# Urban Forestry

## A nature-based solution for the City of Nelson

SCOPING REPORT

August 2024

City of
NELSON
BRITISH COLUMBIA

Pacific Institute
for Climate Solutions

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# Land acknowledgement

Nelson's urban forest exists on the unceded, traditional territory of the Sinixt, Syilx, and Ktunaxa Nations, and on land that is home to the Métis and many diverse Indigenous persons. Honouring our connection and relation to the land that we live on and the life that it supports, even in urban settings, is a worldview deeply engrained in Indigenous ways of being and knowing. Nelson's urban forest management would benefit from continuous and meaningful engagement with Indigenous communities and their perspectives moving forward to represent Indigenous worldviews and support the Truth and Reconciliation Commission's Calls to Action.

Image credit: City of Nelson

# How we manage our urban forest matters.

# Executive summary

This report was written by a Resource and Environmental Management (Planning) graduate student from Simon Fraser University during a 13-week internship with the City of Nelson. The internship was made possible through funding from the Pacific Institute for Climate Solutions (PICS). The purpose of the report is to provide a preliminary overview of Nelson's current urban forest management context. The information presented in the report could be used as a foundation on which to build a more comprehensive urban forest management plan for the City of Nelson.

The City of Nelson is a municipality in the Regional District of Central Kootenay with an area of just under 12 $km^2$. There is a diversity of land uses within the city, including commercial, industrial, institutional, and residential. Parks and greenspaces are also spread out across the community. Defined as the combination of trees, forests, greenspaces, and their related ecosystems, Nelson's urban forest exists across all of these land uses.

Urban forest strategies can serve as community-wide frameworks for action to protect and grow urban canopies for the benefit of current and future generations. Nelson's population is growing and while new residents bring with them diversity and new opportunities and ideas, population growth inherently increases the pressure on municipal services, infrastructure, and lands. Climate change adds additional stressors like the spread of disease and invasive species and increasing frequency of weather extremes. These challenges will take a toll on the integrity of Nelson's urban forest over the coming decades.

Residents and City staff alike have expressed interest in preserving and growing Nelson's urban canopy over time. As such, there is a strong foundation for exploring urban forest management as a nature-based solution. Some objectives that Nelson staff and residents care deeply about in relation to urban forest management are:

- Promoting public health and safety
- Ensuring efficiency and affordability
- Taking climate action
- Protecting biodiversity
- Maintaining a high quality of life for future generations

Protecting urban canopies is a nature-based and nature-positive approach for increasing community resilience. If planned accordingly, urban forest management can support all five of the above-mentioned objectives. Urban forests can improve air quality, contribute to stormwater management, enhance mental and physical wellbeing, reduce building energy use, provide wildlife habitat and connectivity, and many more. By taking care of and growing the urban forest of today, we can ensure that future generations also have access to the benefits that we enjoy today.

# Scope and purpose of the report

## Scope

The information presented in this report was gathered and analyzed over the course of a 13-week internship, funded by PICS. The data collection process involved a combination of document analysis, fieldwork, and a community engagement survey. The document analysis involved reviewing existing Canadian urban forest management plans, City of Nelson policy documents, and additional relevant resources, such as reports and papers on climate projections and urban forest management best practices. The fieldwork involved conducting a boulevard tree inventory of several streets around Nelson's downtown core. The engagement survey was open to the public and the questions allowed respondents to share their perspectives on urban forest management in Nelson. Recommendations for approaching urban forest management challenges in Nelson are provided at the end of the report.

## Purpose

The purpose of the report is to provide an informational baseline on the state of urban forest management in Nelson. The report itself is not an urban forest management plan. Rather, it can be viewed as a foundation for further research and planning of Nelson's urban forest practices to move it from its current state to a desired future state (Figure 1).


Figure 1. *Developing an Urban Forest Strategy allows a community to take a step back and assess what already exists, what would be desirable to have in the future, and the steps to take to get there (Cullington, 2008). For example, while Nelson enjoys the benefits of having a high proportion of mature trees, this age composition comes with risks, such as largescale future canopy loss. Having a proactive urban canopy replacement and expansion plan in place will help to balance the age distribution of Nelson's urban forest, thereby making it a more resilient natural asset.*

## Structure of the report

The Urban Forestry Scoping Report has three main sections:

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Section 1. Urban forestry: A nature-based solution

This section introduces the concept of nature-based solutions. Following the introduction of nature-based solutions, the concept of urban forestry is explained. The section is rounded off with a discussion on the co-benefits that are associated with urban forest management and how these lead to urban forestry being a nature-based solution. Urban forest disservices are discussed as well.

2

Section 2. Nelson's urban forest context

This section provides an overview of various aspects of urban forest management context in Nelson. Six areas are covered in this section. These six areas are: biogeoclimatic context, policy context, stakeholder context, social context, economic context, and urban forest components context. The overview of each area was informed through document analysis, field data, survey data, or a combination of.

3

Section 3. Summary of recommendations and conclusions

Throughout the report, recommendations are provided that are tailored to the different areas of urban forest management context. These recommendations are summarized in this final section of the report.

Additional resources to support the implementation of the identified recommendations or to provide further information are listed in the appendices following the recommendations summary.

# Section 1. Urban forestry: A nature-based solution

The following sections explain (1) the concept of nature-based solutions, (2) why urban forestry is a nature-based solution, and (3) the co-benefits (and disservices) generated by urban forests.

## 1.1. Nature-based solutions

To better understand the value of urban forest management, it helps to understand the concept of nature-based solutions (Figure 2).

Internationally recognized, nature-based solutions are defined as "actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges (e.g., climate change, food and water security or natural disasters) effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits" (Cohen-Shacham et al., 2016, p. xii). In short, they can be thought of as ways to live and work with nature.


The strategic protection and restoration of natural ecosystems and their sustainable management can generate solutions to the following societal challenges (represented by the circular icons):

- Climate change mitigation and adaptation
- Disaster risk reduction
- Economic and social development
- Human health
- Food security
- Water security
- Environmental degradation and biodiversity loss

Figure 2. *This IUCN graphic lays out the principles of nature-based solutions. Nature-based solutions are issue-specific and they involve the protection, management, and restoration of natural ecosystems at various scales. In this way, they can enhance the functioning of engineered infrastructure or serve as their own type of green infrastructure systems. Such ecosystem-based approaches have the potential to address the suite of societal challenges we are facing today, from climate change to water security. The human well-being and biodiversity benefits derived from successful nature-based solutions projects are what make these approaches so conducive to enhancing community resilience (Cohen-Shacham et al., 2016).*

Nature-based solutions provide communities with multiple benefits. These benefits include support for revitalized rural economies, a higher quality of life and health outcomes for residents, and helping meet local and national obligations associated with climate change and biodiversity. Examples of nature-based solutions are: preserving and restoring wetlands so that they may be directly integrated into a community stormwater management plan; implementing green infrastructure to help reduce urban heat-island (UHI) effects, manage stormwater run-off, and reduce snow drifts on road infrastructure; and restoring degraded waterways. Urban forestry combines several different nature-based solutions to increase community resilience (street tree planting to reduce the UHI effect, strategic planting in flood prone zones to help with stormwater management, and more).

