

PLANTING OUR FUTURE

A Tree Toolkit for
Communities



The Best Place on Earth

UNION OF
BRITISH
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Preface

Urban forests—the trees and treed environments in our community, often referred to as “urban forests,” are an integral part of communities across BC. They are a valuable part of the community infrastructure, returning \$2–\$5 in benefits for every dollar invested in them. Many of their values are beyond measure, such as community pride and the urban forest’s ability to store and sequester carbon as a buffer against climate change.

Yet it is not always easy to manage this resource. Urban forest values are often under-recognized and under-valued. It can be difficult to manage the urban forest in the face of threats such as wildfire and pests like the mountain pine beetle. For smaller communities, finding the staff with expertise to manage this resource can be a challenge.

This toolkit was designed to provide an overview of the tools and strategies that can be used to help communities to enhance the values in their urban forest and address some of the challenges. We hope that it will be useful for local government staff and politicians, community groups, First Nations and others who are trying to address the challenges of climate change and economic diversification, and working to improve the quality of life in their home town.

This document includes examples from communities throughout British Columbia and beyond who have developed successful strategies for urban forest management. We know that there are many others out there who have been equally successful, and we did not have room to include them all. If you would like to share your ideas and stories with others, please contact the Ministry of Community Development.

Trees for Tomorrow Website

This Toolkit and additional information on urban afforestation is available on the Internet at:

www.treesfortomorrow.gov.bc.ca

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Glossary

Arboriculture: Arboriculture is the art, science, technology and business of tree care, practiced by arborists. Arborists are trained to promote tree health, discern tree problems and take measures to correct them.

Climate change adaptation: Proactive measures to prepare for the expected impacts of climate change in that region, such as more intense wind- and rainstorms, less or more rainfall/snowfall, warmer or cooler temperatures.

Climate change mitigation: Proactive measures to reduce the long-term impacts of climate change, through reduction of greenhouse gases into the atmosphere.

Cultivar: A variation of a species that has been produced through breeding or deliberate selection.

Integrated Pest Management (IPM): A decision-making process that uses a combination of techniques to suppress pests and that 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.

Municipal Forestry: The practice of urban forestry on public lands and their treed environments, including parks and natural areas.

Plant Health Care (PHC): Plant Health Care involves monitoring, using preventive treatments, and adopting a strong commitment to working closely with tree owners. The objective of PHC is to maintain or improve the landscape's appearance, vitality and—in the case of trees—safety, using the most cost-effective and environmentally sensitive practices and treatments available.

Urban forest: The total collection of trees and associated plants growing in a city or town. It includes trees in parks and yards, along roadways and paths, and in other areas, both on public and private lands.

Urban forestry: Urban Forests is an internationally recognized term which is inclusive of the treed environments in communities of all sizes and compositions. By use of the word "urban," the phrase reflects habitation of a space by people and is not intended to reflect whether the space is densely or sparsely populated. An Urban Forest is the total collection of trees and associated plants growing in a community, and includes trees in parks and yards, along roadways and paths, and on public and private land.

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“Healthy urban forests can help municipalities achieve goals of environmental, social and economic sustainability while reducing greenhouse gas emissions and removing carbon from the atmosphere.”

ICLEI Local Governments for Sustainability



Introduction

“Urban forests” are an intrinsic part of cities, towns, villages, regional districts and communities of all sizes. (Yes, even rural communities have ‘urban’ forests!) They are made up of all the trees and treed landscapes within a community, both on public and private lands, from the downtown core to the rural headwaters of watersheds. A treed landscape includes not only the trees, but their soils and associated vegetation. These landscapes can be largely natural in character (such as a wooded stream bank) or well cultivated (such as a planted sidewalk boulevard). The diversity and mosaic of treed landscapes within a community brings an abundance of functions, values and benefits.

Planting our Future: A Tree Toolkit for Communities has been prepared to help communities in British Columbia (B.C.)—small and large, rural and urban—to maximize the values from their urban forests and address some of the challenges they may be facing. It provides an overview of the values and issues associated with treed environments in our communities, as well as a source of ideas and information. We hope that it will be useful for local government staff and politicians, community groups, First Nations and others who are trying to address the challenges of climate change and economic diversification, and working to improve the quality of life in their home town.



Climate Change and Urban Forests

Climate change is already affecting urban forests across B.C.. Warm dry summers are increasing the risk and frequency of wildfires. Warmer winters have allowed the proliferation of the mountain pine beetle, causing devastation to so much of B.C.'s interior forests. Changing weather patterns are stressing trees through too much or too little rainfall, temperatures that are too high or too low at certain times of year, and more frequent and intense windstorms. Climate change is impacting existing urban trees, while making it harder for new trees to survive in urban environments. Moreover, coping with the clean up of fallen and dying trees is stressing local government budgets, leaving less funding for the necessary replanting efforts.

- The tree canopy in the Greater Victoria area stores an estimated 3 million tonnes of carbon and sequesters an additional 23,000 tonnes each year.
- The City of Kelowna has used UFORE and STRATUM analyses (see page 13) to identify its potential energy and greenhouse gas savings.
- In the future, urban forests may become part of a community's strategy for greenhouse gas reductions or carbon trading. The California Climate Action Registry has approved an Urban Forest Greenhouse Gas Reporting Protocol to calculate carbon sequestration from urban forests in that State.

The Government of British Columbia's goal is to reduce carbon emissions by at least 33% below current levels by 2020, to reduce the amount and duration of global climate change. Many B.C. communities have signed the Climate Action Charter in support of this goal. We need to **mitigate** the impacts of climate change by reducing greenhouse gas emissions, but at the same time we need to plan for and **adapt** to the anticipated changes in climate. Urban forests help us to do both—if we plan carefully.

- Trees store and sequester carbon. Large healthy trees (over 75 cm diameter) sequester 90 times more carbon annually than small trees (less than 10 cm diameter).
- Trees reduce energy consumption, and thus the consumption of fossil fuels. Energy reductions come from shading, windbreaks and encouraging a pedestrian friendly environment.
- Trees can help communities adapt to climate change impacts. Carefully chosen and placed trees can reduce summer heating impacts, absorb and slow water from rainstorms, and buffer windstorms.





Values and Benefits

Trees are more than just ‘a pretty face’.

Carefully-designed and well-managed treed environments can play a significant role in creating livable and sustainable communities that attract and retain business and workers. For every \$1 spent on them, trees give back \$2–\$5 in benefits to the community.

“A healthy urban forest is one of the only municipal capital investments that will appreciate in value over time.”¹

ICLEI Local Governments for Sustainability

Community Benefits

Trees:

- **Create livable communities.** Surveys show that trees are extremely important to residents’ quality of life and sense of civic pride.³
- **Are good for business.** Shoppers will visit more often, linger longer, are willing to pay higher prices for goods (7–10% more), and spend more money overall on streets with trees.⁴
- **Encourage people to visit.** People judge your community as they drive by, deciding whether to visit. Visitors perceive communities with more green space and vegetation as having better business quality, more shopping convenience and lower crime.⁵
- **Reduce stormwater costs.** Street tree canopies intercept rainfall, reducing the amount of stormwater to be handled. For every 5%

of canopy cover, stormwater is reduced by 2%.⁶ Stormwater savings for the District of Sooke (population 9,700) are estimated at over \$11 million per year.⁷

- **Prolong the life of pavement.** Shade trees reduce summer surface temperatures, increasing pavement life by 10–25 years for roads and parking lots.⁸
- **Make communities safer.** Treed communities have lower levels of domestic violence and safer, more sociable neighbourhoods.⁹ Roadside trees reduce the speed of traffic, reduce crashes and injuries, and reduce driver stress and frustration.¹⁰
- **Reduce the heat island effect.** On hot days, downtown areas can be up to five degrees Celsius hotter than surrounding forests. Trees provide shade and cool the air through evapotranspiration.

Resident Benefits

Trees:

- **Increase property values.** Trees increase the value of homes by 3–6% (or more). Commercial real estate values increase with high quality treed landscaping, with rental rates about 7% higher.¹¹
- **Reduce energy bills.** Shade trees reduce the demand for summer air conditioning. Trees placed as windbreaks can reduce winter heating costs by up to 25%.¹²
- **Reduce noise.** Leaves, twigs and branches buffer and reduce sounds, replacing noise from busy highways with sounds of leaves and bird song.

Environmental Benefits

Treed landscapes:

- **Support biodiversity,** providing food and shelter for a variety of birds and other wildlife. Some treed ecosystems provide habitats for species at risk, such as the Lewis’ Woodpecker nesting in a city park in Grand Forks.

