate stakeholder workshops that include large area landowners such as UBC Okanagan, Okanagan Community College, golf course operators and the Kelowna Airport to share information, identify common objectives, build collaborative working relationships, explore greening opportunities, ensure consistent SUFS messaging and address funding challenges across large public and private land facilities.	Year 2-5 and periodically thereafter
d) Facilitate training and education workshops for the green industry to communicate and obtain feedback on regulatory changes, professional report standards, canopy goals, tree retention techniques, best management practices and City expectations for supervision and tree management plans on development sites.	Year 2-3 and periodically thereafter
e) Facilitate stakeholder workshops with the local business community, coordinated with the Kelowna Chamber of Commerce, to consult with business representatives regarding the implementation of regulatory changes that will alter the canopy cover around commercial developments (e.g., malls, sidewalk cafes, car parks). Presentations to the Kelowna	Year 1-5

Recommendation	Time Frame/ Frequency
Chamber of Commerce about the value of trees and opportunities for businesses to participate in new plantings through sponsorship or volunteerism will build a greater understanding of the value of the urban forest and reduce potential conflicts now and in the future.	
f) Investigate options for corporate sponsorship for community initiatives on public or private land from organisations such as Telus, TD Canada Trust and BC hydro, that have helped communities in BC take action on environmental issues for which competition for funding from the regular tax revenue stream can prove challenging (existing initiatives are in progress with TD Canada Trust).	Term of strategy
g) Raise general awareness and education about SUFS implementation through:	Term of strategy
i) A series of open houses to launch SUFS and regulatory changes are made.	Year 1-3
ii) A dedicated web page for SUFS implementation updates, annual progress reports on implementation to achieve targets for canopy cover and post links to the page or announcements on other high traffic City web pages.	Year 1-3 Term of strategy
iii) Media bulletins, magnet campaigns or information sheets reminding citizens to schedule tree-work in the appropriate seasons (*e.g.,* tree planting to occur in the dormant season, tree pruning to avoid winter damage or pest entry to wounds, tree removal to avoid the bird nesting season and forest health management).	Year 1-3 Term of strategy
iv) Approaching action groups to help roll out the strategy to their members. Citizens among each neighbourhood may be encouraged to form a local shade or heritage tree committee, this style of public involvement can bring substantial benefits to the City for in-kind work, spreading the word and encouraging community pride, similar to the existing "Adopt a Street" initiative.	Year 1-3
v) Investigate opportunities for celebrating the City's urban forest such as ArborDay, Earth Day and Maple Leaf Day.	Year 1-3 and annually
8) The City of Kelowna should consider adopting accreditation standards, guidelines and communication strategies for each sector of the green industry, to encourage each sector to embrace the goals and objectives of this strategy and to standardize professional practices across each industry as outlined in section 3.3.3.	Year 1-3
9) Canopy cover should be included as green infrastructure and in corporate reporting. The City of Kelowna should consider monitoring canopy changes across the urban forest within the land categories defined in Section 3.1.1 to derive a measure of strategy performance and determine whether further interventions are required to meet canopy targets. Specifically:	Year 5 & 10
a) Develop a centrally coordinated GIS tree inventory database where all tree related records can be entered and updated easily and there is provision for widespread corporate access and information sharing, rather than corporate data being confined to departmental silos. The City currently has a street tree GIS inventory but would like to expand this database to	Year 1-3