What makes nature-based solutions innovative is that they frame nature as an asset. By framing natural processes and systems as assets, the way we view and manage them has the potential to change. Traditionally, when we think of the term 'assets', engineered infrastructure such as roads, buildings, and pipes come to mind. As a result of being labelled assets, these types of infrastructure are monitored and maintained to ensure their continued functioning and service delivery to residents and businesses. What nature-based solutions ask us to do is to consider natural infrastructure in the same way.

> "There is now overwhelming evidence that shows nature plays a critical role in meeting our societal needs." (IUCN, 2020)

Every bit of nature, whether it is found in an urban streetscape or in a protected natural area, can provide us with valuable service delivery. Some of these services are unique to nature and cannot be replicated or replaced through engineered infrastructure, such as the physical and mental wellbeing benefits we experience as a result of spending time in the outdoors. Other services provided by nature can augment the service delivery of existing and planned engineered infrastructure. A great example of this is how the Clifton integrated constructed wetland project led to the enhancement of a water treatment facility's capacity through a natural pond system (Figure 3). Better understanding how natural assets support the functioning of our communities and formally valuing these services could improve how we monitor and manage natural infrastructure for the benefit of humans and nature.

Figure 3. *Photo of the Clifton integrated constructed wetland in South Yorkshire, UK (Stantec, 2024).*

### 1.1.1. The scales of nature-based solutions

An important thing to understand about nature-based solution is the different scales at which they can be implemented. There is no minimum nor maximum scale, as nature-based solutions can be as micro-level as a single rain garden on one property and as macro-level as an entire watershed being restored through federal, provincial, regional, and municipal collaboration.

The Action on Climate Team (ACT), a state-of-the-art research-to-practice hub operating out of SFU that specializes in climate change and sustainability knowledge mobilization, has developed the graphic below to outline the different scales of nature-based solutions applications (Figure 4). The intention behind the graphic was to increase the actionability of nature-based solutions for decision-makers and stakeholders at different levels of jurisdiction. The four distinct spatial scale lenses of parcel, neighbourhood, community, and watershed align with the different levels of jurisdiction at work in Canada. It is also crucial to recognize that the different scales of action can build on each other. For example, actions taken at the parcel scale, such as installing more permeable surfaces on one's own lot, can lead to improvements in overall water security at the watershed level. Every little bit helps.

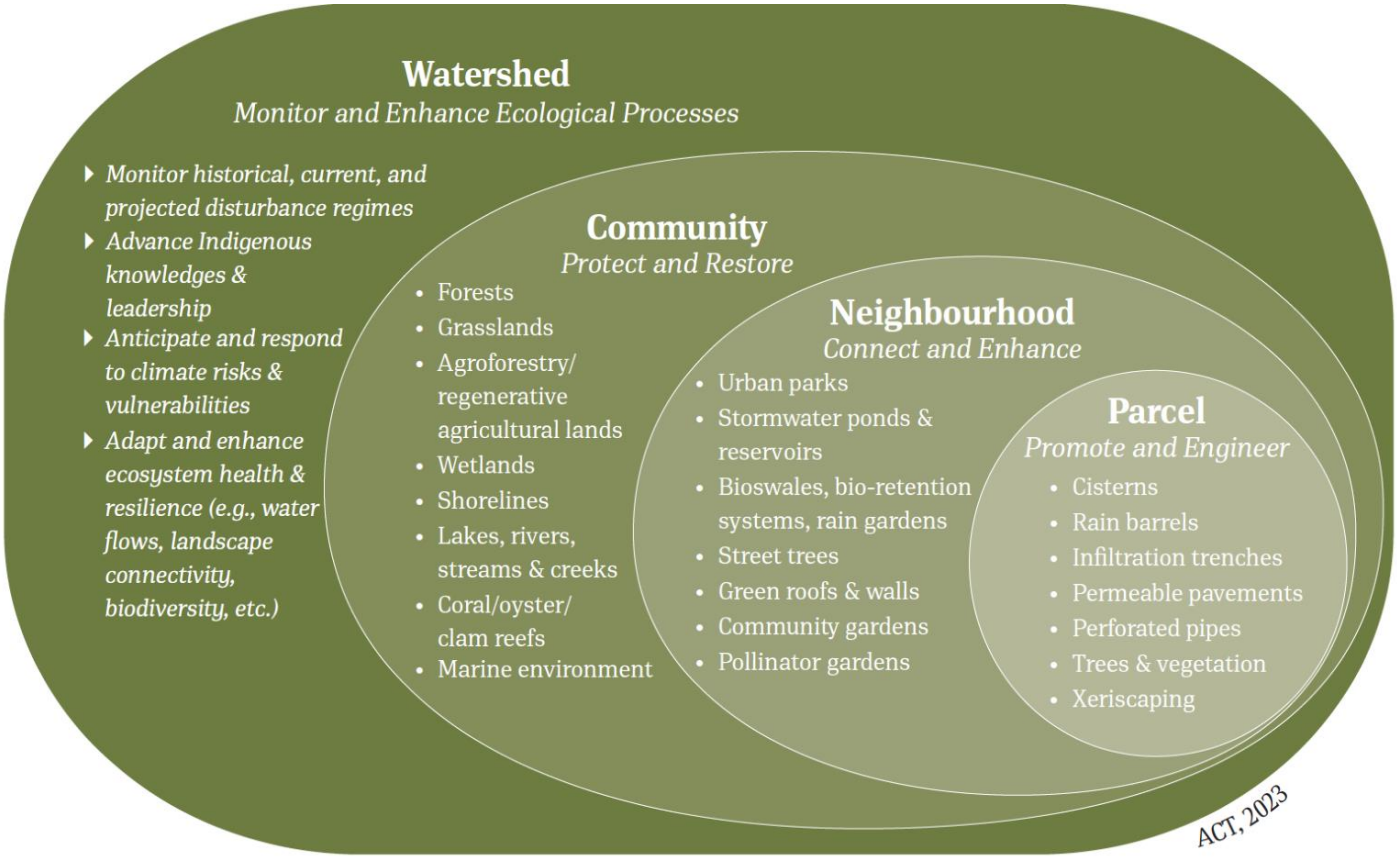



Figure 4. *The different sites and scales of nature-based solutions implementation (ACT, 2023).*

## 1.2. Urban forestry

The term 'urban forest' may sound like an oxymoron. How can a forest exist in an urbanized setting? Though the trees, vegetation, and greenspaces in most urban places don't look like your stereotypical forest, they do still make up a larger ecological network. And this is what is referred to as an urban forest. Urban forests are found in human settlements of all sizes, from small hamlets to big cities.

### The history of urban forestry

Tree Canada's *Compendium of Best Urban Forest Management Practices* explains that urban forestry became a concept around the 1960s to the 1970s, when awareness about the problems stemming from invasive species and monocultures was growing. The 1980s saw a rapid expansion of municipal forestry departments in Canada. The 2003 – 2008 Canada's National Forest Strategy included discussion of urban forests, contributing to the concept's growing legitimacy. Increasingly, post-secondary institutions have come out with urban forestry programs to further the research in this field. Nowadays, many municipalities are developing urban forest management plans to improve the governance of this natural asset (Bardekjian, 2018).

