City of Victoria Urban Forest Master Plan

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Official Community Plan Context Statement

The City of Victoria Urban Forest Master Plan is one of several plans that helps to realize the directions of the City's 2012 Official Community Plan (OCP) (http://www.shapeyourfuturevictoria.ca/). The Urban Forest Master Plan supports the Official Community Plan vision and several of its goals, notably that "*Victoria's urban environment, including urban forests, and public and private green spaces support healthy and diverse ecosystems*." The comprehensive sustainability emphasis of the OCP is supported through the integration of Placemaking, Land Management and Development, Infrastructure, Environment, Parks and Recreation, and Climate Change and Energy objectives throughout the Urban Forest Master Plan. Policy 10.14 specifically directs the City to "Develop and maintain an Urban Forest Master Plan to enhance the urban forest on public and private land."

This Urban Forest Master Plan responds to OCP policy direction as follows:

OCP Goal / Objective / Policy	**Urban Forest Master Plan (UFMP) Policy Response and Reference**
10.14.1 Develop mechanisms to increase the urban forest on City lands, public open spaces and private lands, with consideration of the Urban Place Guidelines in this plan	The UFMP sets a goal to "*protect, enhance and expand Victoria's urban forest*"(Goal 2) and recommends: • increasing urban forest cover to more optimal levels in neighbourhoods currently exhibiting low canopy cover (Recommendation C); • continuing a vigorous street tree replacement program (Recommendation N); • creating opportunities to retain and enhance the urban forest on private land (Recommendations Q to V); and • developing urban forest guidelines specific to each UPD (Recommendation W). Section 1.2 reviews Victoria's current and historic urban forest canopy. Sections 1.4 and 1.5 look at how place (UPDs) influences urban forest abundance and character. Section 1.6 discusses some of the challenges and opportunities in sustaining and enhancing Victoria's urban forest. Appendix B discusses the importance and complexities of setting targets for tree canopy cover and other urban forest health objectives.

OCP Goal / Objective / Policy	Urban Forest Master Plan (UFMP) Policy Response and Reference
10.14.2 Integrate urban forest management with broader planning and management objectives related to infrastructure, climate change, parks, recreation facilities, placemaking, transportation, community well-being, tourism and food systems	The UFMP recommends: • incorporating the goals, policy objectives and strategies of the UFMP within other relevant City plans, policies, bylaws and development guidelines (Recommendation C), to ensure consistency across broad City objectives; and • making use of opportunities to "piggy-back" multiple functions into public spaces (e.g., transforming greenways into productive ecosystem corridors as well as attractive transportation corridors…) (Recommendation P). Integrated planning is a fundamental principle of the City of Victoria and the Urban Forest Master Plan. Section 1.3 looks at the many functions and benefits of urban forests, including economic benefits, livability, biodiversity, green infrastructure, and food production. Section 1.6 discusses some of the challenges and opportunities related to multi-functionality, climate change, infrastructure, public safety and food production.
10.14.3 Manage the urban forest as a green infrastructure to enhance ecological services such as rainwater treatment, carbon sequestration, air purification and maintenance of biodiversity	The Urban Forest Master Plan sets goals to "*design and manage the urban forest to maximize watershed health, biodiversity, and the conservation of sensitive ecosystems*"(Goal 3) and to "*maximize community benefits from the urban forest in all neighbourhoods*" (Goal 4) and recommends: • developing a biodiversity strategy… (Recommendation F); • measuring and reporting on the scope and value of ecosystem services provided by the urban forest… (Recommendation H); • continuing a vigorous street tree replacement program, selecting species and locations so as to …maximize green infrastructure and other benefits (Recommendation N); and • developing landscape design objectives that address urban forest or green infrastructure policy objectives … (Recommendation Y). Ecosystem-based thinking and a multi-functional approach are fundamental principles of the Urban Forest Master Plan. Section 1.3 reviews some of the urban forest's functions and benefits in relation to biodiversity, green infrastructure and watershed health. Section 1.6 discusses some of the challenges and opportunities for enhancing natural values, including biodiversity, management of invasive species and watershed health.

OCP Goal / Objective / Policy	Urban Forest Master Plan (UFMP) Policy Response and Reference
10.14.4 Provide direction for enhancements to the urban forest consistent with the Urban Place Guidelines in Figure 8 and the Walkable Urban Thoroughfare Guidelines in Figure 11	The Urban Forest Master Plan sets a goal to "*maximize community benefits from the urban forest in all neighbourhoods*" (Goal 4) and recommends: • developing urban forest guidelines specific to each UPD (Recommendation W); and • making use of opportunities to "piggy-back" multiple functions into public spaces (e.g., transforming greenways into productive ecosystem corridors as well as attractive transportation corridors for pedestrians, cyclists and electric wheelchairs) (Recommendation P). Section 1.5 discusses the influence of place on character, and considers future opportunities in light of the Urban Place Guidelines.

EXECUTIVE SUMMARY

The city of Victoria is blessed with a veritable forest of attractive treed landscapes, despite its relatively dense urban form. It is one of the defining characteristics of the city, from the flowering cherry trees along downtown streets to the ancient, graceful oaks and massive evergreens that grow in parks, institutional settings and backyards. A generous system of treed parks, boulevards and plazas make up the public face of this forest, while large residential and institutional properties contribute significantly to the tree canopy. The delightful diversity of treed environments is part of what makes Victoria an attractive place to live, work and visit.

"The urban forest...provide[s] many benefits... These benefits accrue not only to the owners of the trees and forest but also to the entire community.."
CanadianUrban Forest Strategy.
http://www.tcf-fca.ca/programs/urbanforestry/cufn/Resources_Canadian/CUFS.pdf

Like other well-treed cities, Victoria has its share of urban forest challenges.

- The street tree population is aging, and will diminish without a significant replacement program that seeks to diversify species and age classes.
- The urban forest needs to be adapted to the changing climate. This region will see more extreme wind- and rainstorms, as well as more prolonged summer drought and new pests that will stress the urban forest. Species that have traditionally fared well in this area may no longer be appropriate choices for new plantings.
- The municipality only has direct management control over part of the urban forest. About two-thirds of highly or moderately treed areas are on private land and thus dependent on the land-use and vegetation management choices of the city's many homeowners, land managers and developers. The City can help to influence these choices through community engagement, strategic land-use and development planning, and its regulatory framework.
- Growing large trees (which provide the greatest range of benefits for residents) takes considerable space both above and below ground. Increasing infill and densification—desirable for many reasons—limits the availability of greenspace for growing new large trees.
- Urban development has degraded the quality of the city's watersheds and biodiversity over time. Renewal of the urban forest provides an opportunity to restore watershed health and to enhance biodiversity.

The UFMP provides guidance on the management and enhancement of treed environments throughout the city of Victoria. It is a high-level plan that provides a 'roadmap' to help the municipality invest in and maintain its urban forest for the next 20 years and beyond. It also includes actions that could be undertaken on private lands by community stewards—homeowners, businesses, developers, community groups, and conservation organizations.

A desirable urban forest is about quality as much as quantity. It envisages a diversity of high quality, productive treed environments, distributed throughout all parts of the community. A high quality and productive urban forest is one that, while abundant, makes room for and supports the broad range of other values, needs and functions within a compact city like Victoria. From this perspective, it is above all an open forest, with plenty of sunlight and well-placed trees. The urban forest character and density will vary by neighbourhood and land use type, reflect local growing conditions and will provide many different functions and benefits for humans and other species that live there.

To meet the present and future challenges facing Victoria's urban forest, this Plan proposes an approach based upon biophilic[1] principles and community-based stewardship:

- A more holistic focus on the urban forest as a coherent resource that plays an essential role in placemaking,

[1] An approach that emphasizes maintaining, enhancing and restoring the beneficial experience of nature in the built environment

whilst providing contact with nature to city residents and visitors;

- Strategic management for a broader range of ecological and utilitarian values; and
- Engagement of the entire community in the stewardship of this resource.

This approach conforms to direction from the City's Official Community Plan.

The Plan's vision and goals were developed with considerable input from a multi-stakeholder Steering Committee, as well as an inter-departmental committee and two public workshops. The vision for Victoria's urban forest 50 years from now is:

> *In 2060, Victoria's homes and businesses lie within a stunning urban forest that is healthy, diverse and abundant in all parts of the city. Treed environments are valued as an integral part of this vibrant, livable and sustainable community: supporting biodiversity and watershed health; enhancing neighbourhoods; and creating places for activity, enjoyment and relaxation. Victoria's urban forest exemplifies sound and innovative practice and community stewardship.*

The vision is supported by four goals:

1. Develop and maintain strong community-wide support for the urban forest
2. Protect, enhance and expand Victoria's urban forest
3. Design and manage the urban forest to maximize watershed health, biodiversity, and the conservation of sensitive ecosystems
4. Maximize community benefits from the urban forest in all neighbourhoods

Each goal is supported by a series of outcomes, which describe what the vision is intended to look like on the ground in more detail. A Framework for Action is presented that includes a comprehensive set of strategies (Appendix C). From these, a shortlist of recommended priority actions have been identified.

The Master Plan is designed to be followed by an Urban Forest Action Plan that sets out a more detailed approach for the various City departments, with budget implications. A draft five-year Municipal Forestry Plan, to guide the work of the Parks Division, has been prepared and is currently being reviewed by Parks staff.

Taken as a whole, the UFMP provides a clear path forward for the City, its Municipal Forestry program and the broader community of Victoria in their joint stewardship of the urban forest.

Recommended Actions

This Plan identifies many strategies that could help the community of Victoria to achieve their vision and goals for the municipality and its urban forest. These are comprehensively presented in Appendix C. The list of recommended actions below presents some of the highest priority actions for both public and private lands.

City-wide Recommendations

A. Create a position for an Urban Forest Planner/Coordinator, who is empowered to work with other Departments to achieve the City's urban forest goals and to report annually to Council.

B. Develop and implement an Urban Forest Action Plan to operationalize the Urban Forest Master Plan, including measures of success, realistic timelines and the provision of estimates and options to resource the plan.

C. Incorporate the goals, policy objectives and strategies of the Urban Forest Master Plan within other relevant City plans, policies, bylaws and development guidelines.

D. Increase urban forest cover to more optimal levels in neighbourhoods currently exhibiting low canopy cover.

E. Conserve or replace sufficient greenspace to sustain the urban forest, with particular attention to the needs of large canopy trees.

F. Develop a biodiversity strategy, including measurable objectives for the protection, recovery or enhancement of sensitive ecosystems, species at risk and other important flora and fauna.

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

H. Measure and report on the scope and value of ecosystem services provided by the urban forest on both public and private lands. Communicate this information as part of a broader effort to engage and educate the community on urban forest values and benefits.

Recommendations for Public Lands

I. Ensure that operational resourcing levels keep up with increases in the public urban forest inventory and its associated support services over the entire life cycle of the asset.

J. Systematically map and measure the urban forest on public lands, identifying sites for new planting.

K. Complete and implement the five-year Municipal Forestry Plan for the Parks Division.

L. Develop a Tree Risk Management Program for public trees (including a Comprehensive Tree Risk Management Policy and Strategy).

M. Manage existing mature street trees so as to extend their Safe Useful Life Expectancy (buying time for newer trees to develop and contribute meaningfully to the urban forest canopy).

N. Continue a vigorous street tree replacement program, selecting species and locations so as to

- maximize species and age diversity,
- be ready for future climates,
- minimize nuisance and risk,
- minimize maintenance costs, and
- maximize green infrastructure and other benefits.

O. Make young tree care a high priority within the municipal forestry program.

P. Make use of opportunities to "piggy-back" multiple functions into public spaces (e.g., transforming greenways into productive ecosystem corridors as well as attractive transportation corridors for pedestrians, cyclists and electric wheelchairs).

Recommendations for Privately Owned Lands

Q. Revise the Tree Protection Bylaw to address the removal of young (non-protected) trees and increase replacement tree ratios and compensation levels.

R. Develop a program to identify and conserve heritage and other significant trees and landscapes throughout the city, with particular attention paid to remnant Garry Oak ecosystems.

S. Consider a pilot project to encourage homeowners to 'host' public trees in their front yards, in areas where there is a high level of conflict between street trees and underground services and infrastructure.

T. Work on Local Area Plans should consider the development of guidelines and standards for permeable areas and urban place-based forest design.

U. Increase community support for the urban forest.

V. Empower homeowners to make good urban forest decisions on their property.

Recommendations for Private Lands under Re-development

W. Develop urban forest design guidelines for new developments specific to each UPD. Guidelines should address desired functional objectives, landscape attributes, appropriate stocking levels, soil volume, and plant selection considerations as well as growth and densification objectives.

X. Consider establishing minimum stocking levels for new development to meet UPD-specific urban forest objectives.

Y. Develop landscape design objectives that address urban forest or green infrastructure policy objectives, and include these as conditions to which a building, development or rezoning permit will be subject.

Z. Improve oversight of landscape design, planting and construction on redevelopment sites to ensure that the City's design guidelines are met.

PREFACE

PURPOSE

The Urban Forest Master Plan (UFMP) provides guidance on the management and enhancement of treed environments throughout the city of Victoria. With direction from Victoria's new Official Community Plan, the UFMP provides a 'roadmap' to help the City and its residents to invest in and maintain their urban forest for the future. Recognizing that much of the urban forest is on private land, the plan includes actions that could be undertaken by the different communities-of-interest that influence and are affected by the urban forest, such as homeowners, businesses, developers, community groups, and conservation organizations.

CONSULTATION PROCESS

The Master Plan was developed with extensive input from a public steering committee, comprising representatives from neighbourhood associations, the (then) Environment and Shoreline Committee, developers, conservation organizations, landscape architects, and others. An inter-departmental staff-committee has also helped to guide the process and frame some of the issues and challenges facing the City. Public workshops were held in January and June 2009 to provide the public with an opportunity to comment on issues, values and their vision for the future urban forest, and to review a draft plan. More detail on the public consultation process can be found in Appendix A.

RESEARCH

This Plan incorporates best practices from across North America and Europe. Urban foresters were contacted and consulted from several jurisdictions, and an extensive review of current texts and journal articles on best practice in urban forest design, planning and management was conducted.

DOCUMENT FORMAT

Part 1 of this document is an introduction to Victoria's urban forest, including its distribution and density, the types of treed environments that compose it, the influences that shape it and the many functions and benefits (existing and potential) it provides to the community. From this foundation, the document considers some of the key challenges and opportunities at play within Victoria's urban forest. It explores best

practices and new ideas in urban forestry, looks at how other communities are responding to similar challenges, and highlights opportunities for Victoria.

Part 2 of the Plan meshes the results of the public consultation process, interviews with City staff, and research with the themes and challenges raised in Part 1. The Plan includes a 50-year vision for Victoria's urban forest, as well as a number of associated goals, outcomes and strategies that provide a framework for a more detailed Action Plan to follow. The document concludes with a list of priority actions.

NOMENCLATURE

Throughout this document, various terms will be used to describe a basic building block of an urban forest, which are the individual trees or spatially distinct patches of trees and their immediate community of associated plants and growing soils. These site level expressions of urban forest are referred to in this document variously as "treed landscapes" (or "treescape" for short), "treed environments", "treed ecosystems" or "treed settings", depending upon the context. Please consider them as basically synonymous.

A Glossary of terms is included below.

GLOSSARY

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

Biophilic city: A city "with abundant nature and natural systems that are visible and accessible to urbanites… A biophilic city is at its heart a biodiverse city, a city full of nature, a place where in the normal course of work and play and life residents feel, see and experience rich nature – plants, trees, animals. The nature is both large and small – from treetop lichens, invertebrates, and even microorganisms to larger natural features and ecosystems that define a city and give it its character and feel."[1]

Biophilic design: "an innovative approach [to urban planning and design] that emphasizes the necessity of maintaining, enhancing and restoring the beneficial experience of nature in the built environment".[2]

Canopy cover: The fraction of a measureable land area that is covered by tree canopy (normally expressed as percent canopy cover).

City of Victoria Municipal Forestry Plan: A strategic plan to guide the operations of the Municipal Forestry Program of the City of Victoria.

City of Victoria Sustainability Action Plan: The City's 2012-2014 Sustainability Action Plan (SAP) follows from the Victoria Sustainability Framework, the draft Official Community Plan and the Corporate Strategic Plan, and focuses on three program areas: reducing waste and emissions and increasing efficiency; transformative sustainability; and creating a liveable city for everyone. A limited number of high impact sustainability projects are identified to move the City towards its Sustainability Vision.

City of Victoria Sustainability Framework: The City of Victoria is committed to achieving a community that is environmentally, socially and economically sustainable. The Victoria Sustainability Framework (VSF) is a comprehensive guide to sustainable decision-making and operations over the long term.

City of Victoria Urban Forest Action Plan: A Plan that operationalizes the qualitative vision and goals of the City of Victoria's Urban Forest Master Plan.

Community Garden: A piece of land gardened by a group of people for the purpose of providing a garden experience/education to citizens of a municipality. Community gardens are offered in partnership between the municipality and community- based organizations and are subject to all policies and bylaws governing public lands.

1 Beatley 2010
2 Kellert & Heerwagen 2008.

Ecological Function: The ecological and evolutionary processes, such as energy flow, genetic transmission, migration and mutation, disturbance, and nutrient cycling, which sustain or modify ecosystems over time.

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

Ecological goods and services: Benefits arising from the ecological functions of healthy ecosystems. These benefits accrue to all living organisms, including animals and plants, rather than to humans alone. However, there is a growing recognition of the importance to society that ecological goods and services provide for health, social, cultural, and economic needs. Examples of services that benefit urban communities include rainwater treatment, carbon sequestration, air purification, soil development, climate buffering, biodiversity and watershed function.

Green infrastructure: An adaptable term used to describe an array of products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. As a general principal, green infrastructure techniques use soils and vegetation to infiltrate, evapo-transpirate and/or recycle stormwater runoff.

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

Greenways: A city-wide network of pathways and bikeways situated on streets, along shoreline areas, and in natural corridors that link parks, employment districts, urban villages and other destinations along routes that give priority to walking and cycling and feature an attractive, well landscaped ambience including street trees and boulevard plantings, viewpoints, heritage resources, and natural habitat areas.

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

Infrastructure: The physical capital and associated services considered basic and necessary to the functioning of an urban area. These include such things as: sanitary sewers, treatment plants, and water pipelines and distribution/collection systems; roads, signals, sidewalks and other components of the transportation system including transit vehicles, ferries and airports; solid waste management facilities including transfer stations and landfills; and, energy supply and distribution systems including hydroelectric and natural gas transmission and distribution systems. More generally, infrastructure can refer to other tangible public and private assets necessary to support the development of a modern urban settlement, such as hospitals, schools and recreation facilities.

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

Neighbourhood: Named geographic sub-areas recognized either informally or formally for their unique local character within a city. The City formally divides Victoria into thirteen neighbourhoods: Burnside, Downtown, Fairfield, Fernwood, Gonzales, Harris Green, Hillside/Quadra, James Bay, Jubilee, North Park, Oaklands, Rockland, and Vic West.

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

Open space: Land that provides outdoor space for unstructured or structured leisure activities, recreation, ecological habitat, cultural events or aesthetic enjoyment that is publicly-accessible but not held by the City of Victoria.

Park: Open land held by the City of Victoria that provides outdoor space for unstructured or structured leisure activities, recreation, ecological habitat, cultural events, or aesthetic enjoyment, not including planted areas within street rights of way.

Place character: The combination of street and lot patterns, landscape features, building forms, and activities that collectively determine the experiential and visual character of a place.

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

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

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

Treed ecosystem: A functional biological environment and its abiotic constituents (such as soil, air, water and sunlight) that in which one or more trees feature as a dominant structural and functional component.

Urban forest: Sum total of all trees and their associated ecosystems, including understorey biota and soils, within the City of Victoria. Urban forest occurs on both public and private lands, including parks, boulevards, remnant ecosystems, residential yards, commercial and industrial lands and open spaces.

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

Urban Place Designation (UPD): Land use designations based on urban place character considerations such as built form, place setting or character, land use and density.

PART 1. VICTORIA'S URBAN FOREST: DISCUSSION

1.1. Introduction

The city of Victoria[1] is located at the southern tip of Vancouver Island, where it enjoys one of the most moderate climates in all of Canada. It is known as the "City of Gardens" because of its extensive greenery, natural parks, themed gardens, and trademark hanging baskets.

It is a relatively densely populated urban area of about 20 km^2, home to about 80,000 people and providing a place of work for many more. It is the economic, social and cultural hub of the Capital Region, and home to British Columbia's provincial government. It will grow and change in the coming years: an additional 20,000 new residents are expected to move to Victoria over the next 30 years, many of them seniors.

Figure 1: Victoria Population[2]

Census Population Results			5 year growth rate	
2001	2006	2011	2001-2006	2006-2011
74,125	78,057	80,017	5.3%	2.5%

Despite its urban character and relatively high density, Victoria is blessed with a veritable forest of attractive treed landscapes. It is one of the defining characteristics of the city, from the flowering cherry trees along downtown streets to the ancient, graceful oaks and massive evergreens that grow in parks, institutional settings and backyards. A generous system of treed parks, boulevards and plazas make up the public face of this forest, while the extensive residential and institutional properties contribute significantly to the urban forest. The delightful diversity of treed environments is part of what makes Victoria an attractive place to live, work and visit.

Victoria's urban forest is part of a larger regional forest, along with its two major creeks (Bowker and Cecilia), the Gorge waterway and their respective watersheds. This is the broader bioregional context within which Victoria's urban planning takes place, including future urban forest planning.

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[1] In this document, the 'City' or 'City of Victoria' refers to the corporation of the City of Victoria, while the 'city' (lower case) or 'Victoria' refers to the community at large.

[2] Statistics Canada. https://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-csd-eng.cfm?Lang=Eng&TAB=1&GK=CSD&GC=5917034

Urban Forest Development

As in most Canadian cities, Victoria's urban forest has evolved in a somewhat haphazard manner, often in response to broader changes within the city. Today's urban forest includes remnants of native vegetation, mature residential tree and shrub plantings associated with earlier land use changes, municipal beautification efforts, and more recent plantings associated with new development. Most formal planning was restricted to the city's treed boulevards and parks, which make up a small fraction of the urban forest. Even here, planning tended to concentrate on a limited set of values (predominantly aesthetic and, more recently, natural area management) and there was no coherent strategy to guide the development of the public tree resource as a whole. As long as land-use pressures are not excessive and reasonable levels of tree canopy and green space remain, this kind of unplanned development can produce an attractive and diverse urban forest, as it has done in Victoria. But it results in lost opportunities to benefit from the full range of values that an urban forest can provide, as well as inadvertent conflicts with other infrastructure and land-uses. As land use pressures increase, these challenges intensify.

Challenges

Like other well-treed cities, Victoria has its share of urban forest challenges. The following challenges are serious enough to threaten the long-term sustainability of Victoria's urban forest:

- Low levels of tree cover in large areas of the city;
- An aging street tree population that lacks diversity (many street trees plantings are even-aged, over-mature and single-specied);
- Conflicts with the built environment (including underground infrastructure and new development);
- Increased densification leading to mature tree loss and the erosion of available greenspace for future urban forest;
- Species at risk, degradation of natural areas and loss of sensitive ecosystems;
- Emerging climate change impacts; and
- A constrained fiscal environment for local government and taxpayers.