- **Support ecosystem functions.** Trees play a fundamental role in the circulation of important chemical elements (such as nitrogen, carbon, oxygen and water) within an ecosystem.
- **Help to control erosion and sedimentation.** Tree roots bind the soil, an especially important role on steep slopes and riparian areas.
- **Help to protect streams and other aquatic habitat.** Trees in riparian areas are essential for healthy streams; providing shade, nutrients and coarse organic debris, while protecting streambanks from erosion.
- **Conserve and enhance soil productivity** by enhancing biological activity (bugs, bacteria and fungi) and the ability of the soil to take up, store and clean rainwater. Certain tree species (e.g., Black Cottonwood) are prized for their ability to remove heavy metals and toxins for the soil.
- **Support sustainable transportation.** Urban forests—including street trees and parks—encourage people to get out of their cars and walk or bike.

The larger trees grow, the more they are worth. Average annual net benefits are \$1–\$8 for a small tree, \$19–\$25 for a medium-sized tree, and \$48–\$76 for a large tree. This is because larger trees are better at providing shade, sequestering (taking up) carbon, reducing stormwater flows and reducing air and water pollution.²

Health Benefits

Trees:

- **Provide air to breathe.** A single mature tree can provide enough oxygen for two people for a year.
- **Improve air quality.** Shade trees reduce temperatures, slowing the formation of ground-level ozone (smog). Tree leaves absorb airborne pollutants such as sulphur dioxide, as well as filtering particulate matter from the air. A mature tree absorbs 54–110 kg of small particles and gases of air pollution each year.¹³
- **Improve water quality.** Tree roots take up potentially harmful chemicals such as nitrates, phosphorus and cadmium that would otherwise enter groundwater and streams.
- **Provide stress relief.** Desk workers who can see natural areas report greater job satisfaction and have 23% fewer sick days.¹⁴ Hospital patients with views of trees recover significantly faster than those without such views.¹⁵ Children with ADHD show fewer symptoms if exposed to natural settings.¹⁶
- **Provide recreational and educational opportunities.** Treed parks provide great places to go for a walk, teach kids how to recognize different trees and birds and maybe even climb a tree or two.

Think about where and how to plant trees so they will provide you with the maximum benefits.





Issues and Challenges

Despite the many values inherent in our treed landscapes, they are complex environments to manage in the 21st century.

Nuisance

Trees that are mis-managed, badly situated or poorly regulated can become a nuisance.

- Tree roots and branches can conflict with underground or overhead utilities.
- Residents may be unhappy when sap covers cars, leaves clog drains, or pollen creates dust or causes allergic reactions, or concerned that large trees near homes will fall in high winds.
- Fruit and berry-bearing trees can attract bears, raccoons and other wildlife.

Tree Loss

We are losing tree cover (and its benefits).

- Treed landscapes are being lost to greenfield and in-fill development, golf courses, agriculture, roads and other uses.
- Natural hazards such as mountain pine beetle, wildfires and windstorms have devastated large parts of B.C.'s urban forests. Climate change will likely bring new pests and diseases that will further threaten urban forests. Finding sufficient, suitable tree stock for replanting activities may be difficult.
- Lack of species diversity—such as rows of elms along highways—is not directly a cause of tree loss, however when a disease such as Dutch elm takes hold, it spreads quickly and can cause

massive tree loss.

- Invasive species such as English ivy are contributing to tree loss and ecosystem impacts.
- Trees are removed on private lands for safety, creation of views and personal preference. Planting of new trees on private land is generally not keeping pace with tree loss.

Planning Challenges

The villages, towns and cities of tomorrow are likely to look and function differently than they did in the late 20th century, as we become a more urbanized nation. Treed environments that 'grew up' during the post-war period will not necessarily fit the landscapes of tomorrow.

- Urban forest decisions are generally made on a case-by-case basis, with no integrated, landscape-level planning. Communities often lack information on the extent of the current urban forest, and how it is changing—and gathering inventory information can be expensive.
- Protecting and restoring mature treed ecosystems is more effective than planting small new trees that will take many years to mature. However, local governments have only limited ability to require tree retention during development, and purchasing these lands can be prohibitively expensive.
- As infill and re-development takes place, small homes are replaced by much larger houses that fill the lot, shrinking the greenspace that was once available for trees. Cumulatively, the loss of space for the urban forest can be significant.
- Bylaws and policies may be outdated or inadequate, unclear or conflicting, or there may be insufficient enforcement to make them useful.
- Competing interests and values among community members can make planning challenging.

Management Challenges

- Management of the urban-wildfire interface is challenging. More human activity increases the risk of wildfire and increases the expense of fire-fighting because of the need to protect human life and property.
- The current urban forest may include tree species that have been planted poorly or in an inappropriate location. This can result in concerns such as a reduced life-span, structural failure, conflicts with utilities, difficulty in snow-removal or grass-cutting, or pavement lifted by tree roots.
- Many communities have large stands of street trees that are even-aged and likely to fail within a similar timeframe. Unless replacement planting has taken place, significant public reaction to the loss of a large number of trees at once may result.
- Issues of risk, liability and public safety can be of great concern.
- Available resources (staff with expertise, training, and dollars) may be inadequate to address planning and management needs, especially in smaller communities.
- Ideally, urban forests should be managed as a

whole unit. This can prove difficult when one forest stretches over multiple jurisdictions with differing bylaws and policies.

Communication Challenges

- Lack of public support for urban forest initiatives can be a significant challenge in some communities. In small resource-based communities surrounded by trees, bringing trees into downtown and residential areas may not seem like a priority.
- Public support—from residents, businesses, and community groups—may be hard to acquire. Most people take their urban forest for granted, and rarely think about what it is worth or how to manage it as a whole. Public education programs are worthwhile but take time and commitment.
- Often one department (e.g., Parks, Public Works) is responsible for trees, but other departments (e.g., Planning, Engineering) are responsible for decisions that affect the urban forest.
 - There may be multi-jurisdictional challenges, for example between

regional districts, municipalities, First Nations, Tree Farm Licence holders, and private land managers.



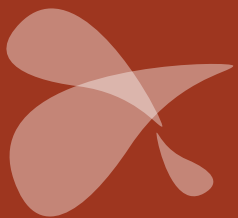
Challenges for Revelstoke

An urban forestry study by the City of Revelstoke identified about 40 different concerns relating to the management of their urban forest, including lack of funding, lack of public information, managing the wildfire interface and dealing with nuisance issues such as bears and fruit trees.¹⁷



Inventory

- The City of North Vancouver used the STRATUM program to analyze the community benefits of their urban forest, estimating that the total value for the City is over \$400,000 per year.
- The City of Kelowna parks department has developed a customized inventory program to manage its urban forest.
- The Central Okanagan Regional District used TEM mapping to prepare a Sensitive Ecosystems Inventory. This was used as a basis for identifying development permit areas and setbacks around riparian areas and other sensitive ecosystems including woodlands and forests.
- The public can also play an important role in the mapping and inventory work. The City of Cranbrook's Communities in Bloom volunteers helped to catalogue that community's trees, and enter the information into a GIS database.



Tools

Local governments have various tools at their disposal to help them to protect and enhance their urban forest.

Inventory and Mapping

Public trees must be actively managed for health, risk and cost. Mapping and inventorying the urban forest is a fundamental requirement for effective management, providing answers to such basic questions as:

- How much urban forest do we have?
- How is it changing over time?
- What types of treed environments are found within our urban forest?
- What are their qualities, functions and benefits?
- Where are they located?
- How do they relate to one another?
- What condition are they in?
- Where do safety hazards exist?

A number of 'off-the-shelf' software programs are available to make the work of measuring, analyzing and managing the urban forest both practical and efficient (see Table 1). Some programs are made for a Windows environment; others need Geographic Information Systems (GIS) software.

Many communities are moving to GIS systems to help manage their asset base. Software purchases contemplated to assist with the management and planning of urban forest resources should be GIS-based, if possible, to allow for easy integration with information from other departments such as Parks, Planning and Engineering.