The 2019-2024 Canadian Urban Forest Strategy (CUFC) provides the following definition of urban forests:

*Urban forests are the trees, forests, greenspaces, and related living, non-living, and cultural components in areas extending from the urban core to the urban-rural fringe.*

(Bardekjian, 2018)

By extension, urban forestry is defined as:

*The sustained planning, planting, protection, maintenance, management, and care of trees, forests, and greenspaces, along with related resources in and around cities and smaller communities for economic, environmental, social, and public health benefits for people.*

(Bardekjian, 2018)

It is important to understand that humans are part of the urban forest ecosystem, as we regularly interact with the trees and greenspaces that surround us - whether directly or indirectly. Going back to the definition of nature-based solutions above, one can start to connect the dots between the concept of nature-based solutions and urban forestry.

Urban forestry involves the protection, sustainable management, and restoration of trees, forests, and greenspaces within a municipality. In carrying out these actions in a coordinated way, both ecosystems and humans can end up better off. This is achieved through the creation of multiple additional social, economic, environmental, and public health benefits. These additional benefits that we derive from the proactive management of the urban forest are called co-benefits. Co-benefits are a key feature of nature-based solutions.

## 1.3. Urban forest co-benefits

As discussed above, urban forests generate a variety of benefits (Figure 5).

- Tree canopies can influence rainfall distribution through interception (Alivio, Bezak, & Mikoš, 2023; Alivio, Šraj, & Bezak, 2023; Zabret & Šraj, 2019) thereby reducing the erosive potential of raindrops by 30-44% (Zore, Bezak, & Šraj, 2022)
- Street trees have been shown to reduce stormwater runoff volume by 4% (Selbig et al., 2022)
- Tree canopies can regulate urban microclimates by blocking incoming solar radiation and carrying out evapotranspiration, reducing ambient air temperatures by up to 3.9 °C (Krayenhoff et al., 2020; Meili et al., 2021)
- Urban forests have an annual carbon sequestration potential of 7.42 metric tonnes per hectare per year (Pregitzer et al., 2022), the equivalent of taking 6.5 cars off the road, and also purify air through the removal of black carbon (Elderbrock et al., 2023)
- Urban forests have been shown to lower building AC-related energy use by 7.2% during the months of June, July, and August (McDonald et al., 2020)
- Careful selection of vegetation species and location can improve urban habitat availability and connectivity leading to increased biodiversity (Sander & McCurdy, 2021; Malloch et al., 2020; Von Thaden et al, 2021)
- Treed shopping streets have been shown to attract more customers and to increase spending rates as shoppers feel more comfortable in such environments (Dyason, Fieger, & Rice, 2024)
- Tree shade has been shown to be a factor contributing to the extension of engineered infrastructure lifespans, such as those of roads (McPherson & Muchnik, 2005)

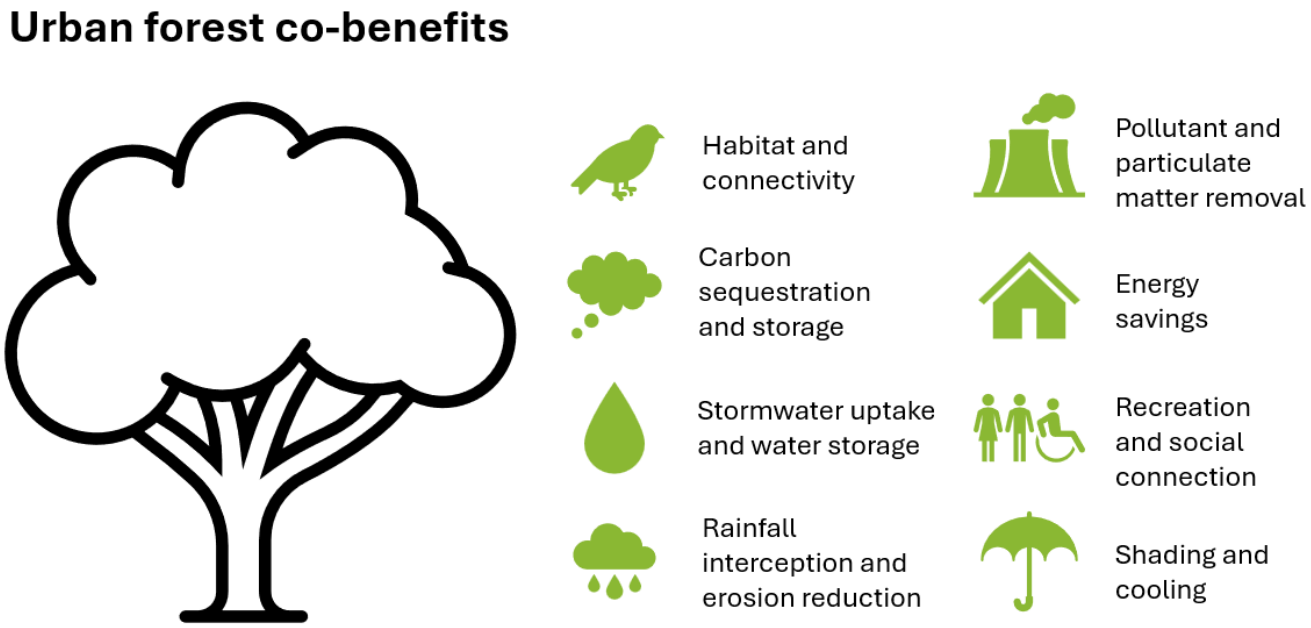



Figure 5. *Summary of some of the main co-benefits that urban forests deliver.*

### 1.3.1. Priority co-benefits for Nelsonites

Community engagement for Nelson Next (2020) revealed which climate action co-benefits Nelsonites value the most (Figure 6). The two top-rated co-benefits are ***human health*** and ***protecting ecosystems***.

Urban forest management that seeks to increase canopy cover in an equitable and ecologically-aware way has the potential to contribute to the delivery of these two co-benefits.