Community and City Initiatives

The community of Victoria has not been idle in the face of such challenges. Recent initiatives undertaken by the private sector, conservation community and neighbourhood groups to manage and enhance the urban forest include the following.

- Several neighbourhood groups are undertaking greenways initiatives that include urban forest and greenways enhancement, such as

the Madison Lane Greenway. Other groups are gardening on city boulevards, such as on Haultain Street.

- Conservation organizations such as the Garry Oak Ecosystems Recovery Team, Garry Oak Meadow Preservation Society and Habitat Acquisition Trust are working to protect, restore and enhance Garry Oak and associated ecosystems in the Victoria area.
- The Urban Forest Stewardship Initiative has mapped tree canopy cover throughout Greater Victoria, providing a baseline by which to measure future trends.
- The University of Victoria's Environmental Law Centre and Restoration of Natural Systems Program, the Pacific Institute for Climate Solutions, and the Pacific Forestry Centre provide robust science-based support for research, public policy development, best practices, and advocacy in support of urban forests.
- Several property developments include significant urban forest enhancements. For example, the St. Mary's Hospital conversion retained two magnificent London Plane trees while planting many new trees and shrubs. The Dockside Green project has incorporated several highly functional pocket green spaces in their development and added significant plantings along the Galloping Goose regional trail. The Atrium Building has pioneered several treed rain gardens in the sidewalk frontage.

Recent City initiatives include the following.

- Investment in more strategic urban forest planning. In addition to commissioning this master plan, the Parks Division has recently completed a draft Municipal Forestry Plan to guide its operations.
- The climate change adaptation process has identified the urban forest as vulnerable to climate change impacts. Where new tree planting occurs, species are selected to be adapted to future climates. For example, an accelerated street tree replacement program that is focusing on drought-resistant stock.
- Increased collaboration between City departments and sections in resolving conflicts between trees, underground services and roadway infrastructure.
- More stringent requirements to protect (or if necessary replace) street trees associated with new development. These are being addressed in updates to the Subdivision Bylaw and the review of the Development Permit Guidelines.
- Local area plans include consideration of the neighbourhood's urban ecology.
- A new protocol for working with the community when it becomes necessary to remove and replace a significant neighbourhood tree.

- Inventory and assessment of the city's street trees (2005 and currently under revision).
- Integrated management of street trees for utility clearance and maintenance pruning.
- Natural area restoration and management of invasive species in several parks and ravines.
- The City is developing a Stormwater Utility that will encourage more pervious surfaces and use of onsite rainwater best management practices (including tree conservation and planting).
- Reduction of pesticide use, using integrated pest management (IPM) techniques that avoid the use of pesticides and herbicides. This is supported by a pesticide bylaw that limits the use of pesticides on private property for cosmetic purposes.
- The draft Green Building Policy encourages green roofs and green walls.
- Creating partnerships with the community, such as the use of some public lands for food production, grants that encourage the creation and enhancement of greenways, and community involvement in planting and invasive species removal events.
- Outreach and education through events such as Tree Appreciation Day, media outreach, the City website, and educational materials.

Strategic Direction

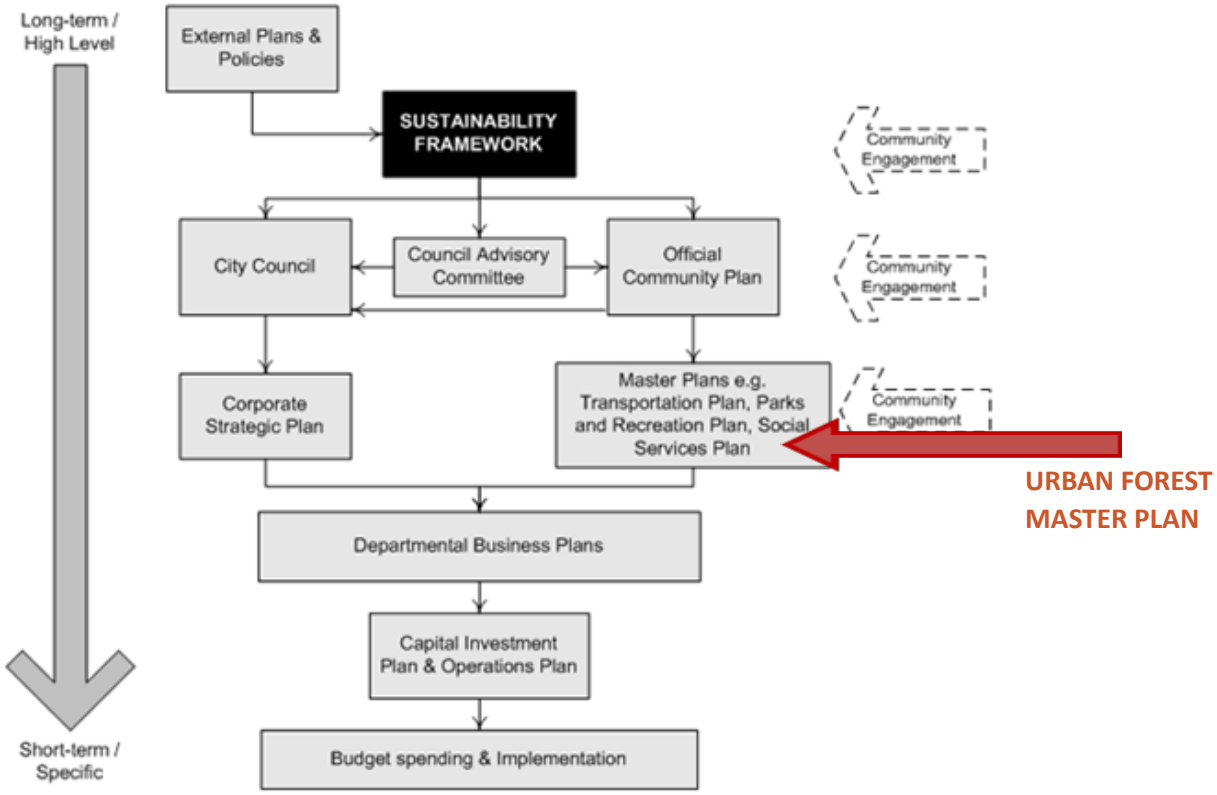
Strategic direction for this Master Plan is provided by several sources:

1. Victoria's Sustainability Framework
2. The City's Corporate Strategic Plan
3. The 2012 Official Community Plan
4. The vision and goals that have been developed for the plan through a comprehensive consultation process with the public and City staff

The Sustainability Framework is the City's guide to sustainable decision-making and operations over the very long term.

The Framework's vision speaks to the need to integrate ecological integrity, liveability, economic vitality and resiliency. Its most explicit direction for the UFMP addresses the role of the urban forest in sustaining biodiversity: "Biodiversity thrives in Victoria's urban environment, including urban forests and public and private green spaces." Other themes that provide implicit direction, given the wide range of benefits provided by the urban forest, include Rainwater, Aquatic Ecosystems, Climate Change, Recreation, Community Vibrancy, Economic Development, and Adaptive Capacity.

Figure 2: Relationship of Urban Forest Master Plan to other Strategic Plans



Source: Modified from City of Victoria Strategic Plan
http://www.victoria.ca/cityhall/sstnbl.shtml

Victoria's Corporate Strategic Plan speaks in its Vision about the City's "…unmistakable sense of place, rooted in breathtaking natural beauty", balancing environmental stewardship with other urban values. A key strategic goal is to ensure that Victoria's natural environment is healthy and sustained for generations to come. This is supported by the directive to "preserve and enhance Victoria's urban forest, parks and public spaces." The City's performance will be measured in part by ensuring that a minimal percentage of its land base is dedicated to natural areas and habitat.

The City's Official Community Plan (OCP) provides comprehensive direction for community development and growth. It has the highest legal status.

The OCP provides clear direction for the UFMP. It enables the shift toward a more holistic and strategic approach to urban forest management, and identifies the importance of the urban forest as part of the livability of Victoria. Objective 10.14 directs the City to
"*Develop and maintain an Urban Forest Master Plan to expand and enhance the urban forest on public and private land; and that:*

- *Develops mechanisms to increase the urban forest on City lands, public open spaces and private lands, with consideration of the Urban Place Guidelines in this plan;*
- *Integrates urban forest management with broader planning and*

management objectives related to infrastructure, climate change, parks, recreation facilities, placemaking, transportation, community well-being, tourism and food systems;

- *Manages the urban forest as a green infrastructure to enhance ecological services such as rainwater treatment, carbon sequestration, air purification and maintenance of biodiversity; and,*
- *Provides direction for enhancements to the urban forest consistent with the Urban Place Guidelines and the Walkable Urban Thoroughfare Guidelines.*[1]

The guidance provided by the Sustainability Framework, the Corporate Strategic Plan and the OCP are consistent with both public and staff input received during the UFMP consultation process. This process has resulted in a 50 year vision for Victoria's urban forest that recognizes that decisions we make (or fail to make!) today will set the course for the forest of the future:

> *In 2060, Victoria's homes and businesses lie within a stunning urban forest that is healthy, diverse and abundant in all parts of the city. Treed environments are valued as an integral part of this vibrant, livable and sustainable community: supporting biodiversity and watershed health; enhancing neighbourhoods; and creating places for activity, enjoyment and relaxation. Victoria's urban forest exemplifies sound and innovative practice and community stewardship.*

This vision is supported by four goals:

1. Develop and maintain strong community-wide support for the urban forest

2. Protect, enhance and expand Victoria's urban forest

1 City of Victoria. 2012. Official Community Plan. http://www.shapeyourfuturevictoria.ca/

3. Design and manage the urban forest to maximize watershed health, biodiversity, and the conservation of sensitive ecosystems

4. Optimize community benefits from the urban forest in all neighbourhoods

A New Approach

A desirable urban forest is about quality as much as quantity. It envisages a diversity of high quality, productive treed environments, distributed throughout all parts of a community. A high quality and productive urban forest is one that, while abundant, makes room for and supports the broad range of values, needs and functions within a compact city like Victoria. From this perspective, it is above all an open forest, with plenty of sunlight and well-placed trees. The urban forest character and density will vary by neighbourhood and land use type, reflect local growing conditions and will provide many different functions and benefits for humans and other species that live there.

"A biophilic city is at its heart a biodiverse city, a city full of nature, a place where in the normal course of work and play and life residents feel, see and experience rich nature – plants, trees, animals." (Beatley, 2010)

To meet the present and future challenges facing Victoria's urban forest, a new approach is proposed for the city founded upon biophilic principles and community-based stewardship. This approach has three pillars:

1. A more holistic focus on the urban forest as a coherent resource which plays an essential role in providing contact with nature to city residents and visitors;

2. Strategic management for a broader range of ecological and utilitarian values;

3. Engagement of the entire community in the stewardship of this resource.

This approach conforms to the basic mission of the Plan as set out in the OCP. Pivotal to fulfilling this mission is an appreciation of the vital influence that land use has upon the urban forest and its ability to deliver strategic benefits. Let's begin by taking a closer look at Victoria's urban forest.

An urban forest includes *all of a community's trees, shrubs and groundcover; the soils in which they grow; and the wildlife that depend upon them for shelter and food. It spans the entire landscape of the city, growing on both private and public lands and is made up of a broad range of treed environments whose utility and character are shaped by natural processes as well as human values and interests.*

Typical urban forest elements include park woodland and forest, street trees, remnant natural areas, residential yards, creek-side buffers and even roof-top gardens. Whether 'natural' or 'cultivated', all treed environments within a city become modified over time in support of urban use and activity.

The urban forest provides a broad range of benefits to the community and contributes strongly to the character, livability and beauty of the city. Finally, the urban forest helps to sustain essential ecosystem functions, such as the cycling of basic elements and nutrients and supporting the health and function of our urban watersheds.

1.2. Victoria's Urban Forest Canopy

A bird's eye view of Victoria gives a sense of the scope of its urban forest. Figure 3 is a graphically enhanced image of Victoria's urban forest canopy. 'Canopy cover'—the amount of tree canopy overlying a given area of land—is a common way of beginning to measure and assess the urban forest. The percent of the total area covered provides an indication of the relative abundance or 'density' of tree canopy across the landscape.

Without tree removals and natural attrition, the overall mass size of the urban forest would be expected to increase year upon year.

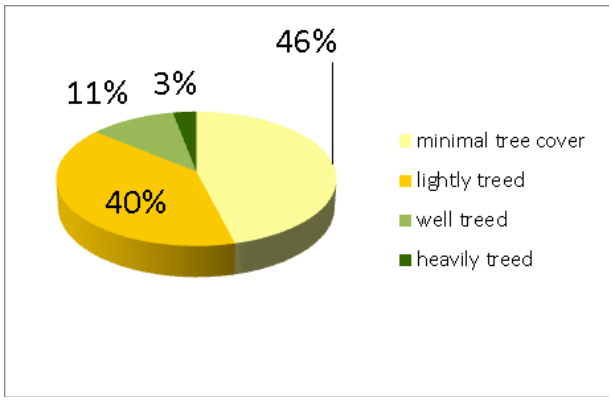
Figure 3: Tree Distribution in Victoria

Source: Caslys Consulting, 2011

The canopy cover for the city of Victoria adds up to a total of about 343 ha or roughly 18% of the city area.[1] This level of gross canopy cover has stayed about the same for the past 20 years—although it is by no means homogenous across the city.[2]

Currently, almost half (46%) of Victoria has minimal tree cover (0 – 10% density), while another 40% is lightly treed (10 – 25% tree coverage) (Figure 4). About 11% of the city is well-treed (25 – 50% density), while only 3% of the city is considered heavily treed (50 – 100% density), almost exclusively within Summit and Beacon Hill parks.

Figure 4: Tree Cover, City of Victoria



Source: Caslys Consulting, 2009

The Pacific Northwest is blessed with a climate and soil conditions in which trees love to grow. If undisturbed, the tree biomass in this region increases by approximately 2% each year, which compounds rapidly over time.

Homeowners who must "plug away" each growing season to control the encroachment of vegetation growth are all too familiar with this trend!

A study of tree canopy within each of Victoria's 13 neighbourhoods[3] found that tree canopy cover ranges from a low of 3.4% in the downtown area to a high of almost 34% in Rockland (Table 1). Most residential neighbourhoods exhibit a moderate amount of tree cover (14 – 21%), while the high-rise, commercial and light-industrial areas of Harris Green, Burnside and North Park have less than 10% tree canopy cover.

This disparity in urban forest cover among neighbourhoods occurs because large trees tend to proliferate where there is the green space to support them. The neighbourhoods with the highest percentage of tree cover tend to be characterized by parks and open space or large, traditional, single-family residential properties, with more generous treed boulevards. Areas with low cover tend to be more highly urbanized, have less green space and more impervious cover. Clearly land use has a significant influence on urban forest cover, as discussed in more detail in Section 1.4.

As noted above, tree cover is a useful way of beginning to measure and assess the urban forest. The real utility of the forest, however, rests with the many functions and benefits that cover provides, both to the community and the environment.

1 Caslys Consulting Ltd., 2008.
2 Caslys, 2008
3 Caslys 2008

Table 1: Canopy Estimates by Neighbourhood

Neighbourhood	Neighbourhood Area (ha)	Tree Cover (ha)	Percent of Neighbourhood (%)
Burnside	237	31	13
Downtown	77	6	8
Fairfield	297	95	32
Fernwood	175	51	29
Gonzales	136	50	37
Harris Green	24	4	16
Hillside/Quadra	166	50	30
James Bay	236	54	23
North Jubilee	63	17	27
North Park	56	11	19
Oaklands	173	48	28
Rockland	128	58	45
South Jubilee	38	10	26
Victoria West	157	30	19
City-Wide Canopy Coverage	**1963**	**510**	**26**

based on LIDAR 2013

Orthophoto images of different parts of Victoria show the variety in canopy cover.

1.3 Functions and Benefits

Urban forests are not just a pretty face. They perform numerous functions within the urban environment that result in many tangible benefits to the community (Figure 5).

Figure 5: Urban Forest Benefits

"…no other city has planted flowering trees on the scale which is planned for this city. Again, Victoria is on the threshold of another pioneer effort in civic beautification, and if it is successfully completed, our flowering boulevards will draw world-wide attention as a tourist attraction and a drawing card for new residents." City of Victoria Annual Report, 1939.

Aesthetics

Trees are frequently planted to soften building facades, create interesting colours and shapes or frame a viewscape. People love to visit Victoria to appreciate both its ornamental and naturalized landscapes. One of the main roles identified for the urban forest within Victoria's OCP is to "beautify… and (otherwise)…enhance the quality of the public realm." This has been a principal function of Victoria's street tree program since its inception in 1939.

Without its trees, Victoria would look very different. Trees play an important role in providing character and a sense of place to a neighbourhood. Certain trees anchor our communities in time and provide continuity for successive generations of residents and visitors, while the city ebbs and flows around them. When these trees die or are cut down, the loss to local residents can be visceral and upsetting.

The Atrium building in Victoria has designed its boulevards for rainwater management. The rain gardens around the building collect runoff to irrigate rooftop trees. The filtered water flows down an interior waterfall to a fountain in the centre of the atrium. Excess water is collected in an underground cistern to be re-used for irrigation before being flushed out through the storm drains.

This innovative approach, approved by the City, won the development team a 2011 CRD Ecostar award.

http://www.crd.bc.ca/ecostar/previouswinners/2011.htm

Economic

It is hard to place an economic value on the urban forest within a community, and yet it is clear that, on the whole, trees both add value to a neighbourhood, and can also reduce costs. Research provides some insight to these economic benefits:

Trees add to property values, increasing residential property values by 3–15%, and commercial real estate rental values increase by 7% or more.[1] Treed greenways and other public spaces add economic value by making the city a more attractive and appealing environment.

Visitors perceive communities with higher levels of green space and vegetation as having better business quality, more shopping convenience and lower crime. On streets with well-designed 'treescapes', shoppers will visit more often, linger longer and pay 7–10% more for goods.[2]

Street tree canopies intercept rainwater, reducing both the amount and rate of run-off to be managed by City storm services. This saves the City of Victoria an estimated $2 million every year in stormwater management costs, and in addition reduces the amount of contaminants that end up in the local receiving waters by taking up many chemicals, such as cadmium, chromium and phosphorus.[3]

The shading from trees can prolong the life of asphalt by 10–25 years for roads and parking lots—again a significant cost saving for the City, as well as institutions and larger retail centres with above ground parking areas.[4]

Health and Livability

Surveys show that trees are very important in creating livable communities with a strong sense of civic pride.[5] Less often recognized are their values in supporting mental and physical health of individuals, and perhaps even reducing crime.

- Treed environments reduce stress. Drivers who continuously view built-up strip mall environments are slower to recover from stressful situations than the same driver viewing more natural environments.[6] Children with ADHD show fewer symptoms when exposed to natural settings.[7] People who can see trees and greenspace from their hospital bed recover more quickly from their sickness,[8] while office workers who can see natural areas from their desk report greater job satisfaction and fewer sick days.[9]

1 Wolf 1998
2 Wolf 2004
3 Caslys 2008
4 ICLEI Local Governments for Sustainability. 2006
5 ICLEI Local Governments for Sustainability. 2006
6 Wolf 2006
7 Kuo 2003
8 Ulrich 1985, reported in Wolf 1998
9 Kaplan & Kaplan 1989

A "Biophilic Design" Approach

Experts in the field of biophilic design hold that "we should bring as much of nature as we can into our everyday environments so as to experience it first-hand." While the 'green' movement has often focused on the means, biophilic design tends toward emphasizing the end results, establishing natural-based habitats for humans to live and work. Rather than merely erecting buildings, architects who utilize the tenets of biophilic design create spaces in which humans can truly fulfill their potential. Biophilic design incorporates elements derived from nature in order to maximize human functioning and health." (Molthrop, 2011*)*

- Trees and other vegetation reduce asthma rates by removing pollutants from the atmosphere,[1] and they also remove heavy metals and toxins from the soil. Victoria's urban forest removes an estimated 110,000 tonnes of air pollutants each year, at an annual value of about $273,000.[2]
- Victoria's trees remove an estimated 55,000 kg of air pollutants every year.[3]
- Shading helps to reduce UV light and prevent skin cancers, as well as reducing heat stress: on hot days a downtown area can be up to 5°C higher than surrounding forests, and trees help to cool the air through evapo-transpiration. Further, treed environments help to fight obesity rates by making outdoor activity more pleasant.
- Treed areas in neighbourhoods create social meeting places that provide 'eyes on the street' and have been shown to reduce crime and violence.[4] They may also be placed to provide a noise and visual buffer from roads.

Biodiversity

While no-one expects a city to have the same range of wildlife as a rural area, there is a surprising diversity of flora and fauna in Victoria. The urban forests provide food and habitat for a variety of urban wildlife, including pollinating insects and a range of butterflies. There are many song- and cavity-making and nesting bird species, as well as raptors, herons and the ubiquitous crows and gulls. The urban forest also helps to support valuable wetted areas that provide habitat for amphibians (such as frogs). Unfortunately, Victoria also has its share of unwelcome alien invasive species, such as the Grey Squirrel, American Bullfrog and Scotch Broom. Residents are divided on whether to include the increasing number of deer and non-native rabbits in this category.

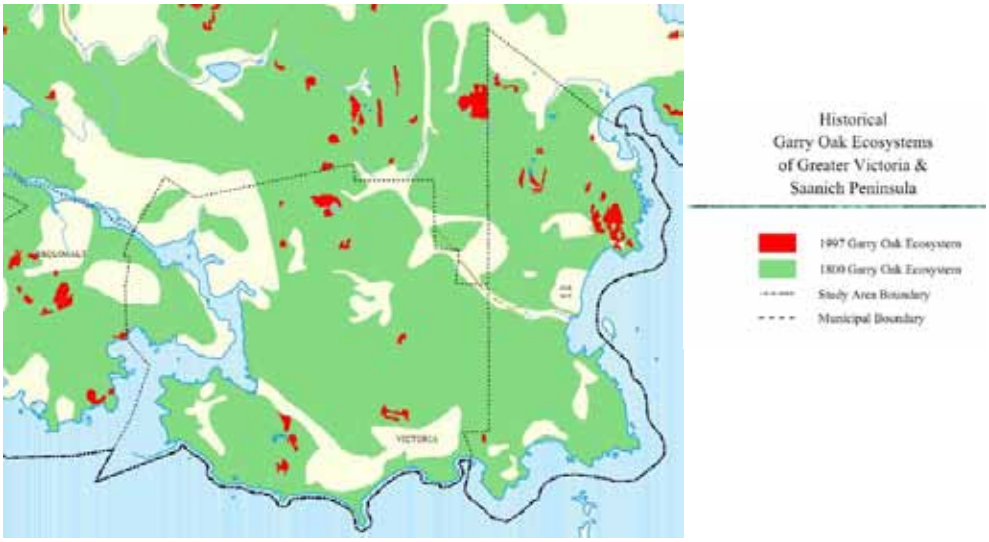
All of Victoria's ecosystems have been extensively modified by human activities. However, there are some remnants of ecosystems that are considered to be of particular value and to be at greater risk than others.

1 Wolf 1998
2 Caslys 2008
3 Caslys 2008
4 Kuo & Sullivan 1996

The federal/provincial Sensitive Ecosystems Inventory[1] identifies a number of ecosystems as sensitive within the City of Victoria, including several areas of 'woodland' (predominantly Garry oak and Arbutus), 'terrestrial herbaceous' (meadows and rocky outcrops), and 'older second growth forest' (in Beacon Hill park).