Table 1

Program	Notes
TreeWorks ¹⁸ (The Kenerson Group)	A widely-used, ESRI-based software for GIS environments. Focus on street trees
Canopy Tree Module ¹⁹ (Arbor Vision)	Can be used in a Windows environment. Arbor Vision has also recently released a module that will allow Canopy to interface with GIS systems. Focus on street trees.
Tree Keeper ²⁰ (Davey Tree)	A web-based street tree management software.
STRATUM ²¹ (Street Tree Management Tool for Urban forest Managers) (Center for	A Windows- or GIS-compatible software that has been developed to assess, quantify and assess valuation metrics to the ecological functions of street trees.
Urban Forest Research	
UFORE ²² (Urban Forest Effects) (U.S. Forest Service)	Can operate in either Windows or GIS. A powerful software for the quantification and analysis of a range of landscape-level attributes and functions of the urban forest. Data is collected by ground-based field inventory.
CITYgreen ²³ (American Forests)	A GIS application produced by the largest non-profit conservation group in the U.S.A. for use by local government and community groups. CITYgreen is designed to assess and calculate the dollar-value of a broad range of natural services provided by urban forest canopy, such as stormwater management, energy conservation or air or water quality remediation.
Vegetation Resources Inventory Protocol ²⁴ (B.C. Ministry of Forests)	Developed to classify and map distinct forest stand-types and associated vegetative communities. This protocol has the potential to be of use in undertaking similar classification work in the urban environment.
NCDC Imaging ²⁵	This Native American company focuses on the provision of geospatial mapping and vegetation inventory services for natural resource management.
Biogeoclimatic Ecosystem Classification and Terrestrial Ecosystem Mapping (TEM) ²⁶ (B.C. Ministry of Forests)	Useful to urban foresters who are interested in understanding what type of vegetation a particular site may be predisposed to, given its particular climatic, topographic, soil and hydrological characteristics.





Planning Tools

Urban Forest Management Plans provide an approach to reviewing, planning and managing the urban forest. This is a community-wide framework for action, including both public and private lands. The process to develop an Urban Forest Management Plan is described in more detail later in this section.

Care should be taken not to confuse municipal forestry with community-wide urban forest planning. The term “**municipal forestry**” refers to the practice of forestry on public lands and their treed environments, including parks and natural areas. **Municipal Forestry Work Plans** are detailed operational plans for the management of treed environments on public lands. They address management of trees on street right-of-ways, treed environments around public buildings and lands, and treed environments found with community parks, ravines and natural areas. An important part of municipal forestry operations is the practice of **arboriculture**—the care of individual trees, generally on street right-of-ways and parks. These operations include individual tree assessments for health and condition, risk management, tree pruning, removal and replacement, and pest and disease control.

The Urban Forest Management Plan and Municipal Forestry Work Plan are critical tools, but urban forest management should also be an integral part of a variety of plans and strategies.

- **Regional Growth Strategies** and **Official Community Plans** set the framework for urban forest management by setting out community goals, directions for development and protection of environmentally sensitive areas.
- **Local Area Plans** (or **Neighbourhood Plans**) provide more localized guidance, and could identify plans for planting, ecosystem restoration or protection of treed areas.
- Supporting documents such as **design guidelines** should address ways to include tree planting as part of streets and subdivisions.
- **Parks master plans, greenways plans** or **natural areas management plans** can be used to identify opportunities for tree protection or planting on public lands. Parks Master Plans should also show how parks environments will relate to treed environments adjacent to them.
- Other community plans such as **Integrated Stormwater Management Plans, watershed management plans**, and **restoration plans** may also influence the urban forest. For example, trees can play an important role in stormwater management.
- Some communities manage community forests, and will have a **Community Forest Licence Management Plan** (or similar document) specific to their planning and management, with emphasis on the working forest, wildfire management, recreation and/or restoration.



Preparing Urban Forest Management Plans

Developing an Urban Forest Management Plan allows you to step aside and take a good look at what you have, what you would like to have, and how to get there.



Current urban forest

Urban Forest Management Plan:

- Principles
- Inventory & situation analysis
- Vision & goals
- Gap analysis
- Strategies
- Implementation of strategies
- Monitoring and evaluation

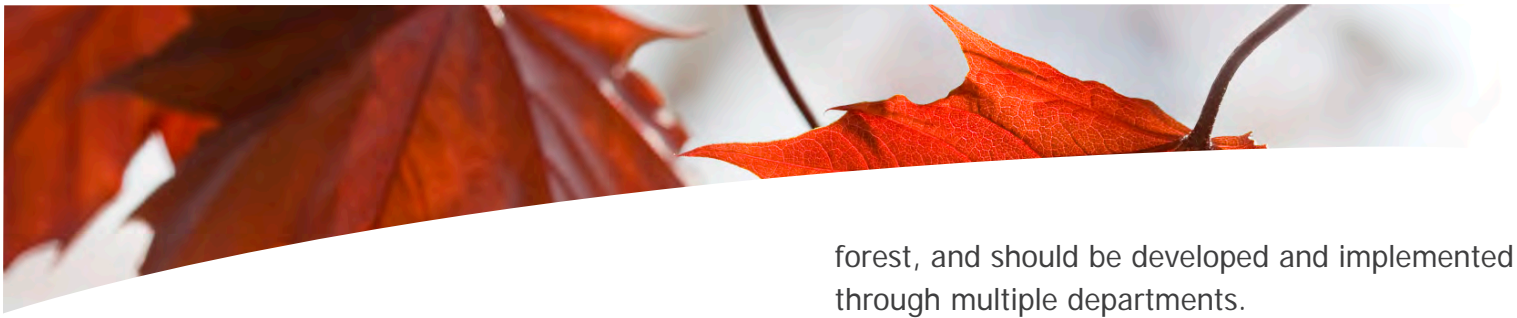


Desired urban forest
(as described in the
vision and goals)

This type of plan provides overall direction for the management of trees and treed environments. The scope of the plan may vary, but should address trees on private land as well as public lands. It could be a simple plan, perhaps two–three pages, that addresses some key questions in your community, or may be a more extensive effort. Hopefully, the information on the next few pages will help you to think through the issues and values related to trees in your community, and provide you with a roadmap for action as well as identifying how you are going to achieve your goals.

Benefits of developing an Urban Forest Management Plan include:

- Improved understanding of the current urban forest in your community and its values;
- Engagement of the public in discussions about the future of the urban forest;
- Engagement of council and staff from different departments in discussions about the future of the urban forest;
- Opportunity to maximize the benefits of the urban forest;
- Identification of resources (staff and dollars) to enhance the urban forest; and
- Reduced costs through streamlining of tree maintenance and enhancement activities.



forest, and should be developed and implemented through multiple departments.

Principles

Principles on which the Urban Forest Management Plan is based will vary by community, but will likely include the following.

- **Public engagement.** The urban forest is a community resource, only a portion of which is directly managed, impacted or otherwise influenced by the local government or First Nation. If the community can learn about the urban forest and articulate a vision of what they want their urban forest to be and do, then governments are better positioned to develop a plan for ensuring that they can meet their stewardship responsibilities.
- **A landscape-level approach** to the management of the urban forest. Urban forests are a mosaic of treed environments that span administrative boundaries. The Urban Forest Management Plan should address both public and private lands, as well as addressing cumulative impacts of tree decisions on the critical, landscape-level ecosystem functions.
- **An integrated approach.** A community's tree resource is influenced by many different decisions, such as land-use planning and regulatory decisions made by council and the planning department, or the decisions made by Public Works relating to overhead or underground services that impact trees. The Plan should address all aspects of the government's interaction with the urban

Situation Analysis

In developing an Urban Forest Management Plan, it is useful to begin with a look at the status quo, and the foreseeable influences that are likely to affect the urban forest. This is much easier if you have some preliminary or more detailed mapping and inventory of your urban forest. For more information see page 13.

A useful approach is to conduct a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The purpose of this is to dispassionately look at your urban forest asset, and assess its current strengths and weaknesses, and opportunities and threats (challenges) for the foreseeable future. Table 2 shows the results of this type of analysis for the City of Portland, Oregon.

A significant threat comes from the impacts of climate change. Regions of B.C. that anticipate more summer drought will have to transform the urban forest to species that are drought-adapted. Other climate change impacts—such as increased rainfall, warmer winters, increased frequency and intensity of windstorms—will all have to be identified and addressed as part of the Plan. At the same time, trees provide an opportunity to help communities cope with climate change. With careful thought, trees can be planted to provide shade or windbreaks, or where their canopies and roots will intercept stormwater.

Community Vision and Goals

The **vision** describes what you want your community to look like in the future—usually 5, 10, 20, 50 or even 100 years down the road. Because of the length of time it takes trees to grow, your urban forest vision should be focussed at least 20 years into the future.

Questions to ask when forming your vision include:

- What timeframe is your vision for?
- What do your residents want to see for the future urban forest? Public consultation during the development of the vision helps to obtain public support for the urban forest program; and
- What do council (board) and staff want to see? (include staff from all local if possible).

