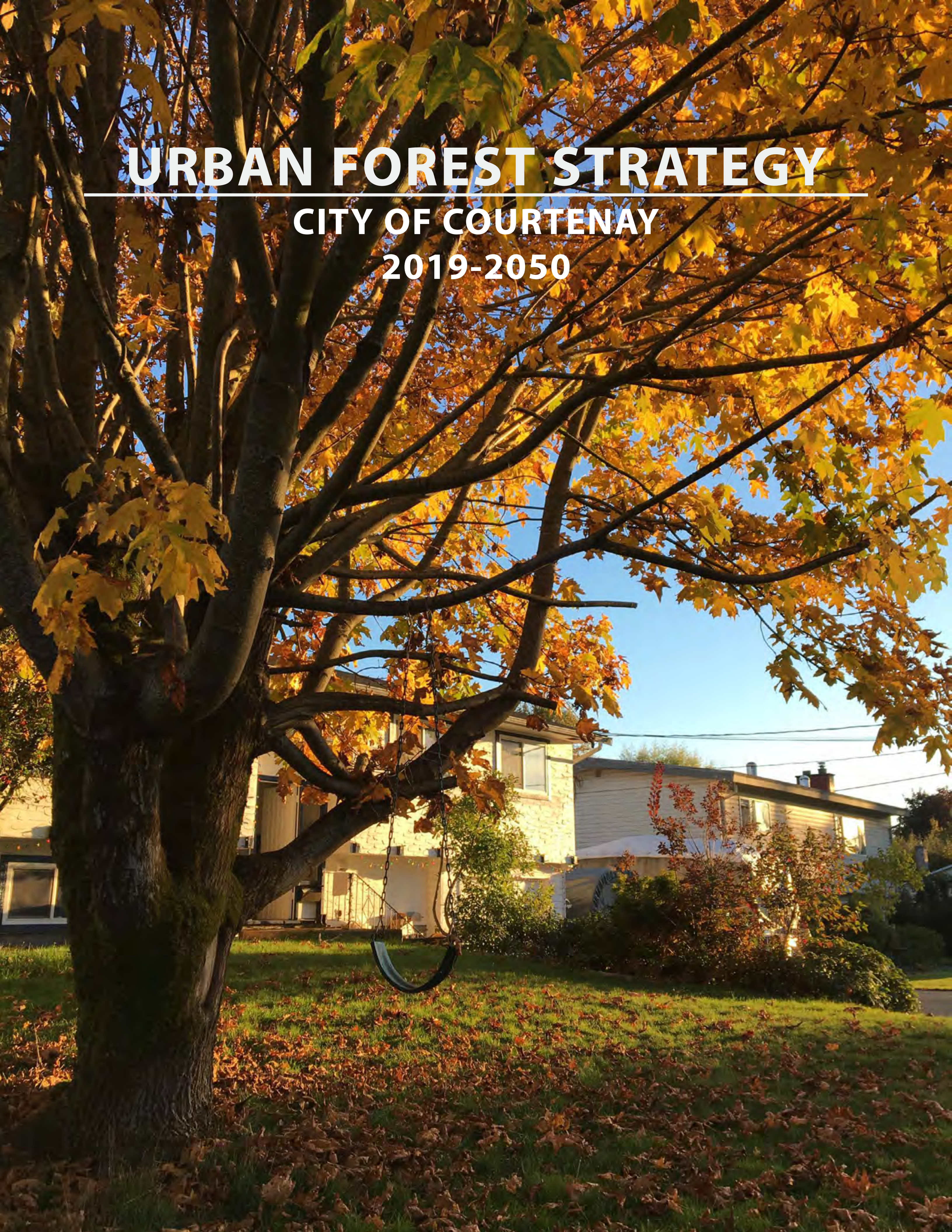
URBAN FOREST STRATEGY

CITY OF COURTENAY

2019-2050



The City of Courtenay would like to thank all participants who have lent their vision and ideas, voiced their concerns and provided quotes, images and information in the drafting of this Strategy. Thank you for participating in shaping the future of this shared community asset.

Photo by Kelsey Ann
Cover photo by Tree Murdock

DIAMOND HEAD

CITY OF COURTENAY

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EXECUTIVE SUMMARY

Courtenay's urban trees and forest patches are valued by the community for the multitude of functions they serve whether they are growing on our streets, in our parks or parking lots, in our yards, protected areas or that patch of private forested land we've come to cherish. While not everyone may agree on the urban forest's most important function, most agree that healthy trees, and a functional network of forest patches, are important to the identity, ecology and comfort of those who call this place home. Residents view thoughtful protection and strategic investment in the urban forest now as climate protection and quality of life investment for the future. The following Vision Statement guides the Courtenay Urban Forest Strategy:

> ***Courtenay residents envision a future urban forest that is more extensive than today, is connected and accessible, maintains mature trees and ecosystem services, is comprised of a sustainable mix of ages and locally adapted species, and is used as a design treatment to reduce the prevalence of pavement in commercial areas, create neighbourhood distinction and canopy streets on key routes.***
>
> ***A canopy cover target of 34-40% distributed throughout Courtenay will inform the refinement of policies and actions to achieve this Vision, as the urban forest changes to accommodate development, climate change and through the natural life span of trees.***

The beauty and offerings of the Comox Valley are no longer a secret and with expected continued community growth will come a need for land development. Loss of forest patches will continue to occur because municipal areas have been identified as the most appropriate urban, serviceable locations for our region's growth. The Urban Forest Strategy is intended to address the tension between protection and development of remaining forest lands, and provide direction on how to mediate that tension. The Vision statement therefore includes a canopy cover target that will be utilized at a high level to monitor and inform the most appropriate interventions over time to achieve the Vision.

The Vision Statement together with the following five goals set the framework for supportive actions that will require ongoing civic leadership, resident and business engagement and partnership power:

- Plan strategically to inform and monitor land use patterns and integrate the urban forest into civic asset management.
- Manage pro-actively to enhance urban forest health, safety and resilience
- Protect prudently to maintain the quality and connectedness of the urban forest
- Grow intentionally to provide urban forest benefits when and where they are needed
- Partner effectively to share stewardship and promote appreciation of the urban forest

As a community-wide land use concept, Courtenay's Urban Forest Strategy identifies a network of critical remaining forest patches linked by watercourses, Environmentally Sensitive Areas and green infrastructure opportunities to become designated as protection and regeneration areas for the ecosystem services they provide.

This network will become the green and blue living veins that support wildlife and convey urban nature, the ecological foundation around which other land use decisions will be made. Within these areas, old growth forest regeneration is an exciting possibility within our children's lifetime. Planning and protection actions will be essential within these areas, although new growth will also be needed to restore connectivity. Existing trees will require management to ensure longevity and suitable co-location with other community values.

Outside of these core priority locations, the urban forest will be more flexibly managed to execute site-specific applications on private or public land, whether they be in service of rain water management, wind abatement, shade provision, food, neighbourhood character, privacy and screening or the appreciation for beauty, form and colour. Growing and managing forest values, and providing the tools for residents and businesses to plan for their properties will be essential actions within these areas.

Because the urban forest is ultimately a shared community asset that spans property lines and changes over time, possibly the most important set of actions in the plan is to support the goal of shared stewardship. The urban forest is unique among City assets because it is living infrastructure that the community can directly help grow, steward and protect. Because the City has limited resources, the achievement of the Urban Forest Strategy Vision will depend on how well we each take initiative and responsibility to play a vital part.

In support of the Vision and all strategy goals, the City will enact leadership by utilizing regulatory tools available to inform land use, providing helpful information to people wishing to contribute or make changes to the urban forest, and demonstrate practices to design with nature through public maintenance and capital projects.

Supported by the Urban Forest Strategy, the City's Tree Bylaw will remain the key regulatory tool to protect identified priorities and ensure lands regenerate when removal takes place. Tree Density Targets required to be achieved when conducting tree removal may be revisited through Tree Bylaw amendments in the future to respond to the canopy cover monitoring information. Corporately, the City will nurture a culture that values trees as part of a wider movement in Municipal Natural Asset Management, providing a platform to be leaders and innovators in the growing field of community planning and design that is learning the immense value afforded to us when we learn to let nature into our communities. Whether in pursuit of utilitarian, public and personal health, quality of life, sense of place or spiritual benefits, this Urban Forest Strategy affirms that Courtenay's future will include these values.

Courtenay's long-term vision will be most achievable if management decisions can be framed within the context of stewarding the urban forest over a time-frame spanning multiple generations – past, present and future.

1 PLANNING COURTENAY'S URBAN FOREST

Trees and forests are a big part of what makes Courtenay a vibrant and desirable place to live. The forest graces our city with scenic natural beauty, clean water and air, native wildlife and provides places for people to recreate, cool off and connect with nature. Our urban forest is the living, life-sustaining part of our human habitat and we plan to continue to be a community with extensive parklands, natural areas and agricultural lands.

The 'urban forest' includes all of the trees, vegetation, soils and associated natural processes across our city - found in parks, schools, forest lands, urban areas, strata properties, and even in your backyard. Trees are the keystone organism of the urban forest; without them the urban forest would cease to exist.

Trees provide much more than beautification for urban streets and yards. They are critical to Courtenay's municipal infrastructure for supporting a healthy community and increasing resilience to climate change. The City initiated the Urban Forest Strategy (the Strategy) to ensure that Courtenay will have trees when and where they are needed to maintain the integrity of our watersheds, provide habitat, reduce energy consumption, beautify the city and provide the multitude of benefits associated with urban forests.

The Strategy defines the community's long-term vision for the urban forest, describes its current status and trends, and sets out the planning priorities, goals and strategies for achieving the urban forest vision.

Being a collective resource, the Strategy contains goals and actions for the many actors who have important roles to play in ensuring we have trees and forest values now, and in our urbanizing future.

COMMUNITY VISION STATEMENT

Courtenay residents envision a future urban forest that is more extensive than today, is connected and accessible, maintains mature trees and ecosystem services, is comprised of a sustainable mix of ages and locally adapted species, and is used as a design treatment to reduce the prevalence of pavement in commercial areas, create neighbourhood distinction and canopy streets on key routes.

A canopy cover target of 34-40% distributed throughout Courtenay will inform the refinement of policies and actions to achieve this Vision, as the urban forest changes to accommodate development, climate change and through the natural life span of trees.

An urban forest is all of the trees, vegetation, soil and associated natural processes across our city's landscape. It is found on both public and private lands including:

URBAN FOREST STRATEGY OVERVIEW

Courtenay's Urban Forest Strategy (the Strategy) is underpinned by the City's Official Community Plan vision for Courtenay to lead in environmental protection, and to expand parks, natural areas and the greenways system in the pursuit of a community exhibiting high quality of life.

The Strategy was developed following a comprehensive review of Courtenay's urban forest resource and with community input. The planning horizon for the Strategy is 30 years, out to 2050, which reflects the time it takes for the urban forest to grow and reach the state described in the vision. It is critical to recognize that trees live long lives and therefore Courtenay's Urban Forest Strategy Vision and actions must extend beyond traditional community service planning horizon. In this spirit, the Strategy should be revisited at regular intervals as the community changes.

Never studied before, the Strategy provides a high level benchmark analysis of the current state of Courtenay's urban forest in terms of extent, composition, threats, opportunities and past and projected trends. A 'report card' of how well Courtenay is doing regarding a variety of urban forest management and policy metrics is presented.

The Strategy responds to this assessment by proposing a high level canopy cover target and a framework of mutually supported goals and actions that will be implemented within the plan horizon. Critical to the plan's success will be a commitment to monitoring and adjusting policy levers to respond to the changes in the urban forest over time. The community's relationship with the urban forest does not end with the creation of this Strategy, but rather is just beginning.

Beyond a planning document, the Strategy also includes the voices of the over 300 residents who participated in the consultation. Respondents to the survey and open house sessions provided an extensive array of values and aspirations for the urban forest. Quotes and photos are included throughout the plan to help tell the story that has emerged from this citizen engagement.

OUR GOALS

Plan strategically to inform and monitor land use changes on the urban forest and integrate into public asset management

Manage proactively to enhance urban forest health, safety and resilience by managing alongside other infrastructure goals

Protect prudently to maintain the quality and connectedness of the urban forest

Grow intentionally to provide urban forest benefits when and where they are needed

Partner effectively to share stewardship and promote appreciation of the urban forest

OUR ACTION FRAMEWORK

Plan (strategically)

1. On public lands, formalize urban forest asset management and protection in City corporate policies and systems
2. Set neighbourhood tree canopy and character goals in consultation with the community to refine expectations and specificity regarding protection, character and function of the urban forest
3. Identify and proactively manage forest fire risk
4. Regularly update urban forest data and key planning and policy documents to respond to changes in land use and technology
5. Actively pursue funds and respond to partnership requests to support the UFS
6. Amend the Tree Bylaw, as needed, to respond to community wide urban forest information

Manage (pro-actively)

7. Develop a City Tree Operations Manual to formalize urban forest asset management and protection in City corporate policies and systems
8. Continue to regularly collect information to populate the city tree asset management system
9. Use information from the asset management system to inform resourcing requirements, including human resources, for the desired level of service
10. Establish forums for interdepartmental, interjurisdictional and interagency communication to continuously improve tree management protocols and clarify tree management expectations across public and private lands

Protect (prudently)

11. Prioritize protection of significant trees and forest stands on both public and private land
12. Refine understanding of the linkages between changes to hydrology and forest patches through land development
13. Review the Tree Bylaw to consider possible amendments that enhance interpretation and tree protection outcomes
14. Improve the quality of park assets inherited through development
15. Consider the creation of a tree heritage registry or significant tree list within the Tree Bylaw in order to protect individual trees of community significance

OUR ACTION FRAMEWORK (Continued)

Grow (intentionally)

16. Improve the quality of new tree planting in the public and private realm
17. Increase the quantity of new tree planting in the public and private realm
18. Plan and prioritize tree planting where it will most benefit community and ecological health, and support other City strategies
19. Support local food security through the urban forest

Partner (effectively)

20. Work together with K'ómoks First Nation and community groups to steward the City's urban forest
21. Develop a Communications Strategy to effectively share the story of the urban forest and engage the community in managing public and private trees
22. Partner with institutions such as UBC Urban Forestry to identify research and co-op student opportunities to study the urban forest and effectiveness of management outcomes
23. Partner with government, municipal and 3rd party utilities and green industry to implement the urban forest strategy
24. Respond to creative ideas from potential partners that advance Urban Forest Strategy implementation

LOCAL POLICY CONTEXT

Both City and Regional policies influence how and where Courtenay's urban forest will grow and change in the future.

At a high level, the Comox Valley Regional Growth Strategy (RGS) and the Official Community Plan (OCP) guide future land use for Courtenay and establish the broad priorities that drive policy setting, programming and infrastructure management within the City. The Comox Valley Sustainability Strategy is a region wide resource guide that provides visionary ideas to guide the region's future.

Council's Strategic Plan sets the more immediate priorities that the City will focus on during a Council's term.

City strategies and plans like the Downtown Courtenay Playbook, Neighbourhood Local Area Plans, Master Servicing plans and the Urban Forest Strategy – which are all guided by the vision and policies in higher level plans – provide the more detailed decision and action framework for managing specific places or infrastructure.

City strategies are implemented on the ground using various regulatory tools that shape land use and servicing, as well as by the City's programs, capital projects and operations.

Courtenay has recently been updating its portfolio of strategic plans, with the Connecting Courtenay Transportation Master Plan, Parks & Recreation Master Plan and Integrated Rainwater Management Plan recently completed or in process. Along with the Urban Forest Strategy, these master plans will provide comprehensive guidance for how the City will manage its grey (e.g., roads and pipes), green (e.g., trees and parks) and blue (e.g., rainwater and stormwater) infrastructure in the coming decades.

TREES IN COURTENAY'S POLICIES

The City currently has a number of policies that influence and regulate land use activities affecting the urban forest in the form of a Tree Bylaw, Development Permit Area (DPA) guidelines and the Official Community Plan (OCP). Operations and maintenance of the public urban forest also occurs, however the policies directing these activities are not yet comprehensively developed. This represents an opportunity identified in more detail in Section 6 .

Courtenay's 2005 OCP contains a number of policies that support the urban forest:

- Plan to maintain and protect existing wildlife corridors to preserve habitat within the City, including working with community groups to achieve this aim (Pg. 13)
- Utilize landscaping to create environments that generate civic pride, facilitate enjoyable recreational experiences and improve the quality of life within the community (Pg. 13)
- Adopt measures to reduce the creation of impermeable ground surfaces (Pg. 13)
- Develop design guidelines that would yield walkable neighbourhoods in new developments with the inclusion, among other things, of heavily planted streets (Pg. 14)
- Continue boulevard tree planting in existing areas to re-establish and reinforce green space in urban residential areas and require new developments to include street trees (Pg. 44)
- Require environmental and tree inventories on large scale developments and any property containing or adjacent to environmentally sensitive areas (Pg. 53)
- Identify existing native vegetation retention as a guideline for all properties requiring a Development Permit (Pg. 80)
- Utilize landscaping to achieve building energy efficiency goals (Pg. 142)
- Ensure the Tree Bylaw is reviewed and updated to continue to protect environmentally important features including wildlife habitat, trees in riparian zones and threatened Coastal Douglas-fir as well as improve the retention of Courtenay's urban forest in general (Pg. 53, and Pg. 145)

Future OCP revision opportunities will take into consideration the recommendations from all City master plan studies, including this Strategy.

A number of neighbourhood scale Local Area Plans for the Old Orchard, Mission Road, South Lerwick, South Courtenay, Sandwick/Headquarters Road and Arden Corridor have been developed, each of which includes policy to support retention of mature trees as a valued part of each neighbourhood identity. The Downtown Courtenay Playbook identifies the goal of growing the canopy within the downtown.

The City's Tree Bylaw is the key implementation tool to achieve goals related to tree removal, retention and replanting on private land. The City has had a Tree Bylaw since 1989 when the population was closer to 11,000 residents. The population is currently approximately 26,000. An examination of other BC communities with Tree Bylaws indicates that small communities under 10,000 rarely enact Tree Bylaws. In the late 80s, Courtenay would have been demonstrating urban forest management leadership to have established a Tree Bylaw at that time, a leadership legacy that may be continued today.

The latest revision of the Tree Bylaw was conducted in 2017 at which time a number of significant changes were implemented such as adding new species to the protection list, applying the bylaw city-wide and setting standardized retention or replacement requirements to be based on a Tree Density Target of 50 stems per hectare of land, regardless of the number of trees originally on the property. The Tree Bylaw is discussed in more detail further in the Strategy.

At the same time as these revisions, Council also approved the creation of a Tree Planting and Replacement Reserve Fund to provide the opportunity for applicants in some circumstances to pay for tree replacement with cash in lieu instead of planting new trees on their property. As the fund grows, the City will examine the opportunities for where to plant replacement trees in conjunction with this Strategy.

COMMUNITY PLANNING TRENDS

That trees and nature contribute to a community's quality of life has been well known for generations. A field of emerging research provides quantification and a deeper understanding of these benefits that strengthen the "design with nature" trend influencing urban and community planning today. In addition to the more commonly understood benefits related to urban forests and their role in maintaining environmental quality in urban areas, we're learning that green and treed spaces promote social interactions, encourage neighbours to build more social bonds and promote a more engaged civil society. Perhaps most profoundly, we're learning the mental, physiological and physical health benefits of a personal connection to nature.

In **community, urban and land use planning** – a field tasked with considering the diverse needs of human habitats – the alliance with public health is a rapidly growing, yet familiar trend. In Canada, community planning and public health have a long history together, beginning in the early 1900s, addressing acute health problems such as infectious disease spread through poor sanitation services and incompatible land uses. Today, chronic diseases including diabetes, obesity and alarming trends in declining mental health are the leading public health concerns in Canada. Community planning is once again seen as a necessary partner to improve public health given these negative health outcomes are linked to sprawling land use patterns. Fortunately, encouraging public and personal health evidence is compiling on the benefits afforded when urban forests, and nature, are incorporated into communities.

As a result, public health officials across Canada are getting behind Smart Growth principles of compact, connected, complete community design, with plenty of access to the outdoors. When designed well, these compact development patterns can not only support public health goals, but also reduce greenhouse gas emissions, cost less in public tax dollars to maintain, and put less strain on peripheral ecosystems thus supporting more regional approaches to forest and ecosystem conservation.

Healing gardens are becoming a standard part of new hospitals, including at the North Island Comox Valley Hospital, shown here.

Bold Planning Trends

In recognition of the Canadian Institute of Planners 100th Anniversary being celebrated this year, we highlight some bold planning trends that suggest promise over the next century - from the city as a "machine for living" to emerging thinking of the city as a living system.

Designing with Nature

The concept of designing with nature was instrumental in informing modern spatial analysis tools such as analytic overlays and GIS (Geographical Information System) mapping in service of a land use planning approach that is based on an understanding of natural processes. At its core, Design with Nature embraces designing in harmony with natural forces as a more intelligent approach to land use planning than fighting against them.

Biophilia

The concept of biophilia, meaning "love of life or living systems", is that humans inherently crave and seek relationship to the natural world. Proving the hypothesis that humans have a psychological orientation of being attracted to all that is alive and vital, because we ourselves are alive and vital systems, Biophilia is emerging as a popular and effective design trend notable in a range of architectural applications whether patient healing, worker productivity, student learning, or relaxation in one's own home. This trend is beginning to make inroads into community planning and design concepts as well to suggest that entire neighbourhoods and cities can be designed to respond to these innate biophilic desires.

Biomimicry

Related to biophilia are the concepts of biomimicry which means applying lessons from nature to human applications. While this mimicry may be utilized in service of specific applications (E.g. Velcro inspired from plants with burrs, wind turbine blades borrowed from whale fins, or looking to termite dens to improve ventilation in high rise buildings), at a community planning scale biomimicry can be seen as a lens through which to view nature not only as something to design *with*, but as something to design *like*.
Given their proven sustainability, resilience and regenerative abilities, natural systems are viewed in this light as having wider lessons to apply to how human communities are organized.

Eco-Revelatory Design

Urban philosophers in this field build on these concepts to propose an exciting string of hypotheses to further support design with nature. If we accept that our built environments silently and persistently communicate a community's values, then they posit that communities that embrace design with nature to meet biophilia needs and biomimicry opportunities have a unique design opportunity to transform urban landscapes into living learning laboratories.

This concept of revealing and celebrating ecosystem processes as a basis of learning about our environment through design is referred to as eco-revelatory. This is seen as critical by these philosophers for our societies are to successfully transition to a sustainable state. Urban forests therefore emerge as one of the most effective and available green infrastructure opportunities to support biomimetic design, respond to human biophilic desires and possibly view local and global environmental challenges from a renewed perspective.

Current Planning Initiatives and Tools

Several provincial, regional and national planning initiatives support the implementation of Courtenay's Urban Forest Strategy.

The **Partnership for Water Sustainability in BC** has been working with a wide range of stakeholders to adopt "design with nature" approaches into municipal planning and operations, particularly around the Georgia Strait. The initiative emerged over two decades ago in response to the growing recognition that what happens on the land affects the ocean, specifically salmon populations. Focused on maintaining "water balance", the initiative aligns with Strategy goals to ensure that forest stands and individual trees contribute to and benefit from the local hydrological cycle.

The **Municipal Natural Assets Initiative** (MNAI) has more recently emerged in response to a trifold challenge facing most Canadian communities today: declining ecosystem health, aging community infrastructure and unplanned climate change impacts to these natural and built systems. The Initiative works with communities to value the services that natural resources and ecosystems provide in municipal asset management and financial planning. It then utilizes green infrastructure to build living resilience into community infrastructure. This national initiative to value nature as part of municipal services began right here in the Georgia Strait in the Town of Gibsons. A number of natural asset valuation initiatives are now occurring across Canada including in Courtenay through the Kus-kus-sum restoration project (explained in more detail further in the Strategy).

At the national level, **Tree Canada**, a national non-profit charity dedicated to promoting and assisting with tree planting and care, has been a leader in advocating for urban forestry across the country since 2006. Their latest Canadian Urban Forest Strategy reports accelerating Canada wide interest in this topic. With provincial chapters now established to further implementation goals, the 2019-2024 National Strategy identifies ways to build capacity, deepen scientific understanding and monitoring tools and raise public awareness of these national assets within our neighbourhoods.

In 2008, expanding on community land use planning tools, the BC Government instituted the **"Local Government (Green Communities) Statutes Amendment Act"** granting additional local government powers to require energy, water conservation and greenhouse gas reduction targets in new developments. All communities in BC can now require that landscaping, including trees, be used towards the achievement of these goals if they choose to enact these powers.

Universities are responding to this growing demand for specialized urban forestry skills, with a number of technical diploma programs being enhanced across Canada and the launch of Canada's first Bachelor of Urban Forestry program at the University of British Columbia in 2014. The first graduates of this specialized program entered the work force in 2018.

"Leading Canadian communities are undertaking municipal natural asset management to protect and preserve natural assets and provide core services at lower cost. Maintaining healthy urban forests is an important part of this trend. In addition to providing recreational, social and cultural benefits, urban forests can absorb stormwater and reduce flooding risk; and, help to keep cities cooler as summers get hotter. Courtenay's efforts to protect nature and let it do its job will result in a healthier, more resilient community and keep costs down." – Roy Brooke, Executive Director, Municipal Natural Assets Initiative

"Planting trees might be the single most useful thing a community can do to improve people's health and wellness, and to enhance overall quality of life. Research today shows overwhelmingly that exposure to green spaces, to trees and nature, has a positive impact on numerous aspects of our lives - making for healthier happier children, better adjusted teenagers and greater longevity and wellness in seniors. Everybody benefits when we plant trees. It is an act of hope in the future."

– Chanchal Cabrera, Fellow of the National Institute of Medical Herbalists (UK) and local farmer.

WHO MANAGES COURTENAY'S URBAN FOREST?

Managing Courtenay's urban forest is a shared responsibility. The urban forest grows on both City and private land, however, water and biodiversity flow through the urban forest unconscious of ownership boundaries. This means that Courtenay's vision for the urban forest must be achieved through collaboration between stewards of public and private land.

Within Courtenay, 80% of land and 84% of urban forest canopy is under private ownership. Private individuals and organizations primarily manage the urban forest on private land, sometimes with assistance from green professionals such as local arborists, landscapers and landscape architects. The City influences the private urban forest by regulating tree removal and replacement during the development process, and through educating and partnering with the public and stewardship groups to foster urban forest stewardship.

On public land, the City is primarily responsible for managing the urban forest, but it also relies on partnerships with the stewardship sector and other levels of government to extend its stewardship capacity. For example, the City of Courtenay recently signed a Memorandum of Understanding with the K'ómoks First Nation (KFN) and Comox Valley Project Watershed Society to collaboratively purchase, restore and manage Kus-kus-sum; a former sawmill, site of cultural and historical significance to K'ómoks people. The vision for this site is to restore important salmon rearing habitat with Sitka Spruce-leading tidal forested wetland, which will contribute to flood mitigation measures as well.

Courtenay's urban forest vision is long-term. Trees live for hundreds of years and ecosystem succession takes place over similar time frames. Over the life-span of a single tree, custody of land may change many times. **Past custodians have determined the urban forest legacy Courtenay has today, and today's custodians will determine what is left for future generations.** Courtenay's long-term vision will be more achievable if management decisions can be framed within the context of stewarding the urban forest over a time-frame spanning multiple generations - past, present and future.

2 VALUING THE URBAN FOREST

URBAN FOREST BENEFITS

Municipalities manage urban forests because, just like roads, sewers and other city assets, **urban trees and forests provide services that improve human health and well being.** Beneficial services provided by the urban forest are called 'ecosystem services' and are often defined in four distinct but inter-connected categories:

- **Cultural:** benefits that relate to how people value the urban forest for its contribution to quality of life, such as beautification, mental health and healing, sense of place, character, heritage, spirituality, recreation and tourism.
- **Provisioning:** products extracted directly from the forest like timber, food, traditional medicine, fresh water and firewood.
- **Regulating:** benefits from the regulation of ecosystem processes like pollination, air and water quality, soil enrichment, erosion prevention, rain and storm water flow, shade and cooling.
- **Supporting:** benefits from supporting habitat, biodiversity and enabling natural processes that maintain the conditions to support life - services that are essential to the production of all other ecosystem services.

While not all of these services can be measured with a dollar value, **several municipalities in BC are exploring an 'eco-assets' approach to include nature as an asset in their financial accounting systems.** This can involve assigning financial values to services like flood management or the maintenance of water quality by estimating the cost of replacing those services or the avoided cost of damage. The eco-assets approach is enabling nature to be factored into decision-making about municipal infrastructure and asset management systems.

The forested environment around urban areas, including the woodlot we manage, is part of our personal concept of home and space. Sometimes for recreation, for spiritual connection, or at other times for resources like water, or timber. This wooded area is an extension of our urban city, like the yard around the house, or the park down the road, it contributes to individual health and enjoyment within society. The forest ecosystem resources in the urban forest need to be protected and managed in order to continue the benefits we all enjoy.

- Mike Larock, RPF, Professional Forester and Urban Woodland Manager

The benefits of urban forests

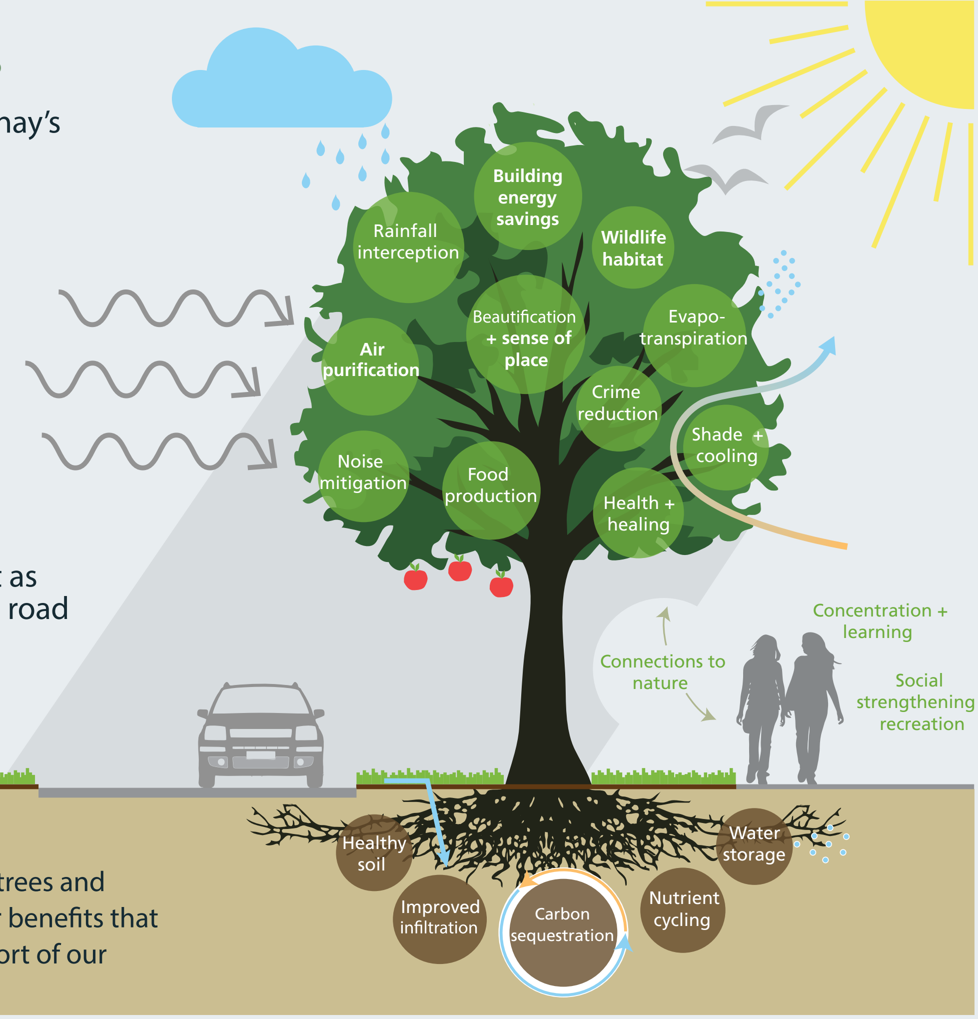
The urban forest is a critical part of Courtenay's appeal and livability.

Trees serve to:

- beautify and cool the city
- intercept rainwater
- remove pollutants
- provide habitat for wildlife
- connect people to nature

... among many other benefits.

These ecosystem services are as important as other infrastructure, like water, sewers and road networks that service Courtenay.