Recommendation	Time Frame/ Frequency
include other trees as well.	
b) Utilize methods such as field assessments and/or periodic surveys and GPS data collection, street tree inventory, veteran tree surveys and forest health/natural disturbance mapping to provide data to the GIS tree inventory database for monitoring purposes.	Annual
c) Project canopy gain from young trees based on relative crown growth over time to refine time and new planting estimates for achieving canopy cover targets.	Years 5 & 10
d) Utilize assessment methods such as the USFS i=Tree Canopy software to monitor canopy cover targets.	Periodic
e) Monitor tree planting targets and identify new opportunities for plantable space, particularly on City or public land that can be funded through the 'Green Kelowna Canopy Fund' and increase the City's ability to meet canopy cover target.	Annual review
f) Monitor the performance of newly planted species and assess their performance. Adaptively manage future species selection based on monitoring outcomes.	Periodic
g) Monitor budgets over time to refine the $ cost/tree establishment estimates and actual costs associated with the strategy in order to improve the accuracy of time and cost to achieve the canopy cover target.	Every 3 years
h) No action is currently recommended in Natural Areas Upland but monitoring of this land category is needed to determine whether action (planting or ecosystem restoration) needs to be taken in order to meet canopy targets and maintain a diversity of habitat types due to either encroachment or tree loss associated with development or natural disturbance such as forest health related mortality or wildfire.	Periodic Year 5 & 10
i) No action is currently recommended in Natural Areas Valley bottom but monitoring of this land category is needed to determine whether the open grassland polygons are converted to Developed Areas Valley Bottom over time as expected.	Periodic Year 5 & 10
10) The City of Kelowna should consider commissioning a study to develop provisions for adaptive management to cope with climate change, a climate change visioning project similar to the one carried out by UBC CALP (http://www.calp.forestry.ubc.ca/) may help set the terms of reference. There may be a need for modified species selection, given the current prediction for climate change, similar to assisted species migration initiative which is currently underway by the Ministry of Forests.	Year 3-5
11) The City of Kelowna should consider adopting formal tree care standards that implement City-wide tree care standards based on those listed in Section 3.4.8 from the American National Standards Institute (parks has already adopted formal tree care standards).	Year 1-3
12) The City of Kelowna should consider expanding the existing green waste recycling program so that:	Year 1-3
a) Wherever possible, tree wood of a merchantable size is salvaged for subsequent use by local artisans, carpenters or firewood merchants and, to encourage small business, consideration should be given to offering this for nominal sums or for free, and in an	Year 3-7

Recommendation	Time Frame/ Frequency
equitable manner. Salvage value for logs should be considered, although the market for local native species, particularly ponderosa pine, is not favourable.	
b) Leaf collection, composting and redistribution of leaf compost are maximized.	Year 1-5
c) Re evaluate the benefits of changing tree management from reactive (RFS system) to a proactive cycle pruning and pro-active tree management regime	Year 3-7
d) Set up a demonstration home/facility to showcase water conservation/trees/xeriscaping and sustainable landscape management techniques, this could easily be sponsored or facilitated by a stakeholder of the green industry sector. Create a video of a demonstration home that the public can view online.	Low priority Year 5-10
13) The City of Kelowna should consider commissioning a report on the feasibility and cost benefits of grey water recycling and its use for tree and landscape irrigation, and research alternatives to promote water conservation across the City (this initiative is currently being addressed by the Infrastructure Planning Department [Jason Ough]).	Currently underway Infrastructure planning department
14) The City should consider working towards closed loop recycling in all corporate operations.	Year 3-7

6 Conclusion

By following the recommendations of this strategy the City of Kelowna will achieve high standards in urban forest planning and demonstrate commitment to enhancing the urban forest canopy to an achievable, scientifically-robust and publicly-desired target of 20%.

Over time the implementation of this strategy will bring enhanced value to the City by making it a more desirable and attractive place to live, work and play. Increasing canopy cover to 20% is achievable but will require regulatory control to protect the existing canopy and approximately 315,000 new trees to be planted on both private and public lands. Depending on the location and type of planting, the cost per tree is estimated to range from $70 to $450, corresponding to a strategy costing between $22 million and $142 million. While these costs are daunting, it is reported that for every dollar invested in trees, the City receives a three-fold payback in terms of cost savings and other benefits. Additionally, the strategy is intended to be implemented over a long time period and costs are proposed to be shared between public and private sources.

Increased tree canopy cover will reduce controlled environment and maintenance costs of buildings and other infrastructure, while other benefits may include reduced health care, improved biodiversity value and avoided greenhouse gas emissions, and contributing to the climate action charter commitments. Stabilizing current tree canopy cover and reversing the trend of canopy depletion evidenced over recent years will require significant investment, community-wide commitment and political support. Increasing the value and emphasis on green infrastructure relative to grey infrastructure may generate some controversy among civic decision makers but it is only by seizing this opportunity to reverse the current trend of canopy loss and taking real steps to reach the City's canopy cover targets that Kelowna will build a sustainable urban forest resource for present and future generations.

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Appendix 1 – Resident Letter

20 July 2011
Mark Brown
BA Blackwell

Dear Mr Brown.