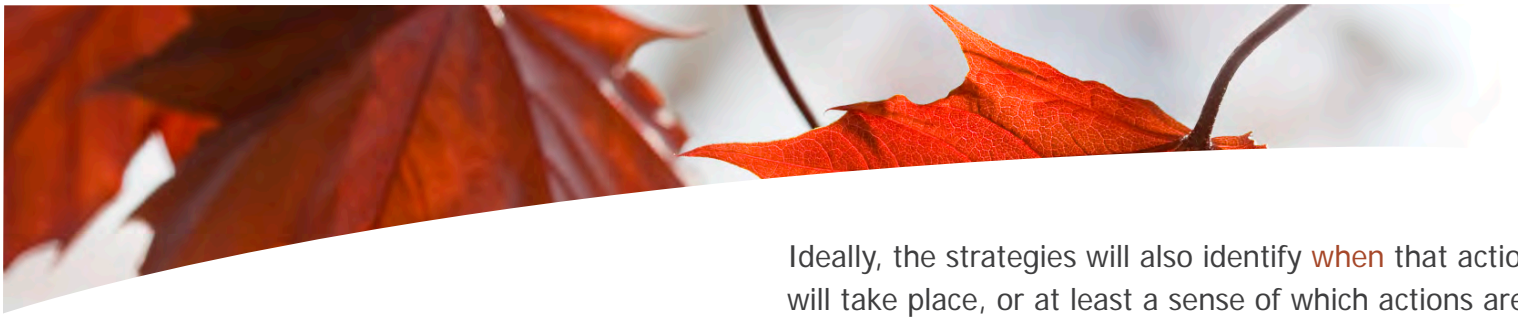
The **goals** describe how you will achieve the vision. Although still high-level, these are more specific statements about the actions that you want to take. Some communities choose also to identify objectives—more specific, measurable tasks to achieve the vision and goals.

Questions to ask when forming your goals include:

- How can we build on our strengths and opportunities?
- How can we address weaknesses and threats?
- What can we reasonably afford to do?
- What will provide quick results? What might take more time, but yield better results in the long run?

Table 2: SWOT Analysis for Portland

<p>Current</p>	<p>Strengths Good climate for trees</p> <ul style="list-style-type: none"> • Active Urban Forestry Commission • Local expertise • Effective revegetation programs • Protection through ordinances (bylaws) • Residents engaged and supportive 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Different city departments with sometimes incompatible goals • Urban forest unevenly distributed • Lack of coordinated information on urban forest quality and quantity • Few places for large canopy trees • Funding sources not stable • Lack of regulation enforcement • Tree removal without replacement
<p>Future</p>	<p>Opportunities</p> <ul style="list-style-type: none"> • Many areas suitable for tree planting • Many remnant stands that could survive with good management 	<p>Threats (challenges)</p> <ul style="list-style-type: none"> • Increased development density, more impervious surfaces, pressure to develop on hillslopes and stream corridors • Invasive, non-native plants • Pests and disease • Wildfires



Gap Analysis

The gap analysis allows you to look at the ‘gap’ between what you want (the vision and goals) and where you currently are (as identified in the inventory and situation analysis). The strategies will need to address how to bridge those gaps.

Developing Strategies

The next step is to flesh out strategies for meeting each of your goals. The Urban Forest Management Plan should identify how to build on strengths and opportunities while overcoming weaknesses and threats.

Typical strategies might address some of the following.

- Issues management (wildfire, pests and diseases, invasive species, conflicts with utilities);
- Risk management and public safety;
- Urban forest retention and enhancement (planting, sources for tree stock, maintenance);
- Bylaws, policies, enforcement, incentives;
- Public engagement and education, opportunities to celebrate trees; and
- Resourcing (people and dollars), staff training.

The strategies will need to identify **who** is responsible for carrying out that strategy. Some may be the responsibility of one or more municipal departments—planning, engineering, public works or parks. Some may be led by community groups or the private sector.

Ideally, the strategies will also identify **when** that action will take place, or at least a sense of which actions are high or low priority. This also helps when you review the Urban Forest Management Plan to identify which aspects you are succeeding in and where you will need to make adjustments to the Plan.

Samples of strategies are provided in “Strategies” starting on page 23. For each of the strategies, you may want to develop a list of tasks and timelines, and identify the resources needed to carry out those tasks. You may also want to identify measures of success through indicators and targets.

Regulatory Tools

Trees on private property are an important component of urban forests. In some communities, 80% or more of the urban forest may be located on private land. Bylaws and incentives are the ‘sticks and carrots’ for local governments to manage trees on private lands.

Filling the Gaps

The City of North Vancouver identified an issue with unsanctioned mountain bike trails and bike stunt structures that were degrading the forest understorey and causing soil erosion. They proposed several strategies to address this, such as large rocks and ‘armed’ plants (such as salmonberry) to block access to the trail and signage. If these are not successful, fencing will be installed.



Tree Protection Bylaws

Tree bylaws are as variable as B.C.'s communities. Some tree bylaws apply to all tree species, some apply only to heritage trees, trees of a certain species or diameter, or just trees in some parts of the community. Some communities have no tree bylaws at all. Tree bylaws are often controversial—some residents would rather there were no controls over trees on their property; others feel that there should be strong controls over tree retention and cutting.

Municipalities have several powers to regulate, prohibit and impose requirements through tree bylaws that apply to private lands.²⁷ These bylaws can:

- Specify the tree species or size of tree to which the bylaw applies;
- Prohibit or restrict tree cutting in specified areas (e.g., steep slopes, riparian areas, environmentally sensitive areas);
- Prohibit or restrict the cutting or damaging of significant trees (e.g., designated heritage trees, trees over a certain size or age, wildlife trees);
- Establish conditions for tree-clearing during development;
- Establish conditions for tree replacement and set fees and penalties.

These bylaws would not apply if it would prevent someone from developing to the permitted uses and densities set by the zoning bylaws, unless this can be negotiated through compensation or similar incentive (e.g., increasing allowable density elsewhere). Exemptions can also be made for the removal of hazardous trees.

Regional districts also have some powers related to tree cutting, but they are restricted to lands that are considered subject to flooding, erosion, or terrain

hazards. For more information on tree protection and other bylaws see Green Bylaws Toolkit.²⁸

Development Controls

Greenfield development that spreads into formerly forested areas creates several concerns:

- Greenfield developments are a significant source of tree loss in many communities in B.C.;
- The new forest edge may be highly vulnerable, as the newly exposed trees have grown up in the interior of forests, and do not have a sufficiently strong root system to withstand high winds; and
- The wildfire interface creates a hazard for properties as well as the forested land.

These issues should be identified and addressed before approving new developments.

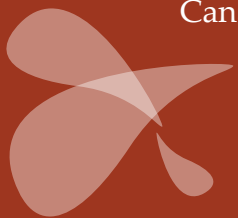




Bylaws and Incentives

- The City of Vernon prohibits damage or destruction of any tree over 8 cm at diameter breast height without a permit to do so. Hazard trees that are endangering people or property may be removed without a permit.
- The District of Highlands prohibits the cutting of more than two trees per year where slopes are greater than 30% in order to protect steep slopes.
- The District of Chetwynd has been given thousands of seedlings by the local sawmill which will be planted by community groups, businesses and residents as well as staff.
- Tree Canada sponsors Green Streets Canada, which recognizes communities for their innovative and creative urban forest programs. Recent winners include Burns Lake, Penticton, Kitimat, Prince George and Kamloops.
- “The community owns 100% of the urban forest... Benefits from the urban forest accrue to the community, not just the owner of the tree. Consequently, an informed and motivated community will be essential to any effective urban forestry program.”²⁹

Canadian Urban Forest Strategy



Other tools may be used to direct development away from forested, greenfield sites.

- **Zoning and Development Cost Charge bylaws** can influence the location and density of development.
- **Development permit areas** (identified in the Official Community Plan) allow the local government to set more restrictive guidelines on how development can occur, for example limiting the extent of tree removal.
- **Development permit information areas** allow the local government to require more detailed information before approving a development, for example on environmentally sensitive areas.
- Tools such as **clustering, density bonusing or density transfer** may be used to encourage developers to restrict development to less environmentally sensitive portions of a site.
- **Setbacks from riparian areas** will help to protect riparian forest.

Incentives

Some communities offer incentive programs that encourage tree retention and replanting such as:

- **Density bonuses** for developments that protect significant treed areas or include extensive tree plantings;
- **Free trees to residents** who wish to plant trees on their property; and
- **Legacy policies** that allow people to plant trees on public property in memory of loved ones.

These types of incentive program also have the benefit of encouraging public understanding and ownership of the urban forest.