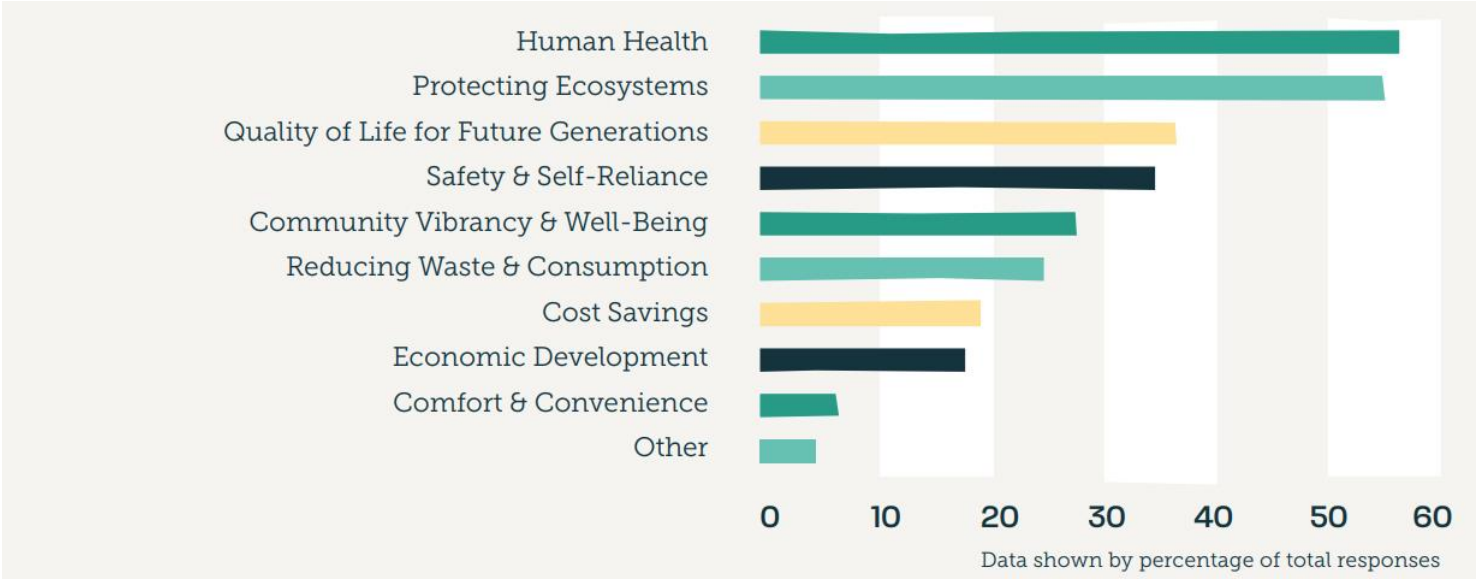



Figure 6. *The priority benefits to climate action for Nelsonites as identified through the Nelson Next (2020) engagement process.*

Comprehensive, proactive, and long-term urban forest management will also ensure ***quality of life for future generations***. Making planting choices that are appropriate for the local surroundings, by keeping FireSmart and transmission line safety in mind, will increase ***safety*** and also has the potential to result in ***cost savings*** if these measures can result in less reactive management of Nelson's urban canopy. ***Community vibrancy & well-being*** can be enhanced through the positive mental and physical health benefits that the presence of nature and greenery creates. Additionally, the urban forest generates many opportunities for community activities such as citizen science projects, guided urban forest walks, and community tree planting events, to name a few. A thriving urban forest can support ***economic development*** as it may draw in businesses, developers, and tourists, while also making it an even more attractive place for existing residents. Lastly, the urban forest's contribution to the co-benefit of ***comfort & convenience*** comes in the form of the above-mentioned health benefits and through convenient and equitable access to tree cover, greenspaces, and forests within the City of Nelson.

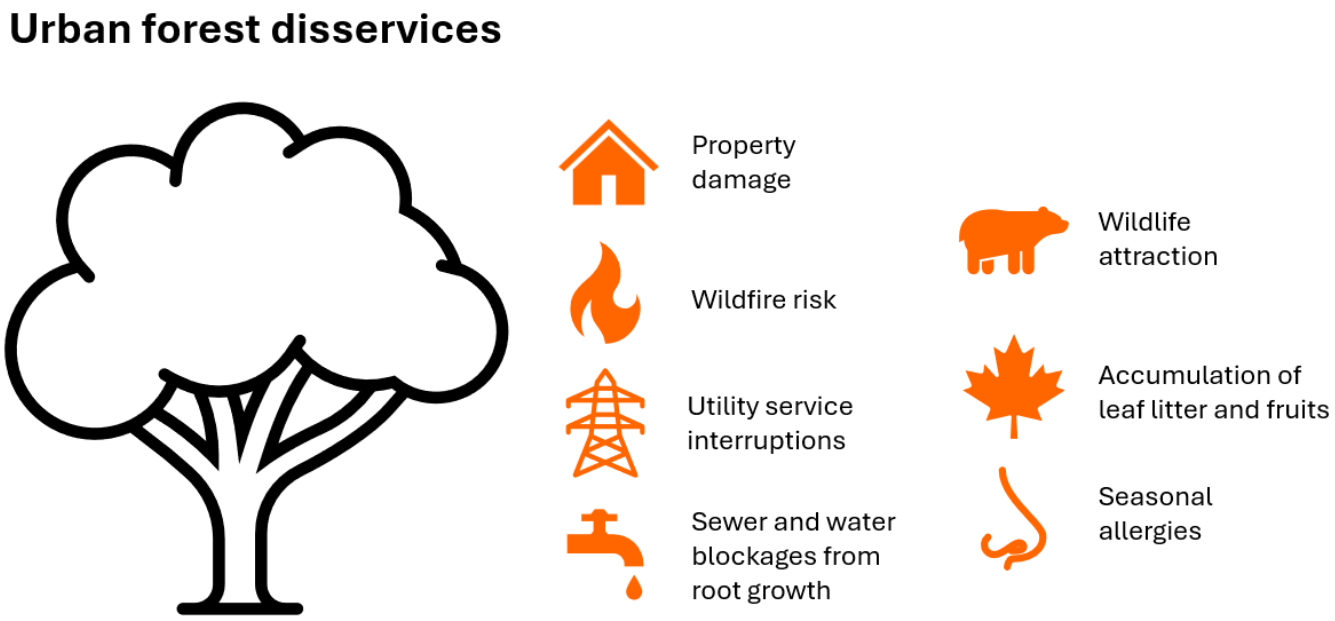
Urban forests are **community assets** and can only be managed sustainably when all stake- and rightsholders are included. Keeping community perspectives in mind will be important in the management of Nelson's urban forest, as competing objectives will always exist. The more the service delivery of Nelson's urban forest can be acknowledged and accounted for, the easier it might be to identify creative opportunities to reach the shared goal of community resilience through the co-benefits provided by nature-based solutions.

## 1.4. Urban forest disservices

While it's important to highlight the services that urban forests provide, it is also important to be aware of challenges, or disservices, that exist (Roman et al., 2020). Being aware of the disservices that can arise will lead to more informed canopy expansion efforts, leading to more sustainable long-term management. Appendix A provides an info sheet that lays out the four most significant planting guidelines to consider in Nelson (FireSmart, power line safety, wildlife awareness, and climate resilience precautions).

"Ecosystem services and disservices are fundamentally coupled concepts, and discussion of one must also recognize the other" (Vaz et al., 2017).

Common urban forest disservices that are relevant to Nelson's context include:





Planting the 'right tree' in the 'right place' is an important consideration in contemporary urban forest management.

Appendix F provides a diagram with two different ways to arrange underground utilities and tree planting locations.

Similarly, Appendix E provides a diagram with suggestions for suitable tree planting locations based on the density of the surrounding urban form.

Figure 7. *Examples of urban forest disservices, such as property damage resulting from storms and tree litter and fruits creating a nuisance* (Roman et al., 2020).

# Section 2. Nelson's urban forest context

As alluded to in the previous section about urban forest disservices, urban forest management requires knowledge of local contexts and trends in order to make sound decisions. Without a broader understanding of the physical landscape – both natural and built – and the social workings of a community, it's harder to identify priority areas and develop a robust management plan that is cognizant of social, economic, and ecological factors.

There is a need to understand the "complexities of competing and compounding interactions among services, disservices, management costs, and differing perceptions among and within stakeholder groups" (Roman et al., 2020).

The following sections provide preliminary context on these areas as they pertain to Nelson:

Geography, ecology, and climate

Policies, plans, and strategies

Stakeholders and collaborators

Social perspectives

Economic valuation and resources

Nelson's urban forest components

## 2.1. Geography, ecology, and climate

The City of Nelson is a municipality in the Regional District of Central Kootenay with an area of just under 12 km$^2$. There is a diversity of land uses within the city, including commercial, industrial, institutional, and residential. Parks and greenspaces are spread out across the community. Nelson is surrounded by forested mountains and significant water features, such as multiple creeks and the west arm of Kootenay Lake (Figure 8).