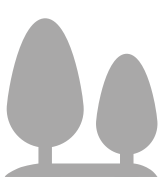


Urban forestry is...

the art, science and technology of managing trees and natural systems in and around urban areas for benefits that contribute to the health, happiness and comfort of our communities.

Urban forest canopy can be used to estimate the value of some ecosystem services provided by the urban forest. The United States Department of Agriculture (USDA) has developed ' i-Tree Canopy', a program that measures tree cover and then estimates a dollar value of carbon sequestration and air pollution removal by trees based on the cost of control or mitigation. Courtenay's 2018 canopy results are shown below.

Ecosystem services reported by iTree Canopy



Carbon Sequestration **$614,274/yr**

Storage **$15,487,769**

Air Pollution Removal **$45,835/yr**

Research generally supports that greener communities enjoy better health, wealth, are more active and more socially bonded. For example, a study in Toronto found that having 10 more trees on your block is equivalent to being seven years younger, or a $10,000 salary raise [1].

Studies have also found that views of or interaction with elements of the urban forest contribute to reduced health care costs, shorter hospital stays and a reduction in the use of pain medication [2]. The availability of parks and open space increases in the frequency of routine physical activity, also leading to improved health outcomes [3]. Kids with attention deficit disorder show less symptoms after playing in green outdoor settings [4]. Patients with dementia or clinical depression also benefit from views of or access to the urban forest [5,6]. **Numerous urban forest health benefit research sources can be found on the 'Green Cities: Good Health' website.**

i-Tree Canopy Annual Tree Benefit Estimates based on these values in g/m²/yr and CAD/t/yr: CO 0.101 @ 121.48 CAD | NO2 0.551 @ 38.36 CAD | O3 5.489 @ 200.57 CAD | PM2.5 0.267 @ 8,532.49 CAD | SO2 0.347 @ 10.64 CAD | PM10 1.838 @ 434.69 CAD | CO2seq 1,117.578 @ 50.52 CAD | CO2stor is a total biomass amount of 28,177.630 @ 50.52 CAD*

As a teacher I try to take my students into the woods as much as possible. The forest is a great classroom as it instills a natural wonder inside all of us. When students are immersed in this setting there is a natural curiosity to ask questions and seek answers; the foundations of education. In the world of education we call this "engaged" and with today's electronic distractions, it can be hard to get youth engaged because they are always looking down at their phones. Forests within Courtenay are an educational resource that many teachers are using to teach students about stewardship, environmental issues, and ecology.

- Jeff Hoy, Teacher, Lake Trail Middle School

WHAT WE HEARD FROM THE COMMUNITY

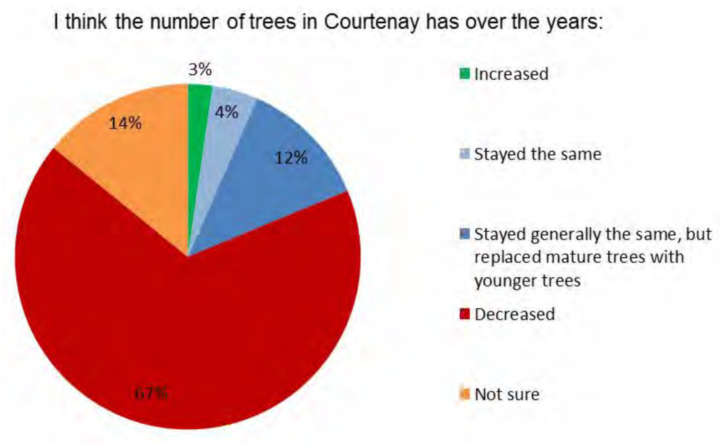
The public and stakeholder consultation approach was organized around two critical phases of the project:

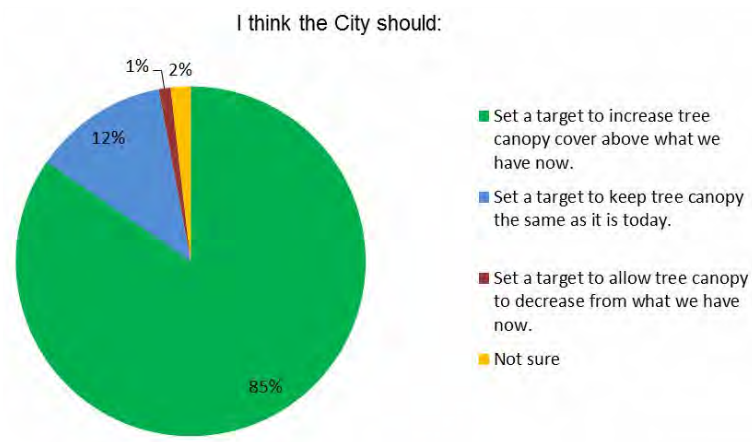
- Phase 1: at the beginning, in summer of 2018 the City conducted stakeholder and public meetings as well as a summer long online survey and photo competition to engage the community and gauge values and level of support for the UFS direction and actions.
- Phase 2: once the Plan was drafted, in spring of 2019 the City held a public meeting and an online survey to present findings and solicit feedback on recommendations.

Of note is the consultation context. Two years prior the City solicited public and stakeholder feedback on the City's Tree Bylaw No. 2850, which demonstrated strong support for an Urban Forest Strategy. The Parks and Recreation Plan consultation also occurred during the summer of 2018 and found strong public support for recreation activities compatible with Urban Forest Strategy goals. These include:

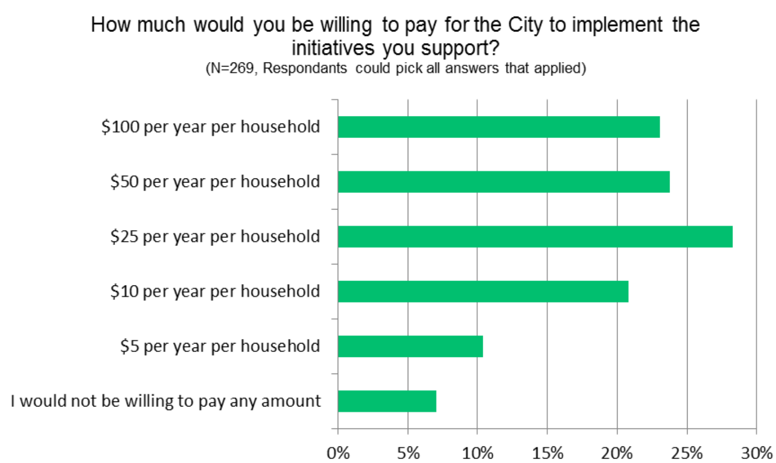
- Walking/hiking/jogging for exercise or recreation was listed as the outdoor activity with the highest participation with 89% of respondent households taking part in this activity. 65% of respondents also rated this activity as the most important outdoor activity.
- Many of the most visited parks/trails are those with strong urban forest values. Preferences are in this order: Courtenay Riverway Trail and Airpark, Lewis Park, Simms Millennium Park, Puntledge Park and nature parks in general.
- The most important activities selected by respondents within the parkland supplied included casual activities such as eating lunch or playing catch, followed by nature appreciation including bird watching or wildlife viewing.

The figures on the following pages provide more detailed results to key findings from the UFS consultation.





Most survey respondents thought that there were fewer trees in Courtenay than in the past and wanted the City to increase its canopy cover.

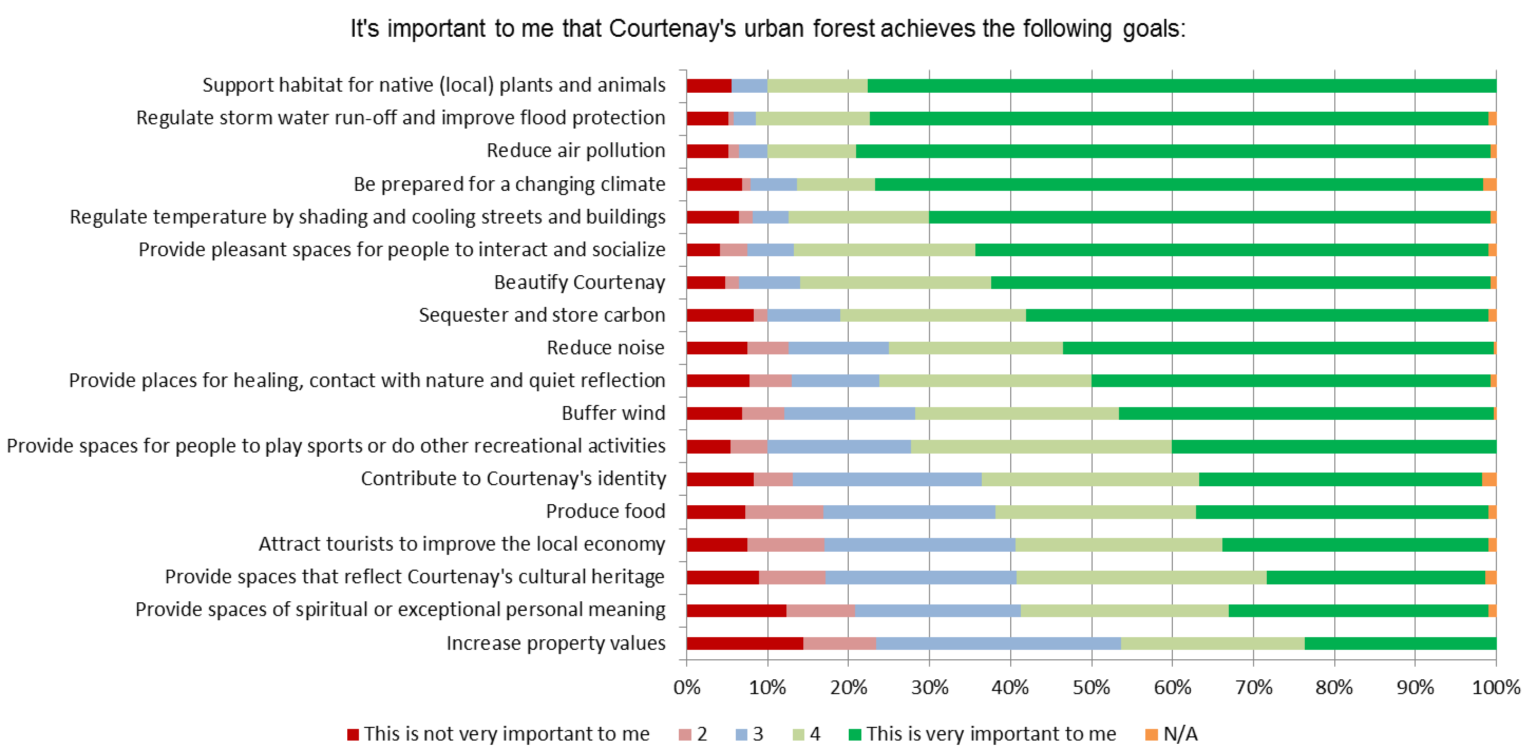


Phase 1 Consultation Highlights

- When asked to rank their values from a list, respondents rate maintaining the environmental quality and beauty of the city highly. Lower ratings were selected for contribution to property values and reflecting Courtenay's cultural heritage.
- When asked to provide in their own words what is valued most about Courtenay's urban forest, the most common responses were beauty, habitat for wildlife and shade (cooling). Air quality, access to nature and locations for quiet reflection were also common values.
- When asked to provide in their own words what is valued least, responses were much more varied and specific. Top dislikes included that there is 'not enough' urban forest, that it is being lost, and specifically that clear cutting is permitted in order to accommodate development. Tree debris maintenance as well as a dislike for unkept or poorly maintained trees were also commonly cited.
- Most respondents think that canopy has been lost over time and are supportive of setting a target to increase canopy cover.

"Thank you for sending this survey. I've always felt concern over the lack of and removal of trees and it made me so happy as a new home owner in the valley to know that we had the tree program. I really hope it stays and increases in its capacity to encourage citizens to plant and keep trees." - Survey respondent

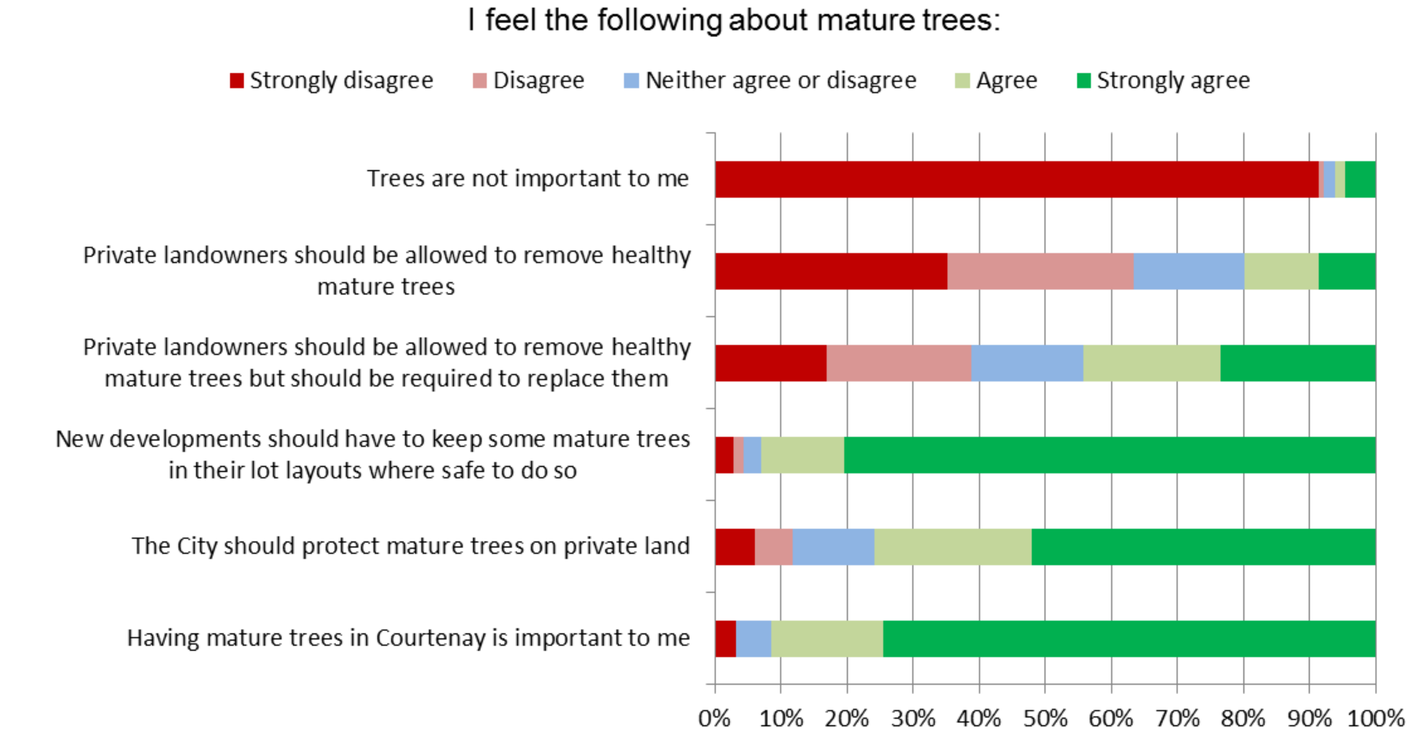
- Most respondents want to see mature trees protected, particularly when it comes to development, but are less supportive of having regulation on their own trees. (This is consistent with the Tree Bylaw findings).
- There is stronger support for increased planting on public lands (parks, natural areas, school lands and streets), than on private lands whether commercial, industrial or residential.
- Respondents indicate strong support for street trees across all land uses particularly in new residential developments (both sides of the street). No respondents indicated that they prefer few or no street trees.
- Respondents indicate there is room to improve Courtenay's streetscapes, with the most preferred outcomes being: a) mixed native tree planting; and b) regularly spaced medium

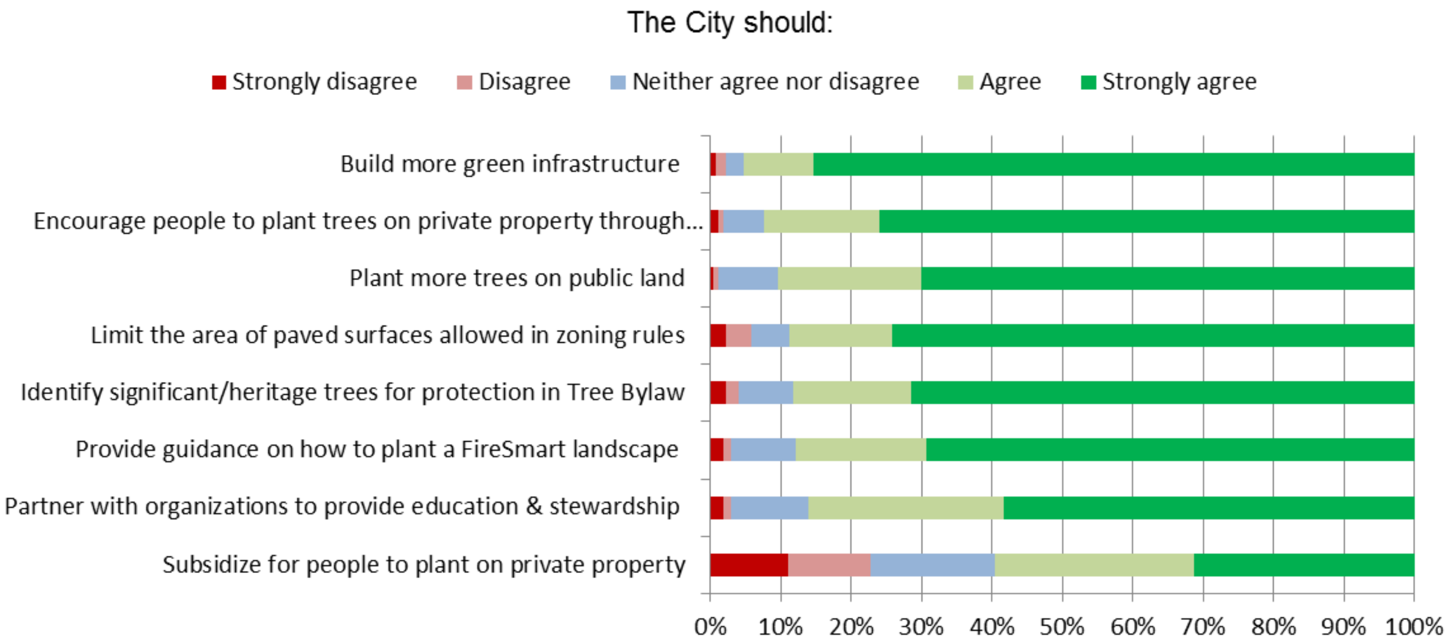


The provision of habitat for wildlife, stormwater management and air pollution reduction were some of the most important urban forest benefits to the survey respondents.

or large trees. This indicates an opportunity for different street characters for different neighbourhoods and street cross sections.

- Most respondents want to make a meaningful contribution to planting trees on their land and don't need free trees to do it. Instead residents would be motivated more by understanding of what trees are needed where (and why).
- Most respondents would pay more tax to support urban forest initiatives citing $25 per household per year as the most commonly selected response. Only 8% of respondents said they would not be willing to pay any amount.
- Most popular initiatives include building more green infrastructure, encouraging people to plant trees on private land and planting more





"I think the City should stick to providing basic services. As far as trees go, plant native trees on City land. The City should have no say in what private land owners do with their trees unless and until those trees impinge on the enjoyment of neighbouring land owners, including the City." - Survey respondent

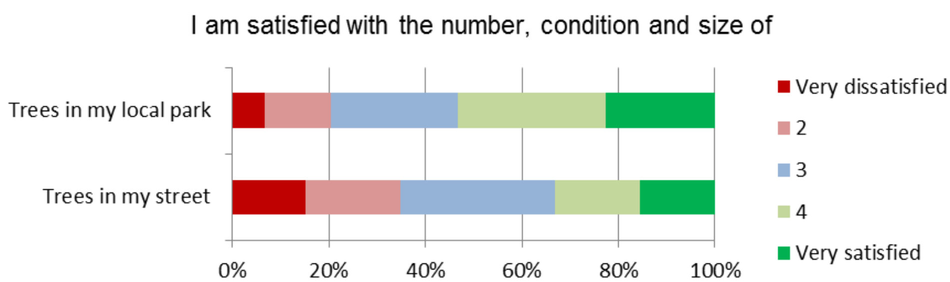
trees on public property. There is very limited support for subsidizing trees for private tree planting, which is a popular initiative in many communities.

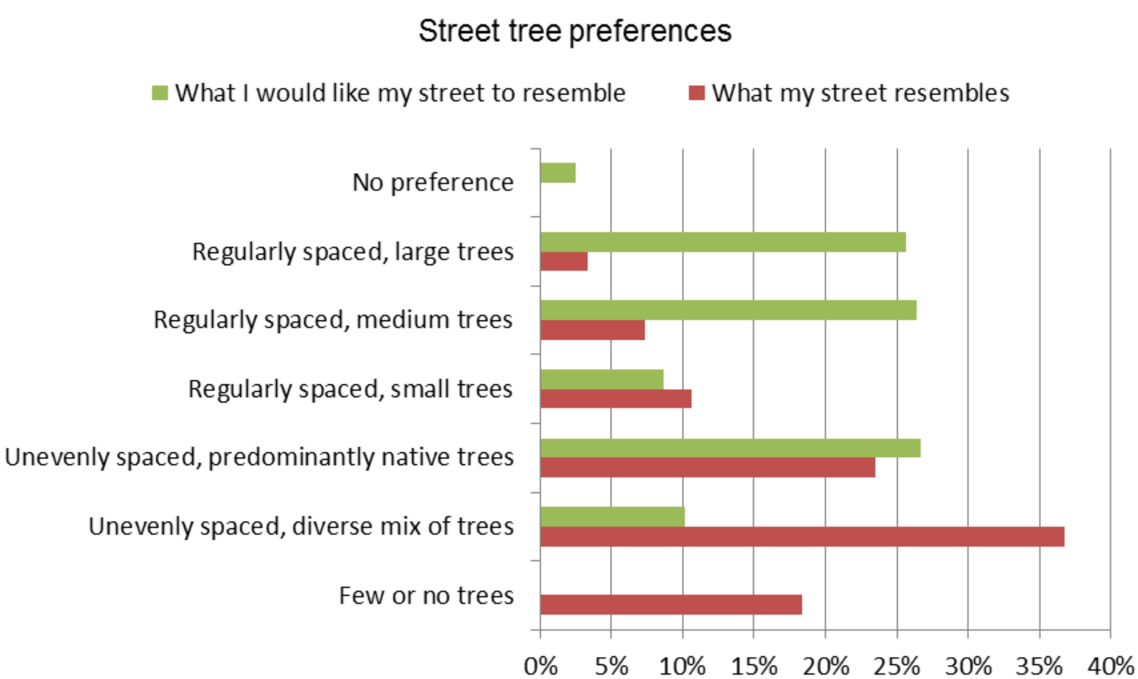
- Respondents indicated support for more education regarding tree management with naturescaping, pruning and managing pests being the most popular topics.
- 92 % of respondents strongly disagree with the statement "Trees are not important to me".

Phase 1 Participation Statistics

- 306 individuals conducted the survey, 77% of which own property and/or live within the City.
- 54 attended two public meetings.
- 865 unique views of the Urban Forest Strategy webpage during Phase 1 consultation window.
- 112 photos submitted on the Story Map.
- Participants represented neighbourhoods across the City, were primarily homeowners of middle age or seniors, and have lived in the City for a number of years.

Two community workshops were held in June 2018 to discuss the priorities for Courtenay's urban forest.



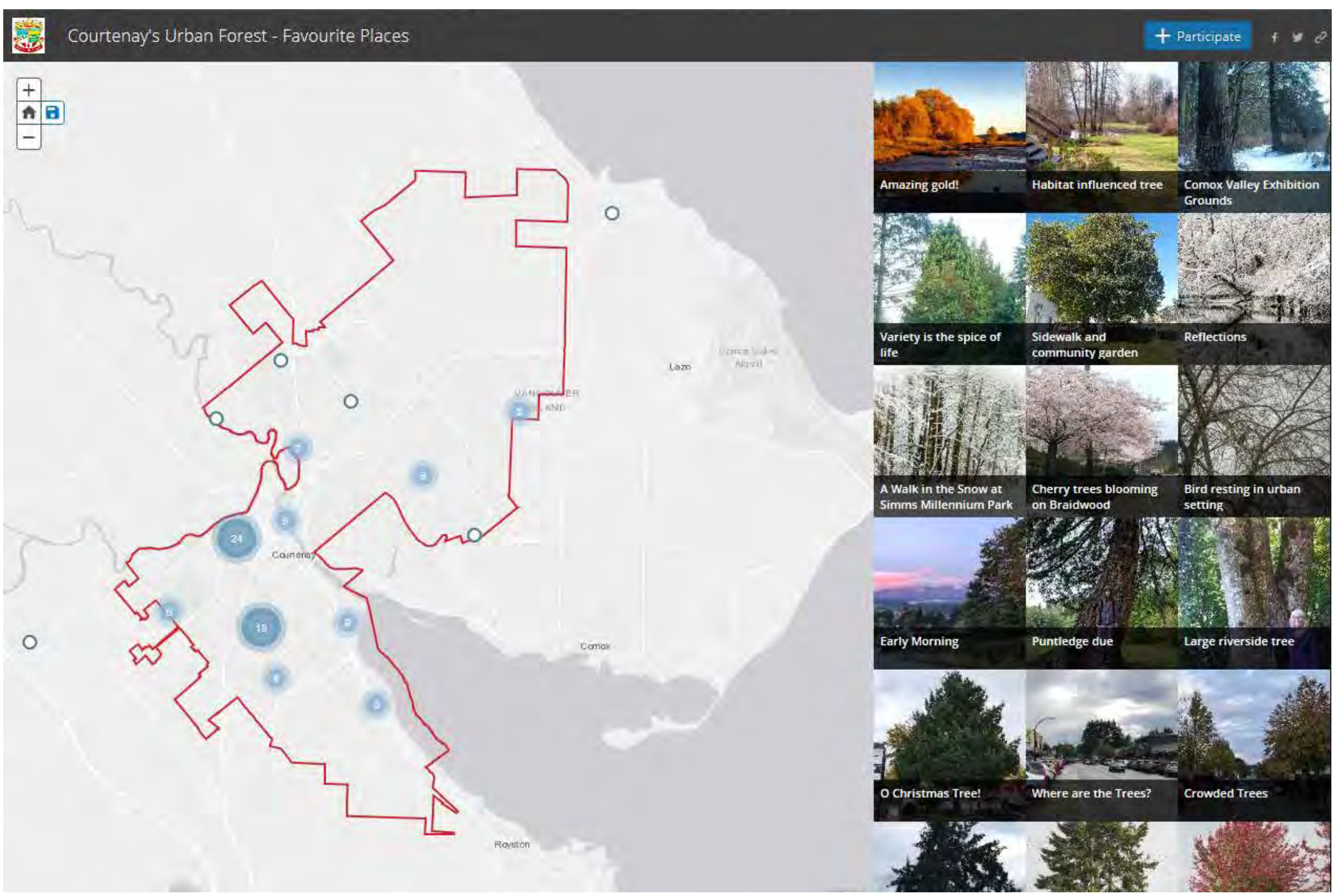


Survey respondents were generally more satisfied with trees in their local parks than trees on their street. They indicated a preference for medium and large street trees as well as native species.

Story Board Map

The consultation included the opportunity for participants to submit photos and comments about specific urban forest locations, in a publicly viewable platform. The Story Board also included background information about Courtenay's urban forest and the ability for participants to zoom in and view aerial images of Courtenay properties. The tools allowed for more visual and creative forms of public input and may be used as an ongoing educational tool past the Strategy planning stage. Images above and below show excerpts of the tools.

Online tools allowed participants to access information about Courtenay's urban forest (above) and to submit their photos and comments about specific urban forest locations.



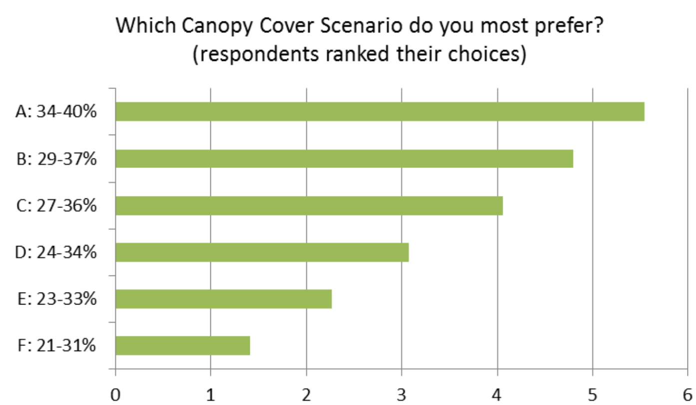
Phase 2 Consultation Highlights

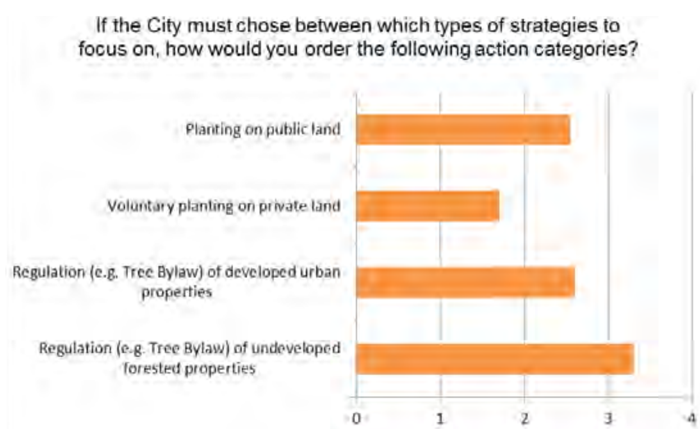
The Phase 2 Consultation was a more focused exercise, narrowing on targeted recommendations of the plan, and offering opportunity for open feedback.

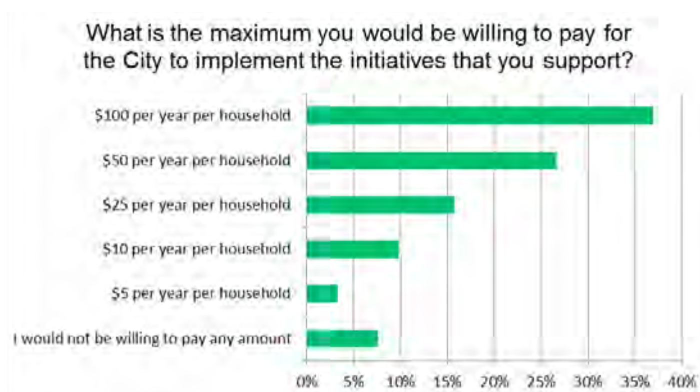
- 87% of survey respondents support the Vision Statement and 87% support the goals identified.
- Participants were presented with six Canopy Cover Target scenarios. Survey results show highest support for the highest targets.
- When ranking the types of strategies the City should focus on, using the tree bylaw to regulate tree removal was more highly rated than planting on either public or private land.
- Asked another way using the 5-goal framework of Plan, Manage, Protect, Grow and Partner, respondents ranked protection actions highest followed by growing, with planning and managing similar, concluding with partnering.
- Consistent with Phase 1 survey results, most respondents want to make a meaningful contribution to planting trees on their land and don't need free trees to do it. Instead, residents would be motivated more by understanding what trees are needed where (and why), naturescaping and energy efficiency considerations.
- Consistent with Phase 1 survey results, most respondents would be willing to pay more tax to support UFS initiatives citing $100 per household per year as the most commonly selected response, a much higher willingness to pay than indicated in the first round of consultation, although a smaller sample size. Similar to Phase 1 responses, on this question, only 8% of respondents said they would not be willing to pay any amount.

Phase 2 Participation Statistics

- 246 individuals conducted the survey, 70% of which own property and/or live within the City.
- 37 attended the public meeting.
- Similar to Phase 1 consultation, survey participants represented neighbourhoods across the City.
- 910 unique views of the Urban Forest Strategy webpage during Phase 2 consultation window.







The questions summarized on the first two graphs allowed respondents to rank their selections. The results are displayed as average ranking for each answer, showing which one was most preferred overall.

Crowd Sourced Photos

The photo on the cover of this document was crowd sourced. Below is a selection of other favorite photos submitted by the public.


Photo by Bill Heidrick


Photo by Monica Hofer


Photo by Wendy Morin


Photo by Wendy Macdonald


Photo by Craig Carson


Photo by Robert Eli

3 HISTORY OF THE URBAN FOREST

Courtenay is located on the unceded traditional territory of the K'ómoks First Nation, whose people have stewarded the "Land of Plenty" since time immemorial. The region around Courtenay was blanketed by predominantly old-growth conifer forests with Douglas-fir as the leading species. Also on the landscape were Garry oak woodlands, wetlands and riparian forests that drained into the Puntledge Estuary.