I believe we met at the Urban Forest open house in Kelowna at the end of June.

Could I please raise an opportunity to increase the forest canopy?

Below is a picture of Union Road between Long Ridge Drive and Begbie Road. This is a new subdivision. During the construction of a subdivision many trees are removed to make way for roads and houses. To maintain the forest canopy trees will have to be replanted. As a homeowner I am obligated to plant trees. In fact a $5,000 deposit is withheld until I comply with the Building Guidelines. I have copied the portion of the guidelines relating to trees below:

Front yards are to have a minimum of 2 yard trees and 1 street tree. Yard trees are to be either healthy existing trees that have been retained or new trees supplied and planted by the Owner. Planted yard trees are to include a minimum 2 inch caliper deciduous tree and a minimum 7 foot high coniferous tree. Street tree(s) are to be supplied and planted by the Owner within the lot at a location as close to the street and middle of the lot as possible. Corner lots are deemed to have 2 fronting streets and as such are required to supply and plant 2 street trees. The street tree species shall be an Autumn Blaze Maple (Acer Fremanii) of a minimum 2 inch caliper.

While the homeowner does his part it seems no one is responsible for planting trees on the boulevard along the road. In the picture one can see that space has been provided between the sidewalk and street. The homeowner has six months to plant their trees or they lose the $5,000 deposit. This portion of Union Road was built over 4 years ago and still no trees.

I am not sure whether it is the City of Kelowna's responsibility or the Developer of the Wilden Subdivision. As always cost seems to be an issue. Such said it should be noted that this road serves 160 new homes with typical assessed values in the $500,000 to $900,000 range. Assuming an annual municipal taxation of $2,500 per home, this generates $400,000 of income for the City of Kelowna per year. As per the Developer, the Wilden website has an article from Business Edge 2 May 2008 that shows this subdivision as the second largest ongoing construction project in the province of British Columbia. Thus the cost argument sounds more of an excuse rather than a valid reason.

Eventually trees probably get planted along the boulevard; however it seems shameful that we do not plant the trees in a timelier manner. Has your study / report dealt with this issue?

Appendix 2 – Recommended Tree Species List

LARGE CONIFEROUS						
SPECIES	**COMMON NAME**	**EXPECTED KELOWNA SITE SUITABILITY**	**Mature size (metres)**		**Growth Habit**	**Notes**
			Height*	Width		
Abies cephalonica	Greek fir	Valley Bottom, moderate to dry	15-30m	4-7m	Pyramidal	Slow growing prefers acidic to neutral, sandy loam soils
Abies lasiocarpa	Subalpine fir	Any, moderate to dry	12-27m	3-4m	Compact columnar	Slow growing prefers acidic sandy loam
Abies magnifica	California red fir	Valley Bottom, moderate to dry	24-36m	4-6m	Compact columnar	Average growth, prefers partial shade, acidic loamy soils.
Cedrus libani	Cedar of Lebanon	Valley Bottom, moderate to wet	15-23m	7-10m	Pyramidal	Full sun, prefers acidic, sandy clay loam.
Cryptomeria japonica	Japanese cedar	Valley Bottom moderate to wet	7-15m	4-7m	Oval, pyramidal	Requires full sun, prefers acidic, clay loam soils
Cupressus glabra	Arizona smooth barked cypress	Valley Bottom, moderate	9-12m	2.5-3.5m	Oval, pyramidal	Requires full sun, moist soils. May be confused with *C. arizonica*, a much rarer and similar species
Ginkgo biloba	Maidenhair tree	Any, moist to moderate	15-22m	12-15m	Pyramidal rounded	Fast growing, moist soils. Plant male cultivars only
Picea likiangensis	Luiang spruce	Valley Bottom, damp to moderate	10-20m	4-7m	Pyramidal	Average growth prefers moist acidic soils
Picea orientalis	Oriental spruce	Any , damp to moderate	15-20m	4.5-7.5m	Pyramidal	Slow growing prefers acidic soils
Pinus jeffreyi	Jeffrey pine	Valley Bottom, dry	15-24m	7-15m	Oval, pyramidal	Average growth rate. Prefers full sun, acidic soils
Pinus wallichiana	Himalayan pine	Valley Bottom, moderate	9-15m	9-12m	Oval pyramidal	Slow growing prefers moist acidic soils
Pseudolarix amabilis	Golden larch	Hillside, moderate	9-15m	4.5-7.5m	Pyramidal	Slow growing prefers full sun, dry acidic soils