Figure 8. *Aerial view of Nelson (City of Nelson, n.d.).*

The Biogeoclimatic Ecosystem Classification (BEC) system is used in British Columbia for categorizing and overseeing forest environments. BEC zones delineate landscapes characterized by specific climates and vegetation types, influenced by topography and soil conditions, where unique patterns of forest growth are anticipated. This classification system informs decisions regarding which species and which geographic location of seed sources should be used for planting (CBT, 2020).

When it comes to natural forests, Nelson is located in the Interior Cedar Hemlock (ICH) zone. More specifically, the Interior Cedar – Hemlock, Dry Warm, West Kootenay variant (ICHdw1) BEC zone (CBT, 2020). This zone is characterized by "warm and moist forests with high species diversity at low to mid elevations" (CBT, 2020). Tree species native to this zone include cedar, hemlock, Douglas fir, western larch, western white pine, ponderosa pine, grand fir, birch, aspen, and cottonwood (CBT, 2020). This variety of species is also sometimes referred to as the "Kootenay Mix" (Figure 9).

Plant hardiness zones need to be taken into consideration when determining which ornamental species to plant. Due to the influence of climate on where specific species thrive, plant hardiness zones have traditionally guided the choice of urban trees and plants appropriate for specific regions. Nelson has a plant hardiness zone of 7 (CBT, 2020), owing to a maritime climate influence, which decreases the difference in seasonal temperature extremes and also leads to greater amounts of precipitation. In turn, a larger diversity of trees can be grown within the municipality. Common trees planted in Nelson include maple, ash, elm, linden, cherry, apple, spruce, aspen, larch, mountain ash, pine, honey locust, oak, western red cedar, horse chestnut, and Douglas fir.

Figure 9. *Photo depicting the diversity of species that make up the Interior Cedar Hemlock zone (Schpakowski, n.d.).*

### 2.1.1. How is climate change going to affect the urban forest?

With climate change, Nelson is expected to experience hotter and drier summers, becoming especially vulnerable to drought. All other seasons are expected to become warmer and wetter. The anticipated impacts of these changes include increased drought, extreme heat and cold events, wildfire weather, rain- and windstorms, and unseasonal frosts that may damage local vegetation (Nelson Next, 2020).

BEC zones and plant hardiness zones are expected to shift with climate change. Native tree seed choices will need to be adjusted to the projected changes in BEC zones to try to ensure their genetic suitability. Urban tree planting choices will need to factor in that Nelson may go up a whole plant hardiness zone by the 2080s, from 7 to 8, based on climate projections derived from a collection of climate model results (CBT, 2020). The climate projections assume a Representative Concentration Pathway (RCP) 8.5 scenario, which is a high-emissions scenario (CBT, 2020). The Province of BC and the Canadian Forest Service are both expected to release model results for BEC zone and plant hardiness zone changes which will provide more accurate climate projection data tailored to the context of BC.

Table 1 outlines the difference between baseline (1961-1990) and RCP 8.5 projected (2080s) conditions in Nelson (CBT, 2020).

| | Baseline (average of 1961-1990) | Projected (2080s, RCP 8.5) |
|---|---|---|
| Main BEC | ICH | |
| Hardiness Zone | 7 | Trial 8 |
| Elevation (m) | 535 | |
| Mean annual temperature (MAT) (°C) | 7.8 | 13.4 |
| Mean annual precipitation (MAP) (mm) | 707 | 762 |
| Mean summer precipitation (MSP) (mm) | 229 | 208 |
| Growing degree days (GDD) (5°C) | 1986 | 3445 |
| Beginning of frost free period (bFFP) | May 4 | March 12 |
| End of frost free period (eFFP) | October 8 | November 14 |
| Precipitation as snow (PAS) (mm) | 142 | 27 |
| Extreme minimum temperature (EMT) | -27.6 | -15 |
| Extreme maximum temperature (EXT) | 37/9 | 44.9 |
| Climatic moisture deficit (CMD) (mm) | 364 | 511 |

Table 1. *Baseline climate and projected climate conditions for the City of Nelson (CBT, 2020).*

### 2.1.2. Summary of expected climate impacts on Nelson's urban forest

Overall, climate change is likely to alter the state of Nelson's urban forest through the six factors outlined in the diagram below (Figure 10). Range shifts, extended growing seasons, drought mortality, increased pest and disease vulnerability, and increased wildfire risk and intensity are attributable to changing conditions such as increasing growing degree days, longer frost free periods, and increasing mean annual temperatures (Table 1). We are already experiencing some of these impacts today. Taking steps today, such as planting climate-resilient species and implementing invasive species monitoring, to "future-proof" Nelson's urban forest will pay off in the long run.

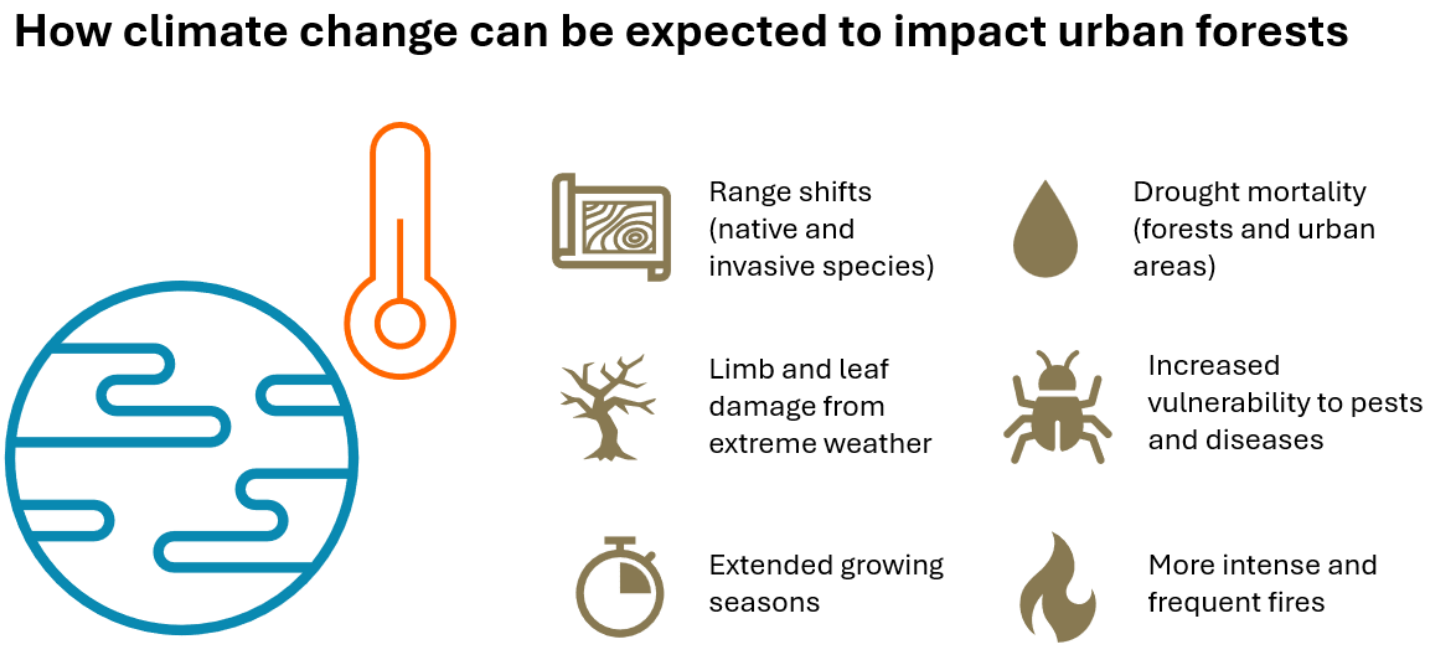



Figure 10. *Diagram of the expected climate impacts on forests and urban areas, adapted from information presented in the Columbia Basin Trust's* Adapting Community Tree Management to Climate Change *report (CBT, 2020).*