The K'ómoks managed the forests and ocean to maintain an abundant supply of food and other resources for their people[1]. They have had a significant impact in shaping and maintaining local forest ecosystems and particularly the Garry oak woodlands, which were maintained using controlled burning. This practice provided edible plants and hunting resources for the K'ómoks people in a landscape that was otherwise dominated by dense forest [7].

Colonial settlement, beginning in the 1860s, dramatically changed the landscape with widespread logging, land clearing, coal mining and urban development. Courtenay settlers initially concentrated along the Courtenay and Tsolum Rivers where they cleared land to farm. Logging was an important economic activity from the early days of settlement in the Comox Valley. Eventually, land clearing took place to make way for residential and commercial development, particularly in and around downtown Courtenay, in the late 1800s.

1 www.komoks.ca

Photo from Courtenay Heritage Commission

As Courtenay urbanized in the late 19th century some native forest areas were retained and preserved in parks alongside introduced ornamental tree species. These were planted in parks and along streets, growing along with the city, with some of these trees still a part of our city's landscape.

For example, part of the Old Orchard area was an apple orchard that was subdivided in the 1890s. Some of the old fruit trees from the orchard still exist and the area has numerous old dogwoods and other mature trees planted with early development.

This pattern continued into the 20th century. The sycamore trees on 2nd Street were planted in the 1920s with a residential subdivision. In the 1960s a landowner planted 12 redwood seedlings brought back from California in what is now a subdivision bounded by 21st and 17th Street. Eight of them survive in the subdivision today.

As Courtenay continued to grow as an economic centre for the region through the 20th century, most of its forests were cleared. However, older forests can still be found in Courtenay. Some of the Garry oak trees in and around Vanier Park are estimated to be more than 150 years old. Forests in places like Lerwick Park and Puntledge Park which were logged in the early days of colonial settlement are now older than 100 years. There are likely other old forests in Courtenay and, if protected, we could have old-growth forests in our city again for future generations to enjoy.

Garry oak woodlands were maintained by the K'ómoks people with controlled burning to supply their community with edible plants and hunting resources. Garry oak trees can still be found in some of Courtenay's neighbourhoods, such as this one on its street namesake: Oakridge Drive. Located near the Courtenay Cemetery, this area contains the highest concentration of remaining Garry Oaks in the City.

Sycamores on 2nd Street planted in the 1920s.

"I remember the horse chestnuts on the road coming into Courtenay from the South (Cliffe Ave) in 1972 and even in 1978 when I permanently moved here. They were grand!"
- Survey respondent

4 STATUS AND TRENDS

TREE CANOPY

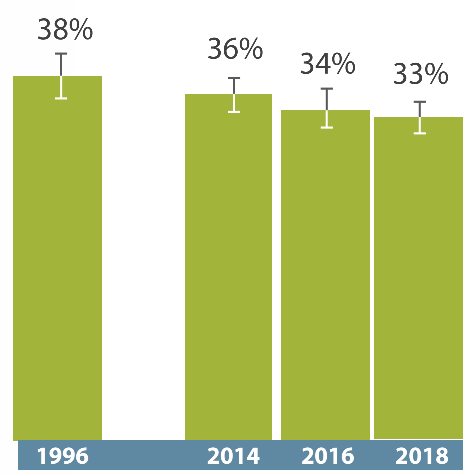
Tree canopy is a common metric used to describe the extent of a city's urban forest. Courtenay's tree canopy is composed of natural forests and planted trees in streets, parks and on private property.

There is no accepted standard for the amount canopy cover that a city should have. Rather, minimum canopy cover is driven by the physical constraints of geography, climate, land use and development density. Determining optimal canopy cover depends on community priorities for and investment in trees and the ecosystem services they provide. For example, if habitat and stormwater management are priorities, then canopy cover targets can be set with those objectives in mind.

The extent of Courtenay's tree canopy was measured from the air using 2016 LiDAR data. LiDAR scans areas of land with a laser sensor shooting pulses to the ground surface to create a 3D model of the ground below.

The USDA's i-Tree Canopy program was also used to detect canopy changes among 1996, 2014 and 2018 orthophotos. Of Courtenay's 3,370 hectares of total land area, canopy cover is 33%, which is a significant decline from 38% in 1996. This represents a net loss of approximately 160 ha of canopy over 22 years, or the equivalent of 204 Vanier turf fields.

Canopy change was measured using Courtenay's current City boundary - some of this change would have occurred prior to those lands joining the City.

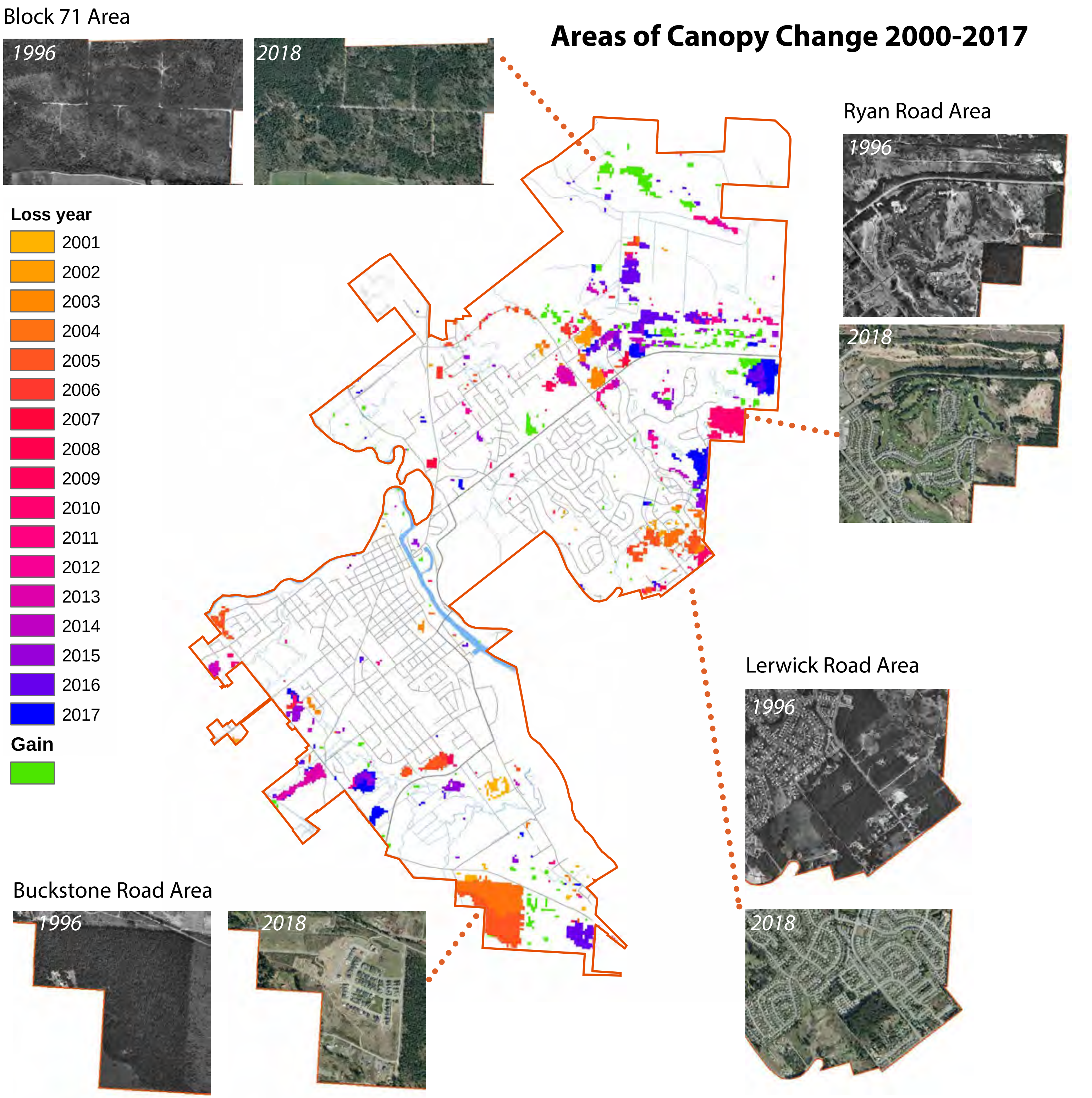


Percent canopy cover

Where Has Canopy Change Occurred?

Changes in global forest cover have been tracked since 2000 by scientists and the University of Maryland [8]. While the scale of the satellite data does not detect individual tree losses, it is useful for detecting large scale forest cover change.

Recent large-scale canopy change in Courtenay has primarily been due to forest lands being developed into residential areas. Large-scale gain occurred in locations where fields or cleared areas reforested. New residential areas have been planted with trees but their growth was not detectable at the resolution of this satellite data.

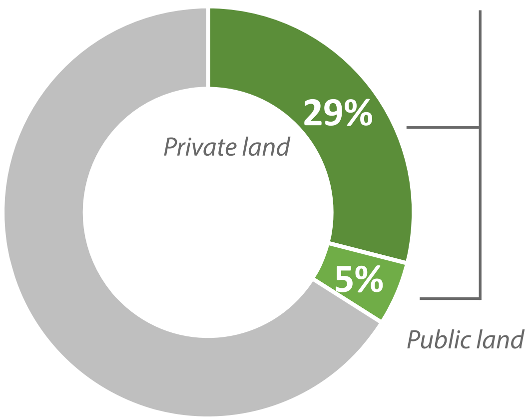


Where Is Canopy Cover Distributed?

Across the Entire city

The 2016 LiDAR canopy analysis found that 34% percent of Courtenay's 3,370 ha land area was covered by trees[1]. The graph on the following page shows land cover distribution by aggregate zoning classification and reveals where most of the 2016 canopy was concentrated.

34% Total City Canopy Cover (2016)

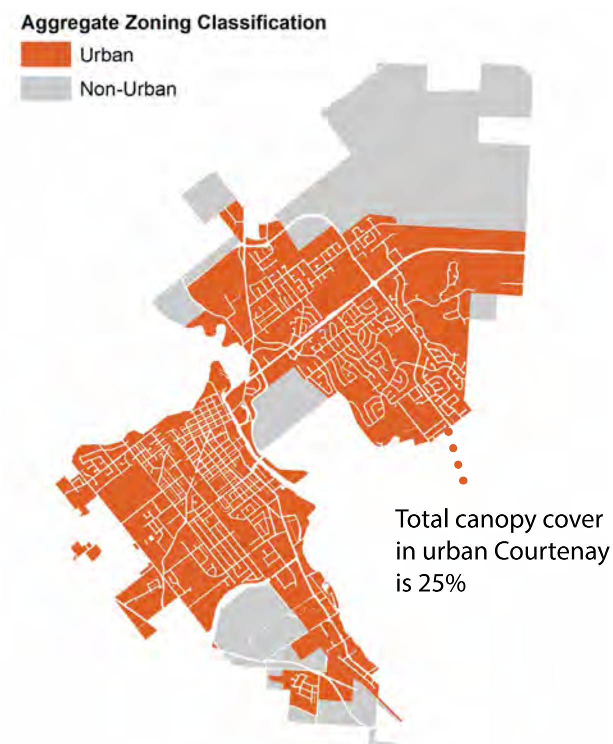


On Private Land

Most canopy cover was on private land. Much of Courtenay's private land area is not developed and is not zoned for development, therefore it is difficult to predict when or how canopy in these areas may change in the future. Lands within the Rural Multi-Use aggregate zoning class contained the largest proportion of Courtenay's tree canopy (392 ha). The next largest contributors were Agricultural (151 ha), Residential (146 ha) and Rural Residential (94 ha).

Within Urban Courtenay

Measuring canopy cover over developed and developable parts of the City, or 'urban' areas, establishes a useful baseline from which to measure the impact of urban forest policy. **Canopy cover in urban Courtenay today is 25%.** This is measured over all public land and private land other than the Agriculture and Rural-Multiuse land use classes defined on the following page.



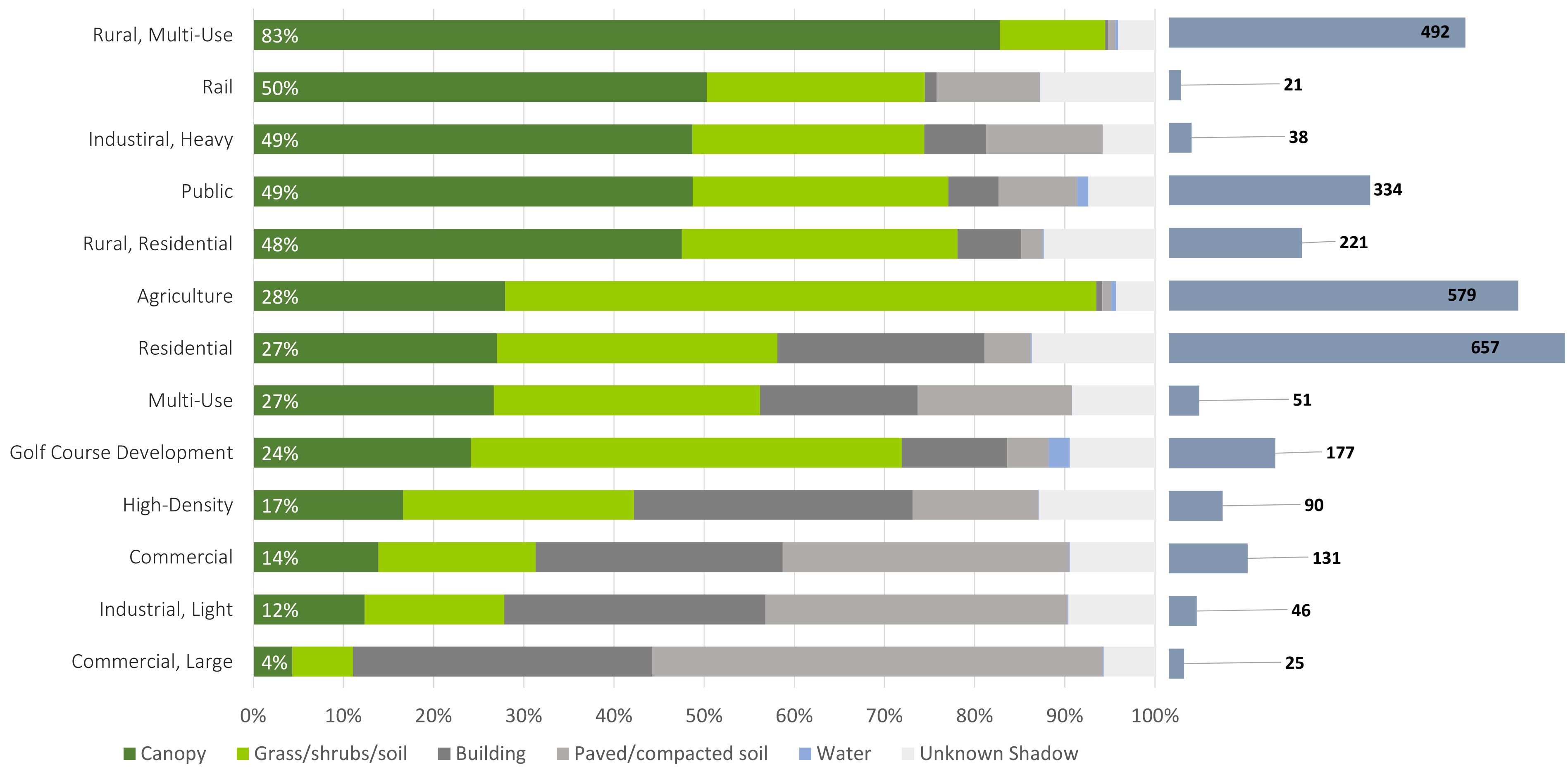
On City Land

Of the proportion of tree canopy on public land, most was in parks. Parks and public properties averaged 58% canopy cover, while roads averaged just 9%.

1 While there has been some canopy change since 2016, the LiDAR analysis provides the most detailed information about where canopy is located across Courtenay.

Land Cover Distribution (%) by Aggregate Zoning Classification

Area (ha) of each aggregate zone



Land cover distribution aggregate zoning classification summary

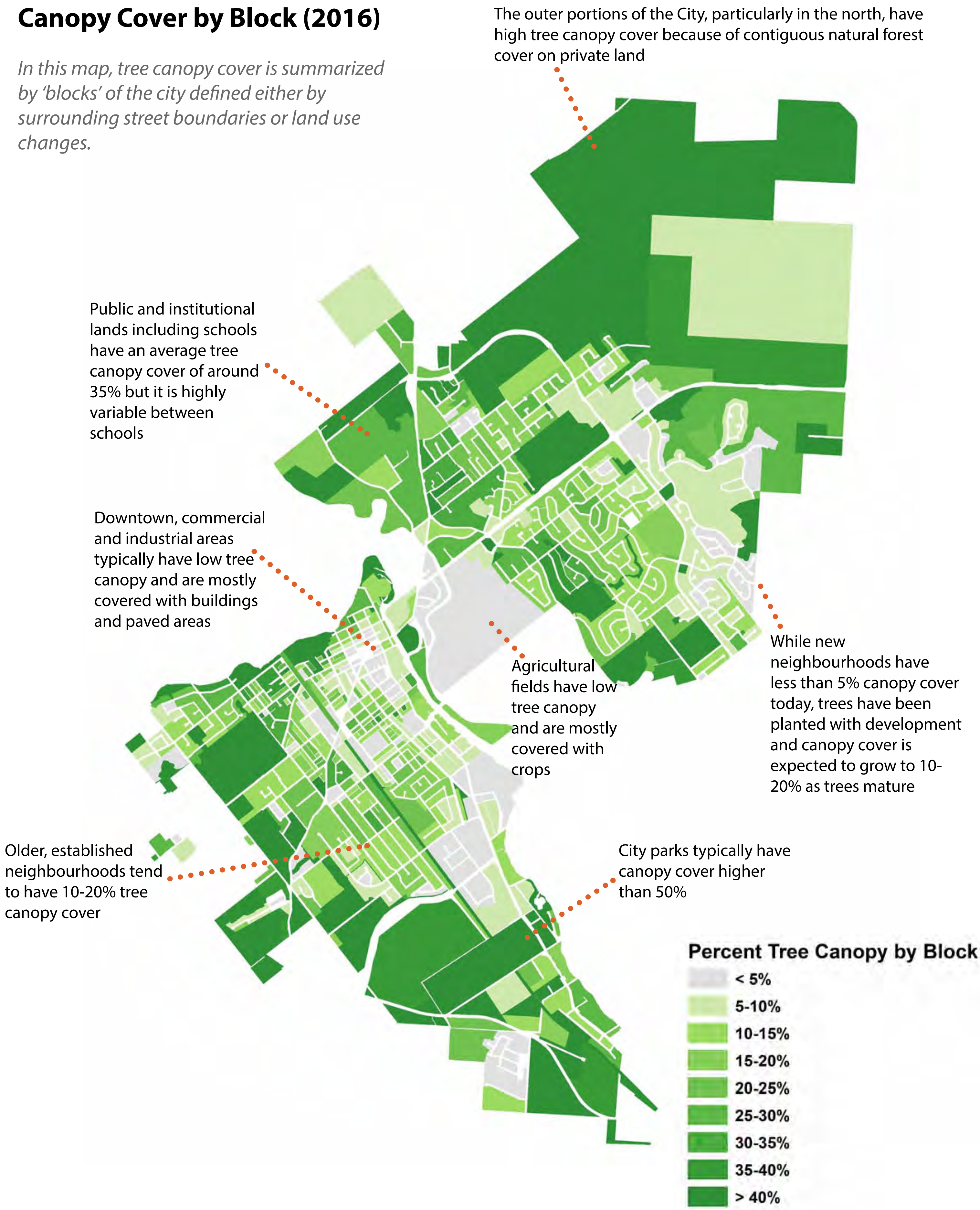
Individual zones within each land use summary

(CVRD Zones apply to lands that have not yet been rezoned to City zoning classifications)

Rural, Multi-use: CVRD zones: RU-1, RU-8, RU-20
Rail: I-3 & TU-1 (CVRD)
Industrial, Heavy: I-1 & IH (CVRD)
Public: all PA zones (parcels only, roads excluded)
Rural, Residential: R-1A, R-1C, RR-2, RR-2S, RR-3, RR-4, R-RU (CVRD) & CR-1
Agriculture: A-1, A-2 & RU-ALR (CVRD)
Residential: R-1, R-1B, R-1D, R-1S, R-2, R-2B, MH-1,. MH-2, CD-1A, B, G, H & I, CD-3, CD-4, CD-6, CD-7A&B, CD-12, CD-14, CD-15, CD-17, CD-21, CD-22, CD-23
Multi-Use: MU-1, 2, 3, 4 & 5, CD-7C&D, CD-9, CD-11
Golf Course Development: CD-1B
High-Density: R-3, 3A & 3B, R-4. 4A & 4B, R-5, CD-16, CD-19, CD-25
Commercial: C-1, C-2 & 2A, C-3, C-4, C-5, CD-1C, CD-1F, CD-24
Industrial, Light: I-2, IL (CVRD)
Commercial, Large: C-1A, CD-8

Canopy Cover by Block (2016)

In this map, tree canopy cover is summarized by 'blocks' of the city defined either by surrounding street boundaries or land use changes.



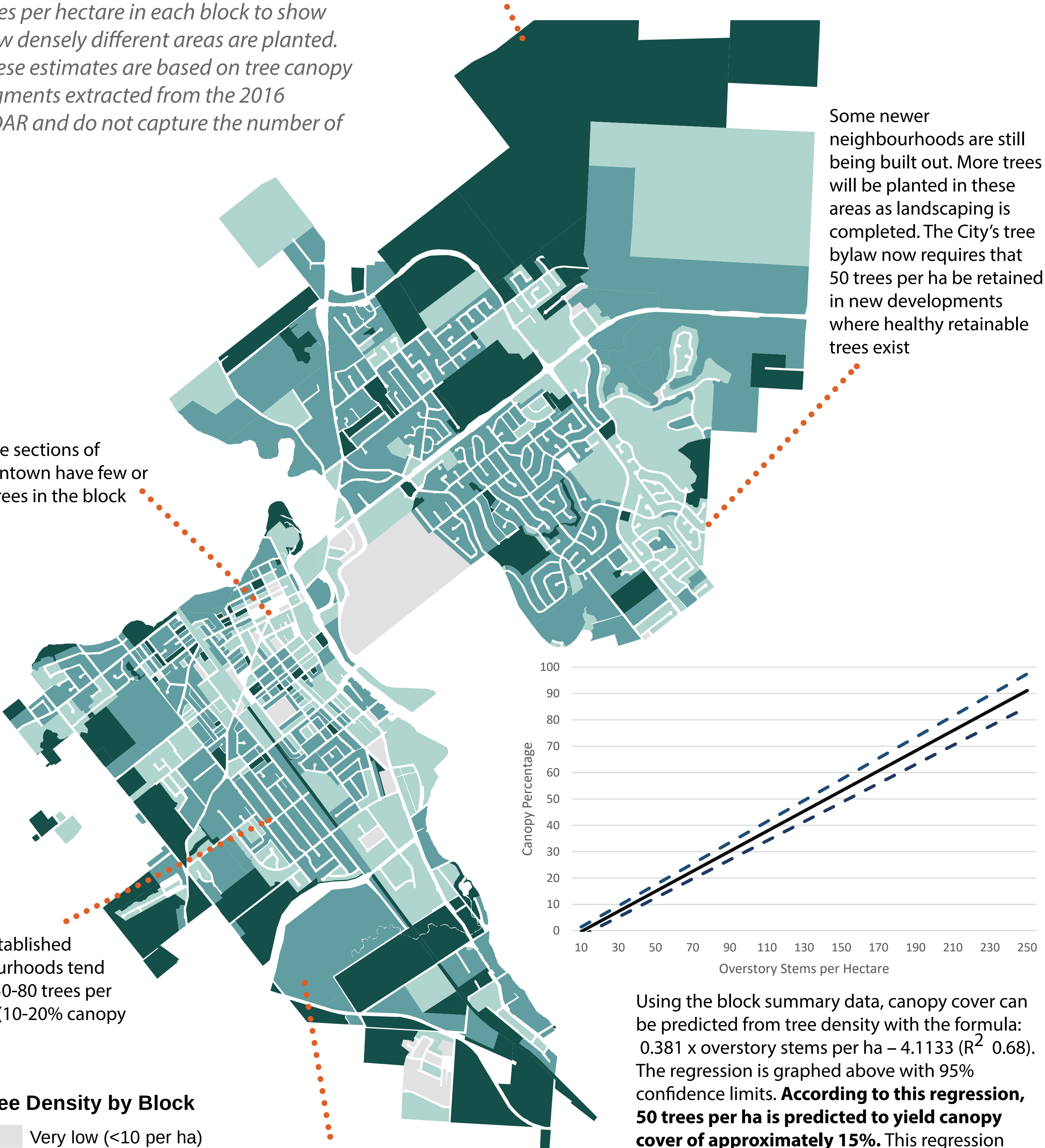
Tree Density by Block (2016)

This map summarizes the number of trees per hectare in each block to show how densely different areas are planted. These estimates are based on tree canopy segments extracted from the 2016 LiDAR and do not capture the number of

Areas of high canopy cover also have a high density of trees

Some newer neighbourhoods are still being built out. More trees will be planted in these areas as landscaping is completed. The City's tree bylaw now requires that 50 trees per ha be retained in new developments where healthy retainable trees exist

Some sections of downtown have few or no trees in the block



Older, established neighbourhoods tend to have 50-80 trees per hectare. (10-20% canopy cover)

Using the block summary data, canopy cover can be predicted from tree density with the formula: 0.381 x overstory stems per ha – 4.1133 (R^2 0.68). The regression is graphed above with 95% confidence limits. **According to this regression, 50 trees per ha is predicted to yield canopy cover of approximately 15%.** This regression analysis provides approximate results as canopy size at maturity will vary depending on species, growing conditions and health condition.

Tree Density by Block

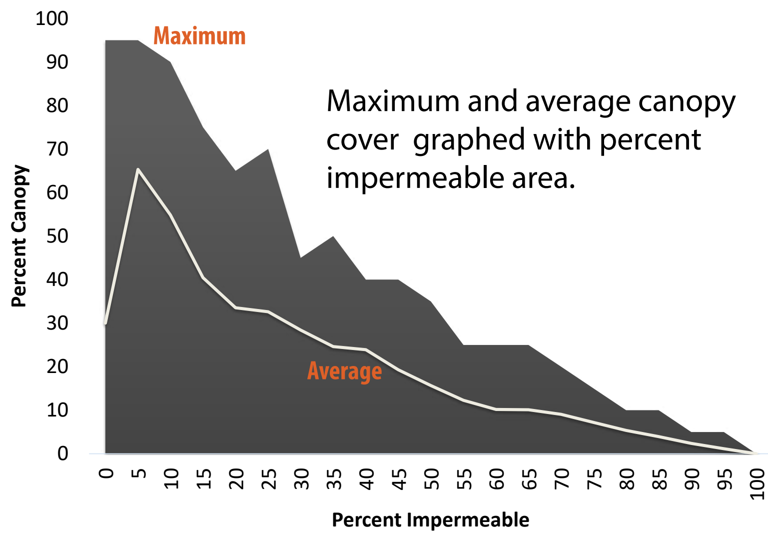
- Very low (<10 per ha)
- Low (10-49 per ha)
- Moderate (50-100 per ha)
- High (>100 per ha)

The City's 2017 Tree Bylaw requires that the lower end of a 'moderate' density of trees be achieved (retained, planted or cash-in-lieu) when removing trees on any property within the City

IMPERMEABLE COVER

Impermeable cover includes hard surfaces like roads and buildings. The more impermeable an area, the less water infiltrates the soil, the more rainwater becomes stormwater runoff, and the fewer trees that area can support. Impermeable cover is a useful metric for understanding the constraints for planting new trees as well as limits to potential canopy cover.

The graph at right shows the maximum and average canopy area recorded by block in Courtenay. Canopy cover becomes increasingly limited with increasing impermeability. This is likely because, the more building, road and paving covers an area, the less space there is for gardens and trees.



Maximum and average canopy cover graphed with percent impermeable area.

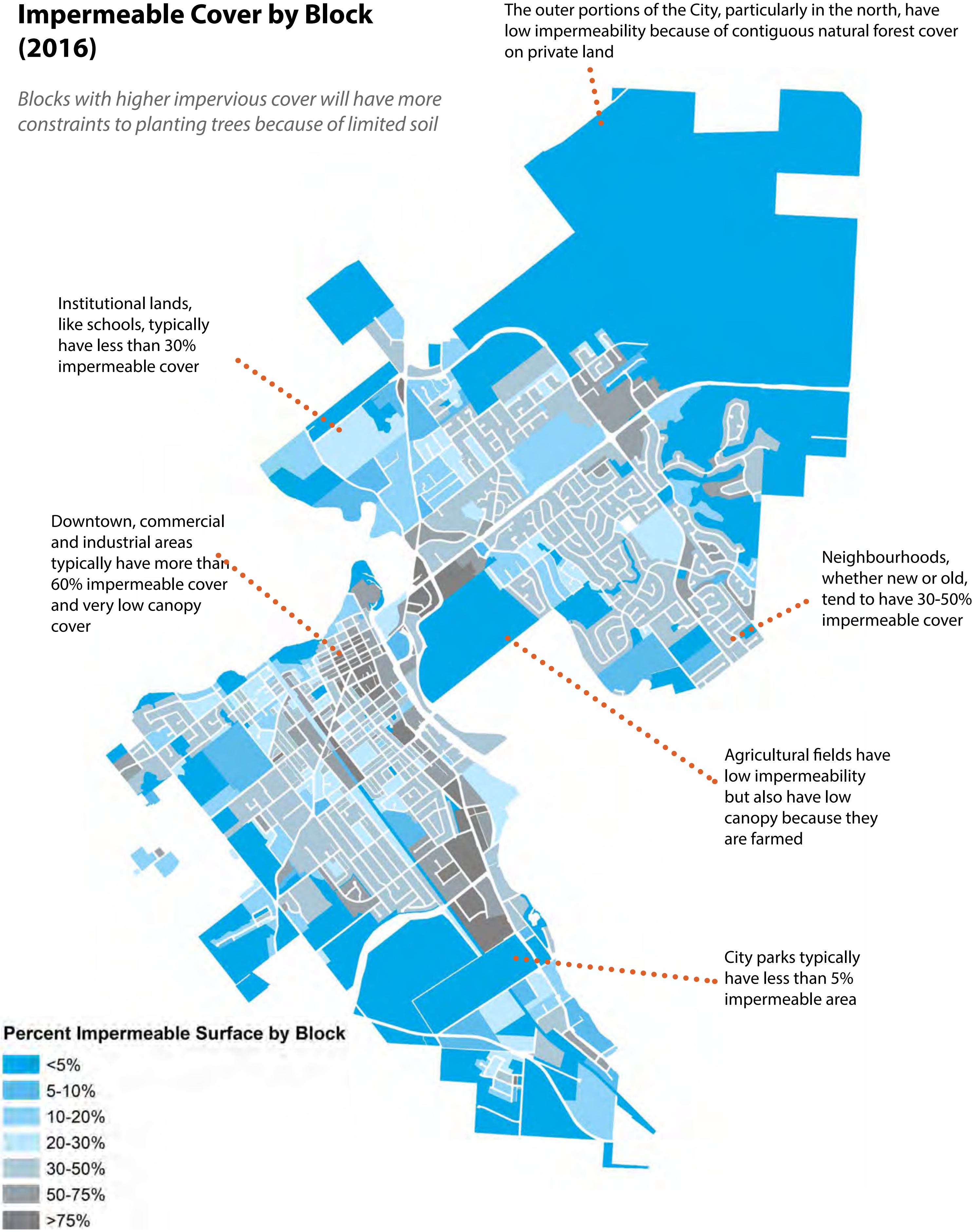
There is strong public support for limiting impervious surfaces. Nearly 90% of respondents to the Strategy survey indicated that they 'agree' or 'strongly agree' that the City should limit the area of paved surfaces allowed within the zoning regulations.

The need for more trees, shade, pervious rainwater infrastructure and less pavement within large commercial parking lots and the Downtown was cited amongst many survey participants as a key Strategy opportunity for existing and new developments.

Top images show the Home Depot parking lot (left) and its surrounding land uses (right). Bottom images show 4th Street in Downtown Courtenay (left) and its surrounding land uses (right).