*Kelowna's climate may not allow large trees to achieve these heights

LARGE DECIDUOUS						
SPECIES	**COMMON NAME**	**EXPECTED KELOWNA SITE SUITABILITY**	**Mature size (Metres)**		**Growth Habit**	**Notes**
			Height	Width		
Acer saccharinum	Silver maple	Valley Bottom, moist soils	18-20m	15-22m	Vase shape, broad spreading	Fast growing prefers moist acidic soils
Celtis australis	Southern nettle tree	Valley Bottom, moist soils	12-22m	12-21m	Rounded broad spreading	Fast growing full sun, moist acidic soils
Liriodendron tulipifera	Yellow poplar or tulip tree	Any, moist to moderate	19-28m	13-18m	Oval rounded spreading	Fast growing, prefers full sun, moist to moderate soils
Platanus orientalis	Oriental plane	Valley Bottom, moist to moderate	21-27m	21-24m	Pyramidal rounded	Fast growing, prefers moist to moderate soils
Quercus ellipsoidalis	Northern pin oak	Any, moderate to dry	15-22m	12-15m	Pyramidal	Average growth rate, requires full sun, moderate to dry soils
Quercus velutina	Black oak	Any, dry free-draining soil	15-22m	10-15m	Oval	Slow growing, full sun, dry soils

MEDIUM DECIDUOUS						
SPECIES	**COMMON NAME**	**EXPECTED KELOWNA SITE SUITABILITY**	**Mature**		**Growth Habit**	**Notes**
			height*	Width		
Acer opalus	Italian maple	Valley Bottom, moderate to dry	9-12m	9-12m	Rounded	Slow growing partial shade, prefers acidic soils
Ostrya virginiana	Ironwood	Any, moderate to dry	7-12m	9-13m	Oval pyramidal rounded	Slow growing, shade tolerant
Oxydendrum arboreum	Sorrel tree	Valley Bottom, damp to moderately dry	7-15m	4-7m	Oval, pyramidal	Slow growing partial shade, acidic soils
Castanea dentata	American chestnut	Valley Bottom, moist soils	7.5-12m	10-12m	Broad rounded	Average growth prefers partial shade, moist acidic soils
Diospyros virginiana	Persimmon	Valley Bottom, wet soils	7-15m	4-7m	Oval, pyramidal	Average growth rate, prefers full sun, wet acidic soils
Fraxinus ornus	Manna ash	Valley Bottom, moderate to dry	7-13m	7-15m	Rounded spreading	Slow growing
Nothofagus antarctica	Antarctic beech	Valley Bottom, moderate to dry	10-15m	9-12m	Upright or erect columnar	Average growth, full sun
Tilia mongolica	Mongolian linden	Any, moderate to dry	10-12m	9-10m	Columnar pyramidal	Average growth, partial shade

SMALL DECIDUOUS						
SPECIES	**COMMON NAME**	**EXPECTED KELOWNA SITE SUITABILITY**	**Mature**		**Growth Habit**	**Notes**
			Height*	Width		
Acer circinatum	Vine maple	Valley Bottom, moist to moderate	3-4m	3-6m	Rounded, spreading or horizontal	Slow growing, full shade or sun, moist soils
Amelanchier laevis	Smooth Serviceberry	Valley Bottom, moist to moderate	7-10m	4-6m	Upright vase or erect	Average growth, full shade to partial sun, moist soils
Crataegus crus-galli	Cockspur Hawthorn	Any, dry	4-7m	4-7m	Pyramidal rounded	Slow growing, full sun, (Large thorns)
Crataegus mollis	Red Hawthorn	Any, moist to moderate	4-7m	4-7m	Oval, Pyramidal	Average growth, full sun, moist soils (Thorns)
Maackia chinensis	Amur maackia	Valley Bottom, moderate to dry	4-7m	4-7m	Rounded vase shape	Full sun, slow growing
Acer griseum	Paperbark maple	Valley Bottom, moderate	4-9m	4-9m	Oval, rounded	Slow growing sun or shade
Acer rufinerve	Redvein maple	Valley Bottom, moderate	5-10m	4-9m	Oval rounded	Slow growing, sun or partial shade
Cotinus obovatus	Chittamwood or American smoketree	Any, moderate to dry	6-7m	6-7m	Rounded	Slow growing