### 2.1.3. Recommendations

| |
|---|
| **Recommendation 1:** Plant climate resilient species that are suited to the projected plant hardiness zone 8 (The Columbia Basin Trusts' *Adapting Community Tree Management to Climate Change* is a good resource to consult). |
| **Recommendation 2:** Apply FireSmart treatments to the forests surrounding Nelson. This will require collaboration with regional, provincial, and private stakeholders. |
| **Recommendation 3:** Continue and grow municipal FireSmart program to educate and encourage more residents to take up FireSmart landscaping on their own properties. |
| **Recommendation 4:** Continue education around water conservation on private property through water storage facilities as well as drought-resistant plant selection to reduce municipal water use. |

## 2.2. Policies, plans, and strategies

While a future Urban Forest Strategy for the City of Nelson will serve as a useful tool for guiding urban forest management, it is important for urban forest management to be referenced in other plans, strategies, and policies that govern the overall workings of the City as well (Cullington, 2008). Repeatedly mentioning nature-based solutions, such as urban forest management, in other policies, plans, and strategies helps to legitimize them as a tool for municipalities to implement.

As outlined in *Planting Our Future* the following types of plans, strategies, and policies can be instrumental in directing urban forest management:

- Regional Growth Strategies and Official Community Plans (OCPs) outline community goals, development directives, and the protection of environmentally sensitive areas (ESAs), all of which influence the treatment of the urban forest
- Local Area Plans or Neighbourhood Plans can provide guidance for more localized planting, ecosystem restoration and protection
- Design guidelines provide instructions on how to design both public and private spaces and could be leveraged to require tree planting and landscaping standards
- Parks master plans, greenway plans, or natural areas management plans govern the maintenance of urban greenspaces and natural areas thereby making them a useful tool to promote the protection of trees on public lands and explaining how these environments connect to the surrounding natural environment
- Integrated stormwater management, watershed management, and restoration plans could promote strategic tree planting as trees play an important role in stormwater management

Below is a snapshot of the plans, policies, and strategies currently in play in the City of Nelson. The documents with the most direct influence on urban forest management are listed first, followed by a list of documents that have less of a direct influence.

### 2.2.1. Policies, plans, and strategies with more direct influence

Tree Management Plan (2012)

The Tree Management Plan (2012) provides an overview of goals, policies, and actions relating to tree management in Nelson. Recommendations for a more robust tree management program revolve around improving tree classification, maintenance and monitoring, removal procedures, renewal processes (i.e., replacement planting), protection and conservation of existing trees and treed areas, communication with and education for Nelsonites. Specific actions are classed into short-term and future timeframes. These actions are still relevant to the context of Nelson's current urban forest management, such as updating the street tree inventory (short-term action) and encouraging and supporting community-based initiatives to plant trees and be stewards of the existing trees (future action).

### Municipal Tree Bylaw (2012)

The Municipal Tree Bylaw (2012) provides for the "management and preservation of trees growing on public property within the City of Nelson" by outlining who is allowed to maintain City trees, who is exempt from the bylaw, the conditions that need to be met before any maintenance approaches can be applied, as well as procedures around penalties and their enforcement. While the bylaw seeks to protect significant trees on public property, the definition given to significant trees is vague. They are described as trees that are "extensive or important enough to merit special attention and protection". Providing more specific significant tree criteria, such as minimum DBH or species, would increase the actionability of said tree protection. For example, the City of Surrey provides a list of significant trees in Schedule B of its Tree Protection Bylaw, complete with address points, species names, and identifying number. Schedule B1 includes a map identifying tree protection zones along a local trail (City of Surrey, 2006).

### Nelson Hydro Vegetation Best Management Practices (2021)

Nelson Hydro's Vegetation Best Management Practices (2021) seeks to provide efficient, effective, and socially acceptable operating procedures around Nelson Hydro's transmission lines to protect the public as well as minimize values conflicts. This document touches on a range of environmental, economic, and social considerations relating to urban forest management: private vs. public procedures; riparian area protection; terrain stability and slope; soil sensitivity; breeding birds; danger trees; wildlife trees; heritage and legacy trees; aesthetic considerations; invasive species; water quality. The information around transmission line safety and appropriate replacement species and locations creates transparency around vegetation management practices, which is important for overall urban forest management.

### Community Wildfire Resiliency Plan (2023)

The Community Wildfire Resiliency Plan (2023) directly influences urban forest management in Nelson through proposed and enforceable FireSmart vegetation management. The plan's primary suggested action for vegetation management is to apply fuel management treatment on municipal lands and increase FireSmart landscaping on private property through outreach and education. FireSmart standards private property plant selection as well. Development Permit Area 3 (Natural Environment and Hazardous Lands) now includes FireSmart's Priority Zone 1a and 1b landscaping requirements. Priority Zone 1a landscaping requirements also apply city-wide.

### Official Community Plan (updated version slated to be released in 2025)

This plan is from 2013 and is currently being updated with a scheduled release in 2025. While OCPs are high-level planning documents that only outline policy recommendations, they form decades-long community roadmaps. The guiding principles for Nelson's updated OCP are: climate resilience, equity, and health. Urban forest management has a role to play in all three of those guiding principles. The 2013 OCP mainly made references to urban forest management in relation to slope stabilization, wildfire risk mitigation, and maintaining ecological integrity through restoration and plant selection. Including additional policy recommendations for urban

management, such as establishing and meeting a long-term canopy cover target through annual tree planting targets, would be beneficial. The City of Courtenay (population of 28,000) has done this in their OCP, which was passed and adopted in 2022.

### Nelson Hydro Public Engagement Framework (2021)

The Nelson Hydro Public Engagement Framework (2021) sets out to better define the roles and responsibilities of stakeholders in Nelson Hydro's service delivery, particularly surrounding vegetation management. Communication is highlighted as a priority to improve public relations. The exact engagement approach differs depending on whether the vegetation is located on private or public property. This is detailed in two flow charts (p.9-10). Urban forest management can be a contentious issue, so it is important to prepare a streamlined and publicly-accessible engagement strategy. An urban forest strategy for Nelson should build on Nelson Hydro's public engagement framework to establish a larger municipal urban forest public engagement framework.