Public engagement

Public engagement is a powerful tool. Community involvement in managing the urban forest can take place in many ways:

- **Consultation** during the development of the Urban Forest Management Plan. Residents are often passionate (and opinionated!) about their urban forest. Consultation helps to ensure their concerns are met and their good ideas are heard. It sometimes provides an opportunity to dispel myths;
- **Education** about tree management on private lands;
- Advice such as how to plant trees, species

Common Grounds

Through its Common Grounds program,³⁰ Evergreen Canada supports governments, community groups and other local partners to steward natural sites in urban communities across Canada. Some of their services include research, professional training, on-the-ground greening projects (including tree planting), and policy development and review.

Volunteers to plant and water

The City of Kelowna plants some of its trees through agreements with developers, partners and volunteer groups. Property owners next to new street trees are asked to help with watering, especially for the first few years and during droughts.

selection, guidelines for hazard tree management and removal, and identifying pests and diseases supports private landowner contributions to the urban forest;

- Residents are often eager to help with **tree planting** activities. It is a great opportunity to involve youth—and also to provide good photo opportunities;
- **Maintenance** of trees on public lands. Residents in some municipalities help by watering trees during early years following planting or in times of drought; and
- **Celebration** of community trees. Some communities celebrate a Tree Appreciation Day, sometimes with tree planting events. Kaslo, Osoyoos and Castlegar all celebrate Maple Leaf Day, the last Wednesday in September, during National Forest Week.

Other community resources include stewardship groups, business organizations, universities and colleges, and other levels of government.



Table 3: Sample Goals and Strategies

Goals	Strategies
Conserve existing treed environments	
Protect treed ecosystems and biodiversity	<ul style="list-style-type: none"> Identify areas with high ecosystem values Set aside intact ecosystems as protected areas Protect treed ecosystems during land development Protect trees on private land Retain existing trees on public lands, restore and enhance as necessary Design the urban forest to support biodiversity Retain wildlife trees Minimize impacts from invasive species
Reduce risk from wildfires	<ul style="list-style-type: none"> Assess the risk of wildfire Develop a Wildfire Management Plan Educate homeowners in the interface area
Reduce the risk of catastrophic loss from pest or disease outbreaks	<ul style="list-style-type: none"> Develop an Integrated Pest Management (IPM) Strategy Enhance species diversity
Manage for tree hazards	<ul style="list-style-type: none"> Assess tree hazards Develop a tree risk management policies Develop an emergency response plan Establish clear standards for reduction of tree hazards Minimize the risk of tree failure Communicate your intentions and reasons for hazard tree removal
Prepare and enhance the urban forest for the future	
Implement tree planting programs	<ul style="list-style-type: none"> Establish targets and standards for tree canopy cover Provide information to help people manage trees on private lands Require appropriate tree replacement by developers and homeowners Plan for succession planting in parks and on streets Ensure an adequate supply of nursery stock
Create space for trees in urban areas	<ul style="list-style-type: none"> Incorporate treed environments into planning and design Identify and acquire public lands suitable for new plantings Design streets and utilities to accommodate trees Allow space for trees to grow Design parking lots to accommodate trees Provide pervious pavement
Maximize potential values from tree planting	<ul style="list-style-type: none"> Develop clear planting objectives Design tree plantings for multiple benefits
Improve canopy coverage, urban forest productivity and longevity: Planting	<ul style="list-style-type: none"> Plant 'free-to-grow' trees Provide adequate volume for root growth Use structural soils
Improve canopy coverage, urban forest productivity and longevity: Maintenance	<ul style="list-style-type: none"> Follow maintenance best practices Establish a Plant Health Care (PHC) program for young trees Establish a regular inspection and maintenance cycle
Increase understanding and support for the urban forest	
Develop public understanding and support for urban forests	<ul style="list-style-type: none"> Provide information Provide opportunities for public learning and pride in urban forests Engage children and youth in the long-term management of trees
Develop strategic partnerships	<ul style="list-style-type: none"> Engage all departments in urban forest management Work with other governments and First Nations Work with businesses and community groups Work with educational institutions Create a multi-agency group to oversee urban forest planning and management
Provide adequate resources for urban forest planning, management and stewardship	<ul style="list-style-type: none"> Demonstrate the value in your urban forest Develop an Urban Forest Management Plan Work with stewardship groups and volunteers Leverage funding partnerships Consider options for utilizing urban forest products

Strategies

There are many strategies to achieve urban forest goals, limited only by imagination (and sometimes funding). This section outlines strategies to consider, together with examples of communities that are putting these ideas into practice, as outlined in Table 3.

Conserve existing treed environments

Goal: Protect Treed Ecosystems and Biodiversity

Existing treed ecosystems provide the greatest urban forest benefits to communities. Healthy, functioning and diverse ecosystems provide resilience for natural

- The Haisla First Nations in Kitimat Village are working on ecosystem assessment and restoration of forest lands. This work provides valuable employment in remote communities.
- The District of Ucluelet encourages developers to limit tree removal to 25% to maintain aesthetics and local character, disturbing the site as little as possible.³⁴
- Noting that “leaving trees does not equal preserving trees”, the City of Surrey requires that retention around a development or home be part of a complete landscape and drainage plan that considers all ecological characteristics of the site, and includes shrubs, ground cover and young trees.³⁵
- The District of Taylor has committed to planting 15,000 seedlings to combat beetle kill and mitigate historic forestry practices that have decimated trees on the Taylor plateau.

areas, wildlife and people, especially in the face of changing climates. Protecting existing ecosystems is much cheaper and simpler than trying to restore degraded areas.

Identify areas with high ecosystem values.

Mapping and inventories help to identify high value treed ecosystems. ‘High value’ may result from the size, age class and condition of the ecosystem, from its habitat value for wildlife (including species at risk), and/or from its connectivity with other high value areas.

- A Sensitive Ecosystems Inventory, combined with Wildlife Habitat Mapping, helped to identify conservation values and appropriate conservation area design for the Bella Vista – Goose Lake Range in the North Okanagan.³¹

Set aside intact treed ecosystems as protected areas.

- The Corporation of Delta uses Tree Protection Covenants to protect trees on private land.³³

Protect trees on private land through bylaws, policies, incentives and education programs

Protect identified areas of high value, together with restoration or enhancement work if necessary.

- The Naramata Rural OCP³² promotes a system of representative protected areas and biological corridors, including protection of trees within the Naramata townsite. The OCP policies encourage infill development to protect the integrity of agricultural and rural lands, and encourage conservation organizations to secure important habitat by means of acquisition, conservation covenants or other stewardship agreements.

Protect treed ecosystems during land development.

Retain complete treed ecosystems, including soils, plants, hydrology and other essential ecosystem features and functions. For more information on environmental protection during land development, see *Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia*.³⁶



- In the City of North Vancouver, trees will not be removed to create view corridors (although judicious pruning may be allowed), to reduce shade or due to nuisance factors (e.g., seeds, leaf litter). Tree removal petitions can be considered by the City if all neighbouring property owners are in support.³⁷
- The Bridge River Indian Band is working to replant a large part of their reserve lands near Lillooet that was burned by fire. The fire also burned more than 50 percent of the main community watershed of the Band and the Village of Lillooet.³⁸
- Sometimes forest restoration involves removing trees. In East Kootenay's Rocky Mountain Trench, fire suppression has led to forest ingrowth. A restoration project is removing excess immature and understory trees to create a complex, ecologically appropriate mosaic of habitats, with shrubland, open range, open forest, and managed forest.³⁹
- The Garry Oak Ecosystems Recovery Team works with garden shops on southern Vancouver Island to eliminate the sale of plants (such as English hawthorn) that can become invasive in native woodlands.⁴³



Retain existing trees on public lands as much as possible. Restore and enhance existing treed areas.

Design the urban forest to support biodiversity.

Clusters of trees are more valuable than individual trees standing alone, proving higher habitat values as well as allowing for better root systems that provide protection from wind, disease and drought. Include a diversity of sizes, species, and age class, as well as shrubs and natural ground covers. To bolster high species diversity, aim for multi-layer canopies that will contribute to high biomass and less maintenance during later states of succession.

Retain wildlife trees. Wildlife trees—standing dead snags—are of critical value to over 80 species of vertebrates, and innumerable insects, fungi, and lichens. While dead trees are a concern in urban environments, topping a dead tree can eliminate the safety hazard, while creating wildlife habitat.

- Top dead trees at five metres or higher and let them rot in place (if they will not pose a safety risk). Never top live trees, as this can weaken their structure and create a future hazard.
- Leave fallen dead trees in parks to provide food and habitat for wildlife. Remove smaller branches and twigs from fallen trees to reduce the wildfire hazard, but leave the main trunk to rot in place.
- Follow the Ministry of Environment's best management practices for tree removal in riparian areas.⁴⁰

For more information on wildlife trees see *Wildlife & Trees in British Columbia*.⁴¹

Minimize impacts from invasive species. Invasive plants are "any invasive alien plant species that has the potential to pose undesirable or detrimental impacts on humans, animals or ecosystems".⁴² They can dramatically change the ecology of treed ecosystems, resulting in loss of wildlife habitat and increased wildfire hazard. Animal species may also be invasive,

such as the grey squirrel which has become a common sight in many urban areas. Invasives are often introduced accidentally by homeowners. Education can help to reduce these accidental introductions as well as teaching people the best techniques for removal of invasives.