Impermeable Cover by Block (2016)

Blocks with higher impervious cover will have more constraints to planting trees because of limited soil



A watershed is an area of land that collects water and drains into a large river, lake, estuary or ocean. Because impermeability is linked to the amount of stormwater runoff and soil moisture recharge in an area, it can have a big impact on watershed health. There are several key ways impermeability affects watershed health:

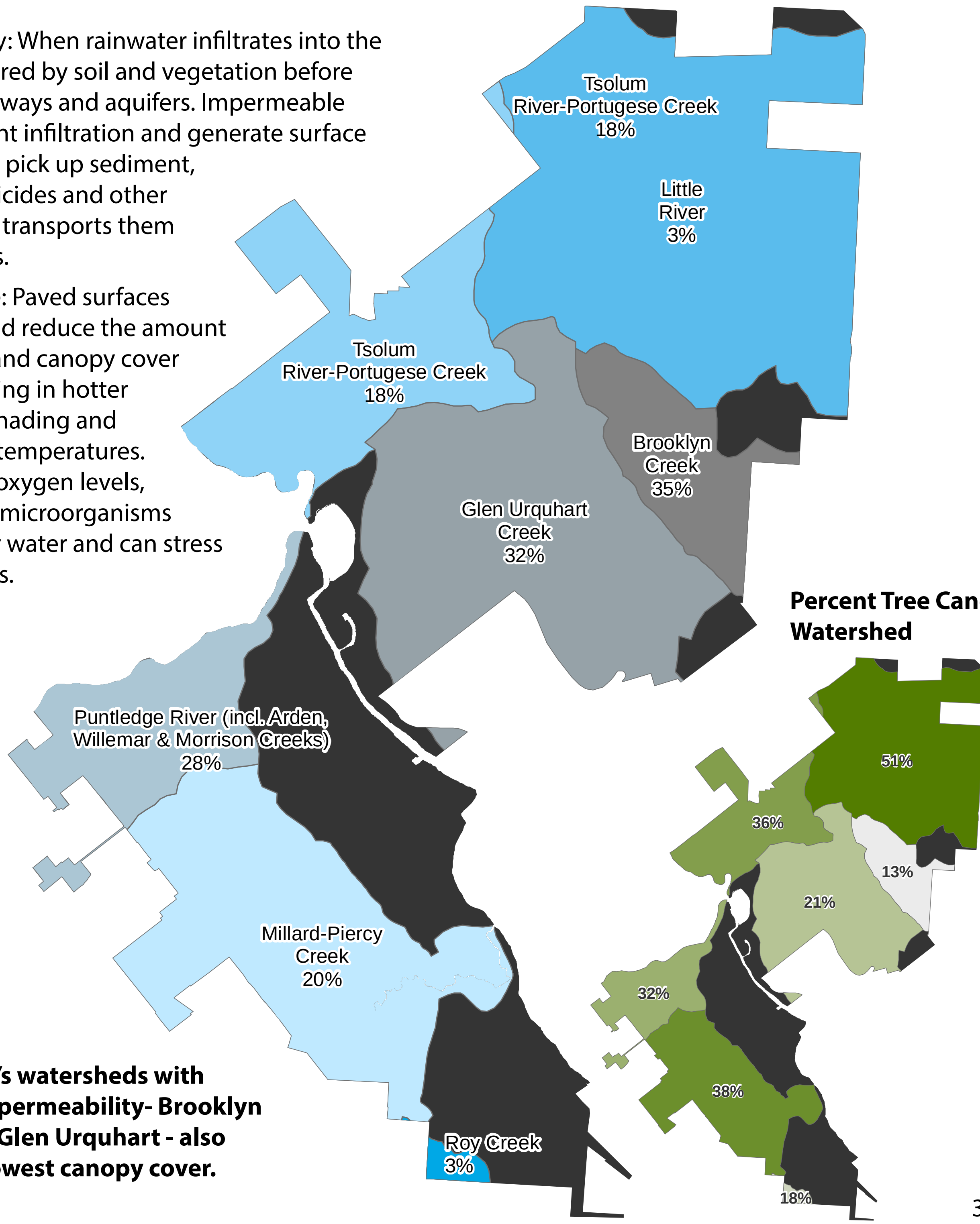
1. Water quantity: Paved surfaces create fast and high volume runoff that causes flooding and erodes soils.

2. Water quality: When rainwater infiltrates into the soil, it gets filtered by soil and vegetation before entering waterways and aquifers. Impermeable surfaces prevent infiltration and generate surface runoff that can pick up sediment, fertilizers, pesticides and other pollutants and transports them into waterways.

3. Temperature: Paved surfaces absorb heat and reduce the amount of vegetation and canopy cover on a site resulting in hotter surfaces, less shading and warmer water temperatures. This alters the oxygen levels, chemistry and microorganisms found in soil or water and can stress aquatic animals.

Percent Impermeable Surface by Watershed (2016)

Watershed health decreases with increasing impermeability



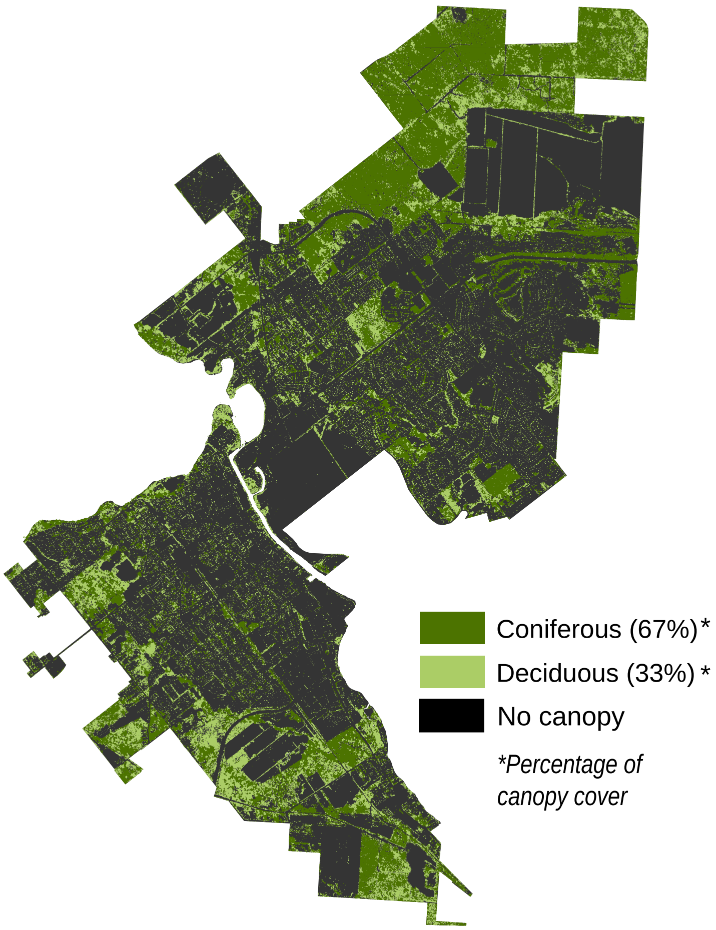
Courtenay's watersheds with highest impermeability- Brooklyn Creek and Glen Urquhart - also have the lowest canopy cover.

NATIVE FORESTS

Courtenay is within the Coastal Western Hemlock biogeoclimatic subzone (CWHxm1). Natural ecosystems in this relatively dry climate have been extensively disturbed from urbanization. Older forests are, therefore, relatively rare and fragmented.

Climate normals[1] show average yearly precipitation of 1,154 mm and an average yearly temperature of 10°C. Records also show extreme maximums as high as 35°C in July and extreme minimums as low as -21°C in January. More typically, winters are mild and summers are cool, though periods of drought are common in the summer.

There are three broad forest types found in Courtenay. Most common is second growth conifer forest that regenerated after timber harvesting. Based on LiDAR analysis, 67% of Courtenay's trees are estimated to be conifers. Less common, but still prevalent forest types, are riparian and woodland forests.



Conifer dominated forests

Conifer forests in Courtenay are typically dominated by Douglas-fir with lesser amounts of grand fir, western hemlock, western redcedar and deciduous tree species. These forests are representative of the region's most typical plant communities in the sense that they occur on average sites for the regional climate conditions. Wetter sites contain more red alder, black cottonwood or bigleaf maple.

Courtenay's coniferous forests typically consist of older second growth ranging from 60 to 100 years old. These forests have regrown following disturbances such as logging and wildfire. Past disturbances have occurred at different times and scales resulting in the mosaic of forest ages seen across the city today.

A hairy woodpecker feeding its young in Lerwick Park

1 Comox A weather station 1981-2010 http://climate.weather.gc.ca/climate_normals/

" The BC Conservation Data Centre shows that all naturally occurring forested ecosystems in Courtenay are considered at risk in BC and/or globally." - Tim Ennis, Coastal Douglas Fir Community Partnership

This pole-sapling forest just southeast of Comox valley Logging Road and Buckstone Road appears to have been clear-cut harvested in the late 1990s.

Young forests in Hurford Hill Nature Park are recovering from logging in approximately 1960. At this age the overhead canopy is very dense, preventing light from reaching the forest floor. This results in a characteristically sparse understory. If left undisturbed, or managed with intent, it could mature into old-growth forest.

This maturing forest at Lerwick park is about 100 years old and still bears stumps from when it was logged in the early 1900s. The forest is beginning to develop characteristics found in old-growth forests, such as a thick understory, a layered canopy, and dead trees that are important habitat for wildlife.

Although the majority of forests are still quite young relative to their potential life span, some are starting to develop old-growth characteristics. For example, forests in Lerwick and Roy Morrison Nature Parks contain relatively large trees, large decayed and undecayed downed logs and dead standing trees.

As these forests continue to age, dead trees will create gaps in the canopy, allowing light to enter. Young trees and thick understory can then establish in these canopy gaps. Old trees will grow increasingly large, as will the size of dead standing trees and logs on the ground. Old-growth forests may no longer exist in the City of Courtenay, but if the older forests are preserved, opportunities to experience old-growth right in the center of the city could return within our children's lifetimes.

"The trees in Courtenay make us feel so West Coast." - Survey respondent

Riparian forests

Riparian forests are also relatively common in Courtenay. These forests occur adjacent to lakes, streams and rivers, and are often dominated by red alder, black cottonwood and big leaf maple. In the absence of major disturbances, mixed deciduous and coniferous forest can establish in riparian areas. However, in locations with wet soils or frequent flooding deciduous trees are more common. Puntledge Park contains older mixed riparian forest with widely-spaced large trees, many of which are greater than 1m in diameter.

Because watercourses traverse the city, many riparian forests provide natural greenways valuable for the movement of wildlife through urbanized landscapes. For example, a strip of young alders that parallels Mallard Drive in east Courtenay provides thick vegetation cover between Hurford Hill Nature Park and Malahat Storm Park to the north (image on next page).

Woodland Forests

The less common woodland ecosystem types include the trembling aspen woodlands and Garry oak woodlands.

Trembling aspen is uncommon in Courtenay but occurs in localized, nutrient-rich swamp sites that have contiguous understory cover of reeds, sedges, and other species tolerant of seasonal flooding and a high water table. This plant community (called aspen-crabapple-sedge) is recognized by the Conservation Data Centre (CDC) as being rare (red listed) in BC. The mature forest has a canopy that is dominated by trembling aspen, with mixed components of bigleaf maple. Pacific crab apple and Nootka rose are found in the shrub layer, while the herb layer contains slough sedge and sword fern. One occurrence of the trembling aspen plant community is confirmed by the CDC in Courtenay, although similar ecosystems were found during ground truthing.

The Garry oak woodland ecosystems in the Courtenay area are unique and, notably, represent the northern-most extent of Garry oak woodlands in Canada. These woodlands are also unique because they occur on deeper, moister soils than other Garry oak populations, growing in an unusual association with Grand fir and snowberry. Many of these Garry oak trees are surprisingly old for their size with several confirmed to be older than 150 years.

A past report on the Vanier Oak property noted "The Garry oak – Grand Fir / Snowberry Mixed Forest community is not currently recognized by the BC CDC because of lack of sufficient information to designate, rather than lack of ecological value, rarity, or sensitivity" [7]. This report also determined that the forest was an open woodland stand in the early 1900s, likely fire-maintained by First Nations for acorn harvesting. In the absence of understory burning, conifers have established a more closed canopy forest today. Increasing Douglas-fir growth may eventually shade out the Garry oaks without human intervention.

The Trembling Aspen / Pacific Crab Apple / Slough Sedge is a red listed ecosystem with one occurrence confirmed in Courtenay. Based on our ground truthing, other similar aspen woodland ecosystems also exist in Courtenay.

The Garry oak woodlands that occur in and around Vanier Park are unique deep-soil woodland ecosystems in an unusual association with grand fir and snowberry. Vanier Park has been identified in the Parks and Recreation Plan as a priority to receive a specific management plan.

Thick vegetation cover shown behind the Malahat Park storm pond in the foreground. Planting trees and native vegetation as part of or in proximity to stormwater management ponds can improve water quality and overall habitat value. Incorporating vegetation into stormwater features must be carefully designed to ensure that operations and management are not negatively affected.

Image at left: Mature Garry Oaks at the St Andrew's Anglican Cemetery. At right: Garry Oak nursery spearheaded by Loys Maingon.

A Perspective on Garry Oak Value and Management...

"Not all trees are created equal. When it comes to climate change, some trees store more carbon than others. Fast growing trees are poor carbon accumulators, and are short-lived - so they release carbon quickly. Garry oaks are our best carbon investment.

Garry oaks are the heritage tree that defines Courtenay's future. Garry oaks have the second highest carbon-storage rate in the North America, exceeded minimally by California redwoods. Slow-growing and able to live well over 500 years, Garry oaks have a dense heavy wood, adapted to the wet winters and extreme droughts of our coastal summers. Requiring little care, it grows into the majestic blue-green tree in the northernmost native grasslands that have made Victoria and Eastern Vancouver Island a floristic mecca.

In the Royal Navy 1860 survey Captain G.H. Richards reported that the Comox Valley was "another Saanich", home to over 65 square miles of Garry oak prairie, stretching from Comox up both sides of the Tsolum River and north to Kye Bay. Before whalers introduced the potato to the coast in 1830 camas and corn were the main source of starch. The "Comox prairie" was the source of wealth for the Pentlatch culture which traded camas and acorn with tribes north and to the Rockies. Unfortunately, most of the prairie has been extirpated by agricultural and residential development. Throughout East Vancouver Island, Garry oaks and Garry oak ecosystems have been reduced to less than 5% of their pre-contact range. In the Comox Valley less than 1 % of Garry oaks remain.

Comox Valley Nature's "Garry Oak Recovery Program" started 6 years ago in 2012 with 500 potted Garry oaks aiming to plant 1,000 oaks by 2020. The program is supported by a nursery stock of about 2,000 potted trees which range from 1 to 8 ft. The program has since planted over 800 trees, and tracks the condition of local veterans. The nursery also grows a number of associated Garry oak ecosystem plants such as Douglas Hawthorn camas, riceroot and spring gold.

Although Garry oaks are easy to grow, and well-adapted to a very broad range of conditions from drought to wet - they need protection in their early years to prevent death from browsing or mechanical damage. The greatest impediment to Garry oak recovery is the will to care for the future."

- Loys Maingon, Garry Oak Ecosystem Recovery Team and CV Nature
www.goert.ca

Forest Heights and Ages, 2016

The City does not have an inventory of Courtenay's natural forest stands that describes their ages. However, LiDAR data analysis has provided a complete inventory of canopy and a canopy height model that provides clues to the age and distribution of forest stands. In general, older stands will contain taller trees; however, site quality can have a significant influence on tree height so it is not always a reliable proxy. Coring Douglas-firs in several taller stands did confirm trees were at least 100 years old, and that some Garry oaks were at least 150 years old.

Canopy height provides clues to stands with older forest potential. Some of Courtenay's very tall stands are highlighted on the map below.

Significant Stands and Corridors

To aid urban forest planning, the City wanted to map significant stands and tree corridors that contribute to urban biodiversity in Courtenay.

An urban forest is inherently modified by humans and, while there are established standards for mapping rare or sensitive ecosystems in natural areas, there are no equivalent standards for mapping 'significant stands and corridors' in the urban forest. In Courtenay's case, significant stands and corridors are those that are:

- Confirmed to, or are likely to, contain sensitive ecosystems or species of interest including aspen woodlands, Garry oak woodlands, older riparian forests and older coniferous forest, based on ground-truthing, LiDAR and orthophoto interpretation.
- Within a 30 m buffer of watercourses or greenways.
- Within mapped Sensitive Ecosystem Inventory (SEI), Conservation Data Centre (CDC) areas or municipal parks.
- Key patches or stepping stones that are important for connectivity based on a network analysis of 3 forest-dependent species.
- Identified by the public as containing values significant to their enjoyment and appreciation of the urban forest.

These significant stands and corridors can inform urban forest planning by flagging locations of potential significance for protecting, restoring or enhancing urban forest values. Not all mapped locations have been ground truthed, nor is there a detailed inventory of sensitive ecosystems and species of interest.

The City also sought to identify areas with a concentration of Garry oak, Pacific dogwood, arbutus, western white pine, Pacific yew and trembling aspen. These are all native species that are relatively rare in Courtenay and BC. Western white pine has become particularly rare because of the disease white pine blister rust.

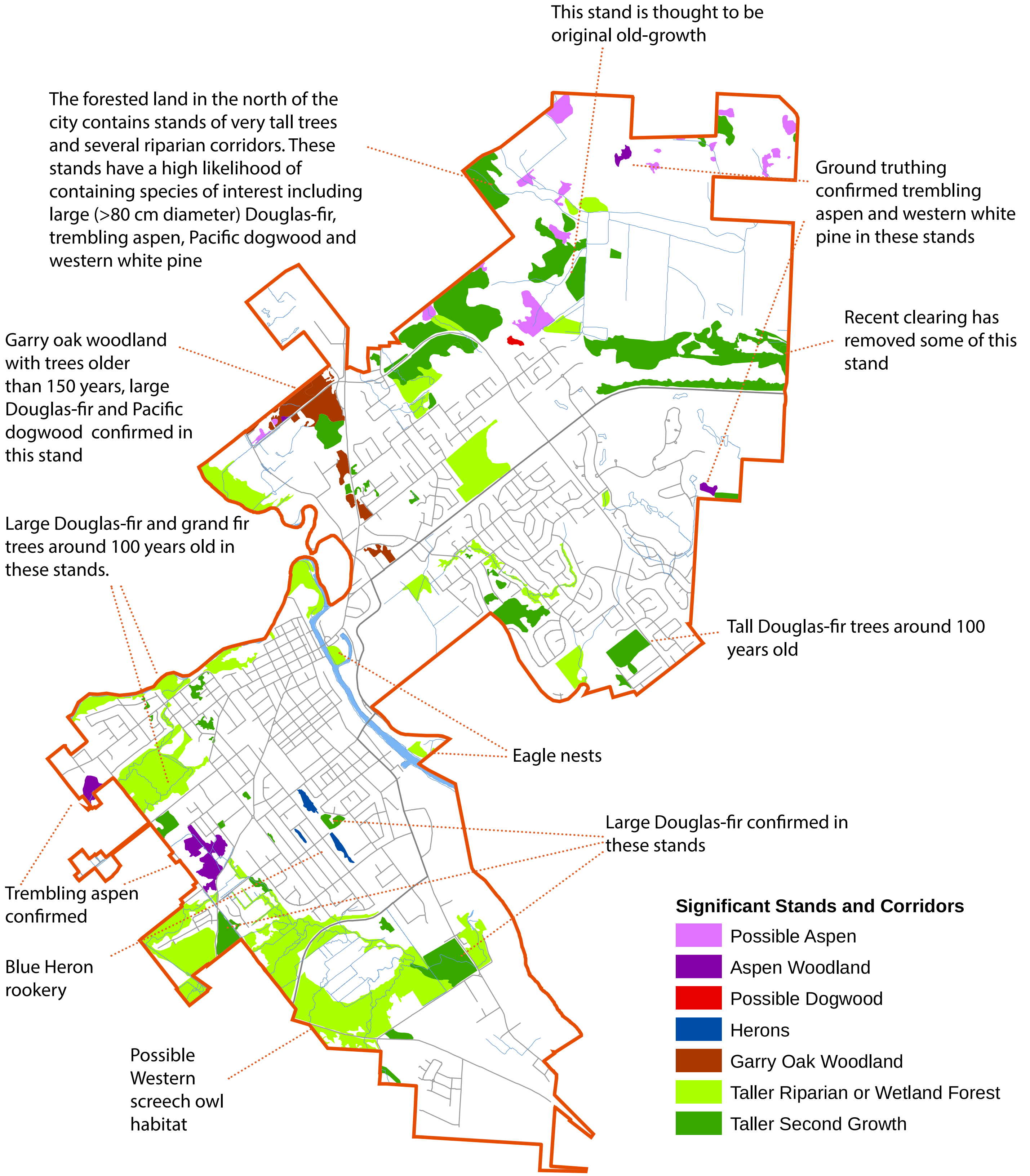
Ground truthing did detect Garry oak, Pacific dogwood, western white pine and trembling aspen in some stands. Due to the limited extent of ground truthing, the results are not an indication of the distribution of these species of interest, or of the absence of arbutus or pacific yew in Courtenay.

Western white pine

Garry oak

The map below highlights some of Courtenay's significant stands. The highlighted areas contain values related to large trees or tree species of interest, sensitive ecosystems, special places, habitats and riparian or greenway corridors.

These areas are potentially significant for maintaining and enhancing Courtenay's urban forest ecosystems, their connectivity and character.

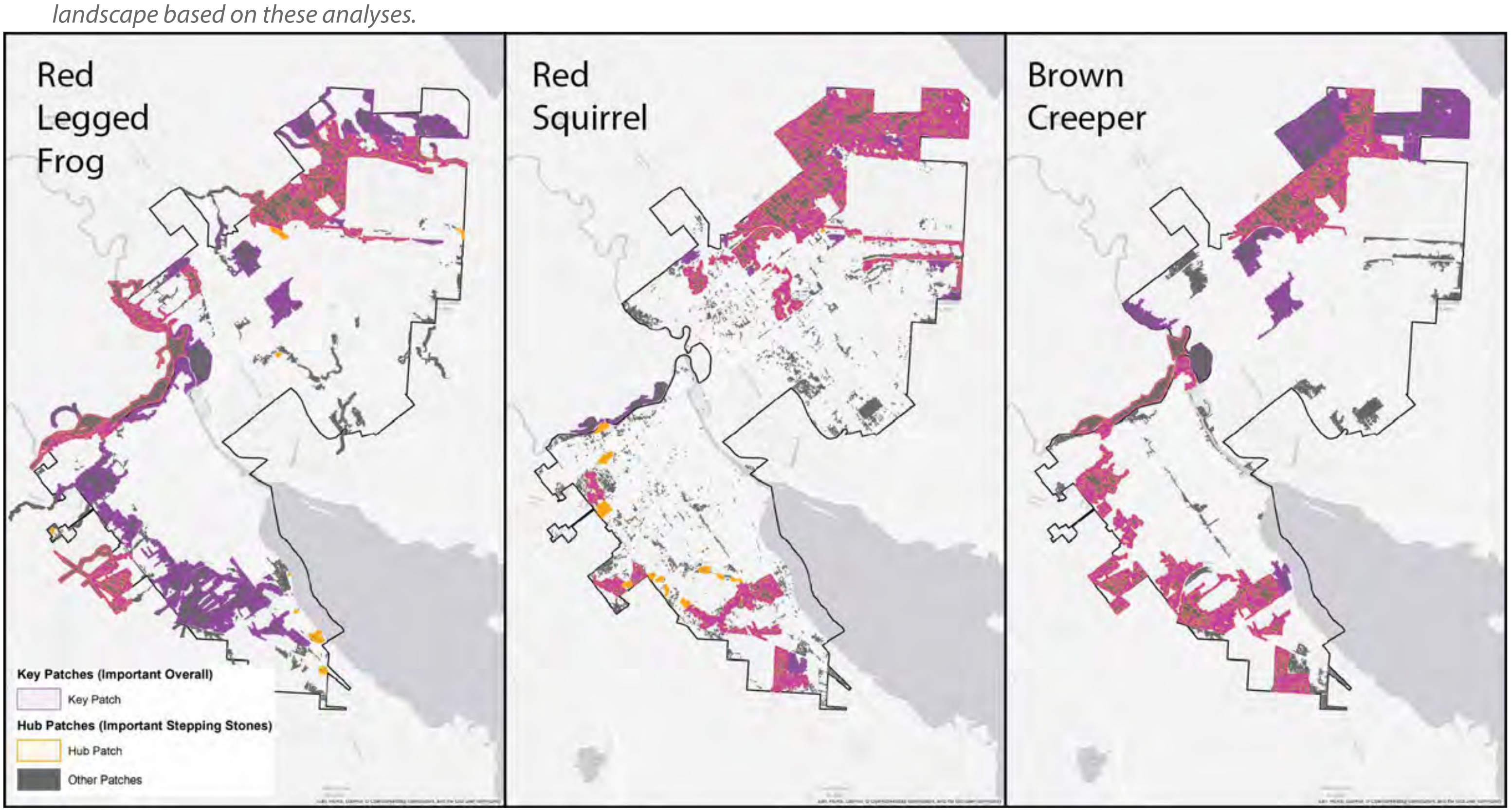


The urban forest can be thought of as a network of habitat patches through which species move. Understanding how connected this network is, and which patches play an important role in maintaining network connectivity can better inform conservation planning.

To understand forest connectivity in Courtenay, consultants used a program called Conefor to quantify how connected the landscape is from the perspective of three forest-dependent species: the red-legged frog, red squirrel, and the brown creeper. Each species can be considered an umbrella species for conserving particular habitat types: aquatic, riparian and moist mature forest for the red-legged frog; mature coniferous forest for the red squirrel; and larger patches of mature forest, either deciduous, coniferous or mixed for the brown creeper.

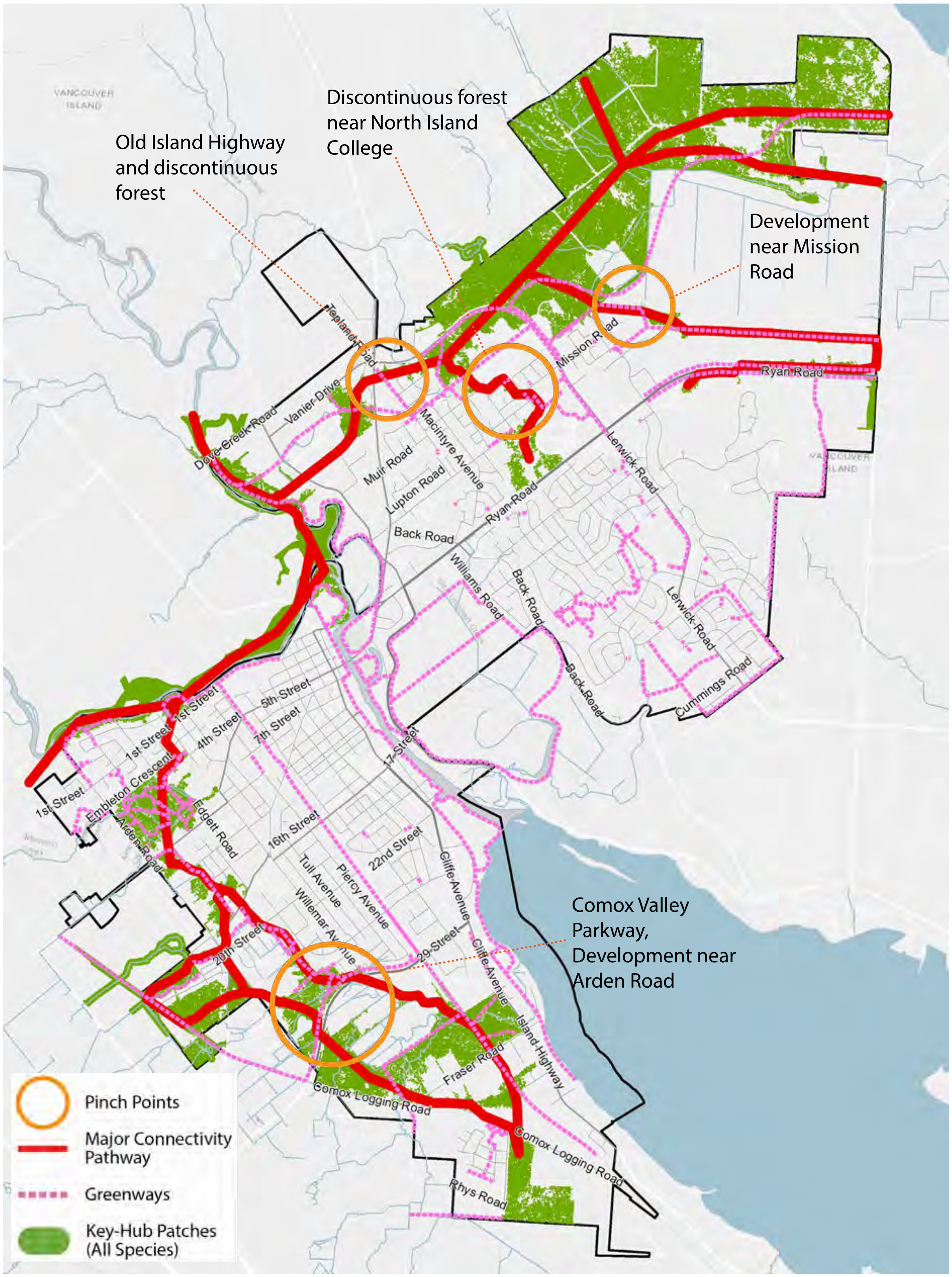
This analysis identified both the key patches that are important for overall connectivity, as well as hubs that are important stepping stones. The maps below show the key patches and hubs identified for each species. Conservation planning for forested areas can be informed by each patch's importance for maintaining the connectivity of the wider network of natural areas, as well as their overlap with other conservation values (e.g., significant stands of trees, sensitive ecosystems etc.).

These three maps show forest areas that the red-legged frog, Red Squirrel and Brown Creeper are expected to utilize, respectively. The most important patches for connectivity are highlighted. The map on the following page shows the most likely pathways of movement through the landscape based on these analyses.



The map below shows the key patches and hubs for all three species. Because these patches are most important for maintaining network connectivity, they are part of routes through the landscape that have the highest probability of successful dispersal for the species modeled.

The major connectivity pathways identify routes for maintaining connectivity throughout and between patches, and to greenspace in the broader Comox Valley region. Pinch points have been identified where barriers to connectivity exist today. These tend to be major roads, built-up areas and recent land clearing.



CITY TREES

City trees are those that have been planted in roads, parks or other City-owned lands. The City plants 300-350 new trees each year. About 50 are street trees installed in new developments and the remainder are planted as shade trees in parks and to help restore natural areas.

Courtenay has a partial inventory of 3,255 of its trees planted in streets and landscaped parks, but the total number of trees on City property is estimated to be closer to 30,000. This higher number comes from a coarse LiDAR-derived estimate of natural forest trees growing in parks or road rights-of-way, and front of yard trees planted by residents that may now have shared or unclear ownership. The purpose of the individual tree inventory is to capture the intensively managed trees in streets and parks, which is why it only covers a portion of the total public tree population.

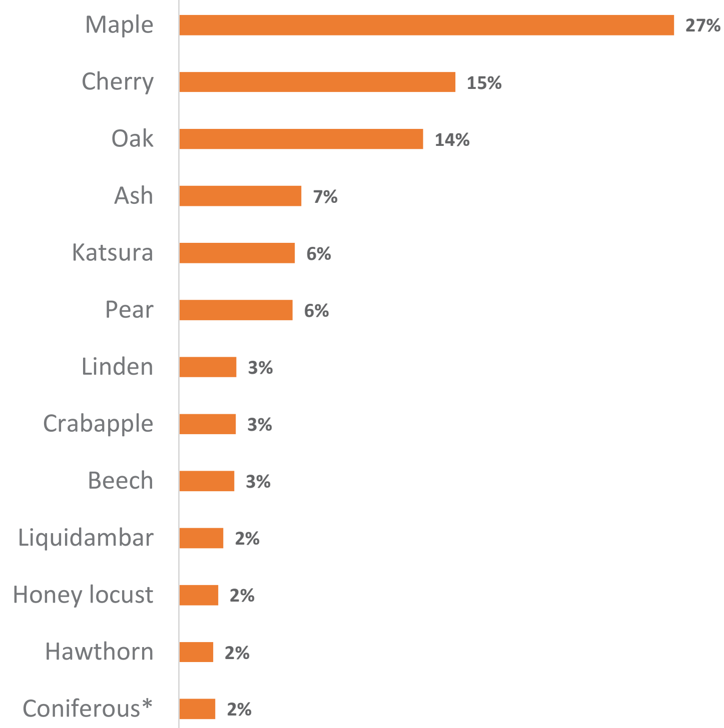
Diversity

The tree inventory provides a good indication of the diversity of species and ages among trees planted in City streets. Species and size information was available for approximately 2,500 City trees.