The Garry Oak and associated ecosystems that shape Victoria's landscape are home to more plant species than any other land-based ecosystem in coastal British Columbia. Many of these species occur nowhere else in Canada. At this time, because so much habitat has been lost or degraded, approximately 100 species of plants, mammals, reptiles, birds, butterflies, and other insects are listed as "at risk" in these ecosystems.[2] Many of these species at risk are found in Victoria—from tiny Poverty Clover in Barnard Park to the iconic Great Blue Herons that nest in Beacon Hill Park.

Figure 6: Historic and Current Distribution of Garry Oak and Associated Ecosystems in Victoria



Source: Garry Oak Ecosystems Recovery Team. Adapted from http://www.goert.ca/documents/go-020202.pdf

1 Ministry of Environment 2000
2 Fuchs 2001

Garry Oak ecosystems have been dramatically affected by land development. It is estimated that in 1800, Garry Oak ecosystems flourished on 1,460 (largely contiguous) hectares of the city. By 1997 that had dwindled to 21 hectares of fragmented and degraded habitat (Figure 6). Conservation organizations, like the Garry Oak Ecosystem Recovery Team, the Garry Oak Meadow Preservation Society, the Habitat Acquisition Trust and The Land Conservancy have worked diligently for years to conserve what habitat remains on private land and to educate government, the development community, schools and the general public about these values.

Green Infrastructure

Communities are increasingly recognizing that urban forests can be an important part of their city's infrastructure, not unlike roads or storm drainage. This green infrastructure provides critical functions such as shading, erosion control, rainwater management, visual and noise buffers, enhancement of greenways, air and water pollution reduction, and climate change mitigation and adaptation. Like other forms of infrastructure, the benefits derived from the urban forest are greater when these environments are properly planned, designed, constructed and maintained—both at a site and landscape level.

Victoria's urban forest stores about 53,000 tonnes of carbon, with an additional 413 tonnes of carbon sequestered.

Increasingly, natural systems, including trees, are being integrated into engineered systems to generate more sustainable outcomes. Treed bioswales and rain gardens that are integrated upstream of public stormwater infrastructure are one example. As these types of initiatives are scaled up and connected to one another (as in an integrated watershed management program), a synergy is created that results in what might be called a "rainbow of infrastructures" that blend the traditional 'grey' infrastructure (roads, sidewalks), with 'green' infrastructure (urban forests, parks, raingardens, green roofs) and 'blue' infrastructure (wetlands, streams and their riparian areas, and marine foreshore).

- Trees in the City of North Vancouver save the community $6,514 in energy per year through shading and wind shielding, avoiding the production of 2.05 tonnes of carbon dioxide. The total value of the City's trees is over $400,000 per year.
- Portland, Oregon estimates that trees in their community remove 2 million pounds of pollutants annually, a value of about US$4.8 million.
- Urban forests absorb more methane (a greenhouse gas) than lawns and gardens (although less than a natural forest). The larger trees grow, the more they are worth. Average annual net infrastructure benefits are estimated at $1–8 for a small tree, $19–25 for a medium-sized tree, and $48–76 for a large tree.

Watershed Health

The urban forest plays a significant role in supporting watershed health. Along streams and creeks, treed environments are important for shading streams (keeping them cool for fish and other aquatic life), providing nutrients, and preventing streambank erosion. Throughout the catchment area, treed environments provide pervious surfaces that allow water to soak into the ground, recharge the groundwater and slow the rate at which rainwater moves into sensitive stream habitat and municipal stormwater infrastructure. Tree roots remove pollutants from stormwater runoff, helping to maintain water quality and minimize flooding and soil erosion. Tree root growth also enhances the biological activity of soils. These "living" soils create the soil structure necessary for the effective infiltration

of rainwater, as well as promoting the conditions for healthy communities of fungi, bacteria, insects and plant communities.

Figure 7: Water Balance in Natural and Developed Areas

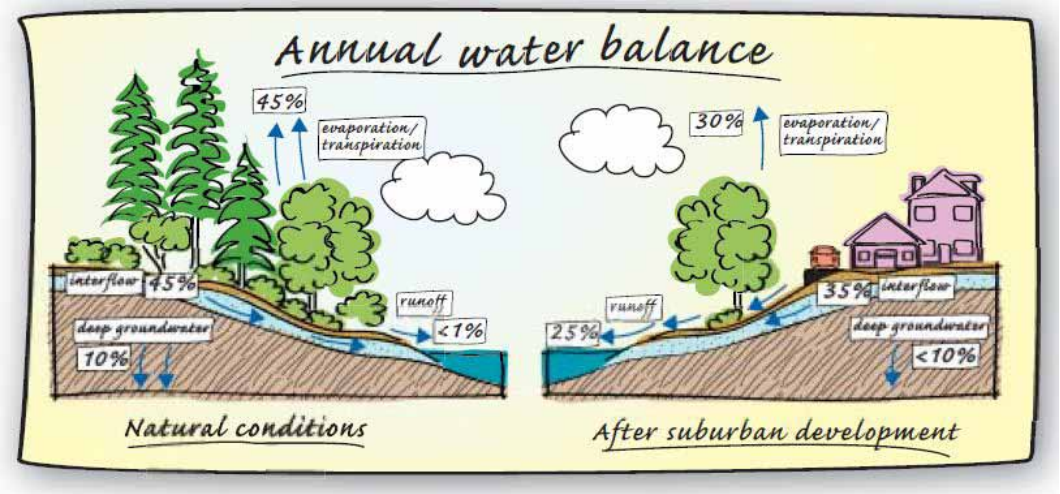


Image from CRD Roundtable on the Environment, 2003. Through the Cracks.

Food Production

With the renewed interest in locally-produced food and issues around food security, there is greater pressure to ensure that public spaces are scrutinized for their potential to provide space and opportunities for the production of fruits and vegetables. Many residents grow a portion of their food in home gardens, while demand for allotment gardens exceeds supply due to the high number of people renting or living in multi-unit buildings who lack access to land. The OCP identifies several strategies for increased local food production, including increasing the number of edible landscapes and allotment gardens, and creating mechanisms to encourage and support food production sites on public land and to acquire park land for food production purposes, where appropriate. It supports experimenting with "pilot projects for the planting, maintenance and harvesting of food-bearing trees on suitable City-held lands." It encourages food production activities in visible and suitable public places, to foster a connection between people and the process of growing, harvesting and eating fresh produce.

There are many trees and shrubs that could be planted for food production, such as apple trees or berry bushes. In parts of the city, homeowners use the boulevards for planting vegetables such as lettuce, potatoes and chard. Parks staff have been planting nut trees on some boulevards, and some Horse Chestnuts are being replaced with edible Sweet Chestnuts and walnuts. Groups such as Lifecycles play an important role in helping homeowners to gather excess fruit from trees on private land and to share it with volunteers and food banks.

While fruit and nut trees on public land can provide many benefits, they also present challenges. For instance, fruit and nut trees on boulevards may create hazards through falling fruit or nuts damaging vehicles, and harvesting may present safety issues. However, on quieter streets, there may be opportunities to work with neighbourhood groups to create well-managed edible gardens, and to support community events that celebrate the harvest.

The City of Victoria has been replacing some overmature and unsafe street trees with edible chestnuts and walnuts

Another option may be to offer structured agreements with organized community groups to grow food- producing trees and edible landscapes in City parks or on unused public land. Regardless of where food-bearing trees are planted on public lands (boulevards, parks, or other public spaces), the questions of ownership of product and responsibility for tree maintenance need to be resolved. All of these will require additional staff time and thus resources to manage, but could be explored in consultation with neighbourhoods, community groups and local businesses.

Heritage

There are many trees that are beloved by residents because of their heritage value. It may be that the tree has a certain physical stature or botanical value, has historical importance, or has reached a venerable age. Some significant trees are located in a prominent spot and are “adopted” by the local community. Some trees are planted to memorialize an important historic event, person or loved one. Whatever the motivation, these trees become powerful symbols in the hearts and minds of citizens and confer a benefit to the community in this respect.

Title: "Victoria situated on Vancouver Island = affords ...

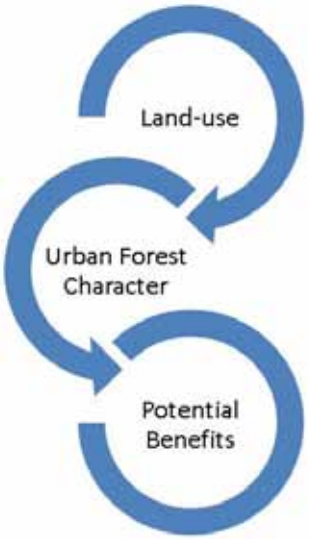
In 1921, H.B. Thompson proposed that Memorial Avenue (now known as Shelbourne Street) should be planted with a living memorial—stately trees on each side, each with a small metal tablet representing the province’s war heroes. It was determined that Shelbourne would offer enough space for 1,500 trees. In March 1922 volunteers planted 175 London Plane and Ash trees, many of which still remain. (Obee, 2008)

Beacon Hill Park’s Mayors Grove was established during a 1927 convention of western mayors in Victoria. Nine mayors planted trees to begin the grove. In following years, visiting dignitaries were invited to plant trees, among them Winston Churchill (a Hawthorn in 1929), the King of Siam (an Oak in 1931) and Lord Baden-Powell (an Oak in 1935). (Ringuette, 2004)

The Relationship between Potential Benefits and Place

The potential of the urban forest to provide benefits to the community is strongly influenced by land use. This is due to the constraints and opportunities imposed by land use on the physical character of local treed environments—i.e., their abundance, size and structure. This relationship, illustrated in the figure below, has important planning implications for the City, as it informs how best to achieve urban forest goals and benefits within the opportunities and constraints presented by different urban environments.

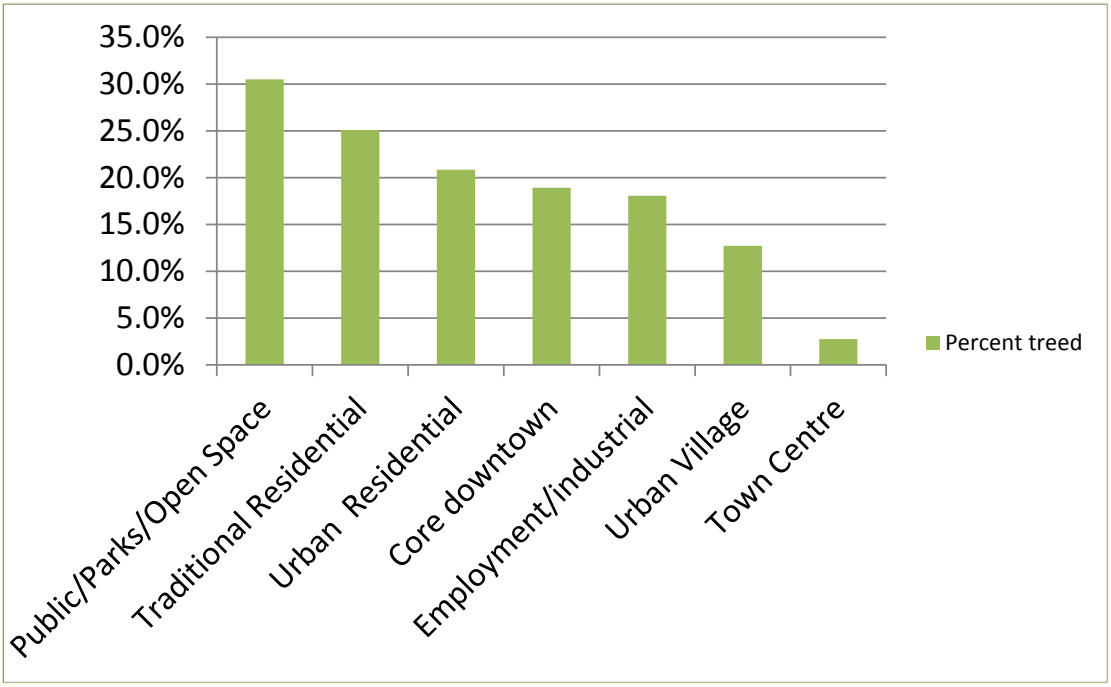
The following two sections illustrate how land use influences both the abundance and the structural character of Victoria's treed environments, making it a key driver of variation within the urban forest.



1.4 The Influence of Place on Urban Forest Abundance

Land use can have a significant influence on the amount of urban forest in a given area, as measured by the tree canopy cover. In its Official Community Plan, the City of Victoria has characterized the city as a mosaic of distinct "urban places", based on built form, place character, land use, and density characteristics. For the purposes of this discussion, some UPDs have been combined (Figure 9, see over). Figure 8 plots the amount of forest cover associated with each of these UPDs. It is easy to see the types of places within the city that tend to have more tree cover than others.

Figure 9: Tree Densities within Different UPDs



Source: Caslys 2011

Figures 10-12[1] show this graphically. Heavily treed areas are found mostly in the Public/Parks/Open space and Traditional Residential UPDs (Figure 10). Not surprisingly, areas of low tree cover tree cover tend to be correlated with more high density land-uses, as illustrated in Figure 12.

1 Caslys 2011

Figure 9: Urban Place Designations

Combined UPD	UPD (from OCP)		
Public/parks/open space	Public facilities, institutions, parks and open space		
Traditional residential	Traditional residential		
Urban residential	Urban residential	Core Songhees	
Urban village	Large urban village	Small urban village	
Town centres	Town centres		
Core downtown	Core historic Core business	Core employment Core inner harbour/legislative	Core residential
Employment/ Industrial	Industrial Marine industrial	General employment Rail corridors	
Note: Working harbour and marine are not included in this document			

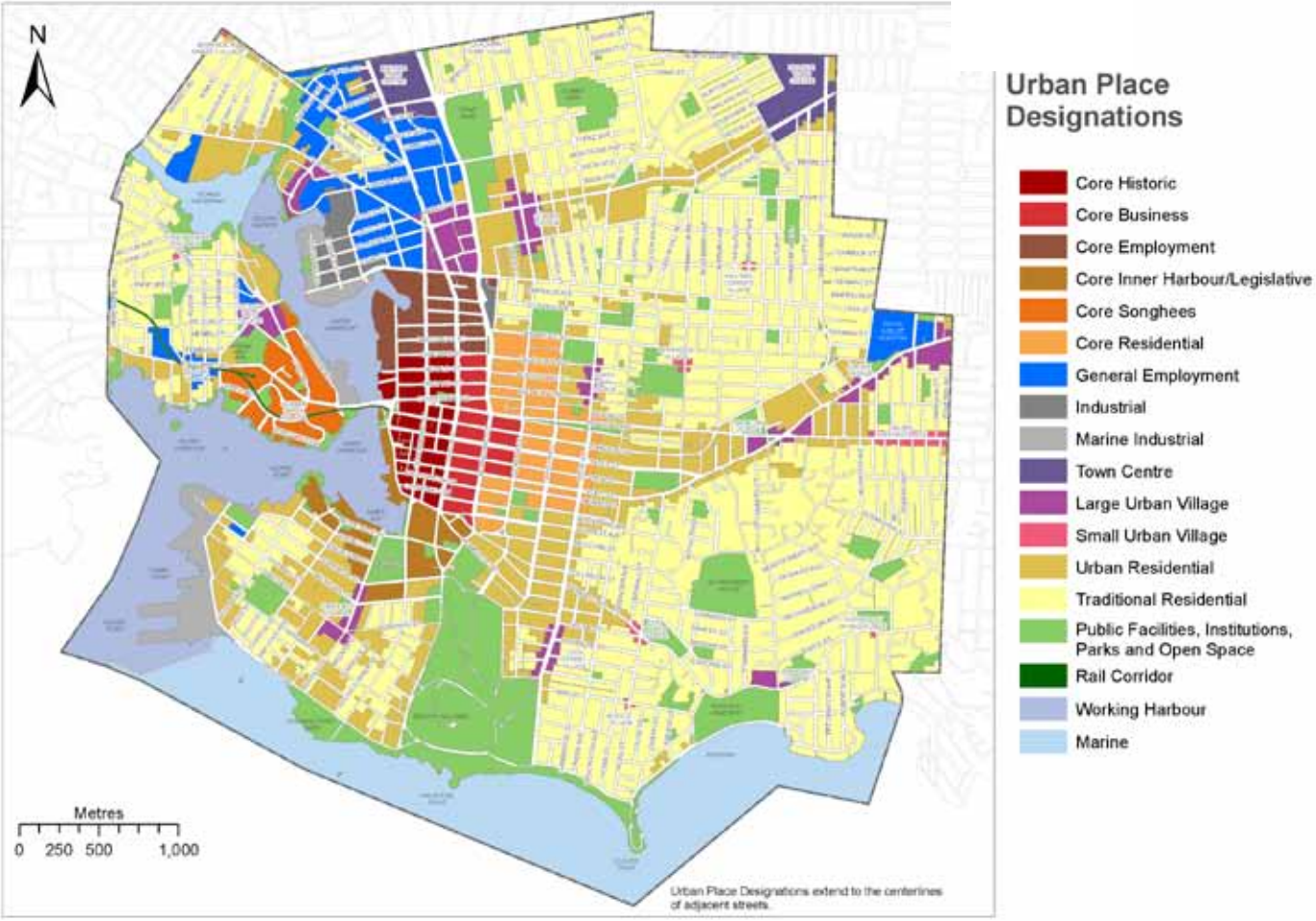


Figure 10: Urban Place Designations Associated with Areas of High Levels of Tree Cover

Figure 11: Urban Place Designations Associated with Areas of Moderate Levels of Tree Cover

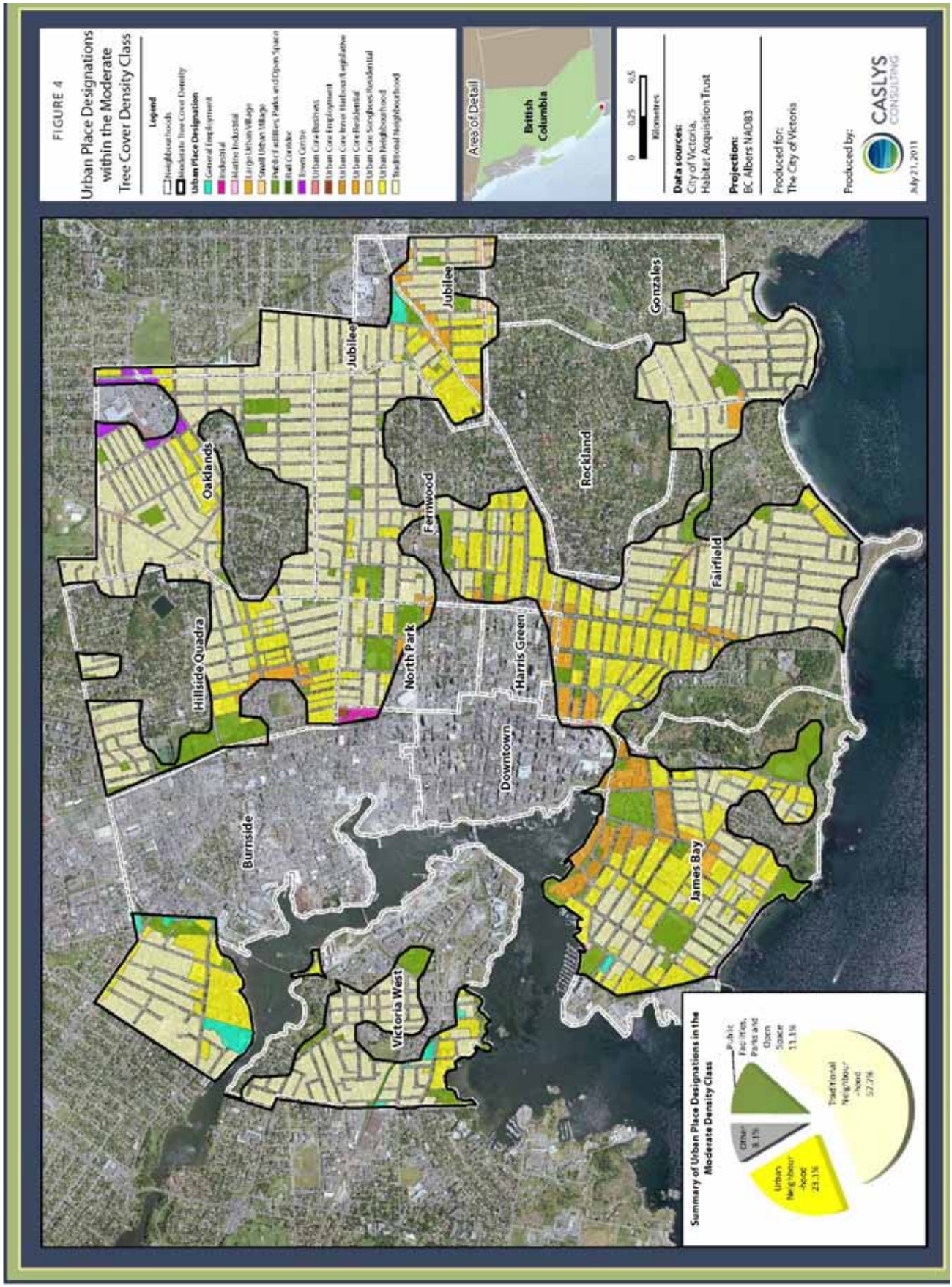
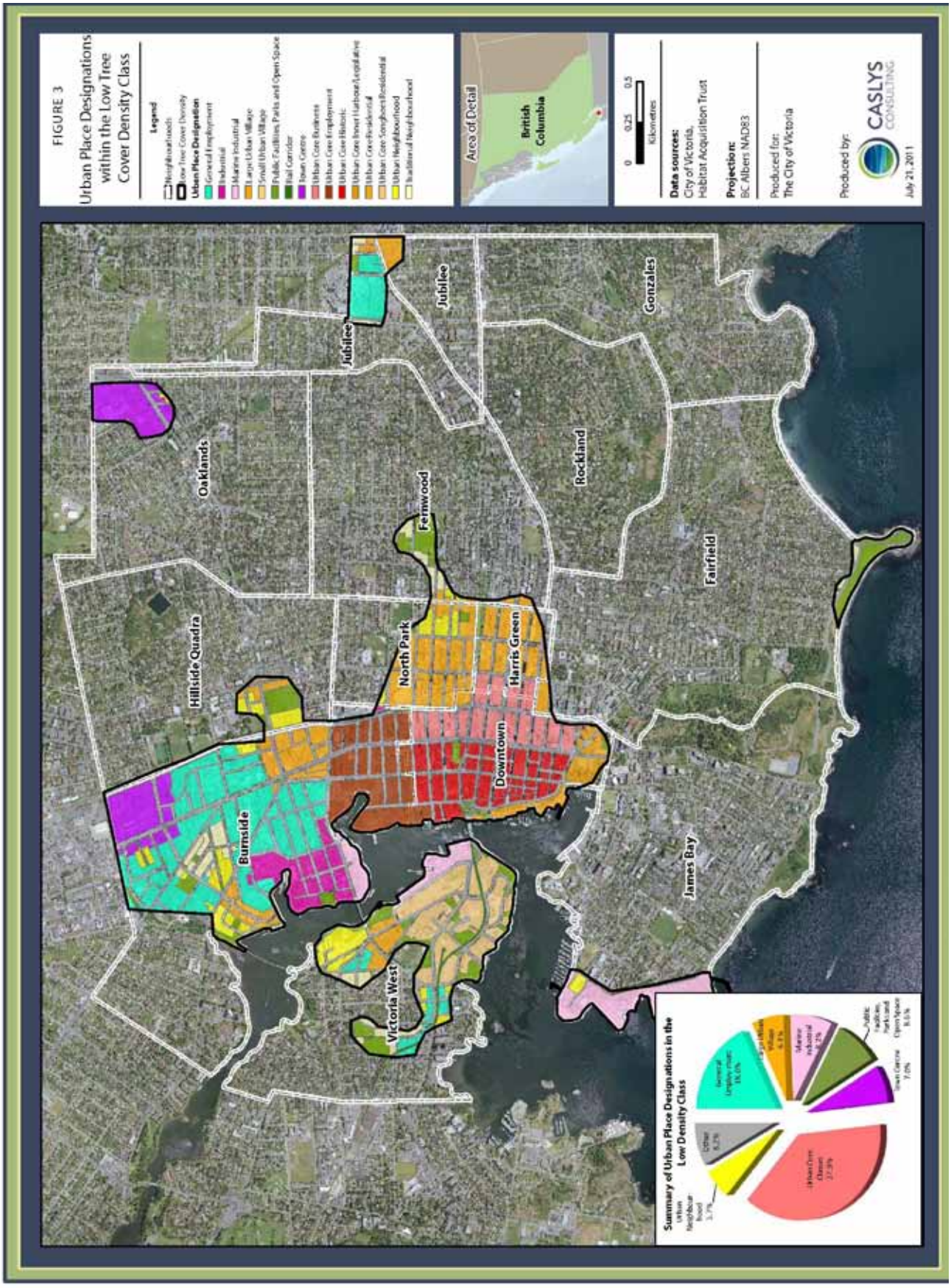


Figure 12: Urban Place Designations Associated with Areas of Low Levels of Tree Cover



This pattern is consistent with that found in other cities. Figure 13 looks at several similar land-use designations with the City of Seattle in relation to their Victoria counterparts. While the actual canopy cover differs somewhat, they are similar enough to reinforce the general influence of land-use on tree cover.