### Natural Environment Development Permit Guidelines (in Schedule H of City of Nelson Official Community Plan, 2013)

These guidelines apply to Development Permit Area 3 (Natural Environment and Hazardous Lands Development Permit Area) and seek to maintain ecological and landscape integrity and require development projects to have a Tree and Vegetation retention and planting plan prepared by a Registered Professional Biologist or Registered BC Landscape Architect. The guidelines state that "tree and vegetation retention should be prioritized" and that "species used in replanting, restoration, and enhancement shall be selected to suit the soil, light, and groundwater conditions of the site". Additionally, "measures to ensure tree and vegetation protection during construction should be identified". Nelson's Municipal Tree Bylaw could be amended to provide specific protection instructions to support the objectives of the Development Permit Area 3 guidelines. As an example, the City of Surrey's Tree Protection Bylaw Schedule C includes instructions on the size requirements of a tree protection barrier based on trunk diameter (City of Surrey, 2006). See Appendix C for the diagram.

## 2.2.2. Policies, plans, strategies with less direct influence

### Nelson Next (2020)

Nelson Next (2020) includes 7 aspirations, 23 strategies, and a wide range of priority, medium, and long-term tactics for climate action. Community engagement also revealed which climate action co-benefits are the most important to Nelsonites. Of the 7 aspirations, Aspiration 3 and Aspiration 4 relate most closely to urban forest management as they pertain to community connections and protecting Nelson's ecosystems, respectively. More specifically, Aspiration 3 refers to the need for investigating neighborhood-level climate solutions, agroforestry, and wildfire resilience planning, all of which could be addressed in an Urban Forest Strategy. Aspiration 4 calls for the development of an Urban Forest & Biodiversity Master Plan, an invasive species management plan, and exploring green infrastructure (such as green roofs), all of which directly apply to urban forest management approaches the City could take.

### Active Transportation Network Design (2023) & Active Transportation Plan (2010)

The Active Transportation Network Design (2023) mentions that the widening of streets to create space for bike lanes may have adverse effects on mature street trees. Many urban forest management programs suggest retaining as many mature trees as possible, based on the cost and benefit vs tree age curves shown in Figure 14 in Section 2.5.1.

The Active Transportation Plan (2010) frames street trees as important components of pedestrian- and cyclist-friendly site design. The idea is that the more attractive active transportation routes can be made, the more likely they will be used, which could lead to health benefits to Nelsonites and bring down overall municipal emissions as a result of lowered fuel-burning vehicle use. If the City of Nelson were to adopt a long-range tree planting plan in the future, strategic planting along active transportation corridors is recommended.

### Path to 2040 Sustainability (2010)

The Path to 2040 Sustainability (2010) strategy includes a *Robust Ecosystems* principle. A comprehensive urban forest management approach would directly support the directions outlined for this principle, such as "protecting the natural areas in our neighbourhoods" and "using natural systems to enhance infrastructure performance". Neighbourhood-level tree planting and stewardship programs and estimating the energy use cost reductions that can result from tree shading are specific approaches that the City could explore to increase engagement and education on the benefits of adopting municipal nature-based solutions.

### Downtown Urban Design Strategy (2017)

An entire section of this strategy, *Section 3.3.9.1. Urban Trees*, highlights that mature boulevard trees define the downtown character and also represent Nelson's heritage as a "green" community. The report states that the "first priority for tree management in the downtown is to retain healthy trees that are not damaging infrastructure, or preventing street reconstruction efforts" (City of Nelson, 2017, p.100). The need to "replace the right trees in the right places" emphasizes the need to plant strategically, both for the benefit of people and the trees themselves. Silva Cells, or similar systems, are recommended to improve tree growth conditions in heavily built-up environments.

### Heritage Master Plan (2022)

The Heritage Master Plan (2022) shares that the deliberate planting of boulevard shade trees in Nelson began as far back as 1897. Mature trees are identified as elements that contribute to the character of many of Nelson's neighbourhoods. Under the Action *Conserve Nelson's distinctive cultural landscapes*, the third bullet states "protect Nelson's tree-lined streets and boulevards by conducting a tree inventory and management plan, and promote the expansion of the urban tree canopy". Currently, heritage trees are not identified on the City of Nelson's interactive Heritage Sites map, which would be a consideration for future updates to the map to serve as an informational tool about heritage trees in Nelson. Using one of the geo-referencing programs that the City of Nelson has access to, it

would be fairly straightforward to plot identified heritage trees.

### Nelson Hydro Nesting Bird Best Management Practices (2021)

The Nesting Bird Best Management Practices (2021) strategy raises awareness about nesting timeframes (March 15 – August 15 of any given year) and local bird species that may be present in Nelson Hydro's operating area. Mitigation procedures are outlined for different bird types (songbirds, woodpeckers, great blue heron, and raptors). As birds are part of the urban forest ecosystem, this strategy can contribute to improvements in human-wildlife interactions and thereby support the functioning of the local ecology.

### Regional District of Central Kootenay Strategic Plan (2023)

The 2024 – 2026 strategic plan has the potential to support urban forest management through the priorities of *Manage our assets and service delivery in a fiscally responsible manner* and *Energy efficiency and environmental responsibility*. Urban forests are natural assets that deliver many services, such as stormwater management, and if this idea was promoted at a regional level it could lead to more resources to support the management of this natural asset.

### 2.2.3. Summary of policy, plan, and strategy review

Overall, Nelson has several plans, policies, and strategies that influence urban forest management. The review of these documents revealed that:

- Heritage is important to Nelsonites and there appears to be a strong desire to preserve Nelson's trees for their historical and social value
- While many of the above documents express the importance of tree protection, it would be helpful to establish more concrete protection criteria and procedures to increase enforceability and transparency
- Public safety in Nelson's urban forest management is a major consideration when it comes to transmission lines, wildfire mitigation, and even stormwater management
- Consultant reports that lay out design plans for the downtown and the active transportation network point to the importance of canopy cover for pedestrians, cyclists, and people who use mobility aids
- Proper tree replacement species, location, and infrastructure (i.e., Silva Cells for heavily built-up environments) increases the sustainability of tree planting (both from an ecological and a budgeting perspective)
- There is awareness around the need for public engagement in urban forest management decision-making as evidenced by Nelson Hydro's Public Engagement Framework

### 2.2.4. Recommendations

| |
|---|
| **Recommendation 5:** Consider amending the Municipal Tree Bylaw to protect trees on private property as well as public property. |
| **Recommendation 6:** Provide clearer specifications for what is considered a 'significant tree'. For example, provide specific diameter at breast height (DBH) measurements or list specific species that are under protection. Establish replacement tree criteria as part of a tree protection bylaw. |
| **Recommendation 7:** Consider making concrete references to the urban forest in the OCP update. |
| **Recommendation 8:** Identify priority areas for tree planting, such as along active transportation routes, to contribute to other climate adaptation and mitigation targets. |
| **Recommendation 9:** Continue exploring the potential for green roofs in Nelson. Any green roof planning should also include considerations for biodiversity benefits, such as establishing connectivity corridors throughout the City. This will require professional ecological expertise. |
| **Recommendation 10:** Create a heritage tree registrar with geo-referenced datapoints that can be uploaded to Nelson's interactive Heritage map to serve as a visual tool for the City and the public. |
| **Recommendation 11:** Establish a municipal canopy cover target to work towards over the next 25 years. A more thorough canopy cover analysis will need to be done first to determine the current canopy cover percentage. Hiring an environmental consultant who specializes in urban forest management plans is recommended for this step. |
| **Recommendation 12:** Consider establishing a tree fund from tree removal permit fees. |
| **Recommendation 13:** Incorporate minimum soil volume guidelines into landscape design standards for street tree planting via design guidelines. |

## 2.3. Stakeholders and collaborators

Because the urban forest exists across public and private lands, there are many stakeholders to consider. Michael Leff's *Sustainable Urban Forest Guide (2016)* outlines a list of possible stakeholders and potential collaborators to consider in urban forest management. Having an overview of potential stakeholders provides direction in a variety of situations, whether the goal is to gather input from the community or to establish an urban forest advisory committee, like the Village of Belcarra has done.