- The City of Nanaimo provides information on techniques for controlling invasive plants, including tips for planning an invasive species removals project, working with existing programs such as Volunteers in Parks, and guidelines for an invasive plant removal project.

More information on invasive plants and their management is available from the Invasive Plant Council of British Columbia⁴⁴ and Invasive Alien Plant Program Application database.⁴⁵

Goal: Reduce Risk from Wildfires

The threat of wildfires has become an increasingly important issue for growing communities with potential impacts to human life, property and the natural environment, as well as soil degradation and increased emission of carbon from burning of the biomass.

Assess the risk of wildfire and its potential impacts to your community. Identify factors affecting risk potential (e.g., landscape attributes, fuel load, number, distribution and location of potential targets, and emergency response preparedness) and conduct a hazard assessment to prioritize mitigation areas and procedures.

Develop a Wildfire Risk Management Plan that addresses:

- Fuel load reduction (removing potential ignition sources from the forest floor such as dry fallen trees or low branching deadwood) and vegetation management (clearing trees and vegetation within certain set-backs from buildings adjacent to woodland, in accordance with FireSmart BC guidelines⁴⁷);
- An Emergency Response Plan (e.g., appropriate

access routes, aerial support and other equipment, and water supply); and

- Guidelines for structural modifications

The Resort Municipality of Whistler has completed a Wildfire Risk Assessment. This identified several significant issues in the wildfire/urban interface area and crews have been working to reduce fuel loadings. The municipality created a defensible space between homes and forest which has also been of benefit to biodiversity. Whistler Fire Rescue are implementing a software program that allows firefighters to perform hazard assessments on individual properties, allowing them to better work with homeowners on risk reduction.⁴⁶

The City of Prince George's Wildland/Urban Interface Wildfire Management Strategy identifies areas at risk in and around the city. The management strategy provides recommendations for fuel load mitigation, risk management and actions for residents to reduce fire risk on their property. Prince George is clearing 10,500 cubic metres of dead pine from over 100 hectares of forest land to improve safety for park users and to reduce the chance of out-of-control wildfires.⁴⁸

(e.g., roofing, exterior siding, window and door glazing, vents and openings, adjacent combustibles).



The International Society of Arboriculture's Best Management Practices for Integrated Pest Management includes practices for designing, planning and implementing an IPM program within a landscape as part of a comprehensive Plant Health Care management system.⁵³

ICLEI Local Governments for Sustainability suggests that no more than 15% of trees planted in groomed parks and roadways represent any one genus, no more than 10% of trees represent any one species, and no more than 7% of trees represent any one cultivar.

In response to the mountain pine beetle epidemic, the City of Prince George spearheaded a three-year tree planting program "ForesTree Fest" (2005–2007) to replace trees lost on City property. Over 6,000 trees were planted in City parks, playgrounds and greenbelt areas. Tree planting took place under the direction and management of City staff to ensure that appropriate species were planted to ensure a healthy and diverse urban forest for the long term.

The City of Cranbrook has recently completed a geo-spatially referenced inventory and risk assessment of their entire public tree stock.

Educate homeowners in the interface area. Ensure key decision makers are fully informed regarding the importance, nature and risk potential for wildfire in your community. Educate homeowners in the interface area regarding risk assessment, planning and best practices. Coordinate wildfire assessment and response plans with other agencies (e.g., Ministry of Forests, regional districts).

Goal: Reduce the risk of catastrophic loss from pest or disease outbreaks

Province-wide insect pest infestations have fluctuated markedly in the last two decades. In the past eight years alone, the loss of timber due to mortality and growth loss from pest activity has increased 18-fold.⁴⁹ In 2007, the Intergovernmental Panel on Climate Change projected that, as a result of the mountain pine beetle, western forests are poised to become net sources of carbon emissions beyond 2020. Various root rots and other diseases also have a serious impact on mature forests as well as shaping the options for re-establishment of the new forest. Warmer winter temperatures associated with climate change are expected to exacerbate pest and disease problems that are normally kept in check by winter cold.⁵⁰

Develop an Integrated Pest Management (IPM) Strategy. Integrated Pest Management is a decision-making process that uses a combination of techniques to suppress pests and minimize reliance on chemical pesticides.

- Control beetle populations as prescribed by the B.C. Ministry of Forest's Provincial Bark Beetle Strategy.⁵¹
- Plant trees that comply with the Canadian Nursery Certification Institute's Domestic Phytosanitary Certification Program standards (DPCP)⁵² for tree purchases and supply.
- Contain nodes of infestation and remove infected plant stock.



Enhance species diversity as low diversity makes urban forests more susceptible to disease, insect infestation and the effects of climate change. Plant a range of tree species and avoid areas of monoculture. Native trees may be best adapted to local climate and soil conditions and are likely to offer the most suitable habitat for local wildlife. However, some native species may not be well adapted to future climates, while some cultivars may thrive better in harsh urban environments. Species should be selected carefully to avoid the introduction of invasive, non-native species.

Goal: Manage for tree hazards

A tree hazard exists when a tree or part of a tree, near to people or property, is at risk of failing.

Assess tree hazards. A tree inventory (page 13) will facilitate the assessment process and record keeping. Tree hazard assessment should be appropriate to the different scales of urban forest environments, the processes that affect them, and to the potential impacts from catastrophic tree loss.

Develop tree risk management policies to identify management and operational priorities as well as limiting liability. A municipal forestry work plan will help to address the many aspects of growing and maintaining public trees so that they remain healthy and risk averse.

Develop an emergency response plan to be able to deal effectively with a natural disaster that results in widespread tree failure or, over longer time horizons, the threat of widespread tree loss and failure.

Coordinate emergency response plans with adjacent local governments and the provincial government.

Establish clear standards for the reduction of identified tree hazards. Address intervention thresholds, response times, abatement decision-making criteria and options, and notification procedures. Ensure operational staff are properly qualified, trained and equipped and that health and safety plans are current and complied with. Establish an effective record keeping system and keep it up to date.

Minimize the risk of tree failure. Avoid inappropriate tree retention in new 'greenfield' developments on private property. Implement a regular inspection schedule for trees over 20 centimetres in diameter in parks and roadways for safety, health, and structure. Plant good quality replacement tree stock and observe best practices for its care and maintenance. Engage in regular preventative maintenance to optimize the health, safety and longevity of your tree stock.

Communicate your intentions and reasons for hazard tree removal. Some residents get upset when street trees are removed. Ensure that measures are put in place to adequately notify communities ahead of such work, or better yet work with neighbourhoods to develop a clear policy that sets out under what conditions trees will be removed and how they will be replaced. Educate home and landowners about the proper tree pruning and care of trees, both before and after extreme weather events.

Staff or sub-contractors responsible for the assessment of tree hazards should be certified in the 'Assessment of Tree Hazards in Urban and Urban-Rural Interface Areas'.





Prepare and Enhance the Urban Forest for the Future

Goal: Implement Tree Planting Programs

Tree planting programs will be an important part of replacing lost trees, and enhancing the urban forest. Aim to plant or restore complete treed ecosystems that address successional development of the plant community, keystone species, management of invasives and connectivity to other treed environments.

Establish targets and standards for tree canopy cover to provide a measure of success. Milestones are also a good measure of progress towards those targets.

Provide information to help people manage trees on private lands.

- The City of Surrey's website includes simple tree planting guidelines based on the recommended practices in B.C. Landscape Standards.⁵⁵

Require appropriate tree replacement by developers and homeowners. 'Appropriate' can refer to size, species, replacement ratio and location.

- In Surrey, developers contribute \$300 per lot for tree planting on boulevards following build out. This funding pays for planting as well as maintenance for the first two years.

Plan for succession planting in parks and on streets.

Many street trees are even-aged, single species stands that will leave a significant gap in the canopy if they all reach the end of their useful life within the same timeframe. Planting younger trees while older trees are still healthy helps to provide continuity in the canopy cover.

- The District of Sechelt has been actively planting street trees, with an average of 30–50 street

trees per year being planted along existing streets throughout the District.

Ensure an adequate supply of nursery stock.