Figure 13: Comparing Victoria and Seattle Canopy Cover by Land Use

Victoria Urban Place designations	Victoria % canopy cover	Seattle % canopy cover
Traditional residential	25.1	18.0
Urban residential	14.7	13.0
Industrial/ Employment	2.3	8.0
Town Centres	4.0	8.0
Public facilities, institutions, parks and open space	30.5	41.0
Downtown/Core	4.4	9.0
CITYWIDE	17.6	18

The canopy cover in several of the UPDs will change over time, as the city grows to meet its OCP goals of greater densification that will accommodate over 20,000 new residents and 10,000 new jobs by 2041. This is further discussed in *Section 1.6 Challenges and Opportunities*.

1.5 The Influence of Place on Urban Forest Character

Just as place influences the quantity of the urban forest, it also influences the quality or character of those treed environments. For example, treed boulevards beautify our roads and contribute important aesthetic and green infrastructure benefits, but their simplified understorey of turf and concrete (designed for a safe operating environment for automotive and pedestrian movement) limit their biodiversity potential. Conversely, natural areas (historically a park use) with their larger patch sizes, native plant communities and more complex understoreys, support higher levels of biodiversity—in fact, it is one of their most valued functions.

When treed environments are well placed, designed and managed, they can make a significant contribution to both the feel and the functionality of the urban settings in which they grow. In Part 2 of this Plan (*Vision*), examples are provided of higher functioning treed landscapes within different urban settings. The following images introduce some of the typical treed environments found in different urban settings around the city.

Public Facilities, Institutions, Parks and Open Spaces

This UPD includes public and private open space, recreational facilities, public parks, schools, public and private institutions, and community facilities including government and public assembly buildings and their grounds. Street trees are also addressed in this section.

These public and private spaces provide a variety of opportunities for increasing biodiversity. Some of this is already occurring in parks, where staff are working with volunteers to remove invasive species and to restore a more natural ecosystem. These areas also offer the best opportunities for the planting and growing of large canopy trees.

Figure 14: Public Facilities, Institutions, Parks & Open Spaces

Parks with significant natural areas such as the Older Forest in Beacon Hill Park and Garry Oak ecosystems in Summit Park provide the best habitat and biodiversity concentrations within the city.

Beyond their natural values, Victoria's large treed parks provide significant aesthetic, recreational and economic benefits (as a tourist attraction) to the city, and help to maintain watershed health.

Other City parks are more open in nature and include ballfields and open meadows. Many parks are already well treed. New tree planting could focus on species and age diversity, ensuring that the urban forest is climate-adapted, and perhaps finding some appropriate spaces for fruit and nut trees as part of local food production.

Photo Summit Park

Open spaces and greenways include treed natural areas are along Cecilia and Bowker Creeks as well as marine foreshore areas, off Dallas Road and in parts of the Inner Harbour. These riparian areas support the health and productivity of these waterways, and their root systems protect the banks from erosion.

Restoration of riparian areas along the creeks provides an opportunity for additional tree planting, which could support creek function.

Photo: Gorge Waterway

Some of Victoria's significant stands of urban forest are found on lands owned by other levels of government or institutions such as Government House, the Legislature, St. Ann's Academy, Pioneer Park, and Ross Bay Cemetery. These urban forests offer beauty and shade for visitors, and support biodiversity and watershed health.

As aging trees are replaced, consideration should be given to species that will provide a large canopy cover at maturity.

Photo: Legislative precinct

Victoria has a significant street tree program. Many streets in residential areas are planted with large shade trees, while others are stocked with smaller ornamental varieties.

A street tree inventory from 2005 identified a total of almost 18,000 trees, comprised of 190 different species. About 30% were from the genus *Prunus* (cherries and plums), with about 10% *Acer* (Maple), 10% *Crataegus* (Hawthorn), 8% *Betula* (Birch and Aspen), 7% *Quercus* (Oak) and 7% *Aesculus* (Chestnut).

When street trees have to be removed for safety reasons, there is an opportunity to replant with a greater diversity of species, and to ensure that they are placed where the potential nuisance value is minimal.

Photo: Harris Green

Traditional Residential

In older single-family residential areas such as Fairfield and Rockland, much of the urban forest is located on private land and on street boulevards. The trees are often a defining characteristic of these neighbourhoods, exemplified by stately old Garry Oaks in Rockland and flowering Chestnuts along Craigflower Road.

The OCP anticpates growth of about 10% in these neighbourhoods through ground-oriented developments and infill. The City could encourage homeowners to plant and maintain large trees in their front and rear yards where feasible.

Figure 15: Traditional Residential

These neighbourhoods are characterized by a larger front and rear yards with ample space for trees. While making up approximately 45% of the land base, Traditional Residential neighbourhoods account for nearly 60% of the city's total tree cover (excluding road rights-of-way).

Typical treed environments include:

- Boulevard plantings of mature shade trees with turf understorey;
- Cultivated gardens with a mixture of tree sizes and types (mostly exotic with some native species) with either turf or a mix of exotic herbaceous and woody perennial under plantings, and perhaps fruit trees; and
- Remnant native ecosystems, often associated with bedrock, native mosses, ferns, and shrubs. Some have very little tree cover, others include native trees such as Garry Oak, Arbutus, Big-leaf Maple, Douglas-fir, Grand Fir, Western Red-cedar, and Shore Pine.

The high proportion of large trees and more complex structural composition contributes to higher property values, as well as shading, rainwater management, and noise buffering. They contribute to the city's biodiversity, in part because of reasonable connectivity with adjacent residential yards into larger neighbourhood blocks of green space and streets lined with large canopied shade trees.

Photos: Rockland, Summit

Urban Residential Areas

Urban Residential areas consist primarily of multi-unit residential dwellings in a wide range of building forms, including single family, duplex, townhouses, and low-rise apartment buildings.

Enhancing the urban forest in this UPD will include finding ways to enhance the functions and benefits, for example through rain gardens and careful choice of species.

Figure 16: Urban Residential

These areas have less space for larger trees and more impervious cover than Traditional Residential, and the canopy cover is less contiguous. Treed boulevards are a significant contributor to the urban forest in this UPD. While making up approximately 15% of the land base, Urban Residential properties account for 11% of the city's total tree cover (excluding road rights-of-way)—the third most significant UPD in terms of tree cover in the city.

Urban Residential landscapes tend to favour smaller, more ornamental trees and shrubs with a mulch, shrub or turf understorey, although some open-grown shade trees and conifers may also be present plant and maintain large trees in their front and rear yards.

The urban forest plays a supporting role by visual 'softening' of larger buildings, while street trees contribute to community character. Benefits focus on aesthetic, health, livability, and green infrastructure values. Native ecosystems are rare and the less ecologically complex landscape provides few biodiversity and watershed benefits

Photos: James Bay, Hillside, Songhees

The Songhees Core Residential area includes several new and developing areas, including the Songhees Waterfront, Bayside and Dockside Green. The urban forest includes many younger trees that have been planted as part of developments. This area also has a large number of parks and open spaces with varying amounts of tree cover. While much of the tree planting has focused on aesthetic benefits, Dockside Green includes trees as part of its roadside rain gardens. The urban forest in this area will provide an increasing number of green infrastructure benefits as it matures.

The open nature of the waterfront provides space for large trees, but maintaining viewscapes is essential.

Urban Villages

Large Urban Villages consist of low to mid-rise mixed-use buildings and multi-unit residential apartments, close to commercial services. Small Urban Villages consist of a mix of commercial and community services primarily serving the surrounding residential area, in low-rise, ground-oriented multi-unit residential and mixed-use building. Much of Victoria's growth in the coming years will focus on large urban villages, which, together with Mayfair and Hillside Mall areas, are forecast to accommodate 40% of Victoria's population growth to 2041 (approximately 8,000 new residents). Another 10% growth (2,000 new residents) will be accommodated in small urban villages.

The OCP references the importance of trees in the public realm for these areas, including wide sidewalks with street tree planting. At the same time, Innovative design and planning solutions will be required to ensure that these urban centres are developed with a healthy and productive green infrastructure, appropriate to their intended use and policy objectives.

Figure 17: Urban Villages

Many of the city's Urban Villages have boulevard trees and plaza plantings, such as in Selkirk, James Bay and Cook Street Village. Lack of green space and high levels of impervious cover limits patch size and structural complexity of treed environments in these places, diminishing both the range and magnitude of functional benefits. Currently, these benefits are limited largely to beautification (aesthetic) and some shading.

Planned growth means that these areas will be subject to increasing densification which will impact both the abundance and the types of treed environments within them

Photos: Cook St. Village, James Bay

Town Centres

Town Centres—Mayfair Mall and Hillside Shopping Centre— consist of large retail areas combined with mixed-use, mid-rise building types and multi-unit residential apartments.

The OCP envisages the urban forest as contributing to a well-defined public realm characterized by wide sidewalks with regular tree plantings. There are significant opportunities to enhance aesthetic, climate adaptation, stormwater management and watershed conservation values by incorporating more trees into parking areas. New trees would need to be supported by pervious pavement and larger soil volumes and rainwater detention capacity within an engineered system of soil cells or planting vaults, where necessary.

Figure 18: Town Centres

Treescapes include ornamental trees and shrubs, and generally few spaces for the growth of large trees. Trees in large parking lots play an important role in shading cars (and their occupants).

Planned densification will impact both the abundance and the types of treed environments within them

Photo: Hillside Mall

Core/Downtown

The Urban Core has the highest density and greatest mix of uses in the city, including civic and institutional facilities of regional and provincial importance, primary retail, entertainment, office and commercial uses, and high rise residential apartments.

The OCP objectives for the Core include a well-defined public realm with wide sidewalks, public squares and open spaces, formal tree planting, and buildings set close to the street frontage. In this area, it will be essential to provide sufficient uncompacted soils (perhaps through soil cells or overground planters) to grow a mature tree. The urban forest should be designed so as to attract business to the commercial areas.

Figure 19: Downtown/Core

The downtown core features large buildings, busy roads and sidewalks, and complex underground infrastructure, often leaving little room for trees. Street trees emerge from sidewalk grates or planters.

More latitude is afforded with the City's two plazas. Centennial Square includes large, retained planting areas that provide room for mature oaks and an understorey of woody and herbaceous perennials. The harbourfront is another area that is receiving more attention for single-tree planting as redevelopment opportunities present themselves. Trees are also popping up on green roofs, which are a valuable and increasingly popular form of urban green space. Core residential landscapes are characterized by smaller, largely ornamental plantings which are kept highly groomed.

Recent developments, such as the CRD conversion of Victoria's old police station and the completion of the new Atrium Building are adding treed environments of greater interest and functionality to the downtown area.

Photos: Government Street, Bastion Square, Harris Green

Employment and Industrial Lands

Employment and industrial lands typically include large amounts of impervious surfaces with buildings and parking lots.

As industrial areas re-develop, there will be significant opportunities to incorporate high-functioning tree cover into these areas on both private and public lands. Exploiting those opportunities will require innovative planning and development design guidelines.

Figure 20: Employment and Industrial Lands

Industrial areas such as Rock Bay and parts of Burnside currently have relatively few trees or shrubs. Exceptions include pockets of green spaces found along the Cecilia Creek ravine and the foreshore of the Selkirk waters. Treed environments that do exist tend to consist of either single landscape specimens surrounded by asphalt, concrete or isolated patches of trees and vegetation (with a high incidence of invasive species). Associated values are very low.

Photos: Rock Bay, Cecilia Creek, Burnside Gorge Community Centre green roof

The Relationship Between Place and Character

These examples show how the character of the urban forest is influenced by different land uses. They also illustrate how the urban forest, in its turn, can contribute to providing or enhancing a sense of place. These principles highlight the need for the City to:

- Be mindful of the constraints and opportunities presented by each place setting in developing its urban forest objectives and design guidelines;
- Be strategic about what urban forest benefits to pursue within different place settings; and
- Encourage a place-based and multi-functional approach to the planning and design treed environments within different urban settings.

Just as the character of the urban forest varies by UPD, so too do the challenges and opportunities for urban forest management.

"During the spring the boulevard on Shelbourne Street, south of Haultain Street, was surfaced with black soil and seeded to grass. Yates Street was replanted with Prunus Pissardi and Mountain Ash; Faithful Street with Paul's Scarlet Hawthorn alternated with White Birch, and Richardson Street similarly planted. Vandalism was very severe on these streets and 40 trees were replanted in the fall. In December, Coventry Street was planted with Prunus Pissardi and Fugenzo Japanese Cherry; Menzies Street with Kanzan Japanese Cherry; Vining Street with Yoshino Japanese Cherry; Howe Street, south end, with Prunus Blireana...." City of Victoria Annual Report 1939.

1.6 Challenges and Opportunities

This section of the Plan examines some of the more pressing challenges facing the city and its management of the urban forest. It presents best practices and new ideas in urban forestry, looks at how other communities are responding to similar challenges, and highlights opportunities for the shared stewardship of Victoria's urban forest.

These are discussed under seven main categories:

1. Sustaining and Enhancing the Urban Forest
2. Optimizing Urban Forest Health
3. Increasing Benefits to the Community
4. Enhancing Natural Values
5. Improving Urban Forest Management
6. Resourcing the Plan
7. Engaging the Community in Urban Forest Stewardship

Victoria's urban forest has continually changed over the years. Areas of dense forest were clearcut by early settlers, and then replanted with many of the trees seen today.

Sustaining and Enhancing the Urban Forest

Participants in the UFMP public consultation process were strongly in favour of taking steps not only to maintain the current extent of Victoria's urban forest, but to expand and enhance it where possible. This is echoed within the OCP, which directs the City to "…expand and enhance the urban forest on public and private lands…" The benefits associated with the urban forest tend to increase with its abundance—provided that it is appropriately located, well managed and does not undermine other values important to the community, such as safety, sunlight or significant viewsheds.

It is possible, however, to overdo tree cover, particularly if it is misplaced or ill-suited to the urban context within which it grows. Indeed, there is anthropological evidence to suggest that, while humans have tended to settle near trees, they favour open woodlands and savannah to dense forest and prefer to live at the edge of such ecosystems, where there is light, warmth and good lines of sight.[1] In urban environments, what we sometimes overlook as we stop to admire a particularly beautiful tree or woodland setting is something all good artists know intuitively: it is the open space and natural light that frame and permeate these scenes that contribute much to their beauty!

1 Coder 1995, Gobster 1994

Optimal Canopy Cover

Victoria's overall canopy cover is about 18%. As noted earlier, however, this cover is not evenly distributed across the city. Some neighbourhoods (such as Rock Bay, Harris Green, Burnside, and North Park) have less than 10% canopy cover.

In areas where there are significant amounts of tree cover, it will be challenging to maintain these levels in the short- to mid-term. This is because a significant fraction of Victoria's urban forest is getting elderly (see Age Distribution below). The City's street tree resource is particularly vulnerable to this demographic "bubble". As this aging trend progresses, older trees will be replaced with young specimens at an accelerating rate. This will result in a temporary reduction in over canopy levels for a time, increasing again as this new cohort of trees matures.

The District of Saanich is using GIS analysis to identify optimal street tree planting opportunities within its urban containment boundary. Their analysis takes into account considerations such as sidewalk width, distance from road intersections, stop signs, light standards, underground utilities and a host of other factors.

In response to this challenge, the City has recently increased its street tree replanting program. Planting empty tree sites on boulevards is one of the easiest ways to maintain tree cover, diversify the age structure and species, and increase the resilience of the urban forest. The City is also working to extend the "Safe Useful Life Expectancy" of its mature street trees, in order to buy time for the influx of new street trees to begin contributing meaningfully to the urban forest canopy.

In residential neighbourhoods, challenges to maintaining canopy cover occur as smaller, older homes are replaced with new and larger homes that cover more of the lot, or, as larger lots are subdivided and then built upon (infill). These trends often result in the removal of (highly productive) mature trees, as well as the available greenspace to support them. Through the diligent application of its tree cutting bylaw, the City has done a good job of reducing significant tree loss where this does not interfere with property owner's legal right to build. By itself, however, the bylaw cannot ensure that Victoria's urban forest will be sustained.

Canopy cover is only one measure of the urban forest. Other measures of success include urban forest health (see page 40) and biodiversity values (page 52).

The greatest opportunity for increasing productive tree cover in those areas of the city with low levels of tree cover will come as they are revitalized. In order to maximize these opportunities, the City must have a clear idea of its performance objectives for the urban forest in all neighbourhoods and ensure that these are effectively translated into its development guidelines and enabled through bylaws and development requirements. The City could utilize new development as opportunities to pursue urban forest objectives on a site-by-site or block-by-block basis, transforming urban landscapes and building green infrastructure, including higher functioning urban forest.

There are also neighbourhoods where a significant number of trees have been and will be removed because of aging trees and new developments. These areas should also be identified as a priority for ongoing afforestation to maintain canopy cover.

The City could also consider increasing the replacement ratio for the permitted removal of protected trees on all private lands. This will ensure that the canopy loss associated with mature tree removal is restored within a more reasonable time frame.

To guide its reforestation efforts, the City could develop some preliminary targets for canopy cover for each of its UPDs. The subject of canopy cover targets is addressed in more detail in Appendix B.

*Organizations such as the Cascadia Green Building Council are working with private and public sector clients to develop biophilic cities through model projects that combine sustainable and compact urban revitalization with generous amounts of restorative greenspace. (*http://cascadiagbc.org/resources*)*

Space for the Future Urban Forest

Natural forests are dynamic systems. Disturbance from fire, windstorms, landslides, and large pest outbreaks are common and serve to increase the diversity and resilience of these systems. Urban forests, like the urban communities in which they grow, are similarly dynamic—change is constantly being thrust upon them. Unlike natural forests, however, urban forests require human intervention to ensure that they adapt to changing urban environments in a productive and sustainable fashion.

The population of Victoria is expected to grow, and the OCP anticipates a need to house a minimum of 20,000 new residents over the next 30 years. Most of these new residences will be in the Urban Core, Town Centres and Large Urban Villages—areas which are already amongst the least treed in the city. As part of its Economic Development Strategy, the City aims to attract many new businesses into Urban Core areas. Many new, higher density mixed-use or commercial developments will have almost 100% lot coverage, leaving little or no room for large trees.

Parking spaces interspersed with boulevard plantings at Dockside Green

Finding space for significant amounts of urban forest within these high-density UPDs is a challenge. Other types of 'greening' such as green roofs and green walls, as well as smaller trees and shrubs in planters will make important contributions. However, this will not achieve the same level of benefits that large, mature trees provide. Urban planners, developers and the design community should be encouraged to find ways to incorporate large-canopy trees into these settings, such as has been done in Portland.

The single greatest impact to the urban forest comes from the incremental loss of greenspace associated with development and densification. In addition to removal of large mature trees, there is a loss of soils and space that could be used for future generations of trees. It takes a significant amount of space to grow a large tree. As land uses change and neighbourhoods are redeveloped, it is critical to ensure that adequate greenspace is being reallocated on-site or elsewhere to sustain the future urban forest. Failure to do so will result in a forest that is diminished in size, more fragmented, less productive and more vulnerable to change—the antithesis of sustainability. GIS capability will enable the City to monitor the amount of greenspace and urban forest that is being lost to development.

Finding space for tomorrow's urban forest will be a significant challenge for the City.

European cities are creating space on streets by removing on-street parking spaces. Both Zurich and Hamburg have frozen the existing parking supply in their city centres, and when a new space is built off-street, an on-street space must be removed. These spots are then repurposed as widened sidewalks or bike lanes. A similar approach could be used on some Victoria streets to widen sidewalks and add in boulevard plantings.

- There are limited opportunities for additional plantings in parks. Many City parks already have high levels of tree canopy, or are spaces that should remain lightly treed or untreed—for example in sports parks, open Garry Oak meadows and coastal bluff ecosystems. Space for new parks within the city is constrained, and it is unlikely that any significant new parklands will be added to the system.
- Many boulevards are already well treed, with limited space for afforestation. Spaces for new street trees are limited by intensive use of underground space (for sewers, fibre-optic cable, etc.) as well as overhead space (for hydro wires and street lighting).

There are similar challenges on private lands. Land in Victoria is expensive, and there are many competing uses and needs for the land. Further anticipated infill development and urban densification will constrain the available spaces for new trees, especially larger species.

Figure 21: Plant Wherever Possible

The City of Portland urban forest makes good use of limited space by planting shrubs around tree trunks, and placing shrubs and small trees in all available nooks and crannies. In the mid-1800s, Portland's pioneers set aside whole city blocks as linear parks, and planted them with American Elms.

In Paris (France), Patrick Blanc has developed "vertical gardens"—green walls that coat the side of a building, improve local air quality, lower the building's energy consumption, and provide a natural shield between weather and inhabitants.
http://inhabitat.com/vertical-gardens-by-patrick-blanc/

There are additional opportunities in some areas that currently have very low canopy cover and that will see comprehensive levels of community development. An example is the Rock Bay industrial area, which is slated for redevelopment as a mixed-use area with significant enterprise and employment activity. Such a wholesale redevelopment of an area at this scale presents opportunities for innovative environmental planning and design at multiple scales. Investment in the urban forest could help transform this area into an attractive and refreshing place to work and live, enhancing its economic vitality in the process. Whatever form it takes, space for urban forest is a worthwhile investment for communities that wish to develop into attractive, livable and sustainable places to live and work.