Food trees						
SPECIES	**COMMON NAME**	**EXPECTED KELOWNA SITE SUITABILITY**	**Mature**		**Growth Habit**	**Notes**
			Height*	Width		
Carya illinoensis	Hardy Pecan	Valley Bottom	20-25m	10-15m	Rounded spreading	Moist well drained soils
Juglans regia	Hardy English Walnut	Valley Bottom Valley Slopes avoid wet soils	10-15m	10-15m	Rounded spreading	Drought resistant, prefers full sun
Castanea mollissima	Chinese Chestnut Tree	Valley Bottom	15-20m	10-15m	Rounded spreading	Prefers full sun, acidic loamy soils

Note: Given the sophistication and well developed orchard industry in Kelowna no fruit trees have been suggested, however these nut bearing trees could be trialled on a limited basis to demonstrate their potential as multi-purpose tree canopy.

SPECIES TO PROHIBIT/REMOVE IN KELOWNA		
Species	**Common name**	**Reason for removal**
Prunus sp.	Flowering cherries, almond etc	**All ornamental cherry species are prohibited in the Okanagan by the Little Cherry Control Regulation.** Little cherry virus disease (SYMPTOMLESS CARRIERS). Western cherry fruit fly. Apple, pear, quince, crabapple are discouraged and must be treated for codling moth if planted.
Ulmus pumila	Siberian elm	Apparently invasive in Kelowna (City staff, pers comm. 2010)
Tree of Heaven - invasive		
SPECIES WITH MINOR ISSUES		
Acer platanoides	Norway maple	Susceptible to sunscald, but in suitable locations is a very valuable urban tree with almost the highest replacement value per tree of >$2700.00 providing a cost benefit ratio/return on investment UFORE (Eastwood *et al.* 2007)

Appendix 3 – Potential Regulatory Framework Changes

Proposed changes to the regulatory framework

TREE BYLAW NO. 8041

DEFINITIONS

critical root zone means the minimum portion or minimum spatial extent of the root system that is required in order to maintain vitality or stability of the *tree*.

crown means the entire system of branches, leaves and reproductive structures of a *tree* extending away from the trunk or main stem(s).

cut means to limb, trim, top, prune any parts of a *tree*, or by any mechanical means remove any branch, foliage, root, stem, or other part of a *tree*, and "cutting" shall have a corresponding meaning.

damage means to take any action that may cause a *tree* to die or decline, including but not limited to girdling, ringing, poisoning, burning, excessive crown lifting, soil compaction, depositing or removing soil, *depositing* toxins on any part of a *tree* or into groundwater taken up by a *tree*, placing concrete or any other hard surface within the drip line of a tree, blasting within 5 metres of the *drip line,* excessive pruning of the crown, branches, limbs and or roots, and pruning in a manner not in accordance with "American National Standards Institute Publication A300-1995" and the companion publication "Best Management Practices – Tree Pruning, 2002".

heritage tree means a designated *tree* that has been determined to be of significant value to the community because of special characteristics such as size, age, uniqueness of species, uniqueness of ecosystem, or heritage or landmark value.

protected tree means:

a) any *tree* on land owned by or in the possession of the City of Kelowna, including, without limitation, a *tree* in a park or on a boulevard, road or lane allowance;

b) any *tree* within a *protected area*; or on real property (excluding Agricultural Land Reserve) subject to the requirements of a development, development variance, rezoning, subdivision, or building permit application

c) any *replacement tree*;

d) any *retained tree*;

e) any *heritage tree*;

f) any tree located on a *wetland* or *waterfront*;

replacement tree means a *tree* required in accordance with this Bylaw to be planted, either on the subject site or at another location, to replace a *tree* that has been cut, removed or damaged, or a *tree* planted as a condition of subdivision, development permit or other municipal approval.

remove means to entirely sever the main stem of or fell a *tree*, and "removed", "removal" and "removing" shall have corresponding meanings.

retained tree means a *tree* that is shown on a site plan attached to a tree cutting permit and must be permanently protected pursuant to a registered covenant or otherwise.

tree protection barrier means a sturdy temporary or permanent fence or barrier at least 1.2 metres in height, with wood-framed top and side rails or equivalent.

work means any activities connected with *landscaping,* the *pruning* or *removal* of a *tree*, the *pruning* or *removal* of *vegetation*, the removal of soil, the *deposit* of soil or other material, the construction of *permanent structures* or *ancillary structures, in-stream work* and the installation of drainage works, but does not include the regular maintenance of planted gardens and/or lawns.