- The Vancouver Park Board has established a nursery in Langley, where future street trees are purchased as inexpensive saplings and then grown until they have a trunk diameter of at least 5 centimetres.

Engaging community volunteers in tree planting and maintenance is also helpful.

The Greenprint program developed by the Sacramento Tree Foundation focuses on the key areas of management, community partnerships and policies and ordinances (bylaws). Each of these areas has a series of milestones ("Growth Rings") that participating cities can use to easily measure and communicate their progress.⁵⁴

The City of Vernon requires that any trees damaged or removed without an appropriate permit must be replaced by a tree of like species and size or as directed by City staff.⁵⁶



Goal: Create Space for Trees in Urban Areas

Incorporate treed environments into the planning and design of compact, complete communities. In urban areas, space for trees is becoming more limited as a result of infill development, and larger houses that fill much of the lot. Designs for compact communities require careful attention to providing sufficient space for trees to grow and spread. For more information on integrating trees into highly built environments see *Up by the Roots: Healthy Soils and Trees in the Built Environment*⁵⁷ and *City Trees: Sustainability Guidelines & Best Practices*.⁵⁸

- The former industrial site at Vancouver's South-east False Creek is being converted into a compact urban community. The plan is to combine urban forests with urban agriculture and plant fruit trees as part of the landscaping of public areas, with residents taking responsibility for maintenance and fruit picking.⁵⁹ (Note that this would not be a good strategy where bears might be attracted by fruit.)

Identify and acquire public lands suitable for new plantings. OCPs, neighbourhood plans, park plans, and greenway plans should identify areas where active tree planting is appropriate. In some places, it may be appropriate to acquire new park land with a focus on protection or restoration of treed ecosystems.

- The City of Coquitlam's Comprehensive Landscape Strategy identifies the types of urban forest in their community, and recommends using Development Cost Charges to assist in the acquisition of new park lands.

Design streets and utilities to accommodate trees.

Trees in urban settings struggle with many stresses that inhibit growth and reduce their life span, such as limited rooting space, air pollution, road salt, high temperatures, vehicle impacts, and damage from humans and animals.

Figure 1: Move underground utilities under bike lanes



Figure 2: Move underground utilities under sidewalk, move trees into road bump outs



Source: Tree Trust and Bonestroo, 2007 (reproduced with permission)



Trees can also be planted beside highway interchanges and in mid-block medians, traffic circles, and roundabouts, placing trees close to sources of pollution.

Allow space for trees to grow. Provide a pavement opening that is expandable to accommodate the future buttress roots of the mature tree (e.g., removable pavers, segmented tree grates or mulching the plant pit). Tree grates and tree guards are not advised except in ultra-urban areas or where insufficient clearance and high pedestrian traffic volumes require it.

- Kelowna was the first city in Canada to use “Rubber Sidewalks”, which allow installation of a sidewalk next to mature trees without destroying their root systems.

Select and place trees to provide maximum canopy cover. Allow for tree rows along streets with overlapping canopies to form distinct urban forest cover when practical (shade at least 50% of streets, sidewalks, and parking lots within 15 years of development). Relate tree size with street width (traffic volumes)—the tree’s canopy should increase as the street width increases.

Design parking lots to accommodate trees. Treed parking lots provide numerous benefits such as reducing the heat island effect, contributing to stormwater management, reducing emissions from parked cars, improving air quality and providing a more comfortable setting for visitors. Consider setting targets for tree coverage in parking lots.

- Sacramento, California requires 50% of the total parking lot surface area to be shaded by tree canopy.⁶⁰

Parking lots can be designed to absorb rainwater and stormwater. Often trees are placed so that surface runoff cannot reach the soil increasing the costs of watering. By turning the parking lot ‘upside-down’ so that water drains towards the trees, vegetation around the tree will filter pollutants from the stormwater, and the tree will receive more water from rainfall events **Provide pervious pavement on sidewalks and in parking lots.** Pervious pavement allows for better nutrient, water and oxygen flow to tree roots and enable groundwater recharge.



Goal: Maximize Potential Values from Tree Planting

Develop clear planting objectives. These will vary with the community management priorities and environments involved but could include:

- Replacing urban forest cover lost to normal attrition;
- Reforesting peri-urban forest cover lost to land-conversion or catastrophic loss;
- Increasing the extent and density of tree cover;

The District of 100 Mile House maintains a demonstration forest serving biodiversity, recreation, green infrastructure, and community involvement needs. The project illustrates current forestry practices with a focus on multiple-use management for recreation, cattle grazing, and wildlife management.

The City of Kamloops is providing “free-to-grow” sized Aspen trees to residents who will commit to maintaining them on boulevard areas along the frontage of their properties. This species has been selected for appropriately moist sites as an ideal candidate to enhance landscape screening (lost to pine mortality) and decrease the fire risk associated with more combustible species.

The District of Chetwynd is working on the establishment of a joint ‘Community Forest’ with local First Nations.

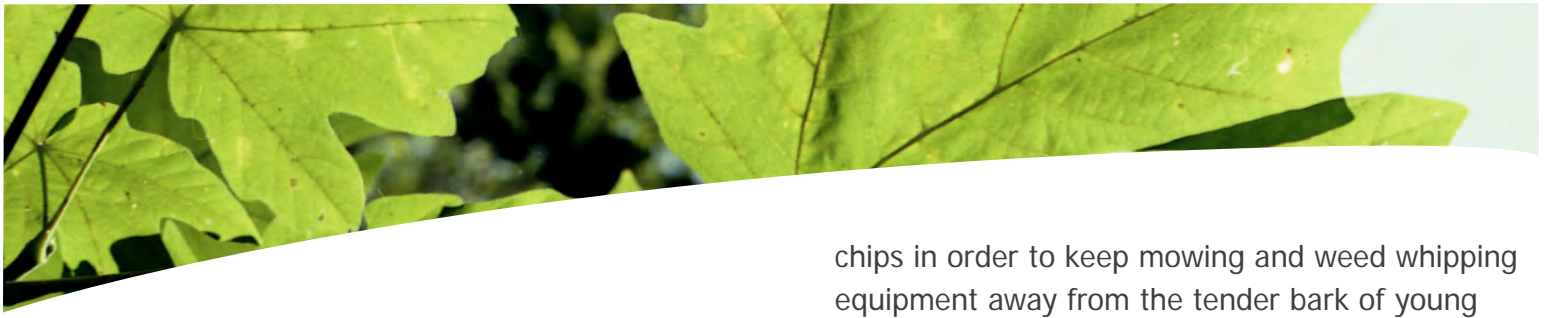
The City of Prince George is pursuing multiple objectives in managing their new Community Forest Licence.

- Improving tree age class distribution;
- Improving genetic characteristics of new plantings;
- Achieving specific landscape design objectives (e.g., shading, screening, beautification, traffic calming);
- Achieving specific environmental service objectives (e.g., carbon sequestration, heat island mitigation, air- or water-quality improvement, remediation of contaminated soils, energy conservation);
- Increasing biodiversity;
- Mitigating new forest-edge conditions and/or riparian edge disturbance associated with greenfield development; and
- Providing connectivity between treed landscapes.

Design tree plantings for multiple benefits. When selecting trees for planting, consider all the many values you want those trees to provide. Shade? Stormwater management? Wildlife habitat? Recreation? This will increase the productivity of the urban forest and make more effective use of scarce time and resources.

- The report “City Trees–Sustainability Guidelines and Best Practices”⁶¹ provides a checklist that allocates points for each of several different criteria such as improving air quality, stormwater interception and reducing heat island effects. A high score identifies a good choice in achieving long-term viability for trees and maximizing benefits.

Community forests provide a good opportunity for collaborative effort. Crown lands are made available to local governments via special forest licences for a range of management objectives that can include timber harvesting. In addition to the Province, other partners may include First Nations, local volunteer organizations and organizations such as Tree Canada who can help to provide seedling stock.



Goal: Improve Canopy Coverage, Urban Forest Productivity, and Longevity: Planting

Plant 'free-to-grow' trees that are large enough to grow freely in an unfriendly urban environment. Ensure that new trees are adequately staked and supported.

Provide adequate soil volume for root growth, as this will increase the life expectancy of a tree by four to five times. Ensure that soils are healthy and aerated. Trees need nutrients, oxygen, moisture, and a sturdy soil structure in order to grow and remain healthy. Use low fencing, bark mulch, or herbaceous plants to protect the soil underneath trees from compaction and erosion.

- Each year the City of Saskatoon mulches approximately 2,500 young trees with wood

chips in order to keep mowing and weed whipping equipment away from the tender bark of young trees, reduce moisture stress, and discourage weeds from growing.⁶²

Figure 3 shows how confined tree vaults (that limit tree growth) can be replaced by a continuous soil medium, covered by pervious paving that encourages water infiltration.