Significant Trees

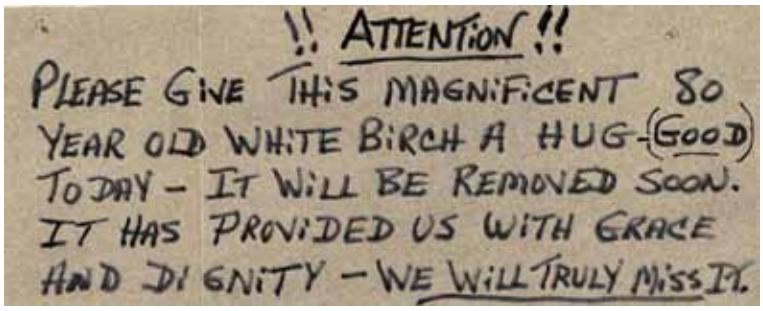
Victoria has many stately old trees that are 'significant' because of their heritage, wildlife, landmark, or historic values. While the Tree Protection Bylaw provides some measure of protection for these much loved veterans, additional measures are required to encourage and optimize their conservation. In many cases, they are literally irreplaceable.

The City does not have an up-to-date register or inventory of significant trees on public or private land The City could work with citizens to develop specific criteria for inclusion on a significant tree list, identify trees that meet these criteria, and add information to the City's GIS database. Community volunteers could also help to gather this data. An inventory of significant trees should also include remnant Garry Oak patches, regardless of tree or patch size.

The District of Saanich maintains a significant tree registry and provides free care to their owners who steward them.

Trees or wooded environments of particular value can be protected on private property by registering a tree protection or natural state covenant on the land title. Where a tree on private land is deemed to be significant, the City could also consider helping the homeowner to care for and protect the tree. Another approach might be to provide financial incentives, such as a small reduction in municipal property tax or stormwater utility bill, for people with a significant tree on their property.

Figure 22: People Value Significant Trees



Sign by a soon-to-be-removed tree in Victoria

All trees eventually reach a stage, however, when either they fail or their removal becomes necessary for reasons of safety. Given the strong emotional attachment that residents have to significant trees, the City's recent improvements to its communications policy regarding tree removal is especially important.

The City provided good information on the 'whys' of removing a 200-year old veteran Garry Oak tree located next to a playground in Blackwood Park, explaining that "Although it looked like a perfectly healthy tree, advanced decay caused by the fungus Inonotus dryadeus (or White Rot), had damaged the structural integrity of its roots system. The tree was significantly vulnerable to failure in the event of snow or a windstorm and posed a risk to public safety." (http://www.victoria.ca/cityhall/compar-garry-oak.shtml)

Optimizing Urban Forest Health

There are many aspects to a healthy urban forest. In addition to abundance and greenspace, key criteria include age-class distribution, taxonomic diversity, tree health and condition, presence of invasive species, site/growing conditions, climate trends, and the incidence or risk of pests and disease.

Age Distribution

A sustainable urban forest should have a healthy distribution of age classes so that younger trees are constantly replacing their older counterparts.

The City manages over 40,000 trees on public lands, a significant number of which are nearing the end of their safe and useful life and will have to be removed and replaced in the short- to mid-term. This is particularly a problem with Victoria's street tree population, which is very even-aged.[1] This challenge extends to private lands as well. Areas such as Rockland have many large, older Garry Oaks and relatively few young or middle-aged trees, meaning that a significant reduction in the Garry Oak population is likely at some future point in time.

In nature, ongoing renewal of forest ecosystems is achieved through natural disturbance, such as wind, fire, pests or disease. In cities, the disturbance regimes are more often human, but a necessary component of a healthy ecosystem if managed thoughtfully. While few people enjoy watching a veteran tree being felled, the removal of over-mature trees provides an opportunity to renew the urban forest, providing these trees are replaced and the greenspace needed to support them conserved. It also provides an opportunity to plant "the right tree in the right place", enhancing the productivity and value of the urban forest while reducing nuisance and risk.

As older trees are removed, there is an opportunity to replace them with a mix of faster and slower-growing species, helping to ensure a future urban forest that has a greater structural mix of both tree sizes and life spans.

1 Talbot MacKenzie & Associates 2005

Tree Health and Condition

Trees in urban environments live in challenging conditions. Spaces for productive root growth are limited by underground services (sewers, gas pipelines) and by very compacted soils. Space above ground may be limited by overhead wires or street lighting requirements. Impervious surfaces—roads, sidewalks and compacted soils—make it hard for water to reach the root system. Trees are damaged by bikes being chained to them, people carving their initials, mowers bumping them, and inappropriate pruning. It is not surprising that many urban trees have a much shorter life-span than their forest counterparts, yet this need not be the case.

Strategies for healthy tree management are detailed in the Canadian Urban Forest Network's Compendium of Best Management Practices for Canadian Urban Forests.

Another factor affecting the health and condition of the urban forest is aging. In 2005, approximately 6% of Victoria's street tree population was rated in poor condition, 30% in fair condition and the balance (64%) in good-to-excellent condition (Figure 23). Parks staff have responded with an accelerated program of tree maintenance (to extend the life of mature trees), removal of sick or dying trees, and replacement with new and resilient stock. An updated inventory is in preparation, and these figures may have changed.

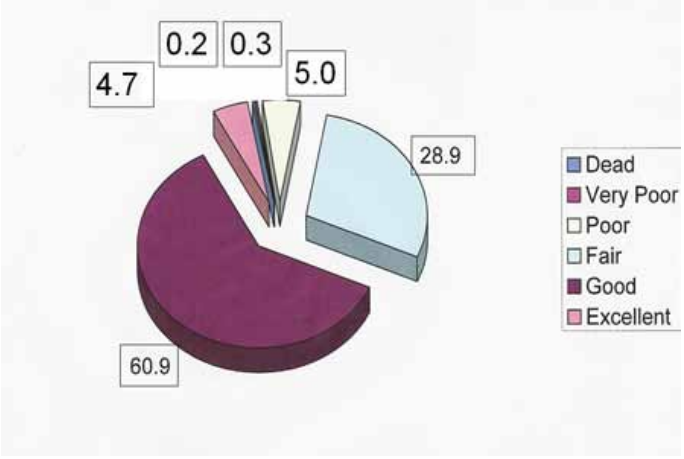


Figure 23: Condition of Tree Population

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

There are no data on tree health and condition in Victoria' parks and private lands. Anecdotal evidence suggests that much of the urban forest on these lands is also reaching a mature stage. There is a need to develop the capabilities to measure and evaluate tree health throughout the city on an ongoing basis.

The reduced availability of pollinators has implications for trees and shrubs as well as for vegetable gardens. Some homeowners are putting up mason bee boxes to encourage this native pollinator. More needs to be understood about the relationship between local native flora and the historical diversity of pollinating insects adapted to our region.

Tree Diversity

A healthy urban forest exhibits taxonomic diversity (or a healthy range of trees from different families, genera and species), as well as diversity in tree size and growth rates.

A boulevard with a single species of trees is vulnerable to pests and diseases that rapidly transfer from one tree to the next. This is a risk for Victoria's signature cherry blossoms, some varieties of which are vulnerable to Bacterial Canker and Cherry Bark Tortrix. A diversity of tree species from different genera and families enhances the resilience of the urban forest and also contributes to the overall biodiversity of the city's landscape. A good guideline is to have no more than 10% of the forest comprised of one species, 20% of one genus, and 30% from one family.[1]

The same guidelines apply to underplantings, particularly in native plant communities, where urban impacts have reduced both the number and amount of native plant species (and associated fauna).

Challenges maintaining species and structural diversity also exist on private lands. It is tempting for homeowners, developers and landscape architects to favour smaller-growing ornamental trees for a host of reasons:

- Green space on sub-divided or redeveloped residential lots is diminishing (leaving no room for larger trees);
- Smaller trees are easier to maintain and have a lower 'nuisance potential';
- Views and sunlight are enhanced.

From a green infrastructure perspective, however, small ornamental tree species provide significantly less benefit in terms of rainwater management, carbon sequestration, climate buffering, energy

1 Santamour 1990

conservation, and cleansing of air and water resources.[1] Considerations for selecting appropriate plant stock should include:

- Species that will be optimally sized at maturity;
- Hardy within Victoria's present and projected future climate;
- Tolerant of wind and longer, drier summers;
- Resilient to pests and disease;
- Healthy, well-formed and defect-free nursery stock; and
- Non-invasive species.

As always, site conditions and functional requirements also play a key role in selecting the best type of tree to plant.

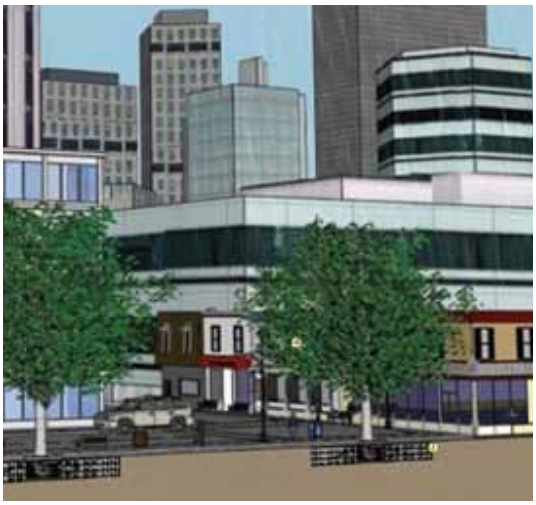
Site/Growing Conditions

Trees require a sufficient volume of healthy soil in order to reach their potential size and lifespan. This can be a challenge in urban environments, where many trees fail to reach a productive size and die prematurely. In these cases, the time and expense associated with planting and tree care is largely wasted. In addition, many benefits are lost if the tree never reaches it full size.

Increasingly, however, landscape architects, arborists and engineers are finding ways to design and construct environments that can support trees to maturity, even under the most adverse conditions. While these efforts require more time and money in site preparation, this investment is returned many-fold over time. It is less expensive to plant a tree well and have it last for 40 or more years, than it is to repeatedly plant trees that fail to grow to maturity.

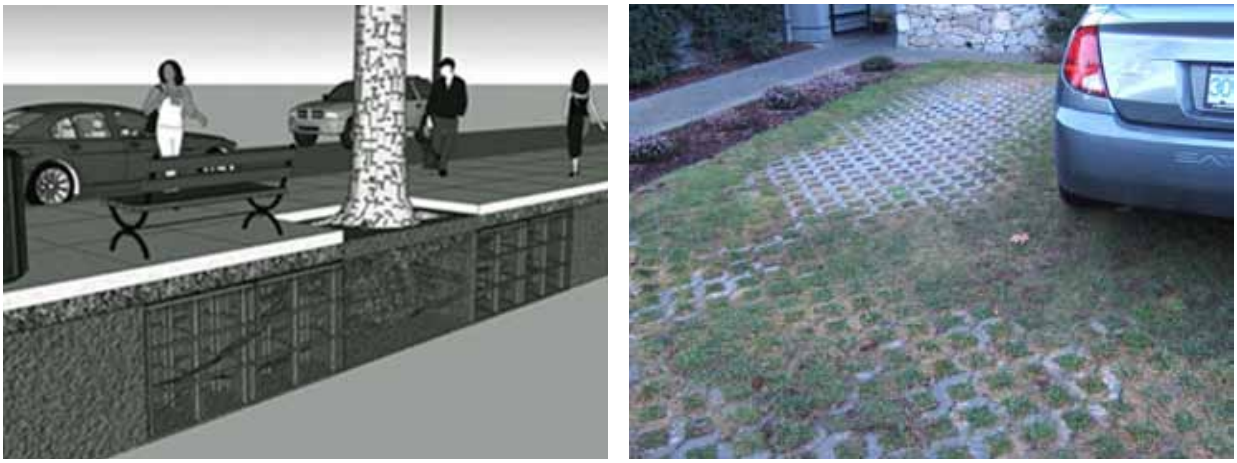
Figure 24: Engineered Soil Cells in situ

James Urban is an American landscape architect with a keen interest in how to grow healthy trees in very urban conditions. He has recently published a definitive guide on the subject: Up by the Roots, Healthy Soils and Trees in the Built Environment. A strategy of Urban's that is currently being piloted in the City of Victoria is the use of engineered "soil cells" to create viable root habitat beneath sidewalks and parking areas. These structural support systems can also function as an integrated tree and stormwater infrastructure.



1 Kenney 2000

Figure 25: Structural Soils



Soil cell allows for root growth in hardened landscapes and porous pavers increase pervious cover and enhance rainwater infiltration, while providing parking space. Image from http://deeproot.com/

In some UPDs, high density development will limit available planting space for large trees. One option may be to promote quality over quantity¬—in other words, rather than asking a developer to find space for and to plant several small trees, it may be a better long-term choice to ask for fewer trees of a larger species, that are planted in an ample soil vault so that they have a greater chance of reaching maturity. Better still is to value and ensure sufficient greenspace even in very urban environments, so that this is a priority for development design from the start.

Climate Change Impacts

Changes to local weather patterns associated with ongoing global climate warming will have an adverse impact on some trees—particularly those susceptible to drought stress or high winds. In 50 years, Victoria's climate is expected to be warmer overall, with more frost-free days in winter and lower snowfall. Summers will be drier, while more precipitation is expected during winter months. Windstorms are expected to increase in both frequency and intensity.[1] The trees that are planted today will face very different climates at maturity, and trees, shrubs and other vegetation that have been good planting choices in the past may not be good choices for the future.

Trees will need to be able to cope with drought (unless irrigation is provided). Victoria ceased the watering of its boulevards in 2004 as water conservation measure and many trees from vulnerable species have already begun to decline. One option is to choose taxa that are less moisture-dependant. However, if only very drought-resistant species were to be planted, this would limit the biodiversity of the urban forest and increase its vulnerability to pests and disease. There are many cultural techniques to enhance growing sites to retain more soil moisture (such as

1 Pacific Climate Impacts Consortium

Many (but not all) species and cultivars from the following genera are drought-sensitive:

- Birch
- Ornamental Cherry, Plum and Crab Apple
- Hawthorne
- Maple
- Dogwood
- Katsura
- European Beech
- Elm
- Hornbeam
- Ash
- Magnolia
- Western Red Cedar
- Western Hemlock
- Grand Fir

More drought-tolerant genera include:

- Oak
- Arbutus
- Eucalyptus
- Pine
- Douglas-fir
- London Plane
- True Cedars

enhancing soil volume, texture and mulching) and thereby increase the range of cultivars that can be supported.

There may also be creative options for extending soil moisture into the dry season through the use of green infrastructure best practices, such as raingardens, bioswales or underground rainwater detention cisterns. Further opportunities could be created through accessing a water supply from culverted streams.

More intense windstorms will also be a consideration. Tree species should be selected and pruned to be tolerant of wind, and exhibit high wood strength and a sound branching architecture.

The City of Victoria's Arboriculture section is taking an approach that deals with several management challenges at once. By systematically removing those trees that are dead or in poorest condition, the City is able to plant new species that will diversify the age class and growth rates of its street tree population, while also providing an opportunity to increase resilience to climate change and the risk of pest and disease infestation.

Pests and Diseases

Globalization and climate change increase the risk of potentially catastrophic outbreaks of exotic pests and diseases.

Without endemic predators or tree stock that has genetic resistance, a new bug or disease can spread and devastate a particular tree species or population. The confirmed presence of particular 'listed' species can result in federal orders to destroy large areas of trees in an effort to control the new infestation and prevent spreading. Early Detection and Rapid Response (EDRR) protocols are essential, along with proactive port protocols and continued networking with risk management agencies. This is an area where adequate preparation and resourcing now can prevent much greater expense and potentially catastrophic outcomes later.

The City of Victoria has been proactive in addressing this risk. An Integrated Pest Management Coordinator has been in place since 1992 and has developed an Integrated Pest Management (IPM) approach.

The IPM Policy "*uses a combination of techniques to suppress pests. This must include but is not limited to the following elements:*

- *planning and managing ecosystems to prevent organisms from becoming pests;*
- *identifying potential pest problems;*
- *monitoring populations of pests and beneficial organisms, pest damage and environmental conditions;*
- *using injury thresholds in making treatment decisions;*
- *reducing pest populations to acceptable levels using strategies that may include a combination of biological, physical, cultural, mechanical, behavioural and chemical controls;*
- *evaluating the effectiveness of treatments."* [1]

The Town of Okotoks aims to manage serious pests and diseases in part through greater species and age diversification.

Where it is considered beneficial to retain or plant more vulnerable species or varieties (such as the flowering Cherry and Plum for which Victoria is famous), the International Society of Arboriculture proposes the following strategies:

- Be strategic about where to utilize these plantings and reduce overall reliance in favour of more resilient ornamental species and varieties;
- Practice good planting and early tree care, including the recruitment and training of certified personnel;
- Aim for a diversity of age classes, as insects will often target older and weaker trees (note however that these older trees also provide important wildlife habitat, so should not be removed without good reason);
- Utilize the most robust varieties available and select healthy stock; and
- Invest in good site preparation, early tree care, and use supplemental irrigation, mulching and integrated pest management, as needed.

1 IPM approach. Purpose statement.

Increasing Benefits to the Community

Optimal Functionality

Trees are planted for many reasons. Today, trees are valued for a wider range of functions and benefits than in years past, but many of the current treed environments are not working to their full potential. In addition, new infrastructure and changing land uses result in greater conflict, particularly with public trees (conflicts which take up precious staff time and resources). **The City's challenge is to foster the design and development of highly productive treed environments that minimize conflict, nuisance and risk.**

Treed environments should be designed thoughtfully to provide a multiplicity of both ecological and landscape functions and benefits. In addition to being well integrated with the built environment, key criteria should include connectivity with other greenspace, patch size and biological complexity. The planting of larger-growing tree species with native plant communities should be encouraged wherever practical. Where rainwater management is a priority, preference should be given to the use of evergreen species (native conifers do most of their photosynthesizing on the "shoulder seasons" when rain is more abundant and deciduous trees are either dormant or preparing for dormancy).

Examples of treed environments that are optimized for functionality can include the following:

- Boulevards or sidewalks that have treed raingardens or bioswales, such as those associated with the Atrium building;
- Parking lots that incorporate soil cells and pervious pavers to support more and larger shade trees and enhanced rainwater infiltration;
- Riparian areas that are restored and re-vegetated to improve stream quality;
- Sensitive ecosystems that are managed to reduce invasive species and recover species at risk;
- Natural areas that are restored, expanded and connected to other areas with high natural values;
- Grey- or brownfield sites that have been reclaimed as urban parkland or community allotment gardens with intensive food production including fruit and nut trees;
- Greenways that have been modified to support more trees, greater biodiversity and active transportation choices;
- Street boulevards and medians that are re-stocked with larger and more resilient trees;
- Commercial landscapes that are made more productive by

incorporating more native plant material and greater ecosystem complexity; and

- Treed areas public, commercial and residential landscapes that are connected to form ribbons of greenspace.

There are many examples of these approaches in Victoria and elsewhere. TreeTrust and Bonestroo (2007) provide a checklist with a point system to maximize multiple benefits as much as possible from each new development (Figure 26). The maximal score is 50 points with 40–50 points considered exemplary and 30–40 points as excellent. The City of Victoria might wish to consider a similar system. Beatley (2011) suggests design elements that can be incorporated at various scales of planning, from a single building to the region as a whole (Figure 27).

Figure 26: Checklist of Sustainability Criteria

Yes	No	?	Credit	CREDIT TITLE AND DESCRIPTION	Possible Points
			1.1	**City Tree Development Plan** Submit a written development plan outlining the integrated design approach taken for this development that demonstrates involvement of the entire development team and urban infrastructure.	Mandatory
			1.2a	**Selection & Location – Optimum Tree Locations** Locate trees on site at the source of pollution. Correlate tree size with street width and development density. Use construction techniques that sustain tree health and longevity, while minimizing tree stress.	Optional (5 Points)
			1.2b	**Selection & Location – Infrastructure Coordination** Acknowledge City trees as a *critical* piece of the urban infrastructure by creatively locating utilities around the trees' identified optimal location.	Optional (10 Points)
			1.3	**Design Implementation & Surface Conditions** Provide the greatest degree of permeability immediately around each tree (100 square feet, minimum). Provide open, planted surface area or covered soil. Use structured soil and expandable pavement openings.	Optional (5 Points)
			1.4	**Improving Air Quality – Large Canopy Trees** Provide trees with high relative Leaf Area (LA) and of the largest canopy practicable for the location and climate zone with relatively high carbon storage and carbon sequestration capabilities	Optional (5 Points)
			1.5	**Reducing Heat Island & Increasing Shade** Use large canopy trees to shade streets, sidewalks, and parking lots. For industrial and ultra urban areas provide at least 25%. For residential provide at least 75% within 15 years of development. Use light colored/high-albedo materials and/or open grid pavement with a minimum Reflective Index of 0.6 for pavements.	Optional (5 Points)
			1.6	**Improving Water Quality – Stormwater Interception, Rate Control, Filtration, & Infiltration** Use water-permeable surface materials in 50% or more of pavements and immediately around each tree, with a structural soil infiltration bed and direct stormwater runoff into it. Provide an adequate drainage system. In conjunction with these, use detention basins, bio-filtering swales, and rainwater gardens to pre-treat stormwater to remove pollutants.	Optional (15 Points)
			1.7	**Maintenance** Provide a long-term management plan and risk management plan that employs best management practices for tree care maintenance.	Optional (5 Points)

Source: Treetrust and Bonestroo 2007

Figure 27: Biophilic Design Elements across Scales

Scale	Elements
Building	Green rooftops Sky gardens and green atria Rooftop gardens Green walls Daylit interior spaces
Site Landscape	Trees and understorey plantings Rain gardens Food gardens Native plant borders Low Impact Development
Block	Green courtyards Clustered housing around green areas Native plant clusterings Contiguous tree canopy across rear yards and between front yards and boulevard tree plantings
Street	Treed boulevards Sidewalk gardens and green infrastructure Vegetated swales Skinny roads (road diets) Greenways, Urban trails and Ecosystem corridors
Neighbourhood	Urban stream development, daylighting and restoration Urban forest patches Wild micro-parks Community gardens Greened grey- and brown-field sites
Community	Urban creeks and riparian areas Well-defined watersheds raised to a higher functioning condition Treed biodiversity networks Green schools Natural Area Parks Multi-use Parks with treed/vegetated elements Greened utility corridors
Region	Major water bodies (fresh and salt water) Riparian systems Regional forested and maritime parks

Source: Adapted from Beatley 2011

Adaptation to Climate Change

The effects of climate warming are expected to become more pronounced over the next several decades. The challenge is not only how to adapt the urban forest so that it will thrive in future climates, but also how to use the urban forest as a tool in adapting communities to those different climates. Opportunities include providing greater summer shading (which protects residents from heat and UV light, as well as reducing the heat island effect), and exploiting the potential of the urban forest to enhance rainwater management and reduce the load on City stormwater infrastructure during intense rainstorm events.

The British Columbia Ministry of Community, Sport and Cultural Development has published a guide[1] to help B.C. communities to better utilize the capacity of their urban forests in adapting to climate change. Best practices include the following.