EXEMPTIONS SECTION

This bylaw does not apply to:

- Agricultural zones located within the Agricultural Land Reserve
- Trees cut or removed under the Hydro Power and Authority Act

TREE RETENTION/MANAGEMENT PLAN

The owner must ensure that each of its development sites has a tree density appropriate to the land use category as defined in (Table 4) to achieve the canopy targets as detailed/adopted by Council. Minimum tree canopy/density shall be calculated on the basis that each mature tree crown will provide coverage of 6 metre diameter live crown (19.64m^2). This can be achieved through a combination of retained and newly planted trees, including street trees which are planted as part of the development. The owner must achieve this requirement within the developable portion of each parcel, and a tree situated on undevelopable land or land which will be dedicated or transferred to the City for Parkland, shall not be included.

The Owner must submit a Tree Retention/Management Plan with every Development, Development variance, rezoning, subdivision or building permit and this Tree Retention/Management Plan must include the following:

- a Hazardous Tree Assessment done by a Certified Arborist/Certified Tree Risk assessor or Registered Professional Forester also qualified as a Certified Tree Risk Assessor
- a report and detailed site plan identifying retained trees and newly planted trees to achieve the tree canopy/density requirements as outlined above

PROHIBITIONS SECTION

Cutting, Damaging and Removal Prohibited

No person shall *cut*, *damage* or *remove,* or permit or cause to be *cut, damaged* or *removed,* a *protected tree*:

- without a *tree permit* issued pursuant to this Bylaw; or
- contrary to a *tree permit* issued pursuant to this Bylaw.

No person shall *cut, damage or remove,* or permit or cause to be *cut*, *damaged* or *removed,* any tree on a site which is the subject of a development, development variance, subdivision or rezoning application

- without a *tree permit* issued pursuant to this Bylaw; or
- contrary to a *tree permit* issued pursuant to this Bylaw.

TREE PROTECTION DURING DEVELOPMENT

Requirement for Tree Protection Barrier

A person performing *work* on lands containing one or more *retained trees* shall:

g) install a *tree protection barrier* around any *retained tree* or group of *retained tree*s at the *drip line* of the outermost *tree*, the outside boundary of the *critical root zone* of the outermost *tree*,

h) ensure that such *tree protection barrier* is constructed of chain link or wooden frame with snow-mesh barrier attached.

i) display signage indicating that the area within the *tree protection barrier* is a "protection zone," and stating that no encroachment, storage of materials or *damage* to *trees* is permitted within the "protection zone;"

j) arrange for inspection by the _____*or delegate* before any *work* commences, and refrain from commencing *work* until the _____has approved the *tree protection barrier*; and

k) ensure that the *tree protection barrier* remains in place until written approval of its removal is received from the _____*or delegate*.

No *work* is permitted within the "protection zone" except in accordance with plans and procedures authorized by a *tree permit*.

HERITAGE TREES

Procedure to Nominate Additional Heritage Trees

A person may nominate a *tree* not identified in Schedule A as a *heritage tree* if such *tree* meets the City of Kelowna criteria for a *heritage tree*, and the City Council shall determine, in its sole discretion, whether such *tree* shall be designated as a *heritage tree*.

ENFORCEMENT AUTHORITY

The Bylaw Enforcement Officers and _____ are designated to enforce this Bylaw by means of a ticket pursuant to sections 264 of the *Community Charter.*

TICKETING

The words or expressions listed below in the designated expression column are authorized to be used on a ticket issued under section 264 of the *Community Charter* to designate an offence against the respective section of this Bylaw.

Designated Expression	**Section**	**Fine (Suggested)**
cut/damage tree without permit		$500.00
cut/damage tree contrary to permit		$500.00
remove tree without permit		$1,000.00
remove tree contrary to permit		$1,000.00
damage or *remove heritage* tree		$1,000.00
damage retained tree		$500