Use structural soils where appropriate. Structural soils are an engineered mix of gravel and soil that prevent soil compaction, facilitate drainage and access to nutrients and oxygen, and allow for deep root growth. These soils should be used in areas where trees are planted near or adjacent to pavement. Structural soils provide a good mix of nutrients for plant health and structural support for the surrounding pavements which help to maximize tree growth and health and minimize future maintenance costs.



Figure 3: Space for root growth

Goal: Improve Canopy Coverage, Urban Forest Productivity and Longevity: Tree Maintenance

“Since the up-front costs to establish trees have already been made, keeping these trees healthy and functional is one of the best investments communities can make.”

Greg McPherson, director of the Center for Urban Forest Research, Southwest Station.⁶³

Follow **maintenance best practices** to help increase the vitality of the urban forest and reduce associated costs over time. The International Society of Arboriculture publishes a complete line of Best Management Practices for tree care.⁶⁴

Establish a Plant Health Care (PHC) program for young trees.

- Mulch and irrigate new trees. Field-grown stock are often grown in heavy clay soils and can lose up to 70% of their root mass when transplanted. For these reasons, it is essential that newly planted ‘ball-and-burlap’ trees are well irrigated during the first few dry seasons after planting, while their root systems re-establish themselves. Mulching the soils around the tree will help to conserve soil moisture and provide essential nutrients.
- Establish a strong framework for young trees. Prune at strategic intervals as a young tree develops to ensure sound architecture later on. The result of this early intervention will be a safer, more attractive and longer living specimen. Future maintenance costs are also reduced, as trees with a strong branching structure require less intervention in subsequent years.
- Implement an Integrated Pest Management (IPM) Program. See page 26.

Establish a regular inspection and maintenance cycle for street trees as they move through their life cycle. A proactive approach to street tree management is less costly in the long run and will result in longer-lived trees, and less risk potential.

The City of Milwaukee’s proactive management of their municipal forest allows early detection and intervention, reducing impacts and prolonging the lifespan of their tree. (Milwaukee has an average street tree age of 62 years, nearly twice the national average!)

The City of Kamloops has recently adopted a seven-year pruning cycle for City-owned trees that will improve the health of these trees and facilitate better growth. Further, the City has recently completed a tree inventory of all City-owned trees that will greatly assist with providing more proactive maintenance of trees and will manage data collection of trees.



The City of Vancouver will respond to requests from residents to inspect trees on their streets and will discuss appropriate options with them.

The City of Coquitlam hosts an annual 'Great Tree Hunt', which involves the community in creating an inventory of significant and unique trees in the City. Community groups, individuals and families can nominate trees or groups of trees that are outstanding in age, size, character or rarity to the 'Great Tree Hunt Display of Trees'.⁶⁶

The Surrey Natural Areas Partnership (SNAP) is a community organization that promotes the stewardship of Surrey's natural areas. SNAP employs over 10 post-secondary students doing habitat restoration and environmental education.⁶⁷

The Town of Richmond Hill, Ontario has been providing an Arbor Week program in conjunction with local Elementary Schools for more than 15 years. This program provides an awareness of the benefits of trees to our future generations as well as a hands-on approach to the "greening" of their schoolyards.⁶⁸



Increase understanding and support for the urban forest

Goal: Develop Public Understanding and Support for Urban Forests

Provide information. A simple way to engage the public is to provide good information so that residents know what they should be doing.

- The City of Kelowna provides information on its website to help residents understand how to recognize pine beetle and lets them know how they can get assistance in removing damaged trees.⁶⁵

Provide opportunities for public learning and pride in urban forests. Opportunities such as a tree appreciation day provide a way for people to help with tree planting and to learn more about their urban forest.

- The City of Nanaimo is hosting a series of public open houses as it develops its Urban Forest Management Plan. These are used as an opportunity to raise public awareness and understanding of the values of the urban forest as well as to gather public input and response to the proposed plan.

Engage children and youth in the long-term management of trees.

- The UK's Growaforest.com offers the perfect baby gift—a tree! For about \$40, you can buy "the perfect gift to celebrate the future and the birth of a child." The tree contributes to a carbon reversal program that is intended to offset carbon emissions. Other communities have created a 'newborn forest', where residents donate trees that are planted to commemorate births, deaths or anniversaries. Over time the area becomes increasingly forested, beautifying the community.

Goal: Develop Strategic Partnerships

Engage all departments in urban forest management.

Urban forests are affected by the decisions of many different local government departments and all should be engaged in planning and management decisions. Staff should be provided with information about the urban forest and trained to carry out tasks expected of them.

- The District of Saanich has made the development of an urban forest strategy a key component of its corporate Strategic Plan. Although this initiative is led by the Parks Department, placing this into the Strategic Plan helps to ensure multi-departmental contributions.⁶⁹

Work with other governments and First Nations.

Policies and actions by others can have great influence on your urban forest. For example, policies of neighbouring municipalities may limit or enable the growth and development of a community's urban forest.

- The Village of Pouce Coupe participated in a partnership with the Peace River Regional District and the City of Dawson Creek in the development of the South Peace Comprehensive Development Plan (CDP). Objectives of the South Peace CDP are to provide for a planned response to growth, enabling local governments to take a holistic approach in addressing new development applications over a long term (15 year) time frame.

Work with businesses and community groups. Strategic partnerships enable communities to achieve results they might not be able to obtain alone.

- During the late 1990s in the District of Taylor, local industry landscaped 32 hectares of land with trees and grasses at a cost of approximately \$500,000, and then turned the land over to the District.

- The Village of Pouce Coupe has registered with the National Tree planting challenge and committed to planting 200 trees by 2010. In 2007, they planted 65 large evergreen trees throughout the community.
- BC Hydro has a vegetation mapping and assessment program—VegSMART—which they will share with municipalities. This cooperation allows BC Hydro to be aware of sensitive areas while ensuring that municipalities are aware of power line locations.

Work with educational institutions. Schools, universities and colleges may provide research support as well as volunteer assistance.

Create a multi-agency group to oversee urban forest planning and management. A multi-partnered group, such as a Forest Commission, can be a successful way to formalize joint decision-making among many agencies, organizations and interests who share a common goal of enhancing the urban forest.





Several B.C. communities have Urban Forest Management Plans in place including the City of Cranbrook, Sechelt and Taylor, along with larger centres such as North Vancouver, Richmond, Kelowna, Kamloops, and Prince George. Coquitlam, Victoria and Saanich have Urban Forest Management Plans under development.

The City of Langford holds an annual tree planting week and partners with local nurseries to provide seedlings to residents free of charge. In 2007, the City planted 779 new trees in parks and boulevards and received a Green Trees Canada award.

B.C. Hydro is providing significant support for community afforestation initiatives through its Community Re-Greening program, which provides funds for the purchase of trees, while communities provide the labour to plant and maintain them.

The Skeetchestn Indian Band in Savona and nine Secwepemc Bands are developing a regional value-added incubator site for wood products using beetle-killed wood. The initial phase of the project will provide a venue for training, product development and testing of First Nations value-added initiatives.⁷¹

The Urban Forest Stewardship Initiative recently completed mapping and valuation of the Capital Region's urban forest.⁷⁰



Goal: Sustain adequate funding for urban forest planning, management and stewardship

All the activities associated with effective management of the urban forest require funding. Budgets are tight, even as the demand for community services continues to grow. Adequate resourcing is required to achieve urban forest goals.

Demonstrate the value in your urban forest. Several B.C. communities have completed landscape-level assessments of the ecosystem services provided by their urban forests. These assessments utilize analytical software tools like CITYgreen and UFORE allow divisional managers, environmental advocacy groups and other stakeholders to demonstrate to funders that urban forests provide natural services to the community that have substantial value which can be quantified in dollars and cents.

Develop an Urban Forest Management Plan. Elected representatives need to know that residents care about their urban forest. A good management plan will seek input from the community on their values, concerns and vision for their urban forest. A clear plan with measurable objectives that has the full support of the community is much more likely to be funded than an initiative that has none of these elements in place.

Work with stewardship groups and volunteers. Working with volunteers helps to reduce labour costs as well as increasing community understanding of the values and management of the urban forest. If you are planning to use volunteers to assist with planting, ensure that any union concerns are addressed and that volunteers are trained and insured.

Leverage funding partnerships.

- The District of Taylor has conducted major upgrades/plantings both independently and with the support of Green Streets Canada.

Consider options for utilizing urban forest products. Wood harvested from urban forests can be used for lumber, chipped and used as mulch, or used to fuel carbon-neutral gasification plants.

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