- Placing groves of large-leaved trees and shrubs upwind of heat island areas, so that evapo-transpiration from the vegetation will create cooler, moister air that blows into the 'hot spots'.
- Planting green roofs and green walls, which help to cool the air through evapo-transpiration of plants.
- Shading large areas of asphalt (e.g., parking lots), which reduces polluting emissions from cars, extends the life of the asphalt, as well as providing a more pleasant environment for parking. In winter, these trees and their roots can be designed to be part of the rainwater management system.
- Planting evergreen species where managing stormwater is a prime concern, to maximize water uptake during the raining seasons.
- Making it easy for water to soak into the ground, through raingardens (especially with trees), or where a generous unpaved area has been left around the trunk area (perhaps planted with shrubs).
- Reducing windfall risks by ensuring that trees are windfirm.
- Selecting tree species that are adapted to expected future climates.

1 B.C. Ministry of Community, Sport and Cultural Development 2010

Food Production

With the renewed interest in locally-produced food and issues around food security, there is greater pressure to ensure that public spaces are scrutinized for their potential to provide space and opportunities for the production of fruits and vegetables. Many residents grow a portion of their food in home gardens, while demand for allotment gardens exceeds supply due to the high number of people renting or living in multi-unit buildings who lack access to land. The OCP identifies several strategies for increased local food production, including increasing the number of edible landscapes and allotment gardens, and creating mechanisms to encourage and support food production sites on public land and to acquire park land for food production purposes, where appropriate. It supports experimenting with "pilot projects for the planting, maintenance and harvesting of food-bearing trees on suitable City-held lands." It encourages food production activities in visible and suitable public places, to foster a connection between people and the process of growing, harvesting and eating fresh produce.

The City of Nanaimo Urban Forest Management Strategy identifies opportunities to incorporate edible landscapes and fruit bearing trees into the public space through their Volunteers in Parks program.
http://www.nanaimo.ca/assets/Departments/Parks~Rec~Culture/Publications~and~Forms/UFMS2010.pdf

There are many trees and shrubs that could be planted for food production, such as apple trees or berry bushes. In parts of the city, homeowners have been given permission to use the boulevards for planting vegetables such as lettuce, potatoes and chard. Parks staff have been planting nut trees on some boulevards, and some Horse Chestnuts are being replaced with edible Sweet Chestnuts and walnuts. Groups such as Lifecycles play an important role in helping homeowners to gather excess fruit from trees on private land and to share it with volunteers and food banks.

While fruit and nut trees on public land can provide many benefits, they also present challenges. For instance, fruit and nut trees on boulevards may create hazards through falling fruit or nuts damaging vehicles, and harvesting may present safety issues. However, on quieter streets, there may be opportunities to work with neighbourhood groups and to create community events that celebrate the harvest.

The City of Vancouver's west end sports a community allotment garden, replete with fruit and nut trees, that takes up close to a half a city block, near Burrard and Davey

Another option may be to offer structured agreements with organized community groups to grow food- producing trees and edible landscapes in City parks or on unused public land. Regardless of where food bearing trees are planted on public lands (boulevards, parks, or other public spaces), the questions of ownership of product and responsibility for tree maintenance need to be resolved. All of these will require additional staff time and thus resources to manage, but could be explored in consultation with neighbourhoods, community groups and local businesses.

Enhancing Natural Values

Despite its long settlement history, compact size and position as the urban centre of the Capital Region, Victoria's landscape remains a place of remarkable natural values. These include its breathtaking marine environments, hidden riparian areas, older park forest and remnant Garry Oak woodlands. These environments provide habitat for many species of flora and fauna, many of which are under significant pressure. The natural environments that are peppered throughout the city are valued by residents and visitors alike—and most of these environments are treed.

The Garry Oak Gardener's Handbook provides suggestions for homeowners wanting to restore some Garry Oak habitat in their front and back yards.

www.goert.ca

Biodiversity and Habitat

As cities develop over time, and land parcels are increasingly subdivided, larger patches of tree cover become fragmented. Their ecological complexity and value is reduced, and wildlife habitat and biodiversity values decline. Genetic diversity is also affected as the normal patterns of genetic transmission across the landscape are interrupted. Over time, this simplification diminishes the resilience of the landscape to change. Victoria contains many small patches of urban forest that contain some or all of the components of important wildlife habitats.

Several strategies can help to support local biodiversity. One is to have larger patches of habitat (such as Beacon Hill Park) which can support a diversity of species. A second is to create connections between these habitat patches in order to foster the safe passage of smaller species and the genetic transmission of native flora. A Biodiversity Strategy with linkages to the regional level would help the City to determine its habitat restoration priorities and the landscape attributes and opportunities needed to achieve these.

Naturescape, a provincial outreach program of the 1980s, was particularly effective in encouraging this type of backyard stewardship, which the City may wish to resurrect on a municipal scale.

There are several opportunities to enhance habitat corridors in the city. The OCP identifies the desire for walkable transportation corridors linking urban villages and proposes "a complete greenways network that includes separated bicycle lanes and generous pedestrian sidewalks and footpaths connects the Downtown Core Area, Town Centres and Urban Villages with major parks, civic institutions, employment districts and recreational attractions." Generous greenspace along these corridors will support active transportation and a reduced greenhouse gas footprint as well as increasing habitat and biodiversity potential.

Victoria's Greenways program supports the restoration, enhancement and re-connection of the city's natural areas. Neighbours in some Traditional Residential areas have forsworn hard fencing and manage their rear yards as larger integrated natural areas, while other residents have restored a portion of their urban gardens back to a natural condition.

Boulevards and properties adjacent to parkland natural areas can be strategically enhanced to help create ecosystem corridors and connections throughout the city as part of Victoria's Parks and Greenways programs.

GIS eco-sensitivity mapping can help to identify those areas and properties with the greatest potential for this work.

Community-based outreach programs, such as the Habitat Acquisition Trust's "Good Neighbour" program (e.g., Colquitz River Linear Park, 2005) and the Madison Lane Urban Forest Initiative have proven effective at engaging residents in this type of initiative. Victoria's Greenways Plan and funding for local groups contributes to this effort.

The Garry Oak Ecosystem Recovery Team has published a series of "restoration-unit" classifications that address the variability of Garry Oak ecosystems found on southeastern Vancouver Island. http://www.goert.ca

Figure 28: Habitat enhancement

The Madison Lane Urban Forest Initiative is a community-based initiative aimed at creating habitat connections and enhancements. The raingarden at Fisherman's Wharf will provide habitat as well as managing rainwater.

Invasive Species

Invasive non-native species—both plants and animals—are one the greatest threats to the integrity of natural ecosystems. Invasive species are an issue in many of Victoria's parks and natural areas, as they are throughout the region. Invasives of particular concern include Carpet Burweed, Scotch Broom, English Ivy, Garlic Mustard, Blessed Milk Thistle, Daphne-laurel, and non-native grasses, all of which can take over natural areas and reduce the natural habitats and food sources for native plants and animals. Sensitive ecosystems such as older forests and Garry Oak ecosystems can be significantly impacted by invasive species.

The City of Victoria has a proactive approach to the management of invasive plants. Parks staff regularly remove invasive species as they find them on public lands, and encourage homeowners to remove them from private property. The City organizes "broom pulls" with volunteers who help with removal of large infestations of broom and other invasive plants. Where an infestation is of particular concern, such as the Carpet Burweed found along Dallas Road, the City has fenced the area to prevent further spread and is engaged in active restoration of the area. The City is also part of the region-wide Capital Region Invasive Species Program (CRISP) which works to share ideas and approaches to address the issues.

B.C.'s forest scientists use techniques for classifying the biogeoclimatic attributes of forested sites, allowing them to determine types of plants and their relative abundances to prescribe for restoration purposes. In the University of Victoria Restoration of Natural Systems program, students learn how to adapt these types of frameworks to disturbed sites, many in urban conditions, to help develop effective restoration plans.

- Invasives can also be a concern to human health. Many people are allergic to the pollen of Scotch Broom, and the sap and berries of Daphne-laurel are toxic.
- Many stewardship groups (such as Garry Oak Ecosystems Recovery Team) provide information on common invasive species and management techniques.
- The District of Sechelt has an Invasive Plant Management Program that includes public signage to educate the public about invasive species and ways to prevent their spread; working with local nurseries to ban the sale of invasive plants; and educating and encouraging neighbourhood associations to establish work days for removing invasive species.

Watershed Health

Most of the former streams and wetlands in Victoria have been put into culverts, diverted, or filled in. With increasing awareness of the importance of watershed function, some sections of streams are being restored or daylighted (reinstated back out of culverts) to restore natural function. In other areas, raingardens are being designed to manage most rain events, while diverting heavy rainfall to the piped system.

More than half of the municipality has greater than 50% impervious surface, limiting the space available for trees and other large vegetation, and reducing watershed health. This is especially true of the downtown area, and industrial lands around Rock Bay. The catchment areas for Cecelia and Bowker Creek are particularly vulnerable. Strategies that increase pervious cover in association with greater urban forest cover will enhance watershed health, conserve moisture and improve the quality of rainwater as it moves through the urban ecosystem.

The City of Victoria is considering a stormwater utility, whereby property owners would pay based on the amount of stormwater generated from their site. As part of this, the City is considering rebates to property owners who undertake improvements that reduce runoff, such as bioswales, raingardens or green roofs.

http://www.victoria.ca/cityhall/engineering-stormwater-utility.shtml

Figure 30: Trent Street Raingarden

A pilot project on Trent Street is directing stormwater into two raingardens planted with native trees and shrubs. It will naturally filter out oils and other pollutants and slow the rate at which water enters the storm drain system during heavy rainfalls. Rainwater runoff produced by the building and the parking area are managed entirely on-site using raingardens and permeable pavements.

Improving Urban Forest Management

This section addresses some of the more pressing challenges addressed in the Victoria Parks Division's *Municipal Forestry Plan*. They have been included here because they are fundamental to the success of the City's broader urban forest strategy.

Cross-disciplinary Collaboration

Managing the urban forest as a coherent and strategic resource is a new concept for many cities, including the City of Victoria. Historically, tree management has been the purview of the Parks Division, but in reality the urban forest is impacted by a broad range of the City's planning and operations activities. The City is broadening departmental involvement and collaboration; and there is potential for the City's Sustainability Department to support this effort in their role of integrating city-wide sustainability initiatives. The City could consider a dedicated staff position to coordinate the implementation of the UFMP and to work with the multiple departments and community partners as needed.

Inter-Departmental Steering Committee for Plan development

Measurement and Assessment

Effective management of any resource begins with good measurement. Establishing metrics and benchmarks for the current extent, structure and health of the urban forest, as well as an estimation of the magnitude of ecological services it provides to the City, is a key first step toward the effective planning and future management of this resource.

Like most cities, the City of Victoria has implemented a digital Geographic Information System (GIS) to assist in the integrated planning, management and maintenance of its hard assets (such as roads, sewers, street lights, and boulevard trees). This is also the best platform for mapping the city's urban forest. An advantage of GIS is that staff can easily see how the various types of treed environments interface with other City assets and systems. Currently, only the city's boulevard trees have been surveyed and incorporated into the City's GIS. This should be expanded to include the many other components of the urban forest on both public and private lands.

- The Arboriculture section of the Parks Division is updating its street tree inventory and work management software. A comprehensive re-assessment of the section's needs has been completed, including an evaluation of the operational performance and service support of several leading software programs. The City has committed to acquiring a new GIS-compliant software. This system willbe able to track the location and status of each tree, including its health, maintenance history and pests/diseases.
- The University of Victoria is developing technologies that can help to model the urban forest and the terrain on which it grows in three dimensions, using optical remote sensing technology known as LiDAR (Light Detection and Ranging). Another technology under development by the university is Multi-Spectral Analysis, which can be used to identify tree species and assess tree health at a landscape scale.

The City of Kelowna has recently undertaken an analysis of its urban forest using i-Tree.

The USDA Forest Service has developed a free suite of tools called I-TreeTM for measuring and assessing the urban forest and the environmental services it provides.

- i-Tree Eco[1] provides a broad picture of the entire urban forest (both private and public). It is designed to use field data from complete inventories or randomly located plots throughout a community along with local hourly air pollution and meteorological data to quantify urban forest structure, environmental effects, and value to communities.
- i-Tree Streets[2] focuses on the benefits provided by a municipality's street trees. It makes use of a sample or complete inventory to quantify and put a dollar value on the street trees' annual environmental and aesthetic benefits.
- i-Tree Hydro[3] (beta) is a new application designed to simulate the effects of changes in tree and impervious cover characteristics within a watershed on stream flow and water quality.

Young tree care

Maintaining public trees over their entire life-cycle can be expensive. This expense can be significantly reduced by fostering healthy trees with sound architecture in their formative years—when they are smaller and relatively inexpensive to maintain. Dollar-for-dollar, this is where the City (and the community) will get the biggest 'bang' for their street-tree dollar. Early care includes the sourcing of healthy, well-formed stock, good planting practice and plant husbandry, and periodic developmental pruning during the first two decades of the tree's life. Early structural pruning promotes the development of well-formed and structurally resilient trees that will require significantly less maintenance during the middle and end stages of their life cycle (when they are more expensive to maintain).[4]

1 http://www.itreetools.org/eco/index.php
2 http://www.itreetools.org/streets/index.php
3 http://www.itreetools.org/hydro/index.php
4 Matheny and Clark 2008

- The Garry Oak Meadow Preservation Society (GOMPS) is working with the City of Victoria to enhance the availability of Garry Oak nursery trees with a local genetic provenance (i.e., they are local to this area). They are using space at the City's greenhouses to germinate seedlings, which are then grown on at the City's nursery for sale, at cost, to the City and to other local governments and local groups wishing to plant Garry Oaks.
- The International Society of Arboriculture publishes many pamphlets and books devoted to the subject of early tree care. Other resources may be found in the Compendium of Urban Forestry Best Practices.
- The City of Kamloops has adopted a seven-year pruning cycle for its public trees, aiming to improve tree health and facilitate better growth.

Tree Root Areas in Sidewalk Environments

Tree grates are often used around trees in sidewalk environments. These are an expensive capital and maintenance cost for the City. Some cities, such as New York, are moving away from using grates entirely. Alternatives to grates can include:[1]

- Underground soil vaults with raised/retained tree planters;
- Use of a stable gravel or synthetic mulch in place tree grates, combined with a tubular guard rail enclosure (which can also function as bicycle lock-up!); and
- Assembling individual street trees into larger "urban groves" of trees within a dedicated planting area.

Conflicts within Road Rights of Way

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

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

These conflicts with trees represent a significant operational and budgetary challenge for Public Works staff. While these conflicts may never be resolved entirely, there are opportunities for reducing their scale.

- Integrate the planning and design of future tree plantings into the broader infrastructure planning and design process for boulevard environments on a block-by-block basis.
- Where new development occurs, rationalize the routing or alignment of underground utilities into a more consolidated footprint, including external utility providers.
- Insist that external utility providers (e.g., phone, cable, gas, and power) provide rigorous 'as-built' survey data for input into the City's GIS and Asset Management System.

1 Urban 2008

- Where existing trees are close to the end of their safe and useful life, use opportunities to replace that tree with new trees and shrubs in locations that will minimize future conflicts. When prioritizing tree removal and replacement, infrastructure conflicts should receive explicit consideration ("right tree, right place" principle).
- Consider options that keep roots away from underground infrastructure, such as barriers that separate tree roots from underground services. In highly built areas, planting environments can be elevated above underground services in large contiguous vaults. Silva cells, while expensive, support longer-lived trees that are less likely to create conflict with underground infrastructure and serve double-duty as part of a broader rainwater detention system.

- Where trees conflict with street lighting, consider moving the street light or using an alternate method of street lighting such as ground-level or low-level fixtures, in ways that meet national lighting standards.
- In areas where leaf fall creates issues with blocked drains, consider evergreen species as a replacement option.
- Consider more "road diets" in the City's greenway and transportation plans as a means supporting multiple OCP policy objectives, including traffic calming, greening and animating the public realm, creating more active and livable communities, and increasing forest cover. Road diets include such techniques as road narrowing or de-activation, one-way traffic, mixed use of public thoroughfares, wider sidewalks, and increased use of landscaping as tools for achieving these objectives.
- For very congested treed boulevards, consider a pilot project that would motivate local residents to 'host' a boulevard tree within their front yard setback, providing the tree with more room to grow and eliminating conflicts with city infrastructure. (This option will evoke some legal and maintenance issues that would need to be weighed as part of a broader consideration of its associated costs and benefits. The current review of the City's Boulevard Program may provide an opportune moment to consider the merits of such as strategy.)

Public Safety

Poorly managed treed areas can, in some instances, create 'hang-out' areas where anti-social or criminal activities can occur. Poorly lit, densely vegetated areas can be a concern if they encroach too close or block sightlines to residences, pathways, playgrounds or other public and private areas where security of person and property is a concern. Crime Prevention Through Environmental Design (CPTED) guidelines have been developed to assist communities in reducing these risks. If overdone, however, the landscape can become denuded or unnecessarily simplified. Best practices include:

- Ensuring a visual separation between a low shrub layer and the bottom tier of tree branches;
- Setting heavily vegetated areas back from buildings;
- Installing adequate landscape lighting; and
- Managing vegetation on a regular cycle.

Wildfire is not considered a high risk in urban areas like Victoria, where city parks are managed for fuel load on the forest floor. In addition, the many users of Victoria's parks provide good "eyes on the ground", ensuring that any fires will be quickly reported to first responders who are close by.

The City of Victoria is utilizing landscape lighting, planting setbacks and modified under planting guidelines to help reconcile security concerns with urban forest values.

Tree Risk Management

The Parks Department is responsible for tree risk management within the City's boulevards and parks, however there is currently no written Tree Risk Management policy and the City has yet to undertake a comprehensive tree risk assessment of its street trees. A systematic tree risk management approach would address the following elements:

- Develop a Tree Risk Management Policy for the City;
- Ensure that staff are certified in tree risk assessment;
- Posting current Tree Risk Management standards within the Parks Department and ensure that program staff are familiar with them;
- Identify those parts of the City that would be most vulnerable to the results of tree failures (such as school grounds and major traffic arteries) and make these areas the highest priority for tree risk assessment;
- Undertake a comprehensive tree risk assessment of the City's street trees;
- Act promptly to abate risk for trees designated as being at extreme or high risk;
- Develop abatement procedures that recognize and balance the benefits of mature trees (such as heritage and wildlife values), as well as the risk; and
- Evaluate the ongoing effectiveness of the program and adapt accordingly.

Many of these steps are addressed in the Certified Tree Risk Assessor's course, adopted by WorkSafeBC and the Pacific North-West Chapter of the International Society of Arboriculture.

Tree Removals on Public Lands

As trees become over-mature, their condition deteriorates. Eventually, steps will be required to reduce the risk of a tree failure. Sometimes—but certainly not always—the only option is to remove and replace the tree. Trees that are very prominent or highly valued by the community are not immune to this process. In the past, it has sometimes proven politically challenging to remove these trees.

The Parks Division has recently developed an effective policy and set of procedures for managing removals of trees that are likely to be more sensitive to the community. Highlights of this new approach include the following:

- A multi-disciplinary committee has been formed to review all potential cases;
- An independent and well-documented assessment of the condition of the suspect tree is completed;
- A meaningful effort is made to consult with affected neighbours, businesses and the local neighbourhood association well before any tree work is undertaken;
- Departmental staff are on hand during the danger tree abatement removal to answer questions and field comments; and
- Replacement tree planting is expedited with large-caliper specimens.

Since being implemented, these procedures have been adopted successfully in the recent removal and replacement of five aged and structurally compromised Horse Chestnuts along lower Cook Street.

A clear approach helps to reduce the number of crisis-driven or conflict-based encounters by ensuring that people are consulted and understand the rationale for the removal of any significant trees.

Private Nuisances Associated with Trees

Some trees can be a real nuisance to residents. They may block views, drip sap onto vehicles, damage driveways, encroach onto buildings, and create a mess when fruit or leaves clog drains. They may also block sunlight, limiting opportunities for solar panels or growing gardens. In some cases, unresolved nuisances can lead to disputes between neighbours, or between residents and the City. In most cases, however, a little good faith between neighbours and the help of a qualified arborist can resolve most tree conflicts satisfactorily. Arboricultural staff within the City's Parks Division respond to hundreds of calls-for-service annually. While being careful to select the right tree for the right place can avoid unnecessary nuisance, trees do grow and change over time and maintenance is necessary over time.

The District of North Vancouver clearly specifies that public trees cannot be removed simply to create (or maintain) views. Conversely, in areas where viewsheds are a premium, the District of West Vancouver uses built-form guidelines to encourage consideration of view corridors in landscape planting plans

Tree Removals on Private Lands

The City regulates the cutting of trees on private lands through its Tree Preservation Bylaw (05-106). Trees which meet the definition of a protected tree within the bylaw are only permitted to be removed under the following conditions:

- The tree is dead, dying or dangerous;
- The removal of the tree is necessary to allow construction of a permitted building within the lot's zoned building envelope, an associated driveway or municipal service hook-up; or
- To make room for off-site parking as required by the City's Zoning Regulation Bylaw.

There are two main challenges to the current bylaw. The first is that certain native tree species only become protected under the bylaw when they reach a critical size threshold (60 cm in stem diameter). Some residents have been removing these tree species before they reach this size threshold simply in order to circumvent the bylaw. A second challenge is the current replacement tree requirement, which is too low to ensure a sustainable forest canopy within the 50-year timeframe of this Plan. It is recommended that a replacement ratio be established with the objective of replacing the biomass lost from the permitted tree removal within 20 years, recognizing that this may not be possible in all locations.

Resourcing the Plan

No matter how many good ideas a Plan contains, they will only be implemented if there are sufficient resources to do so. Trees on public land, like every other public asset, cost money and staff time to manage. Trees on private land also create costs for the City, such as picking up leaves and managing the private property tree bylaw.

There are several investments that the City will need to make in its internal capabilities if it adopts the kind of strategic, urban forest-based approach proposed in this plan. These include the following.

- Investments of staff time/resources for:
  - A dedicated urban forestry coordinator position;
  - Developing and implementing new procedures and approaches, revising building and development guidelines and requirements, and addressing urban forest considerations in its community and functional planning initiatives;
  - Ongoing recruitment and training of qualified urban forestry personnel who can work productively to a high standard; and
  - Regular reporting to Council on progress towards measurable urban forest objectives. City staff already report annually on the number of trees planted vs. trees removed on public land.
- Investment in technology, associated training and staff time to survey, map, measure, and assess urban forest attributes and values for planning and management purposes.
- Investments in maintaining the current urban forest asset:
  - Sustain ongoing maintenance of the existing urban forest on public land and their associated environments throughout their life cycle;
  - Providing additional dollars for an interim period in order to extend the safe, useful life expectancy of the City's mature trees (a key recommendation of the plan); and
  - Increased investment in natural area restoration and connectivity.
- Investment in enhancing the urban forest asset:
  - Capital funds to continue purchasing new plant stock for boulevard and park lands, as well as for the design and construction of any special infrastructure to support these trees, such as soil vaults or soil cells;
  - Maintenance of new trees and their associated environments throughout their life cycle;
  - Reviewing landscape plans (both design and as-built); and
  - Funding of a Biodiversity Strategy for the city.
- Increased investment in community outreach and communication.