The five most common species planted are Japanese cherry (*Prunus serrulata*), red maple (*Acer rubrum*), Norway maple (*Acer platanoides*), katsura (*Cercidiphyllum japonicum*) and callery pear (*Pyrus calleryana*). The next level of classification above species is genus (i.e., Norway maple and red maple are grouped within the maple genus). The most common genera are graphed above and show that maple (Acer), cherry (Prunus) and oak (Quercus) are particularly dominant in Courtenay's streets and landscaped parks.

Diversity guidelines for urban forests are often recommended to reduce vulnerability in the tree population to pests and disease. The most recent guidance recommends 5-15-20 as a rule-of-thumb so that urban forest populations have no more than 5% of any one species, 15% of any genus, and 20% of any family [9]. In Courtenay, maple exceeds the genus guideline. The diversity of species in Courtenay's streets and manicured parks can be increased. In addition, tree species that have invasive potential or are not suitable for future climate will be avoided in future.

MOST COMMON GENERA IN COURTENAY STREETS AND LANDSCAPED PARKS



**In order of abundance: Douglas-fir, redcedar, pine, cypress, spruce, fir, sequoia*

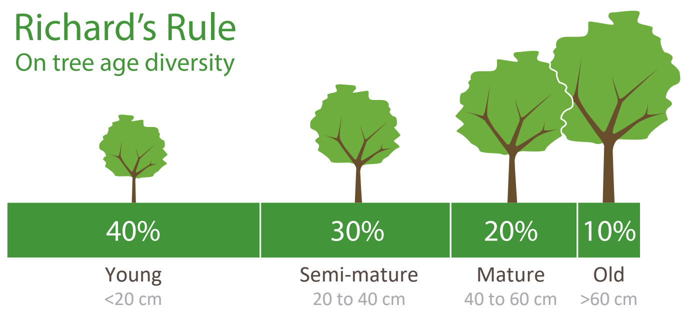
Aerial photo of a public street tree in front of a private property. The depth of the public boulevard in front of a property line can be as much as 5.5m. The City allows people to plant and maintain other vegetation within these boulevards. However, it must not inhibit traffic sight lines or pedestrian passage where sidewalks are present. The City retains the right to remove vegetation from the public boulevard without compensation in case of a conflict.

Age, size and genetic diversity are also important for maintaining stability in urban forest populations over time. Using size as a proxy for age, the 40:30:20:10 guideline suggests that 40% of an urban forest should have a diameter at breast height of < 20 cm, 30% between 20-40 cm, 20% between 40-60 cm and 10% > 60 cm [10]. Maintaining these size ratios in a population promotes stability by ensuring there are enough young trees to replace older ones without sacrificing the ecosystem services provided by more mature trees.

Courtenay's inventoried trees are very skewed towards trees less than 20 cm (55%) and trees 20-40 cm (39%). There are very few larger, older planted trees in streets or parks. This indicates that Courtenay's planted tree population is fairly young and that tree planting has been an inconsistent practice until relatively recently. However, as Courtenay's planted urban trees mature, differentiation in size and age class will increase due to the different size and life expectancy among species. For example, maples, oaks and ash are typically large, long-lived urban trees in the absence of pests and disease. Cherries, katsura and pears are comparatively smaller, short lived species.

Genetic diversity is also important in a tree population, particularly for within-species resistance to pests and diseases. Genus-level pests or diseases such as Dutch elm disease, emerald ash borer and mountain pine beetle have dramatically impacted populations of elms, ash and pine respectively. In areas where these pests occur, individual trees or species with natural resistance are key to the persistence of these genera. Genetic diversity within species is hard to measure without genetic testing. However, it is likely low in the planted urban forest because modern nursery practices rely heavily on industrial scale production of a limited variety of clonal trees.

Many more of Courtenay's City trees are in uninventoried natural areas described in the Native Forests section of the report. The LiDAR and ground truthing indicate that there are large numbers of trees in larger size classes in the natural forests on City property. It is likely that genetic diversity is also higher in naturally regenerated forests.



This guideline for size diversity comes from research on tree populations that found street tree population stability was driven by young tree mortality and replacement. This distribution of size classes was proposed as a guideline for maintaining a stable supply of tree canopy over time.

Young trees in the street with an older stand of native Douglas-fir trees in the background

Inside an older second growth stand of trees in Lerwick Park

Value of City Trees

It is helpful to value City trees in terms of both cost and value to inform decisions about tree preservation, asset management, urban forest budgeting and also as a way of communicating that trees have value.

The Council of Tree and Landscape Appraiser's (CTLA) Guide to Plant Appraisal (latest edition) is the resource used by arborists to guide tree appraisal methodology[1]. City trees may be appraised on a case by case basis when, for example, a tree is hit in a motor vehicle accident or illegally cut. An arborist will assess the tree and provide their professional opinion on the value to be sought in damages. Some cities also use appraisal methods to calculate compensation to be paid for trees removed and replaced with development.

For the purposes of informing tree preservation and asset management, it is not practical or necessary to have every City tree appraised to the CTLA standard. Coarser methods can effectively provide a relative estimate of tree value from the City's tree inventory data. One tool that enables coarse tree valuation is the USDA's i-Tree Eco. This tool provides and estimate of:

- Structural (compensatory) value using a trunk formula method and a version of the location values described in the 8th edition of the CTLA Guide to plant appraisal [11].
- Present value of future benefits based on an income approach to monetizing ecosystem services.

i-Tree Eco was used to estimate tree value for approximately 2,500 inventoried trees that had species, condition and diameter at breast height (DBH) measurements. Because the inventory data and i-Tree's methods are coarse, the structural value outputs are reported as value rankings from very low to very high, rather than specific values. Also, tree condition can change as tree health or structure improves or declines so these estimates are only relevant for the inventory period.

Based on i-Tree Eco estimates, Courtenay's 2,500 inventoried trees store 326,477 kg of Carbon and annually:

- Sequester 9,888 kg of carbon.
- Remove 191 kg of pollution.
- Produce 26,380 kg of oxygen.
- Intercept 4,146 m^3 of water resulting in 926 m^3 of avoided runoff.

Given that these values are quantified for only 2,500 of an estimated 30,000 City trees, the total ecosystem services provided by Courtenay's tree population would be much higher.

Large trees such as this Douglas Fir on 1st Street store much more carbon than a young tree. For optimum carbon storage, Garry Oaks are the best local choice for their dense wood properties and long life.

1 The CTLA Guide to Plant Appraisal considers the following factors: tree **size**, **species**, **condition** and **location**. An example of a high value tree would be a larger and older tree of a species well adapted and durable for the location conditions, which is healthy and well-maintained and stand-alone near a building.

The highest value inventoried trees in Courtenay are concentrated in the older neighbourhoods and are large oaks, sycamores and horsechestnuts. Many large City trees are not inventoried and pockets of high value trees are likely also concentrated in tall second growth or riparian stands.

>50 cm diameter Japanese cherry on Centennial Drive

>50 cm diameter Garry oak on Valley Crescent

80-90 cm diameter horsechestnuts and sycamores on Harmston Avenue. Two of the sycamores have since been removed.

70-90 cm diameter sycamores and honey locusts on 2nd Street

>50 cm diameter Japanese cherry on Robert Lang Drive

Row of 50-60 cm diameter Japanese cherries on Williams Road

>50 cm diameter tulip tree on Royal Vista Way

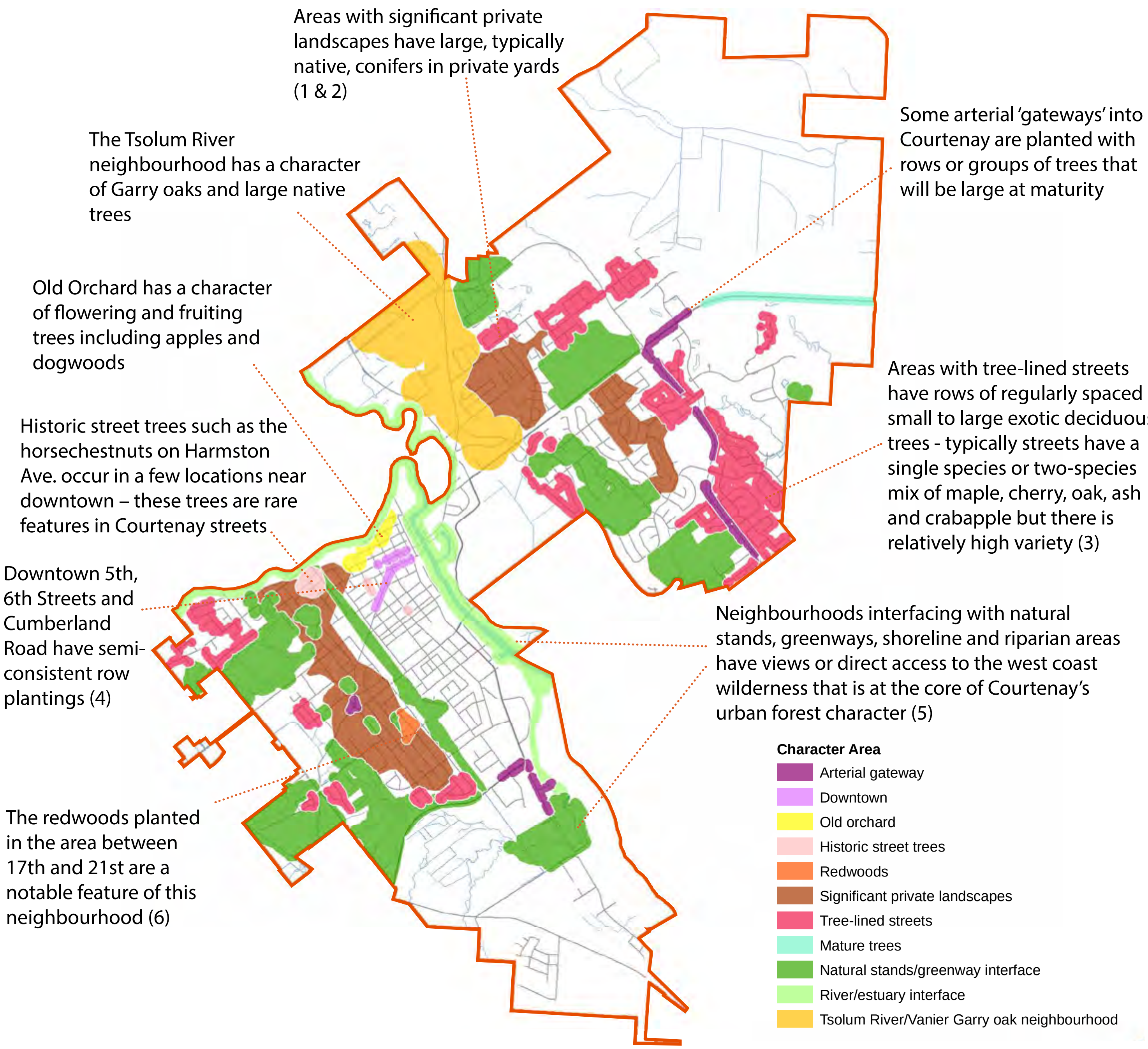
"Trees are the lungs of our city." - Survey

50-80 cm diameter English and scarlet oaks on Fitzgerald Avenue

URBAN FOREST CHARACTER

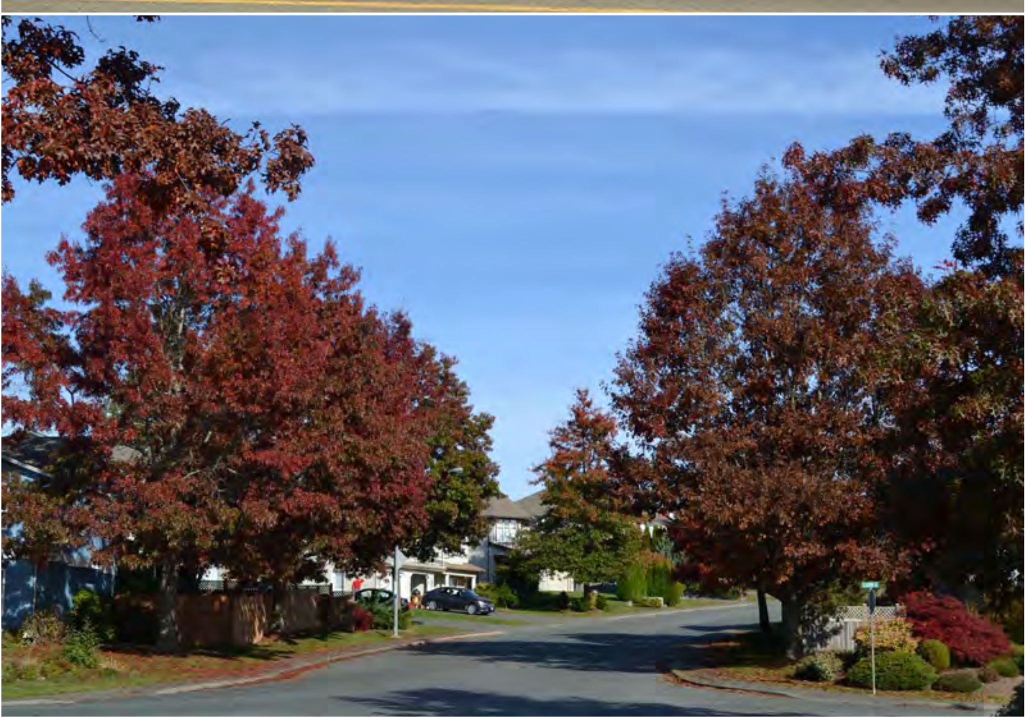
Trees and vegetation in forests, streets, parks and private yards contribute to the unique character of Courtenay neighbourhoods. Flowering and deciduous trees provide signs of changing seasons. Stands of native trees bring the sounds of wildlife and a reminder of our west coast rainforest surroundings. Even a single tree standing out against buildings or from the roadway can be a wayfinding feature for a neighbourhood.

The map below defines broad urban forest character areas for Courtenay based on what is on the landscape. Corresponding numbered character images are on the following pages. This information will guide the reinforcement of existing urban forest character as neighbourhood planning evolves. Future local area planning processes will define the aspirational urban forest character for each neighbourhood and guide new tree planting.



Significant Private Landscapes
(1) In east Courtenay, the mature trees along the hillside facing west provide highly valued hillside views from below and across the Courtenay River and K'ómoks Estuary. Hillside can be seen from Photos 5.

Significant Private Landscapes
(2) In west Courtenay, this Willemar Avenue residence is one of over a dozen properties that have voluntarily retained their mature conifers, lending to a unique character for this busy street.



Arterial Gateway
(3) These Scarlet Oaks on Malahat Road are some of the most mature suburban street trees in Courtenay. Intentionally chosen years ago, they are just now beginning to provide the colour and street framing characteristics originally envisioned.

Downtown

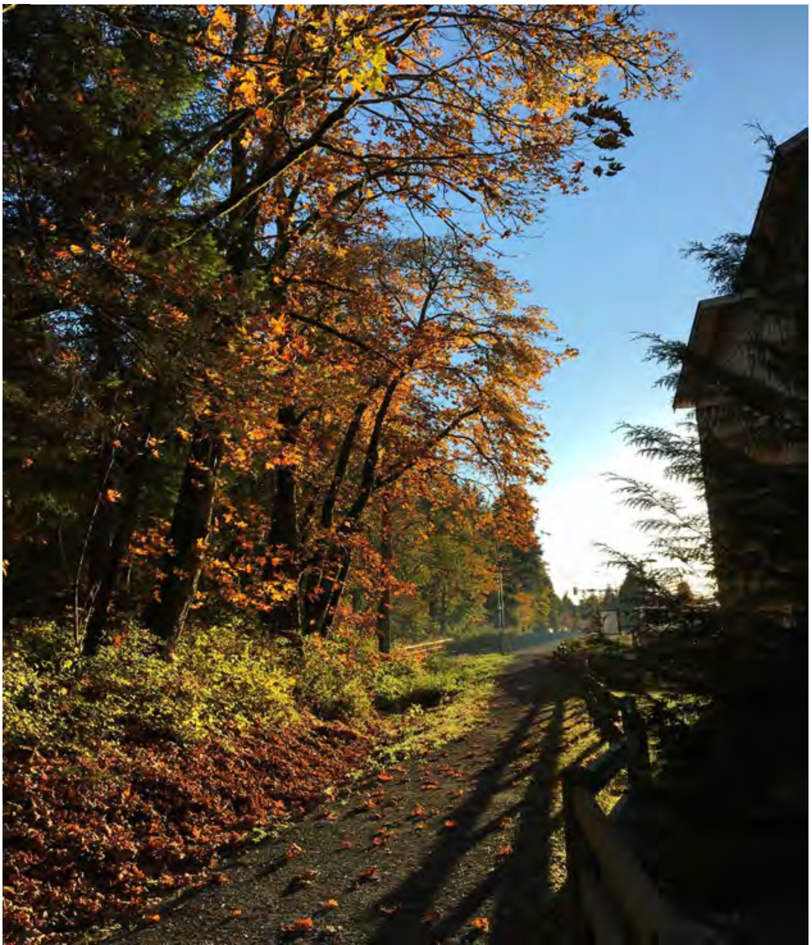
(4) While small canopied, the street trees downtown are valued for their contribution to the street scape. Residents also noted they appreciate the views on 5th Street of either the forested east Courtenay (shown here) or the glacier. Photo credit: Craig Carson.

Greenway

(5 - left) Part of the Riverway Greenway and adjacent to Millard Creek Park, the apartments at Anfield Road demonstrate what an urban-nature interface can achieve.

Redwoods

(6 - right) Redwoods, not native to BC, are scattered throughout a number of west Courtenay properties, a legacy from a resident who brought seeds up from California decades ago.



"Our street has lots of trees because it's an older one. The trees are what attracted us to this neighbourhood." - Survey respondent

"Plant trees along Ryan road from Back Road up to North Island College to screen traffic, noise and pollution." - Survey respondent

"Corridors of trees should be maintained or planted between neighbourhoods to create distinct character" - Survey

"With strategic tree planting we have an opportunity to dramatically improve Courtenay's main entrance points and thoroughfares." - Survey

"The existing urban forests on public lands should be nurtured and grown." - Survey respondent

"We could use more trees on streets running east-west. I walk a lot and they are very hot in the summer." - Survey respondent

"I think most streets and parks in Courtenay could use a lot more tree cover." - Survey respondent

PLANTING OPPORTUNITIES ON PUBLIC LAND

Planting opportunities on public land are concentrated in parks and along road right-of-ways. The map below shows potential planting opportunities identified using LiDAR.

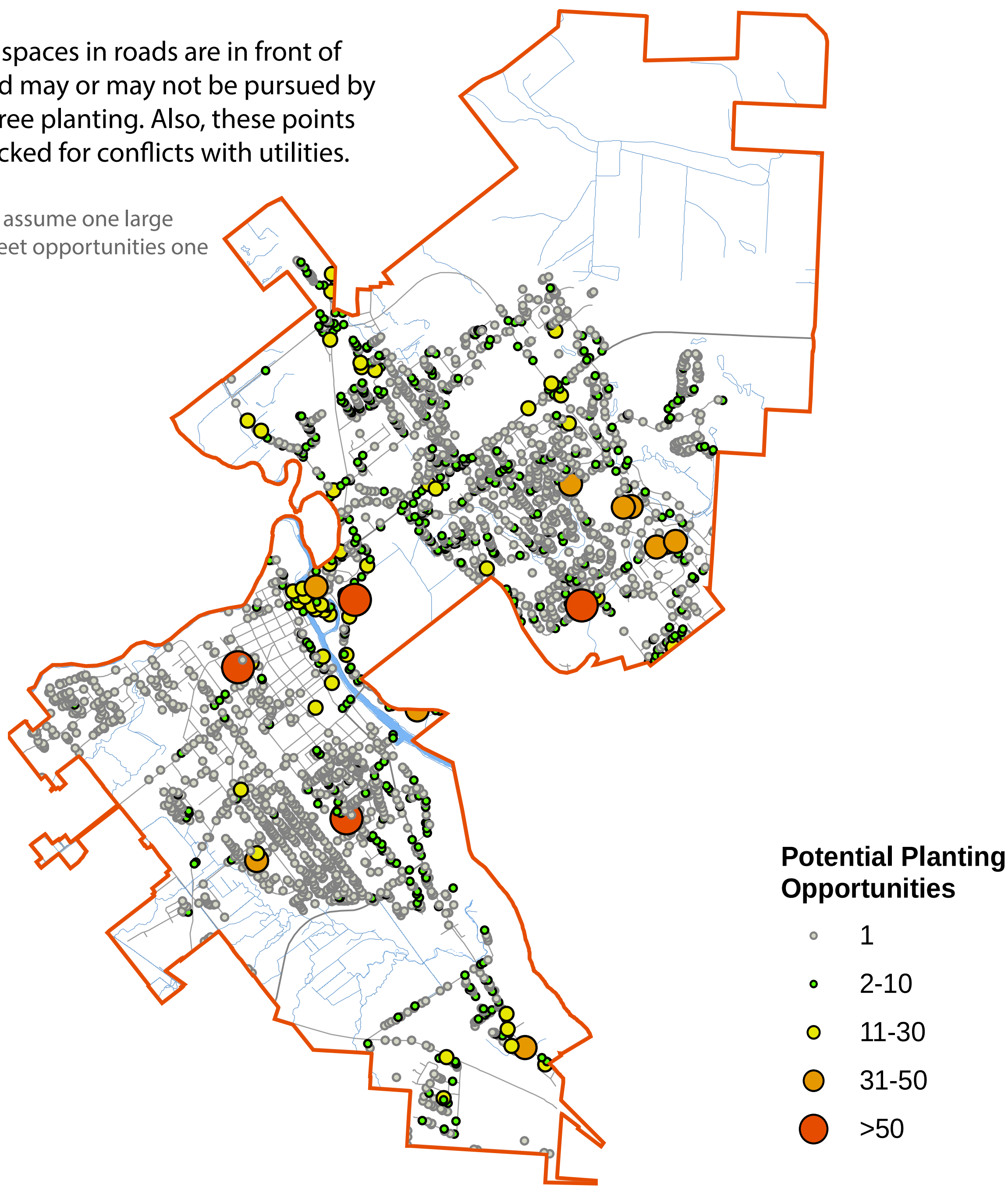
Permeable areas on public land were assumed to be potentially plantable and assigned a number of planting opportunities based on their size[1]. In parks with active uses like sports field, the number of opportunities was reduced to what could likely be planted around the park's edges.

Many of the single spaces in roads are in front of people's homes and may or may not be pursued by the City for street tree planting. Also, these points have not been checked for conflicts with utilities.

1 Park opportunities assume one large tree per $150m^2$ and street opportunities one large tree per $60m^2$.

As a result, the 5,200 estimated planting opportunities will be an overestimate. Though further office and field review is required prior to planting, this map still provides an indication of where existing planting opportunities are concentrated on public land.

This map does not identify locations where new planting sites could be constructed, for example in downtown streets.



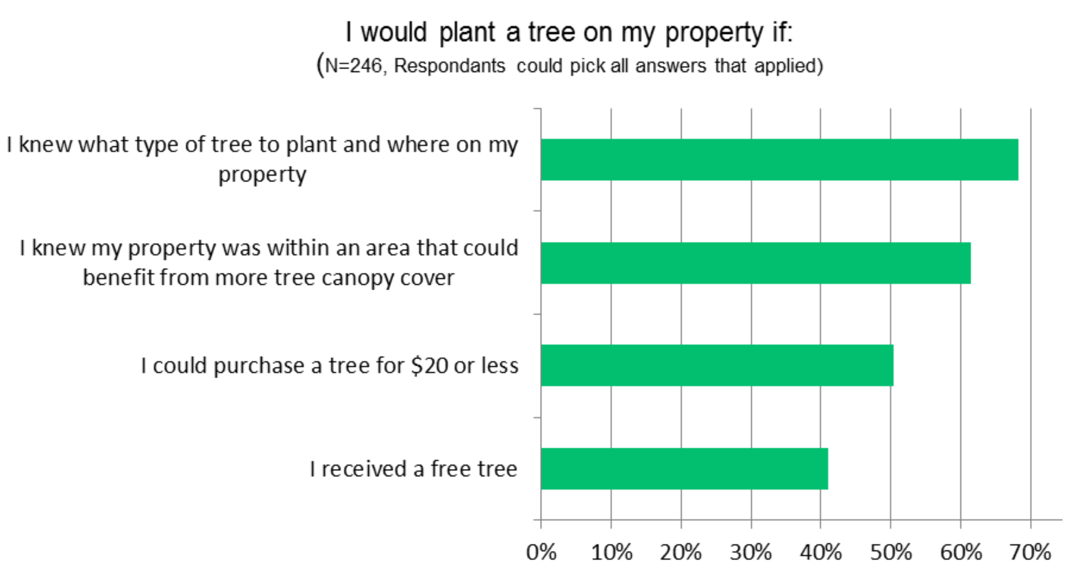
PLANTING OPPORTUNITIES ON PRIVATE LAND

Planting opportunities on private land are determined by the extent of permeable area that could be planted, the land use, and people's preferences for planting trees on their properties.

In Courtenay, the private land uses with the greatest permeable areas are agricultural, residential and golf courses. Obviously, agriculture and golf require unforested, open spaces, therefore, residential land is where the largest potential planting opportunities occur in Courtenay.

Below, we present an estimate of the potential planting opportunities on private land if a target of 100 stems per hectare (expected to yield ~33% canopy cover) were set. This is double the Tree Bylaw Tree Density Target requirement when removing mature trees. This more ambitious target that exceeds minimum replacement standards is possible and encouraged. Agriculture, golf course and industrial land uses were excluded due to likely conflicts with trees. **Almost 40,000 opportunities are estimated to exist on private land, over seven times those on public land.**

Aggregate Zone	Total Hectares	Permeable Hectares	Estimated Planting Opportunities (Density of 100 stems/ha)
Agriculture	579	380	N/A
Residential	657	204	20,417
Golf Course Development	177	84	N/A
Rural, Residential	221	68	6,768
Rural, Multi-Use	492	58	5,757
High-Density	90	23	2,292
Commercial	131	23	2,282
Multi-Use	51	15	1,493
Industrial, Heavy	38	10	N/A
Industrial, Light	46	7	N/A
Rail	21	5	496
Commercial, Large	25	2	171
Total			**39,676**



Residents indicated through the survey an interest to plant trees in support of the Urban Forest Strategy, as shown in the graph to the left.

REGIONAL CONTEXT

The University of Maryland's global forest cover change dataset [8] shows large scale forest cover change in the region.

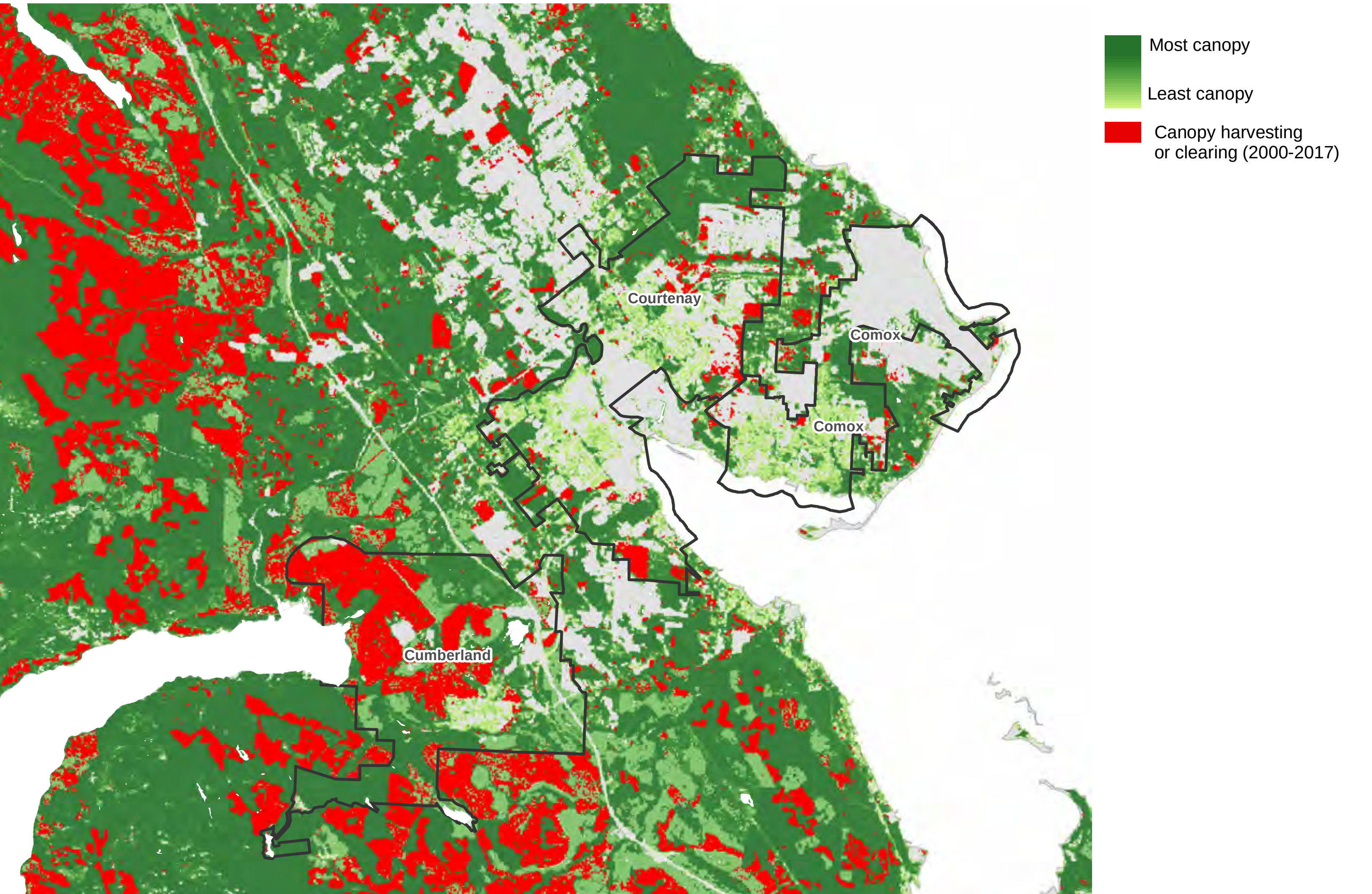
Forestry is the largest cause of regional canopy cover change outside the boundaries of Courtenay, Comox and Cumberland. The red cutblocks show as 'loss' in the satellite data but because they will regenerate, they are not permanent forest cover losses. Some land clearing for agriculture, mining and development also occurs outside the municipal boundaries.

Within the municipal boundaries, the forest cover loss visible on the map below is typically associated with a permanent change from a natural forested area to a residential land use. While these areas will likely be replanted with some yard and street trees, this new canopy will not completely replace the lost forest cover.

Large-scale losses exceed gains in more than 90% of BC municipalities. Slow growing municipalities and fully developed cities like Victoria and Vancouver do not have much new development in forested lands and therefore do not show much large-scale loss. However, tree canopy may still be declining in those cities due to individual tree losses.

Most forest cover loss detected in Courtenay has occurred in the last three years (2015-2017) and is related to land clearing for development. Very little large-scale loss was detected within Courtenay's boundary between 2000 and 2014.

> ***"Focusing on infill housing instead of approving big lot developments that start by clear-cutting would help maintain tree cover." - Survey respondent***



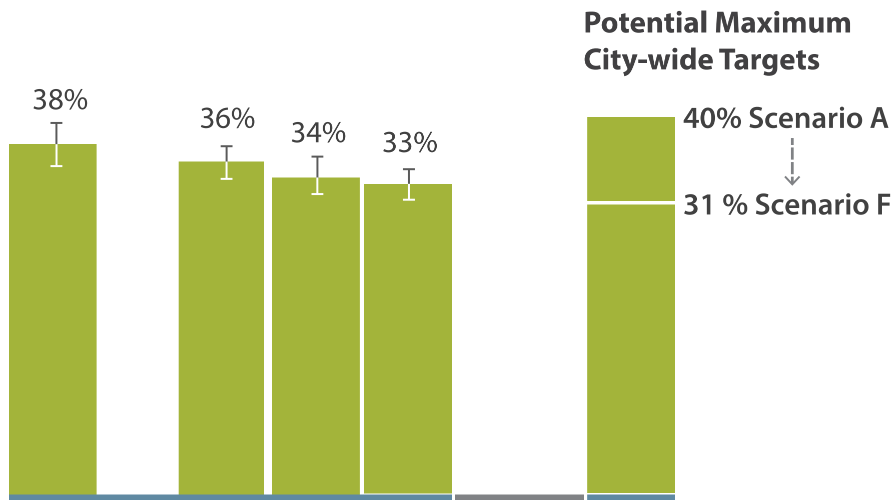
EXPLORING CANOPY COVER TARGETS

The data collected on Courtenay's urban forest and its policy context provide insight into how Courtenay's canopy cover has been and is likely to change in the future.