In Victoria, as with all local governments, resources are limited and there are many demands on available tax dollars. Unfortunately, money does not 'grow on trees'. However, this Plan offers several strategies for resourcing the urban forest asset in the short and longer term.

Recognizing the Urban Forest as a Tangible Asset

Cities that are beginning to utilize urban forest assets more intensively as green infrastructure have an incentive to see these treed environments recognized as tangible capital assets. (Currently, public sector accounting guidelines classify trees along with animals as biological assets, not tangible capital assets.) There are several advantages of increasing the asset status of municipal tree stock that functions as green infrastructure:

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

The City of Victoria could work with other cities to have at least the public component of the urban forest recognized as a tangible capital asset within the Public Sector Accounting Handbook.

Figure 31: Tangible Capital Assets

Local governments are responsible for the management of a diverse range of capital assets. In addition to significant holdings of land, the following diagram illustrates some of the major classes of tangible capital assets (TCA) that support basic municipal services.

Source: City of Hamilton, 2005.

As part of this, the City could develop realistic accounting metrics for the city's natural capital and increase compensation or replacement values for protected trees that are cut down accordingly. A fully mature tree in good health and productively located is potentially worth many thousands of dollars, as is the land on which it grows.

Making the Most of Available Resources

There are several opportunities to make better use of existing resources.

- Existing tree maintenance resources should prioritize early tree care. A relatively small investment in early tree care will produce stronger, hardier and better formed trees at maturity, extending the life of the tree and reducing maintenance costs at maturity.
- The principle of "right tree, right place" will maximize benefits and reduce conflicts and maintenance costs over the lifespan of the tree. This includes favoring the planting of larger growing tree species, wherever practical, as these return an exponentially greater magnitude of green infrastructure benefits than their smaller ornamental brethren.
- As the city becomes a denser environment, investments in the preparation of sustainable growing environments for urban trees will pay dividends. This may include engineered planting vaults with large, contiguous volumes of soil, use of modular soil cells, porous pavement or other best practices. This investment will result in fewer conflicts with other infrastructure and produce healthy, productive and long-lived trees of mature size. The longer life cycle of these trees and enhanced benefits may mean that the capital cost over the life of the asset is actually less than current approaches and generates greater returns.
- Public spaces can be designed to work harder. For instance, public greenways can be modified to function as both active transportation and ecosystem corridors, linking people and nature throughout the city.

Victoria's Economic Development Strategy (Growing Business in BC's Capital City) includes being "Green and Healthy" as a key economic driver for the community, by carving out a unique niche as a green and healthy community and showcasing green infrastructure.

Seeking New Opportunities for Resourcing the Public Urban Forest

The City's Economic Development Strategy notes that the increasing population will bring an expanded tax base. Like other critical City infrastructure, long-term investment in the urban forest should be tied to increases in City revenue, so that the urban forest grows along with the population.

- Establishing a realistic time scale for the implementation of the UFMP will help to make it more affordable and allow the City the time it needs to leverage new community development and other opportunities for achieving its urban forest objectives.
- Budgets should account for the entire life-cycle of new urban forest assets. Each new tree added to the City's inventory should be matched by an associated increase in the operating fund to maintain trees. (Similarly, when a tree is removed the budget could be reduced—however it is hoped that most public trees removed would be replaced by at least one new young tree.)

- The City of Vancouver has a policy that for each new tree added to the City's inventory (whether planted by the City or a developer), an additional $38 per year is added to the program's operating budget over the life of the asset.[1] This ensures that there are sufficient resources to cover the maintenance costs throughout the life of the tree, including its eventual removal. A similar approach could be considered in Victoria.
- In order to sustain the urban forest, trees and the land that sustains them that are lost in one part of the City will need to be replaced elsewhere. The distribution of tomorrow's urban forest will likely be different than today. The City could consider a capital fund for the acquisition and restoration of lands for new urban forest.
- Improved data management and baseline information (utilizing GIS) will allow for more strategic management of the urban forest, including better resource allocation.
- Members of the public may be willing to help the City to purchase new trees through the Parks and Recreation Foundation. Such local initiatives can be amplified by using them to leverage funding for new tree planting from organizations such as Trees Canada and Evergreen Canada.
- Homeowners can support the urban forest on their land. For example, homeowners could be given a financial or other incentive to retain large trees for their green infrastructural value to the community. Treed properties manage rainwater more efficiently and could result in a rebate or discount to their stormwater utility bill. Also, the City could assist homeowners who host trees that are considered to be of extraordinary public value, such as boulevard trees or trees designated 'significant', perhaps by helping to maintain the tree on the homeowner's behalf.

The Parks and Recreation Foundation of Victoria has a 'Greenheart' Tree Donation program to raise funds for the replanting of over 200 trees along City boulevards and in parks city-wide. This is supported by Vancity Credit Union.

1 Bill Stephens, Vancouver City Parks Department, Urban Forest Technician. pers. comm.

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

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

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

- The City can pursue funding or in-kind service agreements with community partners, including community associations, residents' groups, NGOs, centres of learning, corporate funding, the development community and utilities. For example, under the City's partnership with BC Hydro, City staff to prune trees where they might interfere with hydro lines, with Hydro compensating the City for staff time.

Working with the Development Community

The development community has a positive role to play in helping the City to achieve its goals of expanding and enhancing the urban forest. At the same time, they are often a target of public protest when mature trees are proposed for removal to make way for new development.

While urban development can pose a challenge to mature tree retention and the conservation of viable green space on private lands, it also presents opportunities for urban forest renewal and enhancement. These include developing treed environments that work harder, enhance and support other policy objectives (such as on-site rainwater management, energy conservation, contact with nature and place-making) and which conflict less with other infrastructure or site programming.

Responding effectively to these challenges and opportunities requires effective leadership from the City and cooperation and innovation from the development and design communities. Many of the mechanisms required to effect better outcomes for the urban forest on private property can be influenced by City decisions. These include developing clear policy objectives for the urban forest and translating these into local area plans and place-specific guidelines, targets, standards and best practices. Provided these objectives are clear and the mechanisms for implementing them are legal, practical and fair, there is every reason to expect that the

development community will do their part to see they are achieved.

Greater support from the development community will result from communicating expectations early in the permit application process, providing clarity with respect to performance outcomes and improving the consistency and predictability with which tree issues are dealt with during all stages of the development process.

There is sometimes a disconnect between what is communicated by some developers in the public consultation process of a permit application and what is eventually built, resulting in public dissatisfaction (or anger). Better outcomes can be generated by tying project commitments to permit conditions, ensuring effective compliance mechanisms (adequate bonding, inspections and communication) and holding registered professionals accountable to the standards of their profession. Landscape plan checking by the City—both of design and as-built drawings—is recommended, as are post-construction deficiency reports from relevant design consultants (e.g., arborists and landscape architects).

Engaging the Community in Urban Forest Stewardship

There is a strong culture of community-based environmental stewardship within the Capital Region, and residents contribute in a great many ways as stewards of Victoria's urban forest. For the most part, residents do an excellent job of looking after their "patch" of the urban forest:

- Residents contribute to planning processes (e.g., public workshops on the urban forest, community planning initiatives, and Council meetings), and serve on residents' associations and city committees;
- There are many individuals with deep expertise and strong academic backgrounds who volunteer their time in support of environmental stewardship; and
- The design community (e.g., landscape architects, architects, consulting arborists, planners, and engineers) lead the way in innovative design solutions for green infrastructure, tree retention and smart, green urban buildings, landscapes and communities for working and living.

Several developers and building contractors are producing exceptional developments with high standards of tree protection and landscaping (e.g., the Chelsea, the Atrium, and the CRD Building). Community engagement is an essential part of sustaining and enhancing the urban forest. Members of the community who care about or are affected by the urban forest and wish to ensure that values important to them are respected will need to show up and continue to make their voices heard. Hopefully, those voices resonate within this Plan.

Education and Outreach

People enjoy learning about the natural environment around them, and there are many opportunities for education and outreach in Victoria.

Nanaimo's Urban Forest Plan includes strategies to reach out to community groups, schools and business managers, use social marketing techniques to provide updates, and provide training for volunteers working on invasive species removal and tree management.

The City of Surrey has extensive information on its website to help the public to select and plant appropriate tree species, prune and maintain their trees, and find out about the tree bylaws.

Sangster Elementary School in Colwood offers a "Nature Kindergarten" program that provides nature-based education for young children.

- Outreach to the community can occur in many different ways, through the media, social media and websites, as well as more personalized outreach through neighbourhood associations, Tourism Victoria, the Chamber of Commerce, Urban Development Institute, and other community-based groups to provide information to residents and visitors.
- Neighbourhood groups already play a valuable role in co-management activities—such as the boulevard gardens and greenways projects—and teaching others about urban forest values.
- Community groups could host public forums on the benefits of the urban forest.
- Simple labelling of trees in public parks (such as Beacon Hill) helps people to learn to identify different tree species, and learn which are native to the region. As well, information on the history of the urban forest in Victoria could be included on the City website and in walking tours of the City.
- Groups such as Evergreen Canada have programs that encourage schoolyard tree planting programs, which the City could support through provision of tree seedlings. Programs such as the Garry Oak Ecosystems Educational Kit (GEEK) offer activities and lesson plans for K–12 classes. City staff could assist in some school field trips to help youth identify tree species, and discuss some of the challenges in managing the urban forest.
- Events such as Tree Appreciation Day are youth-friendly and encourage participation by families, scout/guide groups and other youth organizations. Continued outreach to involve youth (from toddlers to teens) and young adults in tree-related events should continue and expand. Other opportunities to reach out to youth and young adults include 'adopt-a-park', art programs, and Facebook pages.
- Children are often discouraged from playing on trees on public property, for fear of damage to the trees and liability issues. Small, 'kid-friendly' trees could be planted beside playgrounds that are pruned and managed to encourage children to play on or around them.
- Some cities train and certify nature guides as Urban Park Rangers who earn money giving walking tours and talks at parks and nature sites. This encourages residents to come out and learn about local nature and provides opportunities for the underemployed.[1]

1 Beatley 2011

Wednesday, September 21, 2011 marked the first National Tree Day in Canada. On March 2, 2011 the House of Commons passed Motion-575 to declare the Wednesday of National Forest Week, as National Tree Day, "so that all Canadians can celebrate and share their passion for Canada's forests and trees".

Community Engagement

Most people take the urban forest for granted. For the most part this is not a problem, but the concerns come when "you don't know what you've got 'til it's gone". The more people understand about the urban forest, and what it takes to maintain a healthy urban forest on public and private land, the more likely they are to engage productively in decision-making and support the necessary resourcing. A critical issue is that there are many competing values (which is more important: social housing, low taxes or a quality urban forest?) and community forums are important for sharing ideas and values.

The City of Victoria does an excellent job of engaging citizens in community and local area planning, and in general Victoria residents are keen to show up and participate in public processes. As with other communities, the challenge is to find ways to hear from the silent majority, the people who are unable or unwilling to get engaged in decisions, and to ensure that all voices are heard.

Opportunities for engaging residents include:

- Continuing to ensure that urban forest issues are addressed in local area plans, and in annual meetings between Parks staff and neighbourhood associations;
- Seeking out additional ways to get public feedback, for example adding an urban forest question to the ongoing Ipsos-Reid polling or creating an urban forest blog;

Some communities—such as San Diego and New York—have organized a "BioBlitz" in which kids and adults alike take on an intensive 24-hour search for the biodiversity, large and small, in their community. These events have both an educational and scientific function, and have even resulted in the discovery of new species, such as a new species of centipede found in New York City.

- Using social media, the website and other online tools for engagement;
- Enlisting community support in mapping and identifying aspects of the urban forest; and
- Intensifying networking activities with community-based stewardship partners (such as the conservation community, the development and design community, the academic/science and research community, and utilities).

Celebration

The City of Victoria already has an annual Tree Appreciation Day—an opportunity for people to come out, learn about trees and help with tree planting in parks. This has been popular with youth and adults, and could be expanded to more venues. Events such as this could be sponsored by businesses or other partners, to reduce costs to the City and taxpayers.

Other opportunities for celebrating the urban forest include: incorporating urban forest themes into other civic or public festivals; providing public recognition ceremonies for neighbourhood groups who are actively involved in managing the urban forest; and taking advantage of other community events (such as Environment Week) or initiatives sponsored by community partners (such as Tourism Victoria).

It is also important to recognize outstanding achievements in urban forest stewardship, perhaps through awards events and positive media coverage. These are also opportunities to raise the profile of the City's urban forestry program.

1.7. Towards a Strategic Plan

Part 1 of this document has provided an introduction to Victoria's urban forest, including its benefits, influences and challenges, and considered how some other communities are dealing with similar aspirations and challenges. New research, best practices and case studies have been presented. A basic model has been advanced to help the City think and plan for the future development of the urban forest more functionally.

In the course of this discussion, key themes have emerged which provide the beginnings of a strategy for developing a healthier, more extensive and productive urban forest for the future. These themes can be expressed as a series of strategic principles.

Principles

Community-driven

The urban forest belongs to the whole community, and the community needs to provide direction on the type of urban forest that they would like to see. It is acknowledged that the "community" is actually made up of many communities-of-interest with a diversity of values, needs and perspectives.

Ecosystem-based thinking

Treed environments provide the greatest range of benefits to people and the environment when they most closely resemble fully-functioning natural ecosystems. Urban forestry is not just about trees, but the broader plant communities and ecosystems within which trees are (or should be) embedded. Urban forest enhancement tries to 'stuff as much ecosystem function as possible back into the urban environment.'

This approach benefits humans and their living environment as well, since more functional ecosystems are better able to provide the services and benefits humans need. Included in these benefits is the biologically-coded need of people to be in contact with nature, even (perhaps especially) within urban environments

Multi-scale Approach

The urban forest needs to be considered and managed at many scales, from the single tree to the site, neighbourhood, watershed, city, and region. An overarching challenge is how to reconnect the fragments of green space within the city across multiple scales in a way that enhances functions and benefits and gradually restores some integrity to the entire urban ecosystem.

Multi-functional

Trees need to be more than just a 'pretty face'. Future urban forest planning and design should address the fullest complement of benefits and services that it is possible to provide within a given urban context. These management objectives should respect the full range of values held in respect to the urban forest by the community, including perspectives that consider particular trees and treed environments as having an extraordinary intrinsic value, independent of their immediate utility for human beings.

Integrated Approach to Infrastructure

The urban forest as a whole needs to be recognized as a form of green infrastructure in its own right, offering tangible infrastructural services and benefits to the community. Specific treed environments can be raised to a higher functional condition by their integration into broader systems that combine both engineered and natural components. In this way, the urban forest can be enhanced or purposefully designed and managed to fulfill a variety of green infrastructure functions such as stormwater management, cleansing of air pollution, shading to reduce energy costs and damaging ultra-violet light, carbon sequestration, and reduction of the urban heat island effect.

Integrated Planning

The urban forest is implicated in all land use decisions and environments within the city. It should be explicitly addressed within many of the City's strategic and functional plans. As the city continues to undergo change and transformation, the departments of Planning and Development, Engineering, Sustainability, and Parks, Recreation and Culture will need to work collaboratively to achieve the policy objectives of the OCP as a whole and its urban forest objectives in particular. Properly caring for the urban forest is truly a city-wide challenge and it requires a team approach.

A Plan to Guide the Future

Part 2 of the UFMP meshes the results of the public consultation process, interviews with City staff and research with the themes and challenges raised in Part 1. The Plan includes a 50-year vision for the city's urban forest, as well as a number of associated goals, outcomes and strategies (appended) that provide a framework for a more detailed Action Plan to follow. A list of the most important actions is provided to jump-start the action phase.

PART 2. URBAN FOREST MASTER PLAN

The UFMP contributes to the larger vision of the future community of Victoria, as expressed in the Official Community Plan. The OCP envisages a future with more people living in the Urban Core, Town Centres and large and small Urban Villages. Each neighbourhood has its own sense of place, the "built environment is beautified and softened through natural features in the public realm", and is linked by a network of parks, greenways and habitat corridors. The urban forest contributes to this place making and helps to sustain, animate and beautify the city.

2.1. VISION 2060

The vision and goals of the UFMP were developed with extensive input from the public (Appendix A).

The UFMP vision paints a picture of the City's ideal urban forest, 50 years in the future. This long term vision recognizes that the urban forest we plant today will be the urban forest of that future.

In 2060, Victoria's homes and businesses lie within a stunning urban forest that is healthy, diverse and abundant in all parts of the city. Treed environments are valued as an integral part of this vibrant, livable and sustainable community: supporting biodiversity and watershed health; enhancing neighbourhoods; and creating places for activity, enjoyment and relaxation. Victoria's urban forest exemplifies sound and innovative practice and community stewardship.

It is envisioned that the character of the future urban forest will vary from place to place, much as it does today, reflecting both land use constraints and enhancement successes achieved through directed urban forest planning and management.

Vision 2060....

Tree-lined streets feature trees of many different ages and species. Large tree canopies clean stormwater and reduce air pollution, as well as providing beauty in all seasons. Green infrastructure along the boulevards of larger streets allows for maximum rainwater infiltration, providing a source of water for the trees, shrubs and a diversity of songbirds, pollinators and other canopy wildlife. Many large shade trees are set back on residential frontages, away from underground and overhead services.



Natural areas in parks and institutional lands have been expanded, restored and connected through a range of other urban treed environments to adjacent ecosystems. Residents of all ages understand and appreciate native ecosystems and species. Garry Oak ecosystems are thriving under new climatic conditions, while restored and created streams and wetlands support a diversity of birds, insects, fish, and amphibians. The boundaries that once separated park-bound natural areas and other vegetated urban environments are now more porous, as greater use of native plants and afforestation have improved the quality of these environments.



Vision 2060....

Open spaces such as ballfields, schoolgrounds, and play parks feature clusters of trees where they provide relief from sun and rain, as well as perimeter plantings that connect treed environments on adjacent parcels of land. Fruit and nut trees are intensively managed in designated public garden plots by local groups to provide food for people. Sightlines and understorey conditions are maintained to ensure public safety.



Ecologically functional greenways provide habitat connections throughout the city as well as safe walking and cycling routes. Ribbons of restored native ecosystems connect the backyards of multiple properties, part of a network of green roofs, reclaimed streams and integrated rainwater management systems that maintain watershed health.



Vision 2060....

Traditional Residential neighbourhoods continue to be well vegetated. Large trees grace residential yards, shade homes from summer heat and contribute to enhanced property values. Heritage and significant trees are protected and cared for. Many gardens are spacious and bright, providing habitat for an appealing range of edible plants, fruit and vegetable plots. Smaller and younger trees and shrubs throughout the neighbourhood provide a variety of wildlife habitats and ensure there will be large trees for the future.



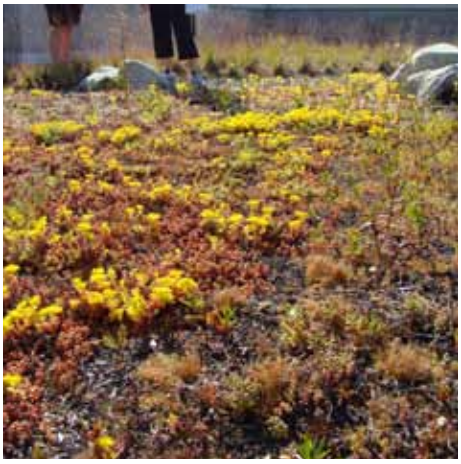
Urban Villages and Town Centres provide a compact building footprint, with generous landscaping in the public and private realm. These nodes of density are surrounded by greenspaces that include modestly-sized groves of functioning woodland, treed walkways, plazas, allotment gardens, and community open space.



Vision 2060....

In the downtown core areas, trees are separated from underground services, either in subterranean or above-ground planting vaults, where they can grow in deep and uncompacted soils and provide a 'breathing space' where people can sit amid a bit of nature. New spaces for trees and green infrastructure have emerged as a result of the community's commitment to creating a more walkable and liveable downtown area, supported by proactive development planning and innovative design. Where space for trees is limited, large shrubs in planters, colourful hanging baskets, green walls and roofs, and small community gardens bring nature into the built environment. Some streets have been de-paved to make way for walking and bicycling trails amid a canopy of trees.

In industrial/employment areas such as Ellice Point and Rock Bay, impervious surfaces are reduced to a minimum, while buildings feature green roofs and ample landscaping. Parking lots for bicycles and electric cars are shaded by large trees whose roots flourish in engineered soil vaults beneath porous rainwater pavers. Patches of greenspace connected by boulevard trees provide places for contemplation and refreshment, as well as a source of food and shelter for song-birds and other urban species.



2.2. GOALS AND OUTCOMES

The vision is supported by four goals. Each goal is reinforced by a series of future outcomes that describe how the goal will be brought to life.

Goal 1: Develop and maintain strong community-wide support for the urban forest

Community support and understanding of urban forest values gives homeowners and land managers a better understanding of ways to best steward this asset, and advocates for adequate resourcing for urban forest programs.

Outcomes:

- Victoria's urban forest is recognized for its visionary approach and model management.
- The urban forest is highly valued at all levels of the community and the region.
- All sectors of the community are actively engaged in the planning and stewardship of the urban forest.
- Children are encouraged to learn about and value the urban forest.
- Resourcing of the City's urban forestry program is supported by the community. Operational and capital budgets are adequately funded to achieve operational and planning objectives.
- Victoria's urban forest connects us to heritage and history.
- Victoria's urban forest links to the urban forest in neighbouring municipalities and across the region.

"Trees should not be an afterthought in the planning process." Schwab, 2009

Goal 2: Protect, enhance and expand Victoria's urban forest

Victoria's urban forest is currently well-established in some parts of the City, but lacking in others. The current tree cohort is aging in many areas and will need renewal and replacement, an opportunity to increase species and age diversity as well as to promote climate-appropriate species. Enhancing tree cover in presently sparsely treed areas is a priority.

Outcomes:

- The urban forest is healthy, diverse and abundant across all areas of the City.
- Treed environments on private land continue to make a significant contribution to the urban forest.
- The urban forest is well-managed on both public and private lands.
- Significant trees and landscapes are identified, abundant and healthy.

- The urban forest is designed for longevity and resilience to threats such as climate change, development disturbance, or pest/disease outbreaks.
- The urban forest helps the city to adapt to changing climates.
- The built environment and urban forest support and enhance one another.

Goal 3: Design and manage the urban forest to maximize watershed health, biodiversity, and the conservation of sensitive ecosystems

The urban forest can play a significant role in supporting watershed health and biodiversity.

Outcomes:

- Every watershed has sufficient urban forest to support the City's objectives for water quality, stream health and hydrologic function)
- A variety of treed environments connect larger, high-functioning natural areas, providing corridors for the movement of flora and fauna.
- The City's urban forest supports an abundance and diversity of native flora and fauna.
- At-risk species and ecosystems are recovered, protected and enhanced.
- Invasive species populations are maintained at or below designated thresholds.

"Try to stuff as much ecosystem function as possible back into the urban environment." Quote from Steering Committee participant.

Goal 4: Maximize community benefits from the urban forest in all neighbourhoods

The urban forest is part of the city's green infrastructure, proving a variety of services that benefit humans and are necessary for a healthy planet. In addition, the urban forest is part of the city's social infrastructure, adding beauty and areas for rest and reflection within the urban fabric.

Outcomes:

- The urban forest is highly productive, providing strategic benefits to the community in a manner that optimizes the constraints and opportunities afforded by different urban land-uses and which respects the diversity of values and perspectives expressed by the community.
- Many treed environments throughout the city have been modified or integrated into green infrastructure systems to enhance their provision of community ecosystem services.
- The urban forest contributes significantly to the beautification and local character of the public realm.
- The urban forest supports the design objectives and functional intent of the city's diverse urban places and thoroughfares.

- The urban forest helps maintain the City's carbon neutral footprint.
- The urban forest is a part of the social fabric of the city, providing a safe place for festivals, smaller social gatherings and the enjoyment of nature.
- Residents enjoy significant health and recreational benefits from the public urban forest.
- The urban forest is designed and managed to minimize risks and nuisances for residents, as well as conflicts with public and private utilities and infrastructure.

"Take action at the earliest opportunity. Just start somewhere and then, as the saying goes 'from one small acorn a giant oak will grow.' " Comment from public workshop, 2009

2.3. FRAMEWORK FOR ACTION

This Plan identifies a large number of strategies that could help the community of Victoria to achieve their vision and goals for the city and its urban forest. These are comprehensively presented in Appendix C. These strategies are a key part of the framework for action, and should be considered carefully in the short and longer term. However, as one person at a public workshop commented—the important thing is to just start somewhere.

The list of recommended actions below presents a starting point of suggested actions for both public and private lands. These recommendations are for the community of Victoria as a whole. Some actions will be led by the municipality, others may be led by community groups or organizations.

Recommended Actions

Recommendations are provided in four categories: city-wide, public lands, privately owned lands, and private lands under re-development.

"The success of an urban forestry program...rides on the commitment of allied professionals, appointed and elected public officials, and the citizens and local businesses who represent the community... All bring something necessary and vital to the process." Schwab, 2009

City-wide Recommendations

A. Create a position for an Urban Forest Planner/Coordinator, who is empowered to work with other Departments to achieve the City's urban forest goals and to report annually to Council.

B. Develop and implement an Urban Forest Action Plan to operationalize the Urban Forest Master Plan, including measures of success, realistic timelines and the provision of estimates and options to resource the plan.

C. Incorporate the goals, policy objectives and strategies of the Urban Forest Master Plan within other relevant City plans, policies, bylaws and development guidelines.

D. Increase urban forest cover to more optimal levels in neighbourhoods currently exhibiting low canopy cover.

Opportunities for the City

- Incorporate urban forest measures and targets into the Sustainability Action Plan at different scales (e.g., City, neighbourhood, UPD, or watershed level). Key measures to consider include % canopy cover, age and species diversity, and stocking levels.
- Identify urban forest cover guidelines for the Cecelia and Bowker watersheds with an aim to enhancing pervious cover, groundwater recharge, interflow water quality, and onsite rainwater management.
- Conduct a series of workshops that assist city staff in revising language in existing policies.
- Conduct a design charette for major new developments, such as the re-development of the Rock Bay area, to determine how best to optimize urban forest and green infrastructure outcomes.
- Support the implementation of green roofs, afforestation of brown- or greyfield sites, road diets, modifying zoning setbacks (or downzoning), land assembly, or strategies to increase the density of urban forest on existing lands where appropriate.

E. Conserve or replace sufficient greenspace to sustain the urban forest, with particular attention to the needs of large canopy trees.

F. Develop a biodiversity strategy, including measurable objectives for the protection, recovery or enhancement of sensitive ecosystems, species at risk and other important flora and fauna.

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

H. Measure and report on the scope and value of ecosystem services provided by the urban forest on both public and private lands. Communicate this information as part of a broader effort to engage and educate the community on urban forest values and benefits.

Recommendations for Public Lands

I. Ensure that operational resourcing levels keep up with increases in the public urban forest inventory and its associated support services over the entire life cycle of the asset.

J. Systematically map and measure the urban forest on public lands, identifying sites for new planting.

K. Complete and implement the 5-year Municipal Forestry Plan for the Parks Division.

L. Develop a Tree Risk Management Program for public trees (including a Comprehensive Tree Risk Management Policy and Strategy).

M. Manage existing mature street trees so as to extend their Safe Useful Life Expectancy (buying time for newer trees to develop and contribute meaningfully to the urban forest canopy).

Opportunities for Public Lands

- Upgrade the Municipal Tree Inventory Management Software, ensuring that key data are shared seamlessly with the City's broader Asset Management System.
- Develop GIS capability (in-house or external) for mapping canopy cover, leaf index, topography, site classifications, habitat suitability alien invasive species distribution and other natural system attributes.
- Work with the University of Victoria to pilot use of multi-spectral analysis, LIDAR mapping and three-dimensional modelling of the urban forest.

N. Continue a vigorous street tree replacement program, selecting species and locations so as to
   - maximize species and age diversity,
   - be ready for future climates,
   - minimize nuisance and risk,
   - minimize maintenance costs, and
   - maximize green infrastructure and other benefits.

O. Make young tree care a high priority within the municipal forestry program.

P. Make use of opportunities to "piggy-back" multiple functions into public spaces (e.g., transforming greenways into productive ecosystem corridors as well as attractive transportation corridors for pedestrians, cyclists and electric wheelchairs).

Recommendations for Privately Owned Lands

Q. Revise the Tree Protection Bylaw to address the removal of young (non-protected) trees and increase replacement tree ratios and compensation levels.

R. Develop a program to identify and conserve heritage and other significant trees and landscapes throughout the city, with particular attention paid to remnant Garry Oak ecosystems.

S. Consider a pilot project to encourage homeowners to 'host' public trees in their front yards, in areas where there is a high level of conflict between street trees and underground services and infrastructure.

T. Work on Local Area Plans should consider the development of guidelines and standards for permeable areas and urban place-based forest design.

U. Increase community support for the urban forest.

V. Empower homeowners to make good urban forest decisions on their property.

Recommendations for Private Lands under Re-development

W. Develop urban forest design guidelines for new developments specific to each UPD. Guidelines should address desired functional objectives, landscape attributes, appropriate stocking levels, soil volume, and plant selection considerations as well as growth and densification objectives.

X. Consider establishing minimum stocking levels for new development to meet UPD-specific urban forest objectives.

Y. Develop landscape design objectives that address urban forest or green infrastructure policy objectives, and include these as conditions to which a building, development or rezoning permit will be subject.

Z. Improve oversight of landscape design, planting and construction on redevelopment sites to ensure that the City's design guidelines are met.

Opportunities for Privately Owned Lands

- Inform and engage the local community when removal of a sensitive tree is necessary.
- Communicate the values of the urban forest through the City website, stewardship projects, regular media spots and events such as Tree Appreciation Day and school outreach programs.
- Celebrate community stewards and examples of excellence in urban forest enhancement and management through awards, festivals and media coverage.
- Provide homeowners with access to knowledgeable staff or volunteer resource people, who can provide information on appropriate plant choices, tree care, etc. A regular phone-in radio spot might prove popular.
- Provide free tree care or landscape restoration for homeowners who have a significant tree or significant ecosystem on their property.

Opportunities for Lands Under Re-development

- Ensure that guidelines for landscaping of new developments are considered through an 'urban forest' lens to optimize functionality.
- Implement landscape plan checking or quality assurance for a representative sampling of new development applications.
- Ensure that new tree plantings are verified post-installation.

APPENDIX A: PUBLIC CONSULTATION PROCESS

This Master Plan process began with a request from the City's Parks Department to develop a systematic plan to address a range of challenges within the department's municipal arboriculture program, including the administration of the City's private property tree protection bylaw. In discussion between the City and consultants, it became clear that this work should be prefaced by a broader approach that engaged both the public and other City departments.

A Steering Committee, comprising representatives from neighbourhood associations, landscapers, developers, conservation organizations, and others has helped to identify issues, values, goals and strategies. An Inter-departmental Committee from various City departments has also helped to guide the process and frame some of the issues and challenges facing the City. In addition, this plan draws heavily on best practices from across North America.

Public workshops were held in January and June 2009 to provide the public with an opportunity to comment on issues, values and their vision for the future urban forest, and to review a draft plan. These consultation sessions were combined with online and hardcopy surveys that gathered additional information and feedback from the public. A report summarizing the public input can be found at www.victoria.ca/urbanforest

APPENDIX B: CANOPY COVER TARGETS

An increasing number of communities are establishing canopy cover targets as part of their efforts to secure the long-term future of their urban forests. While this trend is generally considered to be a positive step forward, care must be exercised. Such targets must be achievable and sustainable. It is important in developing canopy targets that other public values and policy priorities are considered. Nevertheless, it is important work and should be considered one of the core tasks of the Action Plan.

The following approach is recommended for developing canopy cover targets for the city.

- Targets for canopy cover should be developed in conjunction with urban forest health objectives (discussed in the Challenge Section 1.6.2 "Optimizing Urban Forest Health").
- Targets for canopy cover should be developed first for each of the city's Urban Place Designations. These may then be aggregated to provide a city-wide target number. This step is essential, as each UPD presents different constraints and opportunities for urban forest structure. The treed environments within each UPD will also need to meet different functional expectations and be consistent with other strategic land use priorities and public policy. (See the discussions in Sections 1.1 "Strategic Direction" and 1.5 "Influence of Place on Urban Forest Character".)

With these caveats, it is interesting to see what guidelines and targets are being adopted by other communities.

American Forests, a leading urban forest management, conservation and research group, measured and analyzed tree cover in 440 communities with the assistance of the U.S. Forest Service. Through this work, American Forests has been able to quantify both the range and the value of ecosystem services associated with a given amount of canopy cover.

Their research recommends that a canopy cover goal of 40% would be appropriate for cities in the Pacific Northwest, varied as follows:

Suburban (mature residential) areas	50%
Urban residential areas	25%
Street R.O.W.s	25%
Central business districts	15%

Other sources calculate that in order to maintain healthy watershed function, a minimum of 45% tree canopy cover is required.[1] Victoria's

1 Centre for Watershed Protection, 2013. http://www.cwp.org/your-watershed-101/urban-watershed-forestry.html

canopy cover (which includes a mix of these land uses) is currently at about 18%.

- As part of its new Urban Forest Management Plan, the City of Seattle has developed canopy targets for each of its major land-use categories.

Land-use category	Current cover	Current trees	30-year cover goal	Estimated # of new trees to meet goal
Single-Family	18%	473,300	31%	350,200
Multi-Family	13%	103,400	20%	56,000
Commercial/ Mixed Use	8%	49,700	15%	44,400
Downtown Seattle	9%	9,700	12%	3,800
Industrial	8%	68,100	10%	18,100
Institutional Properties	15%	14,600	20%	5,000
Parks: developed sites	19%	90,000	25%	28,400
Parks: natural areas	64%	568,700	80%	143,200
Citywide	**18%**	**1,377,500**	**30%**	**649,100**
Transportation Corridors/ Street ROW	16%		24%	

- The City of Duncan's Urban Forest Strategy proposes a city-wide target of 40% canopy cover by 2050, with an interim target of 30% by 2020. These targets were based on the work of American Forests. An additional 3,729 trees are required to meet the 40% canopy cover target. By land use category, targets for Duncan are:

Zone	Canopy cover (current) %	Canopy cover (proposed)%
Commercial	8.5	15
Institutional, Active Parks	22	
Parks and playgrounds	52.5	
Residential	27.9	50
City-wide	25.8	30-40

- The District of Saanich currently has about 36% canopy cover. Their goal is “no net loss”, with an ultimate goal of growing the canopy cover (no specific target has been identified).
- Kelowna’s current tree canopy is only about 13%, on average, although it is estimated to have another 27% plantable space. Areas with the highest tree cover include vacant / wildland (23%), and agriculture and rural lands (15%), while the lowest cover (3%) occurs on land zoned as commercial / industrial and transportation. Kelowna’s overall target is 25% canopy cover. Kelowna faces significant challenges from the loss of about 80% of the more than 600,000 mature Ponderosa Pines to mountain pine beetle.
- Vancouver’s Green 2020 plan sets a target of a 40% canopy and calls for planting 150,000 trees – one for every four residents – by 2020.
- The City of Tacoma is moving toward a policy that requires proponents to achieve a specified minimum canopy coverage on new development sites “at maturity”. This policy represents a shift from their former approach of requiring a prescribed number of replacement trees (generally 1:1).
- The City of Lake Forest Park, WA., has adopted site-level canopy target guidelines for its community, using lot size as a basis for analyzing canopy and establishing targets.

APPENDIX C: SUMMARY OF GOALS, OUTCOMES AND STRATEGIES

During the development of the UFMP, many strategies were proposed by the project Steering Committee, Inter-departmental Committee, members of the public and members of staff. These ideas are captured and summarized below.

Goal 1. Develop and maintain strong community-wide support for the urban forest

Victoria's urban forest is recognized for its visionary approach and model management

- Complete an Urban Forest Action Plan that details how the master plan will be implemented and resourced
- Synchronize the goals, policy objectives and strategies of the UFMP with other City Plans
- Recognize the urban forest as a strategic part of the City's infrastructure
- Assign oversight responsibility for the Urban Forest Action Plan at a high organizational level within the City corporation
- Encourage an inter-disciplinary approach to achieving the goals and outcomes of the UFMP
- Incorporate continual learning and adaptive management techniques into the City's care and development of the urban forest
- Prepare regular reports (bi-annual?) on progress towards the UFMP goals and outcomes
- Incorporate UPD-specific urban forest design objectives and best practices into guidelines for new building and development. Guidelines should address canopy targets, functional objectives, green space, soil volume, stocking rates and desired landscape attributes

The urban forest is highly valued at all levels of the community

- Continue to build urban forest awareness and literacy. Find creative ways to engage and educate the community about urban forest values and benefits
- Illuminate the potential of the urban forest for achieving and enhancing other high-priority public policy goals
- Celebrate the urban forest
- Measure and publicize the full spectrum of ecosystem services provided by the urban forest, including their monetary value
- Children are encouraged to learn about and value the urban forest
- Provide safe opportunities for playing in and around trees
- Work with schools to promote early awareness of the urban forest
- Encourage youth participation in tree-related community events
- Provide outreach initiatives with other stewardship partners to recreational groups or activities based in forested environments (such as paint-ball, mountain biking or Frisbee golf) within the region. Focus on

education, best practices and impact mitigation

The urban forest is well resourced

- Develop long-term funding strategies for UFMP implementation
- Explore partnering opportunities with utilities, senior levels of government, the corporate sector, and educational and conservation organizations to leverage funding and program efficiencies
- Identify a rolling five-year budget and work plans for urban forest planting and maintenance
- Invest in staff training and development, new information technology and capital equipment that will measurably improve urban forest management performance outcomes and improve productivity
- Develop an urban forest stewardship website for the City and its municipal forestry program to communicate the goals, objectives and current initiatives of the program and provide on-line resources to the public

Victoria's urban forest connects us to heritage and history

- Provide information on the history of the urban forest in an engaging format (street art, greater use of interpretive signage, diaramas, animated web-based format, video documentary, etc.)
- Resurrect the City's Heritage Tree Program
- Support local tree celebrations and memorial programs (e.g. the Winston Churchill Boulevard Tree Memorial along upper Shelbourne Street; Lower Cook Street Serious Coffee Garry Oak Folk-Art celebration)
- Work with the Songhees people to restore one or more demonstration sites of traditional (pre-settlement) landscapes

Victoria's urban forest is managed to support and complement urban forest environments throughout the region and particularly in adjacent communities.

- Network effectively with neighbouring communities and other levels of government to achieve common goals and consistent approaches to stewardship, regulatory language, best practices and design guidelines
- Support the development of regional urban forest, biodiversity and watershed management strategies
- Where appropriate, encourage the vegetation of greenway and urban trail networks to serve as ecosystem corridors
- Partner with communities adjacent to Victoria on urban forest and other conservation initiatives that span both communities (e.g., Bowker Creek Watershed Restoration Initiative)

Goal 2. Protect, enhance and expand Victoria's urban forest

The urban forest is healthy, diverse and abundant across all areas of the City

- Develop measurable objectives and performance indicators for this outcome
- Develop measureable urban forest targets for each Urban Place Designation, neighbourhood and watershed within the city's boundaries. Targets should be developed for tree canopy cover, age diversity and species

diversity. Prepare corporate strategies for achieving these targets

- Identify the functional outcomes desired from treed environments within each UPD and develop the design guidelines required to achieve these
- Ensure that urban forest abundance, character and values are addressed as part of the local area planning process
- Measure progress toward this outcome and practice adaptive management when necessary to stay on track

Treed environments on private land continue to make a significant contribution to the urban forest

- Promote the benefits of trees to homeowners and businesses
- Provide incentives for tree retention and planting on private property
- Encourage participation in local urban forest planning and stewardship
- Develop strategies for achieving the green space necessary to meet the tree canopy goals of each UPD
- Provide effective outreach to local businesses and residents regarding urban forest stewardship objectives for their neighbourhood and what may be done to help achieve these
- Incorporate urban forest objectives into local development guidelines, particularly for landscaping
- Implement a process to review proposed landscape plans and constructed outcomes

The urban forest is well-managed on both public and private lands

- Synchronize the UFMP with other City plans, programs, policies, bylaws, permit processes and design guidelines
- Complete and implement the 5-year Municipal Forestry Plan
- Review the Tree Protection Bylaw to ensure that it optimally supports the policies, goals and objectives of the UFMP. Address issues of ongoing removal of young (non-protected) trees, low compensation/replacement tree ratios, and the inclusion of heritage/significant trees
- Develop procedures for conflicts and grievances related to urban forest management
- Prioritize municipal arboricultural resources toward young tree care and development
- Phase-out use of unqualified part-time staff for municipal tree care. Develop policy requiring use of ISA qualified personnel, standards and BMPs
- Review and update the policies and procedures for tree care for municipal tree management
- Help homeowners and businesses to use best management practices for tree planting and care

The urban forest is designed for longevity and resilience to threats such as climate change, development disturbance, or pest/disease outbreaks

- Focus on planting ‘the right tree in the right place’
- Provide space for root growth
- Follow best management practices for young tree care
- Continue and enhance the Integrated Pest Management program

- Select high quality tree stock that is adapted/resilient to future climate extremes
- Provide lists of species appropriate to different site conditions and applications on the City's urban forest stewardship website

Significant trees and landscapes are identified, abundant and healthy

- Inventory and map significant trees and landscapes within the city
- Consult with the public regarding the removal of trees of a significant or sensitive value to the community
- Provide support for maintenance of significant trees on private property

Goal 3. Design and manage the urban forest to achieve objectives for watershed health, biodiversity, and the conservation of sensitive ecosystems

Every watershed has sufficient urban forest cover to support the City's objectives for water quality, stream health and hydrologic function

- Work in partnership with the CRD and neighbouring municipalities to track and improve the functioning condition of watersheds, particularly those catchment areas feeding the Gorge Waterway, Cecilia Creek and Bowker Creek. Support a regionally coordinated, watershed management approach for these watersheds
- Provide tree canopy targets and afforestation strategies for the catchment areas within the City of Victoria that feed the Gorge Waterway, Cecilia Creek and Bowker Creek
- Use treed ecosystems to increase the amount and effectiveness of pervious surfaces
- Encourage use of rainwater best management practices and other treed green infrastructure on both existing and proposed development

The City's urban forest supports an abundance and diversity of native flora and fauna

- Provide a diversity of treed habitats
- A variety of treed environments connect larger, high-functioning natural areas, providing corridors for the migration of flora and fauna
- Increase habitat patch size as opportunities arise
- Encourage connectivity between areas of natural habitat through greenways enhancement and neighbourhood vegetation enhancement initiatives
- Use GIS Sensitivity Mapping to identify areas with high restoration and enhancement potential

At-risk species and ecosystems are recovered, protected and enhanced

- Work with conservation organizations, recovery teams and other level of government to identify and protect urban forest habitats that support species-at-risk recovery
- Develop a biodiversity strategy and action plan, including measurable objectives for the protection, recovery or enhancement of sensitive ecosystems, species-at-risk and other key flora and fauna.

- Ensure urban forest input into parks management and natural area recovery plans

Invasive species populations are maintained at or below designated thresholds within woodland and forest environments

- Develop a strategy for minimizing the introduction and spread of invasive species
- Identify areas of high priority for invasive species management
- Increase resourcing and pace of removal of high priority invasive species

Goal 4. Maximize community benefits from the urban forest in all neighbourhoods

The urban forest is recognized as a strategic asset of the city that provides multiple services and benefits

- Expand the range and density of urban forest cover within the city and across all UPDs
- Designate treed environments that function as green infrastructure on public lands as a public utility. Calculate and document the asset value of this resource
- Develop a policy of seeking multiple ecosystem benefits from new plantings of treed environments on public lands. Continue integrating treed natural systems into green infrastructure where advantageous to do so
- Provide information to help homeowners, businesses and developers to maximize ecosystem services from new plantings
- Identify and appraise the monetary value of ecosystem services associated with the urban forest on both private and public lands
- The built environment and urban forest support and enhance one another
- Where high-functioning treed landscapes are desired in close proximity to other city infrastructure (e.g. roads, medians, pedestrian thoroughfares, underground or above-ground services etc), integrate the planning and design of these environments to optimize performance outcomes and minimize conflicts
- Develop best practices and design guidelines for incorporating high-functioning treed environments into highly urbanized settings
- Reward new developments that significantly enhance the urban forest
- Provide incentives for developers to protect high-value treed environments

The urban forest has reduced the City's carbon footprint

- Identify the urban forest as a source of carbon credits and develop metrics for assessing and managing this benefit
- Identify those areas within the city that have the greatest afforestation potential
- Develop strategies for increasing the overall level of tree cover within the city
- Consider purchasing carbon offsets from communities with more forest lands and afforestation potential

The urban forest contributes significant and recognized economic benefits to the community

- Document the infrastructure value of the urban forest
- Design and manage parts of the urban forest to produce food
- Harvest the economic potential from specialty lumber and horticultural mulch
- Estimate the monetary contribution that the urban forest makes to enhanced real estate values, tourism and the city's ability to attract and retain new business and workers

The urban forest plays an integral part in the social and recreational life of the city, providing a safe place for the enjoyment of nature

- Design the urban forest to foster and enhance social gathering places
- Develop strategies to encourage safe and acceptable limits of use of treed environments on public property (e.g. by the homeless, for food production, climbing of trees, public events, etc.)
- Consider CPTED guidelines when designing treed areas around built environments

Residents enjoy significant health benefits from the urban forest

- Incorporate health objectives into the planning and design of new treed environments in the public realm, such as mitigating air pollution, volatile organic compounds, exposure to solar radiation and ultra-violet light, mental health benefits and encouraging more active lifestyles and modes of transportation
- Incorporate generous amounts of urban forest into the active transportation network

The urban forest is designed and managed to minimize risks and nuisances

- Develop a formal tree risk management program for the public realm
- Update the City's street tree inventory and risk assessment data
- Use best practices for tree selection, planting and early tree care in order to foster strong, resilient tree stock
- Encourage better integration of new tree plantings into the built environment by means of improved design guidelines, clear performance outcomes and best practices and a robust education and outreach program.
- Update the City's tree management software to better support tree and asset management (both in the field and in the office) and provide GIS capability
- Provide public outreach and education on tree risk management and other management objectives, such as biodiversity, wildlife habitat, heritage values, etc.
- Support the prudent management of nuisance and risk on private property through the use of ISA certified arborists, standards and practices

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