Canopy loss is anticipated to occur as private forested lands develop over time. The City's tree bylaw, Environmental Development Permit Area Guidelines and parkland dedication requirements will see some forest canopy retained or replaced in development areas. As well, there are opportunities for canopy growth by planting out available spaces on public and private land, or by creating new spaces when streets or lots are redeveloped.

Using current canopy cover and its relationship with tree density as a guide, it is possible to coarsely estimate the impact of different scenarios on Courtenay's canopy cover. Six potential canopy cover target scenarios are described below and each includes the following assumptions:

- Canopy area on aggregated agriculture zone, rural-multi-use zone and golf courses is kept constant. While lands could be rezoned in the future, the timing and extent of that process is too uncertain to forecast.
- Of the total aggregate rural residential zone, at least 15% of land is assumed to be undevelopable due to the allocation of lands for public parks and ESAs.
- Canopy targets are reported as both total city-wide canopy targets (graphed below) and urban area targets (described on next page). The urban area refers to aggregate zones that are developed or developable. Canopy targets for the urban areas are forecast with greater certainty because they are already developable.



Canopy cover target scenarios A to F are discussed on the next page.

"The canopy cover should be distributed through the town relatively equally. If a neighbourhood has lost a lot of trees in a year, then removals should be restricted."

"I feel we have adequate tree coverage. I believe trees need to be removed to support development and growth and the removal can be mitigated with new planting." - Survey

"Presently, often only the wealthy have rich tree cover... the poor are left with cement. Trees and greenery enrich our lives in so many ways, and this is required by everyone." - Survey

Canopy Cover Target Scenarios

Each scenario assumes 5,000 new trees are planted on public land and a 15% canopy target over commercial and industrial aggregate zones.

Scenario*	City-Wide Canopy Target (max)	Urban Area Canopy Target	Tree Bylaw Density Target (sph[1])	New Trees Planted on Private Land (voluntarily)	Canopy Target Over Aggregated Residential, Multi-Use and High Density Zones	Canopy Target Over Aggregated Rural-Residential Zones	Actions: Regulation (Tree Bylaw Density Target)	Actions: Voluntary Private Land Planting	Actions: Public Land Planting
A	40%	34%	100	17,000	40%	50%	Highest	High	High
B	37%	29%	75	17,000	30%	40%	High	High	High
C	36%	27%	75	8,500	27%	38%	High	Moderate	High
D	34%	24%	50	17,000	20%	35%	Current	High	High
E	33%	23%	50	8,500	18%	30%	Current	Moderate	High
F	31%	21%	50	0	15%	28%	Current	None	High

1 Stems per hectare

"Courtenay could use a lot more canopy in big box store parking lots, on hospital grounds and in school yards." - Survey respondent

"Downtown Courtenay is very hot on a summer day. Likely a lack of tree cover/shade, and lots of pavement has something to do with it." - Survey

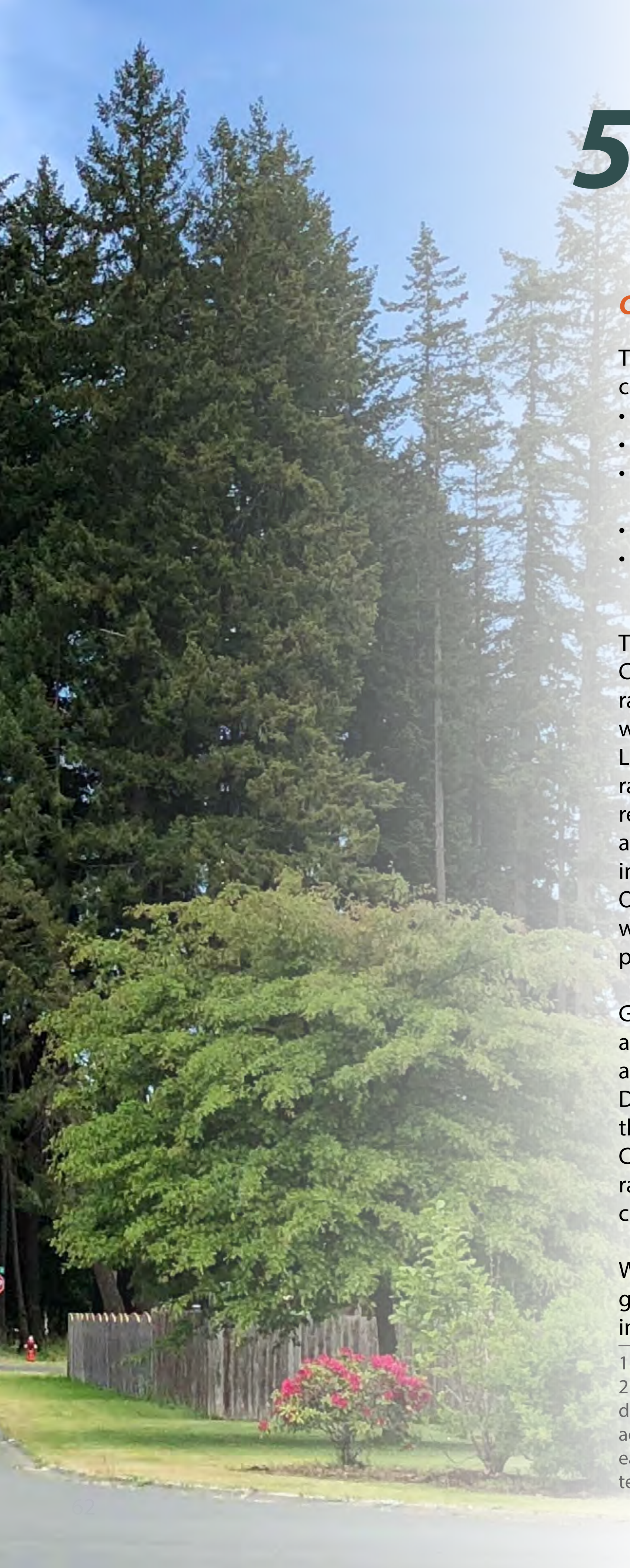
HOW ARE WE DOING?

Courtenay's urban forestry program is in the early stages of development. Developing this strategy establishes the vision, goals and management criteria for the urban forestry program.

The criteria below have been adapted for Courtenay from "The Sustainable Urban Forest: A Step By Step Approach" [9]. Descriptions of each criteria are provided in Section 6.

Management Criteria and Targets for Success	Low	Fair	Good	Optimal
A. PLAN STRATEGICALLY				
Appreciation of trees as a community resource	○	○	●	○
Clear and defensible urban tree canopy assessment and goals	○	○	●	○
Trees on private property	○	○	●	○
Green infrastructure asset management system integration	○	●	○	○
Wildfire planning	○	●	○	○
Interdepartmental and interagency cooperation	○	●	○	○
Urban forest funding to implement the plan	○	●	○	○
B. MANAGE PRO-ACTIVELY				
City tree inventory	○	○	●	○
Maintenance of City owned streets and park trees	○	○	●	○
City tree risk management	○	○	●	○
Storm response	○	●	○	○
Pest and disease management	○	○	●	○
Urban wood and green waste revitalization	○	●	○	○
Usage of publicly owned natural areas	○	●	○	○
C. PROTECT PRUDENTLY				
Tree protection, policy development and enforcement	○	○	●	○
Publicly-owned natural areas management planning and implementation	○	○	●	○
Privately-owned ESAs protection policy and enforcement	○	○	●	○
D. GROW INTENTIONALLY				
Tree establishment and replacement planning	○	●	○	○
Planting design guidance, site specifications and standards	○	●	○	○
Equity in planting program delivery	●	○	○	○
Native vegetation planting	○	○	●	○
Green infrastructure for stormwater management	○	●	○	○
Building energy efficiency	●	○	○	○
E. PARTNER EFFECTIVELY				
Citizen involvement and neighbourhood action	○	●	○	○
Involvement of large private land and institutional landholders	●	○	○	○
Green industry cooperation	○	●	○	○
Utilities cooperation	●	○	○	○
Regional collaboration	●	○	○	○
Urban forest research	●	○	○	○

Targets	***2018 baseline***	***2050 target***
Canopy cover city-wide (percentage)	33%	34-40%
Block tree density (average trees per ha per block excl. industrial, ALR)	67	100-120
Species diversity (maximum percent species, genus in City tree inventory)	S8%-G27%	S5%-G15%
Useful life expectancy distribution (percent of City tree inventory) with >30 yr ULE	87%	90%
Young tree mortality rate (annual percent mortality in City trees less than 5 years old)	>3.5%	3.5%
Climate suitability of tree inventory (percent of inventory considered suitable)	71%	90%



5 PLANNING PRIORITIES

CLIMATE CHANGE

The Pacific Climate Impacts Consortium 2080s[1] climate projections for the Comox Valley are that:

- Summer precipitation will decline by 17%
- Precipitation in other seasons will increase
- Snowfall in winter and spring will decline by 51% and 71% respectively
- Annual temperature will increase by 2.5ºC
- Growing Degree Days (above 5°C)[2] will increase to 582

The anticipated impacts of climate change for Courtenay include sea level rise and more extreme rainfall events, higher storm surges, flooding and waterlogged soils outside the summer months. Lower winter and spring snowpacks, less summer rainfall and warmer temperatures are expected to reduce stream flows, and lower ground water tables and reservoir levels. Warmer temperatures will increase evaporation and vegetation water demand. Overall, water supply is expected to be reduced while water demand is likely to grow, increasing the possibility of drought.

Growing degree days provide an index of the amount of heat available to support the growth and maturation of plants and insects. More Growing Degree Days and milder winters are likely to increase the range of plants that can grow successfully in the Comox Valley. This change could also benefit the range of potential forest pests that can survive in our climate.

Warmer, wetter springs may increase the initial growth of plant biomass, which will then dry out in the summer months. It is possible this pattern,

1 https://pacificclimate.org/analysis-tools/plan2adapt

2 Growing degree days accumulate whenever the daily mean temperature is above 5°C; the value is not the accumulation of actual days but rather the number of degrees each day's average temperature is above the threshold temperature)

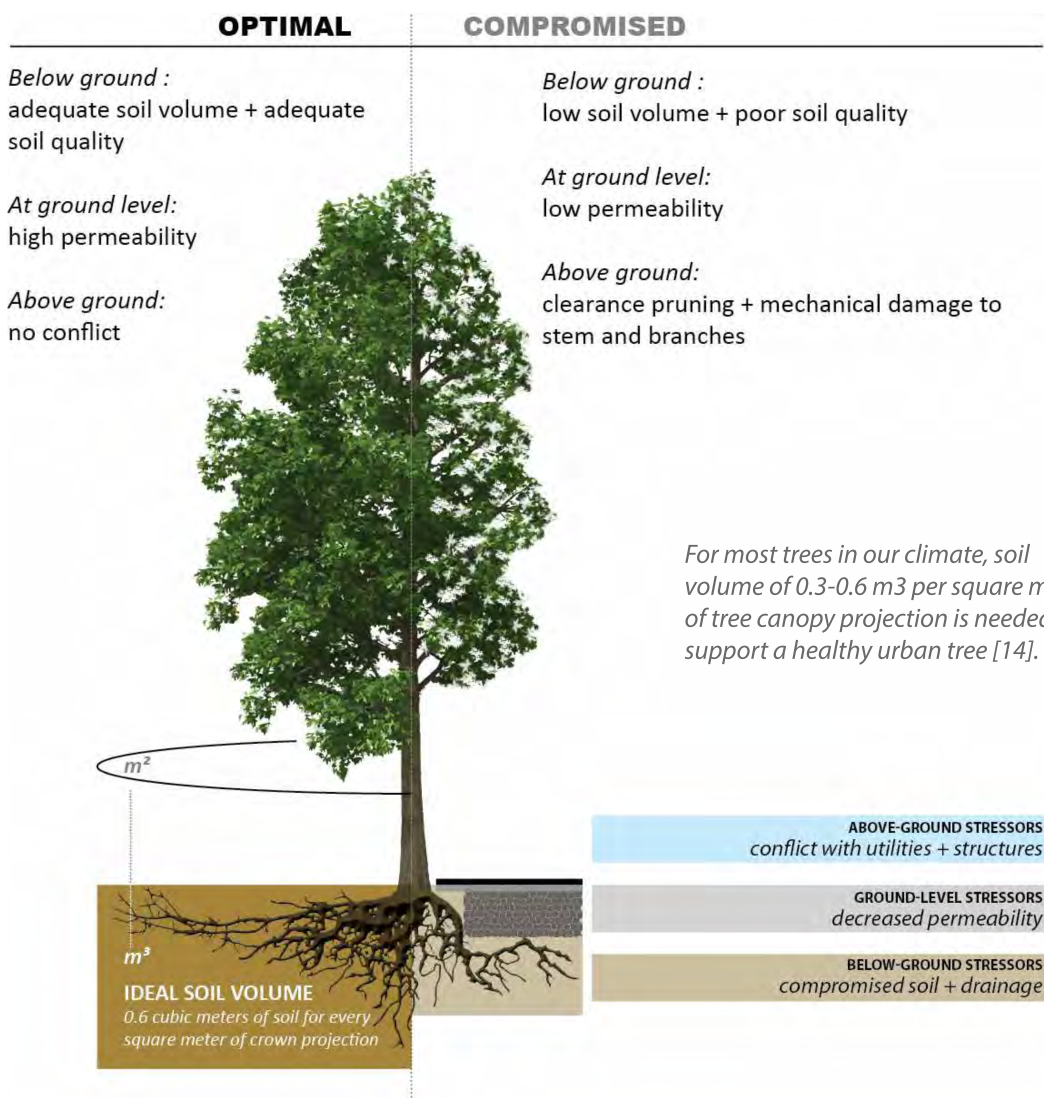
A recent study of the factors contributing to BC's record breaking 2017 wildfire season that burned 1.2 million hectares - now surpassed by the 2018 fire season - found that human-induced climate change substantially increased the fire risk and area burned [13]. The authors conclude that extreme wildfire seasons will be more likely in the future.

combined with a higher possibility of drought, will increase the amount of fuel available to burn in forests. Longer, hotter, drier summers are also likely to increase the length of the fire season, duration of high fire risk and the area burned by wildfire [13]. Hotter, drier conditions and smoky summers are likely to increase stress on people, plants and animals. For people and animals, the urban forest can be used to help adapt to climate change impacts, as well as mitigate greenhouse gas emissions.

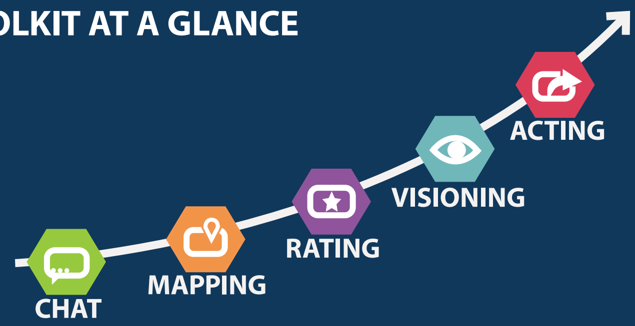
Trees can be used to shade people and buildings to reduce air conditioning requirements and energy demand. Trees can shade surfaces and streams and cool the air with evapotranspiration, creating cool refuges for people and animals in hot weather.

Irrigated landscapes planted with low flammability trees can also act as fire breaks if properly maintained. Vegetation flammability will need to be considered in wildfire interface areas. Wildfire planning can identify locations where strategic fuel breaks and vegetation fuel treatments would benefit the community. Strategically designed forested parks in low lying areas can double as flood protection by being places for water to accumulate safely in times of flooding.

For the urban forest, adapting to warmer, drier summers will require that planting sites have enough good quality soil to hold moisture and support healthy trees. Planting at the appropriate time of the year will be critical. Tree species will also need to be adequately drought tolerant for the planting site and a list of species and their climate suitability rating is provided in Appendix 1. Tree diversity will need to be managed to reduce vulnerability to pests and diseases.



COOLKIT AT A GLANCE



A do-it-yourself process on climate change that gradually ramps up community engagement in several steps

UBC CALP
calp.forestry.ubc.ca/

UBC Forestry's Collaborative for Advanced Landscape Planning (CALP) have developed a citizens 'Coolkit' to support community members understanding of how climate change affects where they live, and to facilitate working together to climate-proof their neighbourhoods[1].

1 http://calp2016.sites.olt.ubc.ca/files/2018/07/CALP-UBC_Coolkit-reduced-size.pdf

ECOSYSTEMS AND BIODIVERSITY

Courtenay's natural environment is an identifiable and memorable feature of the community for residents and visitors alike. Bird watching, wildlife and 'habitat' in general were commonly cited 'most important values' provided by Courtenay's urban forest in the open ended portion of the public survey. Key attributes include rich biodiversity, multiple forest types (described earlier in the Strategy) and a number of ecosystems and species at the northern extent of their range (e.g. Arbutus, Garry Oak meadows), thus providing for many nature protection, education and stewardship opportunities.

Healthy ecosystems and biodiversity are essential to the provision of habitat and for sustaining natural processes to support life. In Courtenay, the ecosystems that exist are also part of the community's culture and livelihood.

The Comox Valley has experienced intense and rapid development and associated degradation and fragmentation of natural ecosystems [15]. In the 1990s, seven intact and rare/fragile ecosystems types were mapped to create the Comox Valley Sensitive Ecosystem Inventory (SEI): wetland, riparian, older forest, woodland terrestrial herbaceous (rocky outcrops), coastal bluff and sparsely vegetated (dunes, spits and cliffs). **The SEI, when re-evaluated in 2002 and 2012, found that 42% of the rare/fragile ecosystems identified in the 1990s had been disturbed and that these once abundant ecosystems now cover only 6% of the land base [15].**

Because intact natural ecosystems are rare in Courtenay, modified urban ecosystems are more commonly what is available for habitat. For example, Great Blue Herons have established a rookery in a narrow strip of tall trees between homes and the railroad tracks even though they are known to prefer undisturbed sites [16]. In light of this, two human modified ecosystems have also been identified for conservation: 60 to 100 year old forests and seasonally flooded agricultural fields. The SEI updates found that 97% of these ecosystems had been reduced in size and now cover only 7% of the Comox Valley.

The 2013 document "Nature Without Borders: The Comox Valley Land Trust Regional Conservation Strategy"[17] provides a regional conservation planning framework for the protection of sensitive natural areas. The Conservation Strategy identifies priority ecological areas for conservation in the region.

Both the Sensitive Ecosystem Inventory and the Conservation Strategy's priority ecological areas for conservation are integrated into Courtenay's Official Community Plan (OCP) as areas requiring Environmental Development Permits. In addition, Courtenay includes riparian areas, rare ecosystems, important habitat features and areas near active or inactive raptor or Great Blue Heron nests in Environmental Development Permit Areas (EDPAs). This means that, prior to any development occurring adjacent to these areas, a Registered Professional Biologist and other relevant professionals need to undertake an Environmental Impact Assessment and make recommendations for the minimization and mitigation of any impacts to EDPAs.

Recent ground truthing suggests that not all of the occurrences of some ecosystems slated for conservation in Courtenay are captured in the mapped sources informing the EDPA. These include instances of Riparian, Woodland, Wetland, Seasonally Flooded Agricultural Fields and Older Second Growth Forest ecosystems.

Courtenay's municipal park system and the use of EDPAs protects sensitive ecosystems. However, there are still areas of potentially significant and sensitive ecosystems that are not under municipal ownership or otherwise protected. The Garry oak woodlands in the vicinity of Vanier Park a notable example. Other sensitive ecosystems are likely to occur in the privately held forest lands around the outer edges of the community.

"Heron colonies will often relocate when becoming too vulnerable to their predators, bald eagles. As communities grow, it's very important to maintain mature stands on the landscape so that our local herons have options for nesting. They are proving that they can cohabit our urban environments as shown in west Courtenay which is good news for this provincially blue-listed species!"

- Connie Miller Retzer, Ecosystems Biologist, BC FLNRO

CONNECTIVITY

The protection of sensitive ecosystems is an important aspect of maintaining urban ecosystems and biodiversity, but restoring habitat and connectivity between them is also essential for their long term resilience.

In addition to EDPAs for sensitive ecosystems and riparian areas, some municipalities have started to include habitat 'hubs' and potential locations for corridors that could be restored or protected to support biodiversity and connectivity. A co-benefit of this approach is that defined hubs and corridors can become part of a long-term parks acquisition strategy that provides connected recreation access for people.

Beyond the options for the municipality to eventually protect ecosystems and corridors through park acquisition or the development permit process, landowners can also voluntarily conserve land with a Conservation Covenant. The covenants remain on title and secure parts of the land for long-term conservation; the lands are still for private enjoyment but cannot be destroyed or built on beyond the terms of the covenant.

SOILS

We often focus on what is above ground when thinking about biodiversity and connectivity. However, a vast amount of living biomass is below ground, including plant roots, fungal mycorrhizae and soil animals. Recent work by researcher Suzanne Simard and others has been exposing the importance of mycorrhizal fungal networks for facilitating inter-tree communication. These networks have been found to enhance understory seedling survival, growth, nutrition, and mycorrhization, improve plant defense chemistry and kin selection, and enhance the health of the whole forest ecosystem [18].

Given the importance of soil for biodiversity and plant productivity, and its function in water filtration and storage, management of soil in urban environments requires more attention. Municipalities such as Vancouver and Surrey have been developing guidance for improving soil management to enhance green infrastructure performance[1]. Courtenay still has a native soil resource where soil disturbance and removal has been limited, thus presenting an opportunity to establish good practices to maintain healthy soils.

Courtenay's expanding greenways are a highly valued amenity. When designed to retain mature forest features, greenways can provide forest connectivity as well as recreational and aesthetic values. The greenway pictured above borders Piercy Creek.

1 https://vancouver.ca/files/cov/integrated-stormwater-management-best-practice-toolkit-volume-2.pdf https://www.waterbucket.ca/gi/sites/wbcgi/documents/media/289.pdf

The opportune time to retain native soils is following land clearing and prior to soil compaction practices.

"As I bike through Courtenay a lot, I notice the value of trees in decreasing temperature and their value to other species."
- Survey respondent

"I moved to this neighbourhood because it has lots of big, mature trees. People/ walking groups from around the Valley come to my neighbourhood to walk because of the connectivity. This is probably the only neighbourhood in the Valley where you can do almost a complete circuit in wonderful, forested habitat without having to repeat yourself. The forests are wonderful and different every time you go out so you never know what gem you will find around the corner."

- Kathryn Clouston, Morrison Creek Streamkeeper and avid dog walker

CITY TREE MANAGEMENT

City trees are part of Courtenay's municipal infrastructure, just like roads, sewers, lighting and water assets. Elevating trees to the status of a municipal asset ensures that they will be budgeted for, maintained and protected for the community's benefit.

Municipalities are increasingly incorporating trees into their asset management systems as a means of accounting for their costs, replacement timeframes and asset value. Courtenay has an existing asset management framework and is in the process of incorporating intensively managed City trees into that system.

The City's urban forest management program has evolved over the last two years to include a full time staff member and completion of a partial tree inventory. Courtenay has recently procured technology to manage work orders and maintenance of inventoried trees. In the past, trees have predominantly been planted with development or by the Parks department but have not been tracked or had a dedicated maintenance budget.

Investing in planting the right tree, and properly maintaining it over its life-cycle can create an asset with a useful life expectancy of more than 100 years - much longer than most other types of infrastructure assets.

Over a tree's life-cycle, the greatest costs come at the time of planting and removal. Planting long-lived trees in suitable locations, combined with proactive maintenance, extends the beneficial service life of trees by maximizing their establishment success and correcting defects before they become serious. Proactive inspections and corrective actions are also an important component of a defensible tree risk management program.

Within the last couple of years Courtenay has been transitioning to a proactive maintenance program for intensively managed City trees. An analysis of the current tree resource has yielded an estimate of the budget impact to transition Courtenay to an optimal proactive maintenance program (Table 1).

There appears to be public support for investing in City trees. When surveyed, Courtenay respondents indicated they were willing to pay more tax to implement the urban forest strategy with $25/year being the most supported tax increase.

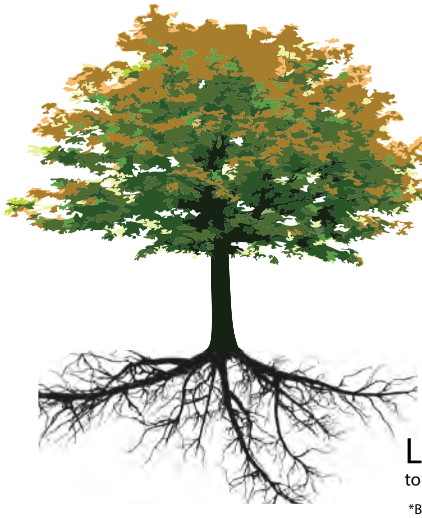
TABLE 1 Estimated budget implications based for implementing a tree maintenance program for City trees in Courtenay

Tree age class	Maintenance activity	Total trees in class	Est. annual budget impact
New and young[1]	Planting (285 new trees), watering, pruning	800	$140,000
Semi-mature and mature in pruning cycle (streets and manicured parks)	Proactive inspections and 5-year pruning cycle	2,700	$40,000
Semi-mature and mature in risk assessment zones (forest trees in trails/parks/facilities/road ends/buffer parks etc.)	Proactive and reactive risk assessment	3,000	$20,000
Stressed and overmature	Reactive health or risk management treatments	200	$30,000
Dead or high risk removals	Removal Stump grinding	50	$50,000
		Total annual budget estimate to maintain Courtenay's current inventory of trees	$280,000

1 Most of the cost associated with new and young trees is related to tree planting. Per tree planting cost vary depending on the location; for example street tree planting costs are higher than park planting due to the equipment, installations (e.g. roots barriers) and larger tree size required.

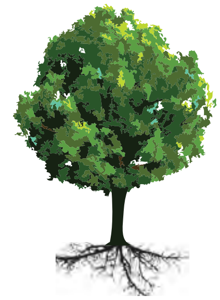
THE LARGE TREE ARGUMENT

Large, long-lived tree species provide many times the benefits of small tree species over a much longer timeframe when planted in the right place.



Large tree
60 cm scarlet oak
northeast side City Hall

$107 benefits/year*
>100 years
life expectancy



Small tree
30 cm yoshino cherry
northeast side City Hall

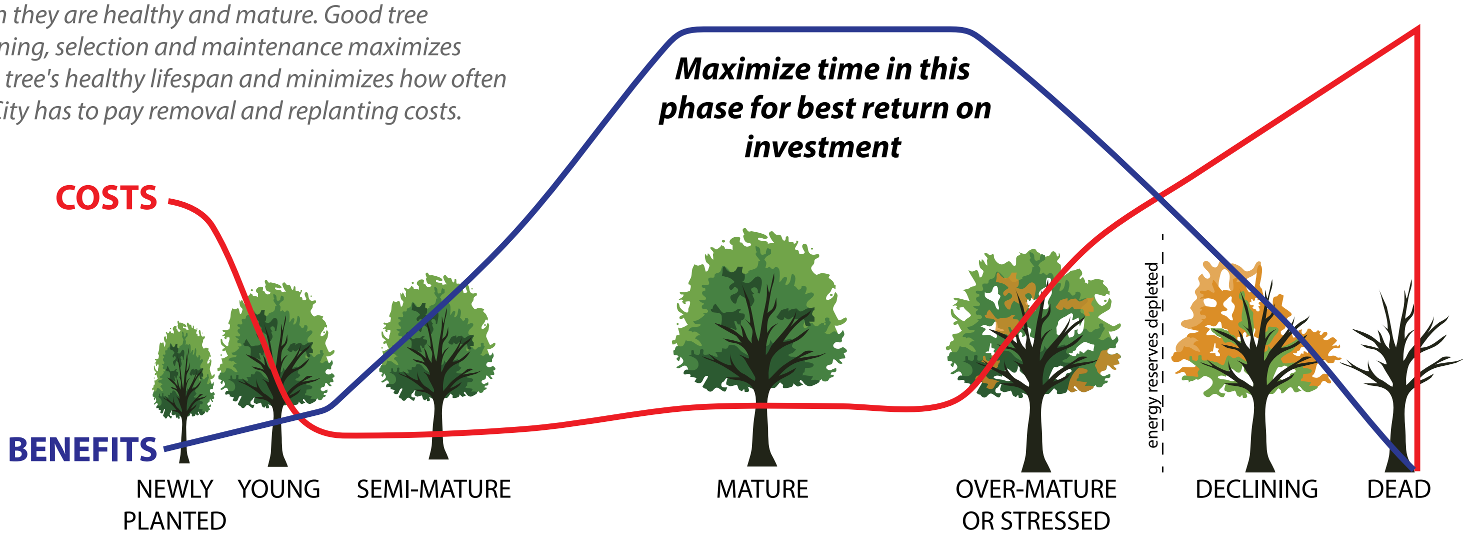
$27 benefits/year*
<40 years
life expectancy

Large tree species provide **many times the value** to the community compared to small trees over their lifetime.

*Benefits calculated using i-Tree Design https://design.itreetools.org/

LIFE-CYCLE COSTS

Trees cost the most at the start and end of their lives and produce the greatest benefits in the middle, when they are healthy and mature. Good tree planning, selection and maintenance maximizes each tree's healthy lifespan and minimizes how often the City has to pay removal and replanting costs.



YEARS:	1-3	4 - 15	~ 15 - 40	40 - life expectancy		
Best practices program	Planting, watering, young tree pruning		Proactive inspection and pruning cycle		Tree health and risk management treatments	Removal

A 2014 TD Economics report on the value of urban forests in Canadian cities found that, for every dollar spent on trees, the return in benefits was between $1.88 and $12.70 [19].

STREETSCAPE IMPROVEMENTS

Courtenay's streets presently average 9% canopy cover and have space to support more canopy. When surveyed, Courtenay respondents indicated that there is room to improve Courtenay's streetscapes, with the most preferred outcomes being:

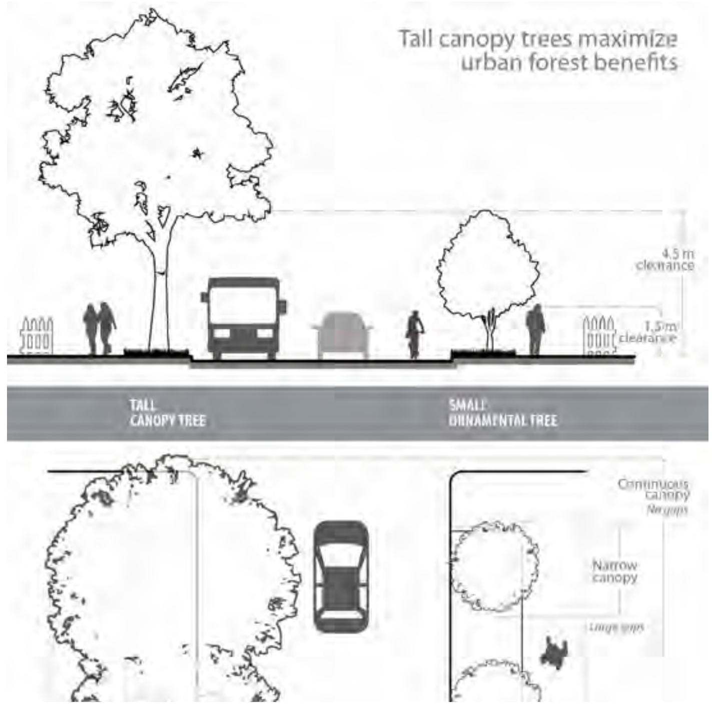
- Mixed native tree planting
- Regularly spaced medium or large trees

These preferences represent two distinct planting characters that would provide an appropriate contrast between streets in more urban parts of the city and those bordering natural forest. **Future local area planning processes are an opportunity to clearly define urban forest character at the neighbourhood scale.**

Courtenay has developed a vision for the future of downtown to revitalize the city's core and the plan includes incorporating trees into key streets. The City recently initiated a complete streets pilot project to upgrade 5th Street with new utilities, enhanced walking and cycling facilities, and improved stormwater facilities and vegetation. Unfortunately street trees could not be accommodated in the road improvements but the green infrastructure retrofit has shown a transformative impact on the streetscape. In the core downtown areas with large building coverage, street trees are often the only opportunity for greening.

"I own a business Downtown, and love the small trees but would love to see more green space, and to see those trees continue to be cared for and grow to create shade." - Survey

Retrofitting trees and stormwater infrastructure into streets is often a costly project. However, several potential funding sources are available to support green infrastructure projects. The federal government has been funding green infrastructure projects and climate innovation projects in municipalities. Another possibility is cost-sharing streetscape improvements with BIAs, such as in Toronto's Streetscape Improvement Program. Courtenay has recently established a Tree Planting and Replacement Reserve Fund, which will be used for planting trees within the City.



Large canopy trees create a comfortable pedestrian space, maintain horizontal sight lines and allow vertical clearance while maximizing the functional benefits from trees.

Duncan Avenue, looking north from 6th Street

Visualization of the street transformed with mature street trees

The Vancouver Island Health Authority's 'Healthy Built Environment Linkages Toolkit' [20] includes guidance to plant and place urban trees strategically to reduce energy use, air pollution and storm water runoff, improve pedestrian safety and to add to the aesthetic appeal for recreation and tourism.

PRIVATE YARDS

Private land holds 84% of Courtenay's canopy cover and approximately 88% of potential planting opportunities. The future of Courtenay's urban forest canopy will largely be determined by what happens in people's yards - both those of existing and new homes. **Implementing the urban forest strategy will be a shared effort combining the resources and governance of the City with residents' voluntary actions on public and private land.**

While it is a mandate of municipal governments to provide services for the public good (like maintaining trees in parks), not all homeowners may be willing to pay to maintain a private tree for the benefit of the broader community. Some communities have addressed this by providing rebates for tree maintenance. Others have provided free or subsidized trees. However, when surveyed, most Courtenay respondents indicated that they were willing to plant a tree on their own property and that a subsidy was not an incentive. Rather, respondents preferred to know what and where to plant to contribute to enhancing the urban forest.

In terms of where to plant a tree in a yard, the following guidelines are recommended:

- When planting near a building, preferentially place trees on the east- or west-facing sides to provide the greatest shading and energy conservation benefit.
- For shade, trees should ideally grow to at least 6 m tall and be planted at least 3 m away from the building foundation. Trees can be planted between 3 m and 18 m from buildings and still provide energy savings.
- For wind protection, plant groups of trees upwind from the building at least 2.5 tree heights away.
- If the yard is too small for a shade tree, then plant a small tree anywhere and select for desirable benefits such as fruit, nativeness, pollinator or bird friendliness.

When considering the size and type of tree to plant,

- Measure the size of the yard and consider the amount of soil available below ground, as well as how much room is available for the tree to grow above ground, and where it will cast shade.
- If possible, plant the tree far enough from the building that its branches will not touch the structure, although this can be managed with pruning.
  - Large trees grow taller than 15 m and generally spread 10-30 m depending on the species.
  - Medium trees grow 10-15 m tall and spread 7-12 m depending on the species.
  - Small trees grow to less than 10 m and generally have a spread of up to 8 m.
- Deciduous trees are often more suitable for shade trees in proximity to homes because they allow winter solar access, coniferous trees are often more suitable for windbreaks because of their dense evergreen canopies and, if native, also provide habitat value for native wildlife.
- The decision of what to plant should incorporate personal preference to ensure that the tree will be loved.
- A list of climate suitable small, medium and large trees is provided in Appendix 1.

Current neighbourhood street design standards do not require street trees on both sides of the street, and many existing properties do not have street trees. Private front yards provide the perfect opportunity to plant a tree that will provide street tree character.

"Leaving or removing trees on private land may have to be considered on a case by case scenario. Citizens own these trees and should have allowances on their property as to what they want to do with them. Danger trees need to come down, but if a tree isn't in the way then it should be left to provide bird habitat and everything else a tree does for

"The Fruit Tree Project is an interesting mix of private and public, in that people are sharing their private food resources for the public good. This is a really important model for long term food security in our community. Annual average harvests range between 25,000 – 40,000 lbs, picked by dozens of volunteers on over a hundred properties across the valley. That is a lot of capacity and food and we're always welcoming more people to get involved!"

– Maurita Prato, Executive Director, LUSH Valley

TREE PROTECTION AND DEVELOPMENT

Courtenay is a growing city, which recently has seen a marked increase in the rate of development. **New subdivisions typically occur in previously undeveloped 'greenfield' lands, that were once-forested.** As a result, building homes to support Courtenay's growing population often comes with a loss of forest canopy.

It is a reality of development, whether building new homes or replacing old homes, that there will be conflicts with trees in the landscape. In the case of forest stands, the trees have grown up in groups and often cannot be retained alone due to windthrow risks. In the case of individual trees, they typically have to be removed if they are too close to a building foundation or servicing because the cuts to their roots would cause them to become unstable.

Many developers and home builders have historically made voluntary efforts to either retain or replace trees in their developments. However, the City noted that tree retention was too often failing due to inadequate protection measures, and recently updated its Tree Protection Bylaw to address this and other urban forest objectives. The update focused on improving the standards for assessment of retention and removal decisions, measures for tree protection, and requiring replacement or retention to a standardized density of 50 trees per net developable hectare.

General outcomes that the City intends to achieve by regulating trees in the development process are to:

- Retain high value trees (based on size, specimen quality, species or their significance in the landscape) that will contribute to the quality of the future urban landscape.
- Retain significant groups of trees that provide connectivity of habitat, perform important ecosystem functions and will contribute to the quality and enjoyment of the future neighbourhood.
- Replace trees, when retention is not possible, with trees that will grow to contribute to a resilient urban forest and a beautiful neighbourhood.
- Apply regulation of tree retention and replacement fairly and consistently.

For a tree bylaw process to run smoothly, City staff, consulting arborists and developers need to work together to identify the best outcomes for retention and replacement in the context of each development. To inform the process, each participant has an important role to play:

- **City staff** need to clearly communicate the application process, information standards, and decision criteria staff use to approve retention, removal and replacement per the Council policy.
- **Developers** need to consider where high value or significant groups of trees exist on their properties when first developing their concept plan at the pre-application stage so that staff can provide early feedback to inform further development design.
- **Consulting arborists** need to provide accurate information on tree condition, location and the nature of conflicts to justify removal recommendations or protection measures.

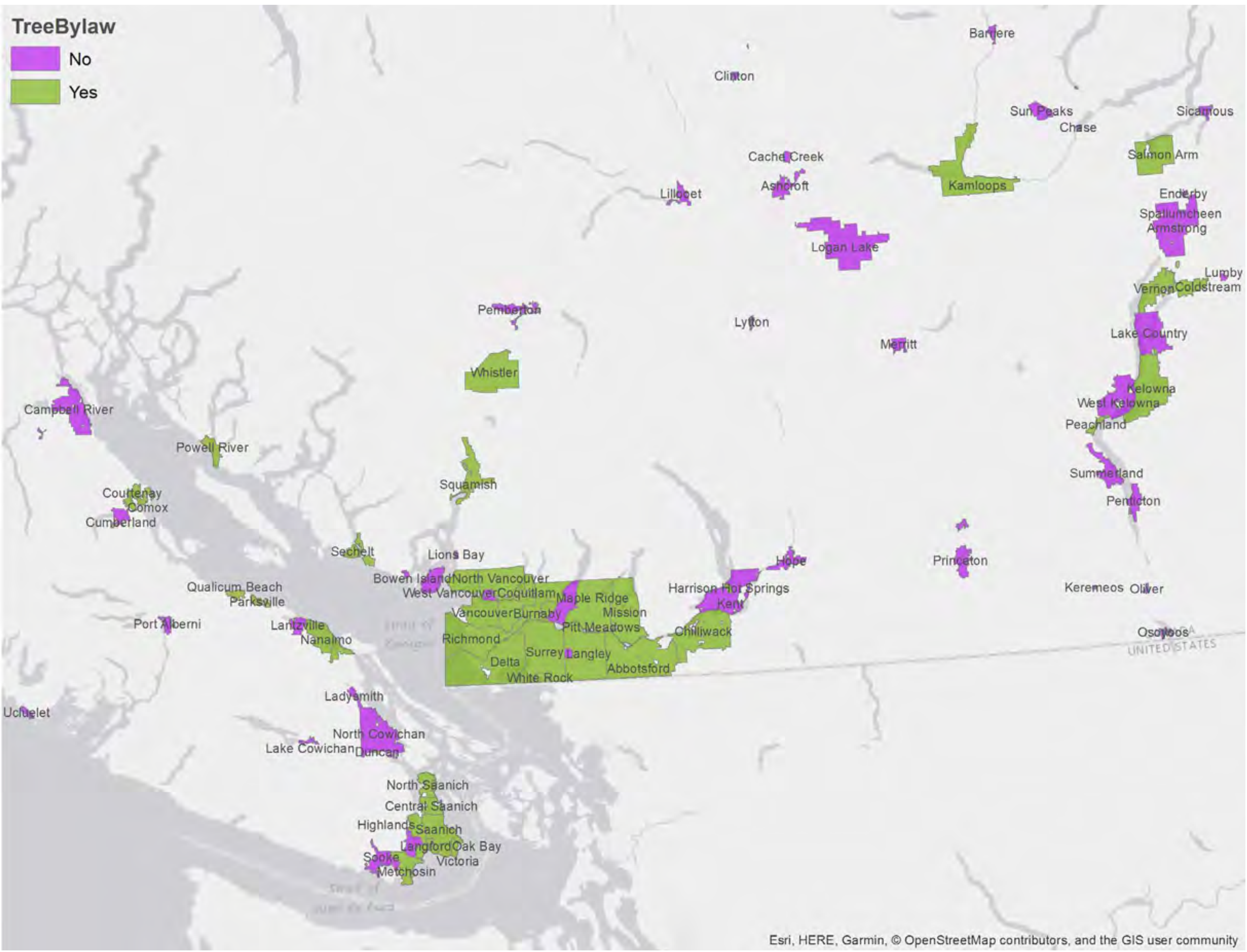
Recent engagement with arborists, developers and City staff highlighted several issues including:

- Retention of unsuitable or non-windfirm trees on some lots or park dedications.
- Inaccurate tree locations resulting in unplanned conflicts with protected trees at the time of building.
- Clarity and flexibility for development in making retention versus replacement decisions.
- Increased cost of the process to development.
- Identification of significant stands to be prioritized for protection.
- Lack of protection for large, mature trees or stands of trees (not already meeting the definition of protected trees) outside the development process.

The Strategy provides a number of recommendations to improve the Tree Bylaw, discussed in Section 6.

> *" Setting a number of trees is too arbitrary. When a development occurs trees have to be removed to put in services, roads, etc. It is not practical to create a plan to try and force developers to keep trees. There should be a tree replacement plan and that is all." -*

> *"Developers should not be allowed to 'clear cut' a lot slated for development. I don't understand why they are permitted to cut down beautiful mature trees just to make it easier to develop, then plant little saplings that will take decades to look like real trees. I have seen this happen over and over again and it never fails to frustrate me." - Survey respondent*



Based on a review of tree bylaws available online, 77% of municipalities Courtenay's size or larger have a private tree bylaw. Tree bylaws are increasingly common in BC municipalities as population densities increase.

STEWARDSHIP

Stewardship described here refers to activities undertaken by individuals and organizations to protect, monitor, restore and advocate for the natural environment whether on public or private land. Stewards include traditional environmental non-profits such as Land Trusts, Streamkeepers and naturalist organizations, and may include any individual working towards nature protection and enhancement goals on their own land no matter the size.

The Comox Valley is home to a highly engaged, organized and dedicated stewardship sector made up of dozens of individual organizations. In 2008 groups came together to form the Comox Valley Conservation Partnership (CVCP) after concern was raised that fewer than 5% of original regional sensitive ecosystems remained, and that there was no regional plan to prioritize and protect sensitive ecosystems. Since that time the CVCP has worked with their 25 member organizations to develop the regional strategy "Nature Without Borders" which is used as a guiding document by the private and public sector to understand nature conservation priorities for the region. These currently include: protecting our drinking water, eco-asset valuation and government policy and land use development practices.

The stewardship sector has initiated, secured capital and project managed a number of significant restoration activities within Courtenay's boundaries notably along the Courtenay River and K'ómoks Estuary, further enhancing their role as an active stakeholder in the health of the local environment. The K'ómoks First Nation has been a leading partner on a number of these initiatives and has valued perspective to share in advising on the stewardship of Courtenay's urban forest.

In the context of stewarding Courtenay's public urban forest, the City relies on the activities and expertise of the stewardship sector to help understand the ecology of municipal nature parks, identify restoration priorities, assist with restoration efforts, educate the public of the value of these public lands and secure funding for these activities. Routine stewardship activities within public nature parks includes ecological inventorying and monitoring, invasive species, rubbish and fire-fuel removal, native vegetation planting, informal trail decommissioning, creating content for interpretive signage and reaching out to adjacent land owners to educate on the negative impacts of dumping and encroaching into these areas. Further partnership opportunities include defining a more active management role for volunteers through the creation of individual nature park management plans.

The stewardship sector also currently plays, and has an opportunity to expand, an important role in advising private land owners of urban forest management opportunities. In support of this Strategy, the stewardship sector is well positioned to assist in leading, advising and monitoring tree planting initiatives, and provide educational tools to help build stewardship capacity within the general public.

In addition to nature stewardship, the Strategy also recognizes the value of stewardship in the cultivation of an urban food forest, for the purposes of supporting food security principles. Food security emerged as a common theme when survey respondents were asked to describe their vision for Courtenay's urban forest. With local leadership and capacity to build upon, a favorable climate and an engaged public, Courtenay has the potential to enhance the number of fruit and nut trees on private and even public land.

"I envision in 2050 areas with common food trees, fruit, nuts. Programs that support community use of the trees and share and teach to future generations" - Survey respondent

Image above shows the industrial site in its current condition. Image below shows adjacent protected Hollyhock Flats which is what the industrial site will restore to. Photo inset shows the Kus-kus-sum restoration vision from above.

Photos from Marine Side

Photo from Robert Lundquist

"The restoration of the Kus-kus-sum site will turn this industrial site into an ecological asset for the community and will help local salmon runs that have to migrate through the area. The site used to be a tidal forested wetland dominated by Sitka Spruce. These tidal forests are rare, and have been hit hard by shoreline development and industrial activities, yet they form significant habitat for salmon. Restoring this area to a forested wetland will provide green infrastructure that will support fish by providing shade, food (overhanging branches feed bugs and other nutrients into the water below) and hiding places from predators. The trees will also provide habitat for other wildlife, improve water and air quality, provide some flood attenuation, and provide recreational opportunities for the public."

- Jennifer Sutherst, Project Watershed Biologist

6 GOALS, STRATEGIES AND ACTIONS

The purpose of Courtenay's Urban Forest Strategy is to provide strategy to achieve the community vision:

Courtenay residents envision a future urban forest that is more extensive than today, is connected and accessible, maintains mature trees and ecosystem services, is comprised of a sustainable mix of ages and locally adapted species, and is used as a design treatment to reduce the prevalence of pavement in commercial areas, create neighbourhood distinction and canopy streets on key routes.

A canopy cover target of 34-40% distributed throughout Courtenay will inform the refinement of policies and actions to achieve this Vision, as the urban forest changes to accommodate development, climate change and through the natural life span of trees.

URBAN FOREST GOALS

Plan strategically to inform and monitor land use changes on the urban forest and integrate into public asset management

Manage proactively to enhance urban forest health, safety and resilience by managing alongside other infrastructure goals

Protect prudently to maintain the quality and connectedness of the urban forest

Grow intentionally to provide urban forest benefits when and where they are needed

Partner effectively to share stewardship and promote appreciation for the urban forest

To achieve each goal, a set of strategies and supporting actions have been defined. These are provided in the following Sections. The estimated timeframe and cost for implementation is provided in the next Section.

URBAN FOREST INDICATORS

Urban forest indicators have been established under each goal to enable measurement of Courtenay's implementation performance. These indicators have been adapted from the urban forest sustainability model first proposed by Clark et al. in 1997 [12] and recently updated in Leff, 2016 [9]. In some cases, indicators have been modified to better meet Courtenay's urban forest context and program goals.

Each indicator is further described by its key objective, its optimal condition rating, and the current rating for Courtenay.

Optimal conditions provide a benchmark to strive towards but are not a commitment by the City, or any stakeholder, to achieve that rating. As the actions section of the Strategy notes, most actions will require further study to understand what level of service is achievable and what condition rating the City will ultimately strive for.

URBAN FOREST TARGETS

Targets

- **34-40% canopy cover**
- **100-120 trees per hectare per block**
- **No more than 5% of any single species and no more than 15% of any genus for City trees**
- **Useful life expectancy >30 years in 90% of the tree population**
- **Young tree mortality <3.5% for City trees**
- **90% of species in the inventory are suitable for future climate**

Art work by Sofie Skapski

Plan strategically to inform and monitor land use changes on the urban forest and integrate into public asset management

PLAN – INDICATORS

INDICATORS	Low	Fair	Good	Optimal
1. Appreciation of trees as a community resource			●	

a. **Key objective**: Courtenay's urban forest is recognized as vital to the community's environmental, social, and economic well-being.

b. **We have achieved this when**: Stakeholders understand, appreciate, and advocate for the urban forest as a community resource. There is widespread public and political support and advocacy for trees, resulting in strong policies and plans that advance the viability and sustainability of the urban forest.

c. **How we rate now**: Good. Trees are widely acknowledged as providing environmental, social and economic services – resulting in some action or advocacy in support of the urban forest.

INDICATORS	Low	Fair	Good	Optimal
2. Clear and defensible urban tree canopy assessment and goals			●	

a. **Key objective:** Urban forest policy and practice is driven by comprehensive goals municipality-wide and at the neighbourhood or land use scale informed by accurate, high-resolution assessments of existing and potential canopy cover.

b. **We have achieved this when:** The City has a complete, detailed, and spatially explicit high-resolution Urban Tree Canopy (UTC) assessment accompanied by a comprehensive set of goals by neighbourhood and land use.

c. **How we rate now:** Good. The City has a complete City-wide, detailed, and spatially explicit high-resolution UTC baseline assessment, but not yet for the neighbourhood or land use scale.

INDICATORS	Low	Fair	Good	Optimal
3. Trees on private property			●	

a. **Key objective:** Understand the extent, location and general condition of privately owned trees.

b. **We have achieved this when:** The City has a sample-based assessment of trees on private property, as well as detailed Urban Tree Canopy analysis of the entire urban forest integrated into a municipality-wide GIS system.

c. **How we rate now**: Good. LIDAR-based assessment of individual trees on private property.

INDICATORS	Low	Fair	Good	Optimal
4. Green infrastructure asset management integration		●		

a. **Key objective:** Integrate green infrastructure asset value into the municipal asset management system to support valuing and accounting for natural assets in the City's financial planning to build a climate resilient infrastructure.

b. **We have achieved this when**: The City recognizes and accounts for the value of natural forms and functions within an asset management system and invests in green infrastructure protection and enhancement.

c. **How we rate now**: Fair. The City recognizes the value of natural forms and functions but does not yet have adequate information to value green infrastructure as a municipal asset. This is a current work in progress.

INDICATORS	Low	Fair	Good	Optimal
5. Wildfire planning		●		

a. **Key objective:** Proactively manage forest fire risk.

b. **We have achieved this when**: A wildfire protection plan is in place and implemented along with FireSmart development guidelines .

c. **How we rate now**: Fair. Open burning regulations in place, online guidance on fire danger and high risk activities.

INDICATORS	Low	Fair	Good	Optimal
6. Interdepartmental and interagency cooperation		●		

a. **Key objective:** Ensure all relevant municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities.

b. **We have achieved this when**: Municipal urban forest policy is implemented by formal inter-departmental and inter-agency working teams on all municipal projects.

c. **How we rate now**: Fair. Municipal departments, affected agencies and urban forest managers recognize potential conflicts and reach out to each other on an ad hoc basis.

INDICATORS	Low	Fair	Good	Optimal
7. Urban forest funding to implement the plan		●		

a. **Key objective:** Maintain adequate funding to implement the urban forest strategy.

b. **We have achieved this when**: There is sustained public and private funding to comprehensively implement the strategy.

c. **How we rate now**: Fair. Resourcing for public lands in the form of a dedicated staff, equipment and tree-care specific funds are provided for some proactive management, all of which has been enhanced significantly in the past few years. However, a dedicated budget is required for tree management.

PLAN – ACTIONS

1. On public lands, formalize urban forest asset management and protection in City corporate policies and systems

1a. Adopt a Council-approved City Tree Asset Management Policy to guide City tree protection, removal, replacement and level of service expectations and decisions.

1b. Utilize the Policy to inform the creation of a City Tree Operations Manual to guide staff decisions and respond to public inquiries regarding public trees. This action item discussed in more detail in the Manage section.

2. Set neighbourhood tree canopy and character goals in consultation with the community to refine expectations and specificity regarding protection, character and function of the urban forest

2a. Establish neighbourhood planning units across the City through the next OCP review process. Use these planning units when creating Local Area Plans.

2b. Whenever conducting Local Area Plans, ensure UFS goals are discussed alongside other community planning goals, using a standardized framework. The framework would include, but not be limited to: setting a neighbourhood specific canopy cover target; identifying key streets and other transportation routes eligible for enhanced canopy and green infrastructure rainwater treatments that support trees; neighbourhood planting character goals; street naming conventions to reflect ecological or cultural heritage; identifying specific locations for tree planting or replacement; identifying significant trees or stands of trees; and UBC developed Climate Action Coolkit.

2c. Set street tree character goals along key transportation routes in conjunction with neighbourhood planning, and community servicing study updates

3. Identify and proactively manage forest fire risk

3a. Once available, work with the Comox Valley Regional District to investigate opportunities to support the CVRD-KFN Community Wildfire Protection Plan with regards to Courtenay.

3b. Apply for UBCM funding to support municipal Fire Smart planning for the City which could include defining risk and risk mitigation including fuel treatments on public land, FireSmart standards, training, education and suppression resources.

3c. Within the next OCP review, consider implementing a Wildfire Development Permit Area for development within or adjacent to the wildland forest edge to require new construction and landscaping to meet FireSmart standards.

4. Regularly update urban forest data and key planning and policy documents to respond to changes in land use and technology

4a. Collect aerial LiDAR imagery every 5 years to detect canopy cover changes and remeasure tree density by neighbourhood. Ensure LiDAR data is classified into different data types (e.g. bare earth, vegetation, building, etc.).

4b. Research cost estimates of arborist reports and memos, tree protection installation and arborist supervision to enable City staff to quantify the cost impact of tree protection on development.

4c. Review and update the UFS Implementation Plan as close to 10 years as possible using the monitoring information identified above.

4d. When conducting comprehensive OCP reviews, ensure that the most currently available information regarding canopy cover, sensitive ecosystem inventories, connectivity analysis and invasive species inventories are included to inform long range land use decisions and Development Permit guidelines.

4e. Provide updates to Council and the public every two years on the implementation progress of the UFS and any pertinent new information available.

5. Actively pursue funds and respond to partnership requests to support the UFS

5a. Use the Tree Replacement Reserve Fund contributions, pursue grants, partnerships and allocate dedicated Council funding.

5b. Consider developing a policy for Municipal Ticket fines and financial outcomes of enforcement negotiations and prosecutions to be dedicated to initiatives such as the Tree Replacement Reserve Fund.

5c. Consider amending the application of Tree Replacement Reserve Funding to address required UFS needs, as monitored over time. Currently the program designation is for the planting of trees on public lands or on private lands in accordance with a program created to provide tree planting incentives to private land owners. For example, explore whether tree management could be an eligible use of funds.

6. Amend the Tree Bylaw, as needed, to respond to community wide urban forest information

6a. Expected amendment cycles include following Urban Forest Strategy plan updates, in coordination with Official Community Plan updates or in response to canopy cover monitoring information.

Manage proactively to enhance urban forest health, safety and resilience by managing alongside other infrastructure goals

MANAGE – INDICATORS

INDICATORS	Low	Fair	Good	Optimal
1. City tree inventory			●	

a. **Key objective:** A current and comprehensive inventory of intensively managed trees to guide management, including data such as age distribution, species mix, tree condition and risk assessment.

b. **We have achieved this when:** The City tree inventory is complete, is GIS-based, supported by mapping and includes detailed tree condition as well as risk ratings.

c. **How we rate now:** Good. Significant improvements over 2017 status. The street tree inventory is accurate, GIS compatible and includes detailed tree condition ratings.

2. Maintenance of City owned streets and park trees			●	

a. **Key objective:** Maintain all publicly owned intensively managed trees for optimal health and condition in order to extend longevity and maximize current and future benefits.

b. **We have achieved this when:** All publicly owned, intensively managed trees are routinely maintained on an ongoing basis according to level of service expectations.

c. **How we rate now:** Good. Significant improvements over 2017 practices. Publicly owned trees are inspected regularly and street trees are proactively maintained on a 5 year cycle.

3. City tree risk management			●	

a. **Key objective:** Fully implement a comprehensive tree risk management program according to ANSI A300 (Part9) "Tree Risk Assessment" standards, and supporting industry best management practices.

b. **We have achieved this when:** Risk management is integrated with the routine pruning cycle, the level of assessment and response is reasonable to meet the duty of care (i.e., priorities and timelines for mitigation are established based on the characterization of risk).

c. **How we rate now:** Good. Risk inspections are conducted periodically, resulting in scheduled follow-ups or more advanced assessments when needed but the program is newly initiated and not yet integrated with a routine pruning cycle.

4. Storm response		●		

a. **Key objective:** A response plan guides call-out procedures, resources available and the clean-up response.

b. **We have achieved this when:** An action plan for responding to storm damage is in place and a response drill occurs periodically.

c. **How we rate now:** Fair. A call-out procedure, roles and responsibilities, and criteria for prioritizing tree hazards and removing debris is in place, but there is need for further development in this area.

5. Pest and disease management			●	

a. **Key objective:** An Integrated Pest Management (IMP) plan guides treatment responses to existing and potential pest threats to the urban forest.

b. **We have achieved this when:** An integrated pest management plan is in place and is implemented.

c. **How we rate now:** Good. No integrated pest management plan but IMP is practiced.

6. Urban wood and green waste revitalization		●		

a. **Key objective:** A closed system diverts all urban wood and green waste through reuse and recycling.

b. We have achieved this when: All green waste is diverted to its best use.

c. **How we rate now**: Fair. While most green waste does not go to the landfill, uses are limited to chips or mulch.

7. Usage of publicly owned natural areas		●		

a. **Key objective:** Management levels of service are informed by a detailed understanding of the ecological structure and function of all publicly owned natural areas as well as usage patterns.

b. We have achieved this when: In addition to usage patterns, ecological structure and function of all publicly owned natural areas are assessed and documented.

c. **How we rate now**: Fair. Publicly owned natural areas are identified in a plan (e.g. the Parks and Recreation Plan).

MANAGE – ACTIONS

7. Develop a City Tree Operations Manual to formalize urban forest asset management and protection in City corporate policies and systems

7a. The Operations Manual will guide staff and arboriculture contractors (where relevant) in the following topic modules, which are currently under development:

i. Planning and Design (pre-planting): define strategic priorities for planning the urban forest by spatial area and specific typologies. In addition, this will cover authority to plant, planting design, species selection and stock quality and diversity standards.

ii. Planting: include cover bulk soil management and soil volume standards, technical standards for planting trees in streets, parks rainwater facilities, and notification and engagement.

iii. Management and Plant Health Care: include tree protection, watering, pruning, integrated pest management, prevention and management of infrastructure conflicts and notification. Include liaison with Canadian Food Inspection Agency's Plan Pest Surveillance Unit.

iv. Inventory, Inspection and Emergency Response: covers the inventory and work management system, inspection policy for risk management and emergency response including personnel responsibilities, resources available and clean-up priorities.

v. Succession Planning and Removal Management: define strategic priorities for succession management, authority to remove, poorly performing trees, development/capital works related removals, notification and engagement, re-use tree waste.

vi. Monitoring and Adaptive Management: cover how key metrics at the City tree level and public urban forest level will be monitored and include recommendations for adaptive management, including resourcing, to continuously improve implementation.

7b. Priority implementation items to explore for inclusion in the City Tree Operations Manual include:

i. A tree watering protocol or program for trees within 1-3 years of planting, and for older trees as needed.

ii. Continue to transition from demand risk management and tree maintenance to a preventative program. Define zones for inspection cycles, define frequency, inspection methods, assessor qualifications, responsibilities and documentation, as well as a rating system to prioritize and complete corrective action within a timeframe to meet a reasonable standard of care.

iii. Develop a system for evaluating and prioritizing demand maintenance and removal requests within defined level of service expectations.

7c. Develop management plans for unmanaged parkland dedications in partnership with community stewardship groups.

8. Continue to regularly collect information to populate the city tree asset management system

8a. Inventory trees and vacant planting sites with the maintenance cycle.

8b. Value, life expectancy, maintenance and replacement costs of City Tree assets.

8c. Mortality rates, failure rates, pest incidence and causality in City trees.

8d. Research opportunities to account for public tree carbon storage and sequestration in corporate climate action GHG reporting.

9. Use information from the asset management system to inform resourcing requirements, including human resources, for the desired level of service

9a. Provide dedicated capital and operational budgets for urban forestry to meet the desired level of service defined in the City Tree Asset Management Policy and supported by the City Tree Operations Manual, with emphasis on the first 5 years to transition to preventative maintenance and risk management programs. The 5-year work-plan shall include staffing, equipment, budget requirements and a review of investment to inform future budgets.

9b. Maintain regular staff training, participation in industry workshops and conferences, and industry standard certifications.

10. Establish forums for interdepartmental, interjurisdictional and interagency communication to continuously improve tree management protocols and clarify tree management expectations across public and private lands

10a. Hold annual interdepartmental staff workshops focused on: upcoming and current capital projects; on-the-ground activities around City trees; and design or planning projects involving City trees to identify recurring tree conflicts, quality issues and innovative solutions. Include utilities and contract labour when appropriate.

10b. Include all staff who interact with tree management in their course of work. For example, planning staff who administer the Tree Bylaw in order to build tree literacy for more helpful Bylaw administration.

Protect prudently to maintain the quality and connectedness of the urban forest

PROTECT – INDICATORS

INDICATORS	Low	Fair	Good	Optimal
1. Tree protection, policy development and enforcement			●	

a. **Key objective:** Secure the benefits derived from trees on public and private land by enforcement of municipality-wide policies and practices including tree protection.

b. **We have achieved this when:** Municipality-wide policies and practices are integrated to protect public and priority private trees, and the policies are consistently enforced.

c. **How we rate now:** Good. Policies and practices are in place to protect public and private trees, and are generally enforced.

	Low	Fair	Good	Optimal
2. Publicly-owned natural areas management planning and implementation			●	

a. **Key objective:** Acquire and restore publicly-owned natural areas in pursuit of meeting municipal-wide biodiversity and connectivity goals.

b. **We have achieved this when:** A biodiversity strategy, or equivalent, is in effect to manage, restore existing natural areas and acquire future natural areas network throughout the municipality.

c. **How we rate now:** Approaching Good. The Parks and Recreation Plan is adopted. Parks/area specific plans will be created.

	Low	Fair	Good	Optimal
3. Privately-owned environmentally sensitive areas protection policy and enforcement			●	

a. **Key objective:** Secure the benefits derived from environmentally sensitive areas by enforcement of municipality-wide policies in pursuit of meeting biodiversity and connectivity goals.

b. **We have achieved this when:** Policy and enforcement are in place to protect environmentally sensitive areas on private land.

c. **How we rate now:** Good. Policy is in place to protect privately-owned identified environmentally sensitive areas, but enforcement powers are limited.

PROTECT – ACTIONS

11. Prioritize protection of significant trees and forest stands on both public and private land

11a. Consider expanding the definition of "Protected Tree" to include trees with a single stem exceeding 60cm DBH, and update Section 5.3 of the Tree Bylaw to include a permit requirement for these trees.

11b. Explore designating western redcedar as a protected species, given its vulnerability to climate change.

11c. Consider options, such as land acquisition or regulation, to enhance protection of Significant Stands and Corridors (see pages 44 and 46) on private property.

11d. Set targets for protecting key habitat patches, Significant Stands and Corridors in the OCP review

11e. Develop soil preservation guidelines to encourage retention or storage of native soils for use on development sites.

11f. Meet an equivalent standard for tree protection, removal and replacement on City projects to that required on private land, and incorporate Local Area Plan urban forest priorities.

11g. Where significant trees on City property cannot be retained, explore the opportunity to memorialize the removed tree by milling specialty timber for use in other City projects.

11h. Target a permanent protection solution for the Garry Oak ecosystems in the vicinity of G.P. Vanier Secondary School and Vanier park.

11i. Explore development incentives such as density bonusing and amenity contribution policy to protect Significant Stands and Corridors in the OCP and Zoning Bylaw review.

12. Refine understanding of the linkages between changes to hydrology and forest patches through land development

12a. Explore how to maintain hydrological pathways to retained forest patches through management initiatives or bylaw changes affecting rainwater infrastructure.

12b. Require that calculations for stormwater management plans for new development utilize runoff coefficients that incorporate the historical land cover value for up to 25 years.

13. Review the Tree Bylaw to consider possible amendments that enhance interpretation and tree protection outcomes

13a. On greenfield properties where forest cluster or corridor configurations may be possible but are not proposed, require a design rationale for why such configurations are not possible.

13b. Require a tree survey by a BC Land Surveyor for any trees that are proposed to be retained in order to accurately inform the arborist's tree inventory report and tree protection requirements.

13c. Require a CAD (Computer-aided design) drawing Tree Protection and Removal Plan that accurately maps the tree survey, site plan, trees to be removed and retained, protection fencing and annotations for arborist supervision.

13d. Consistently apply arborist monitoring requirements as follows:

- i. Prior to tree cutting permit issuance, require arborists to submit a comfort letter outlining work near trees that needs to be supervised and ensure it is signed by the arborist and owner, and accepted by the City.
- ii. Require an arborist memo be submitted to confirm tree protection fences are field constructed to the required standard. Such memos shall be submitted prior to construction drawing approval, issuance of building permit on any property that has a retained tree, and at time of or immediately following adjacent tree removal for greenfield tree removals.
- iii. Regardless of the size of the property, require a final arborist memo at the conclusion of all development activities adjacent to retained trees, confirming that protection measures were properly implemented as a condition of releasing securities.

13e. Limit the number of tree security releases per project.

13f. Clarify hazard tree replacement requirements.

13g. Require TRAQ (Tree Risk Assessor Qualification) Certification for arborists submitting any tree risk assessment.

13h. Require Registered Professional Forester status for windfirm boundary assessments when cutting into a forest stand.

13i. Update Section 12.1 such that a permit may be refused if "the proposed work would adversely impact a protected tree, and alternatives to tree preservation have not been explored to the satisfaction of the Director."

13j. Update Section 10.1(c) (tree replacement within Environmentally Sensitive Areas) to require that replacement ratios follow Provincial Planting Criteria.

13k. Create a tree cutting permit fee for small-scale removal on greenfield properties.

13l. Require that tree replacement security requests occur during active growing season in order to best determine health of the tree.

13m. Allow Tree Bylaw Tree Density Target requirements to be achieved on trail connection lands designated as "highway".

14. Improve the quality of park assets inherited through development

14a. In support of Parks and Recreation master planning:

- i. Locate community parks next to natural areas where synergies will benefit users.
- ii. Include and protect existing trees within parks where possible.

14b. Review development design and procedural guidelines for parkland dedications to improve retention of windfirm groups of trees, maintenance efficiency, fire suppression access and amenity value.

- i. Determine minimum greenway corridor widths, and develop nature trail specifications, to protect retained forest stands adequately. Ensure that corridor widths reflect that 3m trails include a minimum of a 5m zone of impact and therefore 10m corridors allow for very minimal mature tree retention, unless adjacent lands contain forest values that are protected.
- ii. Require invasive species, high risk trees, windthrow risk and fuel hazard mitigation prior to acceptance of new park land.
- iii. Require a tree asset management plan from the applicant's arborist upon park dedication in order to incorporate management needs into the City's Asset Management inventory and resourcing framework. The plan shall include at minimum: a description of the tree assets, estimated age and composition, identified risks, potential impacts from changes in adjacent land use (e.g., hydrology), management recommendations and timeframe.
- iv. Adopt a City review and inspection procedure involving public works staff to ensure that incoming park tree assets are selected carefully and treated sensitively during all phases of development from adjacent land clearing to park dedication.

15. Consider the creation of a tree heritage registry or significant tree list within the Tree Bylaw in order to protect individual trees of community significance

15a. Use local area planning processes as the opportunity to create the heritage/ significant tree list.

15b. Allow for trees of significant scientific, cultural or landscape visual value to be included.

Grow intentionally to provide urban forest benefits when and where they are needed

GROW – INDICATORS

INDICATORS	Low	Fair	Good	Optimal
1. Tree establishment and replacement planting		●		

a. **Key objective:** Develop a comprehensive and effective tree planting and establishment program that is driven by canopy cover goals and other considerations according to the UFS.

b. **We have achieved this when:** Tree planting and replacement is guided by strategic priorities and makes progress towards targets set for canopy cover, diversity and tree health.

c. **How we rate now:** Fair. Some tree planting and replacement occurs, but with limited overall municipality-wide planning and post planting care.

2. Planting design guidance, site specifications and standards		●		

a. **Key objective:** Ensure all publicly owned trees are suitable for the site and planted into conditions that meet requirements for survival and maximize current and future tree benefits.

b. **We have achieved this when:** All trees planted are in sites with adequate soil quality and quantity, and with sufficient growing space and over all site conditions to achieve their genetic potential and thus provide maximum ecosystem services.

c. **How we rate now:** Fair. Appropriate tree species are considered in site selection.

3. Equity in planting program delivery	●			

a. **Key objective:** Ensure that the benefits of urban forests are made available to all, especially to those in greatest need of tree benefits.

b. **We have achieved this when:** Equitable planting and outreach at the neighbourhood level are guided by strong citizen engagement in identified low-canopy/high-need areas.

c. **How we rate now:** Low. Tree planting and outreach are not determined equitably by canopy cover or need for benefits.

4. Native vegetation planting			●	

a. **Key objective:** Encourage the appreciation of native vegetation by the community and ensure native species are widely planted to enhance native biodiversity and connectivity

b. **We have achieved this when:** Policies require the use of native species and management of invasive species on a project-appropriate basis, in public and private land development projects, and native species are commonly voluntarily used.

c. **How we rate now:** Good. Policies require the use of native species and management of invasive species on a project-appropriate basis.

5. Green infrastructure for stormwater management		●		

a. **Key objective:** Incorporate passive and active rainwater capture into streetscapes and development projects to improve tree health, stormwater management and green and blue community-wide connectivity.

b. **We have achieved this when:** Stormwater management guidelines incorporate passive and active water capture[1] considerations for vegetated landscapes and are equivalent to regional best practices standards.

c. **How we rate now:** Fair. Passive and active water capture considerations for vegetated landscapes are occasionally incorporated into City or private land development projects.

6. Building energy efficiency	●			

a. **Key objective:** Use trees and vegetation to improve building energy efficiency.

b. **We have achieved this when:** Energy Conservation Development Permit Area Guidelines (Local Government Act S.488 (1)(h)) are established based on equivalent regional climatic best practices standards and include the valuation/calculation of avoided emissions.

c. **How we rate now:** Low. Landscapes are planted, and new developments designed, without consideration for the location for building energy efficiency.

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1 **Passive rainwater capture systems** receive and hold water to gradually infiltrate it into surrounding soil. These systems do not have any mechanical components. For example, a vegetated swale by the side of the road or pervious paving that receive rainfall and allow it to permeate from the surface into the surrounding soil.
Active rainwater capture systems actively collect, filter, store and reuse water. These systems generally include mechanical components such as pumps or filters that require electricity and require ongoing maintenance. For example, a biofiltration raingarden that filters road runoff into a below ground cistern used to irrigate landscapes.

GROW – ACTIONS

16. Improve the quality of new tree planting in the public and private realm

16a. Develop design guidelines and species selection criteria to guide planting on public land and private development projects. Guidance should cover downtown streets and other street types, parking lots, narrow yards and planting beds, aerial servicing and property lines. Ensure climate adaptability and fire resistance are factored in.

16b. Update streetscape standards and details for City infrastructure (e.g. boulevards, tree pits, soil trenches, soil cells, structural soil, etc.) to incorporate street trees with stormwater management options in targeted areas. As guidance, minimum single/shared soil volume targets recommended are: 10m3/5m3 for small trees, 25m3/15m3 for medium trees and 50m3/30m3 for large trees. Soil volume can be met in the tree pit or by providing root bridges to adjacent soil areas.

16c. Develop soil investigation protocols and remediation standards for new and failing planting locations.

16d. In the next Zoning Bylaw review, and as part of neighbourhood consultations, consider limiting the area of paved surfaces within certain zones.

17. Increase the quantity of new tree planting in the public and private realm

17a. Plant 300 trees per year on public land (in addition to replacement and restoration plantings) and work with residents to plant approximately 850 trees per year on private land.

17b. Within the next OCP review explore Development Permit Areas for the establishment of objectives to promote energy and water conservation and the reduction of greenhouse gas emissions, in order to utilize tree planting and landscaping to support these goals (S.488 (1) (h)(i) & (j) of the Local Government Act). Details to explore include standards for tree canopy, permeable cover and extent, green infrastructure such as raingardens, soil volume and quality with emphasis on adequate tree canopy in parking lots, along publicly fronting streets, and property perimeters.

17c. Within the next OCP review, clarify that landscaping targets shall achieve the Tree Bylaw Tree Density Target for Development Permit Areas that may set stipulations on landscaping. For infill properties (as defined by the Tree Bylaw), that require such a Development Permit, the Tree Density Target shall be achieved through retention wherever possible.

17d. Within the next Specifications and Standards Bylaw update, include specifications to support larger canopied trees, and on both sides of the street in identified key transportation character routes. This will require increased soil volumes and spacing depending on size of tree (e.g. 6-9m for small trees, 8-12m for medium trees and 10-20m for large trees).

18. Plan and prioritize tree planting where it will most benefit community and ecological health, and support other City strategies

18a. Prioritize tree planting in the public and private realm through the Local Area Plan process and using metrics on street tree density, block tree density, canopy and impervious cover. Additional context should be provided Environmentally Sensitive Areas, Significant Stands and Corridors, transportation character routes, heritage and Integrated Rainwater Management watershed restoration locations.

18b. Prioritize street tree improvements when downtown streets are scheduled for capital improvements towards implementation of the Downtown Playbook vision.

18c. When planting in or adjacent to significant stands or corridors prioritize the use of ecologically appropriate native species.

19. Support local food security through the urban forest

19a. Establish a community orchard on public land as a food security demonstration project provided that adequate community partnership support is available.

19b. Explore opportunities for fruit and nut trees in the public realm where there is demand from the community.

PARTNER – INDICATORS

INDICATORS	Low	Fair	Good	Optimal
1. Citizen involvement and neighbourhood action		●		

a. **Key objective:** Citizens and groups participate and collaborate at the neighbourhood level with the municipality and/or its partnering NGOs in urban forest management activities to advance municipality-wide plans.

b. **We have achieved this when:** Proactive outreach and coordination efforts by the City and NGO partners result in widespread citizen involvement and collaboration among active neighbourhood groups engaged in urban forest management.

c. **How we rate now:** Fair. Some active neighbourhood groups engaged in advancing urban forest goals, but with little or no overall coordination with or direction by municipality or its partnering NGOs.

INDICATORS	Low	Fair	Good	Optimal
2. Involvement of large private and institutional landholders	●			

a. **Key objective:** Large private landholders to embrace and advance city-wide urban forest goals and objectives by implementing specific resource management plans.

b. **We have achieved this when:** Large landholders develop comprehensive tree management plans (including funding strategies) that advance UFS goals, and there is active community engagement and access to the property's forest resource.

c. **How we rate now:** Low. Large private landholders are generally uninformed about urban forest issues and opportunities.

INDICATORS	Low	Fair	Good	Optimal
3. Green industry<?> cooperation		●		

a. **Key objective:** Green industry works together to advance city-wide urban forest goals and objectives, and adheres to high professional standards.

b. **We have achieved this when:** There is a shared vision, goals and extensive committed partnerships in place as well as solid adherence to high professional standards.

c. **How we rate now:** Fair. There is some cooperation among green industry as well as general awareness and acceptance of city-wide goals and objectives.

INDICATORS	Low	Fair	Good	Optimal
4. Utilities cooperation	●			

a. **Key objective:** All utilities – above and below ground, City and 3rd party – employ best management practices and cooperate with the City to advance goals and objectives related to urban forest issues and opportunities.

b. **We have achieved this when:** Utilities support engineered solutions to accommodate trees and utilities, and participate in formal interdepartmental/interagency working teams on all municipal projects.

c. **How we rate now:** Low. Utilities take actions impacting the urban forest with varying degrees of municipal coordination or consideration of the urban forest. Notifications from some 3rd parties occur, although best management pruning practices are not always followed. Coordination internally on utilities maintenance could be improved.

INDICATORS	Low	Fair	Good	Optimal
5. Regional collaboration	●			

a. **Key objective:** There is cooperation and interaction on urban forest plans among neighbouring municipalities within the region, and/or within regional agencies.

b. **We have achieved this when:** There is widespread regional cooperation, including with relevant authorities such as the health authority , resulting in development and implementation of a regional Urban Forest Strategy.

c. **How we rate now:** Low. Municipalities have no interaction with each other or the broader region for planning or coordination on urban forestry.

INDICATORS	Low	Fair	Good	Optimal
6. Urban forest research	●			

a. **Key objective:** Research is active and ongoing towards improving our understanding of the urban forest resource, the benefits it produces, and the impacts of planning, policy, design and management initiatives.

b. **We have achieved this when:** The urban forest is a living laboratory - in collaboration with public, private, NGO and academic institutions - integrating research and innovation into urban forest management.

c. **How we rate now:** Low. No urban forest research is currently occurring.

PARTNER – ACTIONS

20. Work together with K'ómoks First Nation and community groups to steward the City's urban forest

20a. Work together with K'ómoks First Nation to identify culturally appropriate stewardship activities and opportunities for public land.

20b. Develop a volunteer strategy to include objectives and guidance for community urban forest stewardship. Volunteer activities could include, but not be limited to: tree or understory restoration planting, invasive species removal, stewardship education, citizen science projects and basic tree health monitoring, subject to training.

20c. Actively respond to requests for partnership, recognizing that the City has limited resources to implement the urban forest strategy.

21. Develop a Communications Strategy to effectively share the story of the urban forest and engage the community in managing public and private trees

21a. The Communication Strategy shall serve as a long term marketing and education tool and shall seek to identify the values of the urban forest, promote urban forest supportive behaviours, clarify regulatory expectations and celebrate the role of the stewardship sector in promoting and being an active stakeholder in the UFS.

- i. Key behaviours that the Communication Strategy shall promote are assistance with watering public trees during establishment years, avoiding impact within critical root areas, and not initiating any work on public trees.
- ii. Include messaging on responsible fruit tree management (to avoid vermin and bears).
- iii. Identify when to use competitions, promotions and prizes to build awareness and a spirit of fun.
- iv. Identify partners to target for engagement to increase awareness of UFS goals and advance urban forest management on large private and institutional lands.

21b. Work together with K'ómoks First Nation to include their perspective in the urban forest story and its connection to culture and reconciliation.

21c. Maintain information on the City's website and public GIS or Story Map that:

- i. Is an interactive City tree map linked to the City's tree inventory that reports individual tree data.
- ii. Shares the story of Courtenay's urban forest, its heritage and trends.
- iii. Explains the urban forest's critical role in maintaining healthy community, ecology and culture.
- iv. Links to the ISA Consumer Information Program www.treesaregood.org as a reliable and current source of tree care information for tree owners.
- v. Provides season-relevant information, updated each month, such as that from the www.treesaregood.org website, and bird nesting season reminders.

21d. Revisit the Communication Strategy to respond to changes in public messaging, emerging research and urban forest trends over time.

22. Partner with institutions such as UBC Urban Forestry to identify research and co-op student opportunities to study the urban forest and effectiveness of management outcomes

22a. Topics for exploration include but are not limited to:

- i. Mapping protected species for inclusion in the City's mapping to have accurate information when responding to public inquiries.
- ii. Monitoring restoration efforts for effectiveness;
- iii. Use of the UBC developed Climate Action Coolkit in neighbourhood engagement endeavours.
- iv. Identifying trees of cultural and historical significance and documenting local stories.
- v. Production value of the urban food forest.
- vi. Carbon credit accounting.
- vii. Biodiversity characteristics and value of the urban forest.
- viii. Habitation of the urban forest (by the homeless) including drug usage increase and management solutions.
- ix. Any other item within the UFS that does not involve sensitive or confidential information.

22b. Participate in the Canadian Urban Forest Network to share information, develop best practices and stay informed of funding opportunities.

23. Partner with government, municipal and 3rd party utilities and green industry to implement the urban forest strategy

23a. Work with and educate local nurseries on non-invasive and climate-appropriate species lists as a strategic point of communication to consumers.

23b. Work with local nurseries to procure diverse and climate suitable tree stock, including exploring the possibility of municipal growing contracts to provide future public trees and/or protected species.

23c. Work together with the local non-profit Garry Oak Nursery to explore the potential to expand the number of endangered native species available, and promote the work of this group.

23d. Explore salvage options for sourcing protected species to be removed during land clearing activities when they cannot be retained or in adjacent jurisdictions that do not have Tree Bylaw protection. For example, local provenance genetic stock of pacific dogwoods are difficult to germinate commercially due to climate and are not currently locally available.

23e. Continue to work with the consulting arborist and development community towards a mutual understanding of Tree Bylaw information requirements and tree protection measures.

23f. Continue to work with BC Hydro to share information about pruning City trees and expectations for pruning standards.

23g. Work with Comox Valley Regional District to ensure that Courtenay's urban forest, and urban forests within the region, are included in future Regional Growth Strategy deliberations, and identify opportunities to share costs, resources or messaging for implementation regional urban forest strategies.

23h. Work with all neighbouring jurisdictions to address boundary opportunities, common public messaging and partnerships with green industry that have regional applicability.

23i. Encourage developers to engage the stewardship sector during the land development process.

24. Respond to creative ideas from potential partners that advance Urban Forest Strategy implementation

24a. Assisting teachers develop modules for student exploration of the urban forest.

24b. Working with a community arts program that celebrates the urban forest.

24c. Participating in events promoting the urban forest, such as annual arbor days, Earth Day, green industry, food and arts festivals.

Photos by Kathryn Clouston

7 10-YEAR IMPLEMENTATION PLAN

The implementation plan sets the timeframe and approximate budget for implementing the Strategy over the next 10 years. Given that the planning horizon for the Strategy is 30 years, out to 2050, the implementation plan and Strategy will be revisited at regular intervals. The following implementation framework summarizes the City's approach to achieving the Vision and Goals:

1. Set a canopy cover target and monitor over time. How the urban forest is changing will inform which policy levers and programs to invest in over time.
2. Protect a network of the critical remaining urban forest. Significant stands and corridors will be evaluated along the community's growth plan to target conservation areas alongside development needs.
3. Encourage neighbourhoods to determine their neighbourhood forest goals. Residents will be invited to share their neighbourhood's specific urban forest vision through local area planning.
4. Support a dynamic urban forest on infill properties outside of identified protection areas. Flexibility in tree management is permitted on lands targeted for infill development.
5. Continue to integrate City trees and forests into asset management planning. Information about public tree management will be used to inform level of service expectations.
6. Demonstrate leadership and build partnership. As a shared asset, we must steward the urban forest together.

Updates on Urban Forest Strategy implementation will occur every two years at a minimum to inform the public and the City of Courtenay Mayor and Council of implementation progress. Full recommendations within the plan will be incrementally implemented within the general timeline described on the following page.

To stay up to date on the City of Courtenay's Urban Forest Strategy, please visit www.courtenay.ca/urbanforest

Implementation Timing and Responsibility

Strategy	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Lead Department
PLAN											
1. On public lands, formalize urban forest asset management and protection in City corporate policies and systems+	1a										Public Works
	1b										
2. Set neighbourhood tree canopy and character goals in consultation with the community to refine expectations and specificity regarding protection, character and function of the urban forest+	2a	2a									Development Services
	2b	2b									
	2c	2c									
3. Identify and proactively manage forest fire risk+	3a										Development Services
	3b										
	3c										
4. Regularly update urban forest data and key planning and policy documents to respond to changes in land use and technology*+			4a*					4a*			Development Services/ Legislative Services
	4b										
								4c*			
		4d									
		4e		4e		4e		4e			
5. Actively pursue funds and respond to partnership requests to support the UFS+	5a										Development Services/Public Works/ Legislative Services
		5b									
		5c									
6. Amend the Tree Bylaw, as needed, to respond to community wide urban forest information+			6a						6a		Development Services
Budget sub-total			30k					30k	60k		
MANAGE											
7. Develop a City Tree Operations Manual to formalize urban forest asset management and protection in City corporate policies and systems+		7a/b									Public Works
			7c								Public Works
8. Continue to regularly collect information to populate the city tree asset management system+	8a-d										Public Works
9. Use information from the asset management system to inform resourcing requirements, including human resources, for the desired level of service*+	9a*										Public Works
	9b										Public Works
10. Establish forums for interdepartmental, interjurisdictional and interagency communication to continuously improve tree management protocols and clarify tree management expectations across public and private lands+	10b										Public Works
Budget sub-total	100k	140k	180k	200k	215k	230k	245k	260k	275k	290k	
PROTECT											
11. Prioritize protection of significant trees and forest stands on both public and private land+*			11a								Development Services
			11b								
	11c										
		11d									
	11e										Public Works
	11f										
	11g* (cost unknown)										Recreation and Cultural Services
	11h										Development Services
12. Refine understanding of the linkages between changes to hydrology and forest patches through land development+	12a/b										Development Services
13. Review the Tree Bylaw to consider possible amendments that enhance interpretation and tree protection outcomes+			13a-m								Development Services
14. Improve the quality of park assets inherited through development+	14a										Development Services/ Public Works/ Recreation and Cultural Services
		14b									
15. Consider the creation of a tree heritage registry or significant tree list within the Tree Bylaw in order to protect individual trees of community significance+			15a/b								Development Services
Budget sub-total	To be completed in house or within other planned projects (e.g., OCP update)										
GROW											
16. Improve the quality of new tree planting in the public and private realm+	16a-d										Development Services/ Public Works
17. Increase the quantity of new tree planting in the public and private realm*+	17a*										Public Works
	17b-d										Development Services
18. Plan and prioritize tree planting where it will most benefit community and ecological health, and support other City strategies+	18a-c										Development Services/ Public Works
19. Support local food security through the urban forest*+	19a/b* (cost unknown)										Public Works/ Recreation and Cultural Services
Budget sub-total		40k	60k	80k	80k	80k	80k	80k	80k	80k	
PARTNER											
20. Work together with K'ómoks First Nation and community groups to steward the City's urban forest+	20a-c										Recreation and Cultural Services/ Public Works
21. Develop a Communications Strategy to effectively share the story of the urban forest and engage the community in managing public and private trees+		21a									Development Services/ Legislative Services
	21b										
	21c										
								21d			
22. Partner with institutions such as UBC Urban Forestry to identify research and co-op student opportunities to study the urban forest and effectiveness of management outcomes+	22a/b										Development Services
23. Partner with government, municipal and 3rd party utilities and green industry to implement the urban forest strategy+	23a-h										Public Works/ Development Services
24. Respond to creative ideas from potential partners that advance Urban Forest Strategy implementation+	24a-c										Development Services/ Legislative Services
Budget sub-total											
Budget estimate	100k	180k	270k	280k	295k	310k	325k	370k	415k	370k	

* Recommendation with budget implication (some maintenance costs are already paid through other budgets)

+Recommendation with staff time implication (staff time or positions not costed)

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APPENDIX 1 - URBAN TREES FOR THE FUTURE

Metro Vancouver has developed an urban tree list of over 300 species that indicates their suitability to current and projected future climate. Search "Urban Forest" on www.metrovancouver.org for more information. Projections for Courtenay's future climate are within the same range as parts of Metro Vancouver and this list is therefore anticipated to be relevant for Courtenay also.

VERY SUITABLE = species anticipated to tolerate a broad range of sites under future climate

- Arbutus menziesii
- Albizia julibrissin *
- Arbutus unedo
- Calocedrus decurrens *
- Catalpa speciosa *
- Cedrus deodara *
- Celtis occidentalis *
- Celtis sinensis ●
- Cercis canadensis
- Cotinus coggygria
- Crataegus crus-galli
- Crataegus x lavalleei
- Crataegus x mordenensis
- Cupressus arizonica *●
- Cupressus macrocarpa *
- Cupressus sempervirens
- Cupressus x leylandii
- Eucommia ulmoides
- Ficus carica *
- Fraxinus ornus
- Ginkgo biloba
- Gleditsia triacanthos
- Gymnocladus dioicus
- Juglans major ●
- Juniperus chinensis
- Juniperus virginiana *
- Koelreuteria bipinnata *●
- Koelreuteria paniculata *
- Lagerstroemia x 'tuscarora' ●
- Maackia amurensis ●
- Maclura pomifera *●
- Notholithocarpus densiflorus
- Nyssa sinensis
- Olea europaea *●
- Phellodendron amurense *
- Pinus banksiana
- Pinus contorta
- Pinus flexilis
- Pinus mugo
- Pinus nigra
- Pinus pinea *●
- Pinus ponderosa
- Pinus sylvestris *
- Pinus thunbergii *
- Pistacia chinensis
- Prunus dulcis ●
- Pyrus calleryana *
- Pyrus pyrifolia ●
- Quercus acutissima *
- Quercus agrifolia ●
- Quercus alba
- Quercus coccinea
- Quercus garryana
- Quercus ilex ●
- Quercus imbricaria ●
- Quercus macrocarpa
- Quercus shumardii
- Quercus suber ●
- Quercus virginiana ●
- Rhus typhina
- Sorbus aria
- Ulmus propinqua ●

SUITABLE = species anticipated to tolerate all but the driest sites under future climate

- Abies concolor
- Abies procera
- Acer buergerianum ●
- Acer campestre *
- Acer cappadocicum
- Acer grandidentatum ●
- Acer griseum
- Acer japonicum
- Acer miyabei
- Acer negundo *
- Acer nigrum
- Acer platanoides *
- Acer pseudoplatanus *
- Acer rubrum *
- Acer saccharinum
- Acer saccharum
- Acer tataricum *
- Acer triflorum
- Acer x freemanii
- Aesculus hippocastanum *
- Aesculus x carnea
- Alnus cordata *
- Alnus rubra
- Amelanchier canadensis
- Amelanchier laevis
- Amelanchier x grandiflora
- Araucaria araucana
- Arbutus 'marina' ●
- Betula alleghaniensis
- Carpinus betulus
- Carpinus japonica
- Castanea mollissima
- Castanea sativa
- Catalpa bignonioides *
- Cedrus atlantica
- Cercis chinensis
- Cercis occidentalis ●
- Cercis siliquastrum
- Chamaecyparis obtusa
- Chamaecyparis pisifera
- Chionanthus retusus ●
- Cladrastis kentukea
- Clerodendrum trichotomum
- Cornus controversa
- Cornus florida
- Cornus mas
- Corylus avellana *
- Corylus colurna
- Crataegus douglasii
- Crataegus grignonensis ●
- Crataegus phaenopyrum *
- Cryptomeria japonica *
- Davidia involucrata
- Eriobotrya japonica ●
- Eucalyptus pauciflora ●
- Fraxinus angustifolia
- Fraxinus excelsior
- Fraxinus velutina
- Heptacodium miconioides ●
- Hibiscus syriacus *
- Juglans regia
- Laburnum anagyroides *
- Laburnum x watereri *
- Lagerstroemia indica *●
- Ligustrum japonicum *●
- Ligustrum lucidum *●
- Liquidambar styraciflua
- Liriodendron tulipifera
- Magnolia grandiflora
- Malus baccata *
- Malus domestica
- Malus floribunda *
- Malus pumila *
- Malus sylvestris *
- Malus transitoria
- Malus tschonoskii ●
- Malus x moerlandsii ●
- Malus x zumi
- Manglietia insignis
- Morus alba *
- Nothofagus antarctica
- Ostrya carpinifolia
- Ostrya virginiana
- Oxydendrum arboreum
- Parrotia persica
- Photinia x fraseri ●
- Picea glauca
- Picea omorika
- Picea pungens
- Pinus parviflora
- Pinus radiata *
- Platanus x hispanica
- Platycladus orientalis ●
- Populus alba *
- Populus fremontii ●
- Populus nigra *
- Prunus americana
- Prunus armeniaca
- Prunus avium *
- Prunus caroliniana
- Prunus cerasifera *
- Prunus cerasus *
- Prunus domestica *
- Prunus emarginata
- Prunus pendula ●
- Prunus salicina
- Prunus sargentii
- Prunus serotina
- Prunus serrula
- Prunus serrulata
- Prunus subhirtella
- Prunus virginiana *
- Prunus x blireana
- Prunus x yedoensis
- Pseudotsuga menziesii
- Pyrus communis *
- Pyrus kawakamii ●
- Pyrus salicifolia
- Quercus alba x robur
- Quercus bicolor
- Quercus frainetto
- Quercus lobata ●
- Quercus robur *
- Quercus rubra
- Rhamnus purshiana
- Salix scouleriana
- Salix x sepulcralis
- Sequoiadendron giganteum
- Sophora japonica *
- Sorbus x thuringiaca
- Stewartia monadelpha
- Stewartia pseudocamellia
- Styrax japonicus
- Syringa pekinensis ●
- Syringa vulgaris *
- Taxodium distichum
- Taxus baccata
- Taxus brevifolia
- Thuja occidentalis *
- Tilia americana
- Tilia cordata
- Tilia platyphyllos
- Tilia tomentosa
- Tilia x euchlora
- Tilia x europaea
- Trachycarpus fortunei
- Ulmus americana *
- Ulmus parvifolia *
- Ulmus procera *
- Ulmus wilsoniana 'prospector' ●
- Ulmus x hollandica
- xChitalpa tashkentensis
- Zelkova serrata

MARGINAL = species anticipated to be restricted to moist sites under future climate

- Abies grandis
- Acer capillipes
- Acer circinatum
- Acer macrophyllum
- Acer palmatum *
- Acer pensylvanicum
- Acer truncatum
- Aesculus flava
- Aesculus pavia
- Alnus rhombifolia
- Amelanchier arborea
- Betula jacquemontii
- Betula nigra
- Betula papyrifera
- Betula populifolia
- Betula utilis
- Carpinus caroliniana
- Carya illinoinensis ●
- Cercidiphyllum japonicum
- Chamaecyparis lawsoniana *
- Chamaecyparis nootkatensis
- Cornus kousa
- Cornus nuttallii
- Cornus x nuttallii
- Cornus x rutgersensis *
- Fagus grandifolia
- Fagus sylvatica
- Fraxinus americana
- Fraxinus latifolia
- Halesia carolina
- Juglans cinerea
- Juglans nigra *
- Larix decidua
- Laurus nobilis
- Liriodendron chinense
- Magnolia denudata
- Magnolia 'galaxy'
- Magnolia kobus
- Magnolia sieboldii
- Magnolia stellata
- Magnolia virginiana
- Magnolia x kewensis
- Magnolia x loebneri
- Magnolia x soulangeana
- Malus fusca
- Metasequoia glyptostroboides
- Nyssa sylvatica
- Picea abies *
- Picea sitchensis
- Pinus halepensis ●
- Pinus monticola
- Pinus strobus *
- Platanus occidentalis
- Populus balsamifera
- Populus tremuloides
- Prunus ilicifolia ●
- Prunus padus *
- Prunus persica ●
- Quercus palustris *
- Quercus phellos
- Salix babylonica
- Salix matsudana *
- Sequoia sempervirens
- Sorbus alnifolia
- Sorbus americana
- Sorbus intermedia ●
- Styrax obassia
- Syringa reticulata
- Thuja plicata
- Thujopsis dolabrata
- Tsuga canadensis
- Tsuga heterophylla
- Tsuga mertensiana
- Ulmus davidiana
- Ulmus glabra
- Umbellularia californica ●

* Invasive potential - capable of self-seeding so avoid planting in locations where seeds can disperse and germinate

● Trial - species is present in future analog (comparable) climates and has the potential for introduction to Metro Vancouver

Courtenay residents envision a future urban forest that is more extensive than today, is connected and accessible, maintains mature trees and ecosystem services, is comprised of a sustainable mix of ages and locally adapted species, and is used as a design treatment to reduce the prevalence of pavement in commercial areas, create neighbourhood distinction and canopy streets on key routes.

Courtenay's long-term vision will be most achievable if management decisions can be framed within the context of stewarding the urban forest over a time-frame spanning multiple generations - past, present and future.