### 2.3.1. The importance of considering equity in urban forestry

"When striving for a sustainable urban forest, it's better to err on the side of inclusivity" (Leff, 2016).


Helpful resource

This report by researchers from the University of Tasmania is a good resource for examining what may be causing exclusion in engagement and also identifying potential solutions to increase inclusion in urban greening initiatives.

The discussion around equity in urban forest management has grown a lot over the last decade. While every community has its own unique equity context, there are some broadly applicable equity targets that have emerged in urban forestry research.

UBC professor Cecil Konijnendijk developed the 3-30-300 Rule to serve as a guideline for "greener, healthier, more resilient cities" (Konijnendijk, 2023) (Figure 11). The 3-30-300 Rule suggests that:

- Everyone should be able to see 3 trees from their home
- Neighbourhoods should aim for 30% canopy cover
- No one should be more than a 300 meter walk away from the nearest park or greenspace

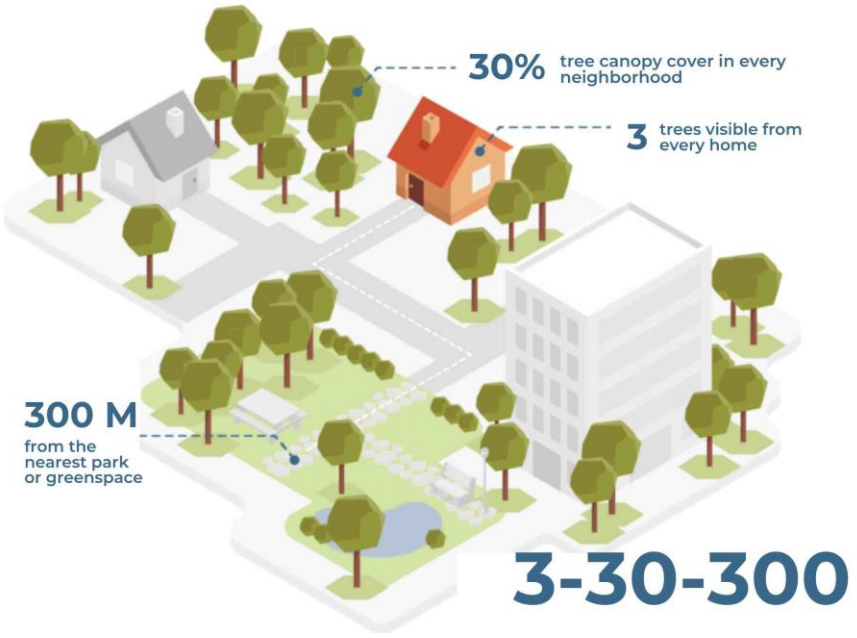



Figure 11. *Depiction of the 3-30-300 Rule developed by Cecil Konijnendijk (PlanITGeo, 2024).*

### 2.3.2. List of stakeholders and collaborators

Below is a list of stakeholders and collaborators (Table 3), adapted to the City of Nelson's context, based on the blueprint provided by Leff (2016). **Please note that this is not an exhaustive list.** Opportunities for new collaboration and engagement are always emerging as new relationships are developed and new organizations and businesses are formed.

Table 3. *List of stakeholders and collaborators relevant to the City of Nelson.*

| City of Nelson departments | Private organizations and property owners |
|---|---|
| • Development Services and Climate<br>• Operations<br>  ○ Operations & Continuous Improvement<br>  ○ Parks & Public Works<br>• Administration<br>• Finance<br>• Nelson Hydro<br>• Fire & Rescue Services<br>• Library | • Residential homeowners<br>• Commercial and industrial<br>• Developers<br>• Arborists and tree care companies<br>• Landscape architects<br>• Design and civil engineers<br>• Ecological restoration practitioners<br>• Small business associations<br>• Chamber of commerce<br>• Corporate sponsors |
| **Regional** | **Public** |
| • RDCK Environmental Services department<br>• RDCK Development & Community Sustainability department<br>• RDCK Community Services department | • General public<br>• Community and neighbourhood groups<br>• Faith groups<br>• Tree planting volunteers<br>• Elected officials<br>• Local elementary and high schools<br>• Other institutions |
| **Provincial ministries** | **NGOs** |
| • Environment and Climate Change Strategy<br>• Forests<br>• Health<br>• Indigenous Relations & Reconciliation<br>• Municipal Affairs<br>• Tourism, Arts, Culture, and Sport<br>• Water, Land, and Resource Stewardship | • Friends of Kootenay Lake<br>• Living Lakes Canada<br>• Columbia Basin Trust<br>• Doctors and Nurses for Planetary Health<br>• West Kootenay Climate Hub<br>• CKISS |
| **Indigenous** | **Education** |
| • Sinixt Nation<br>• Ktunaxa Nation<br>• Syilx Nation<br>• West Kootenay Metis<br>• Circle of Indigenous Nations Society | • Selkirk College<br>• Other colleges and universities in BC |

### 2.3.3. Recommendations

**Recommendation 14:** Collaborate with academic institutions, such as Selkirk College. Explore the potential to integrate further research on Nelson's urban forest into student or other research projects.

**Recommendation 15:** Establish an urban forestry interest group. Survey respondents who were interested in receiving updates about Nelson's urban forest management provided their emails. These contacts could be a starting point for assembling a group of likeminded individuals who care about the management of the urban forest.

**Recommendation 16:** Create an Urban Forestry webpage on the City of Nelson website to share information with the public.

**Recommendation 17:** Continue engaging with local First Nations, Metis, and non-local Indigenous Peoples to ground Indigenous worldviews in the management of Nelson's urban forest. Indigenous worldviews are grounded in stewardship, which is a perspective that is key to sustainable urban forest management.

**Recommendation 18:** Citizen science groups have had success in supporting urban forest management. These groups can provide continuous data collection services which can be useful in future evaluations of changes to urban forest management practices.

**Recommendation 19:** Consider establishing a municipal urban forester position.

**Recommendation 20:** Local schools could apply to Tree Canada's *Greening Canada's School Grounds Grant* (Appendix B).

## 2.4. Local perspectives

An online community engagement survey was open from Monday, July 15th to Sunday, August 4th. The survey was hosted through the online survey software, SurveyMonkey. The survey was designed to gather some preliminary input about urban forest management perspectives and experiences in Nelson.

Below is a snapshot of the types of themes that the survey engaged with. The following pages will review participants' responses, including the demographics of the participants as the consideration of socio-economic data is a pillar for successful urban forest management.

A total of 400 survey responses were collected.

Thank you to everyone who participated!

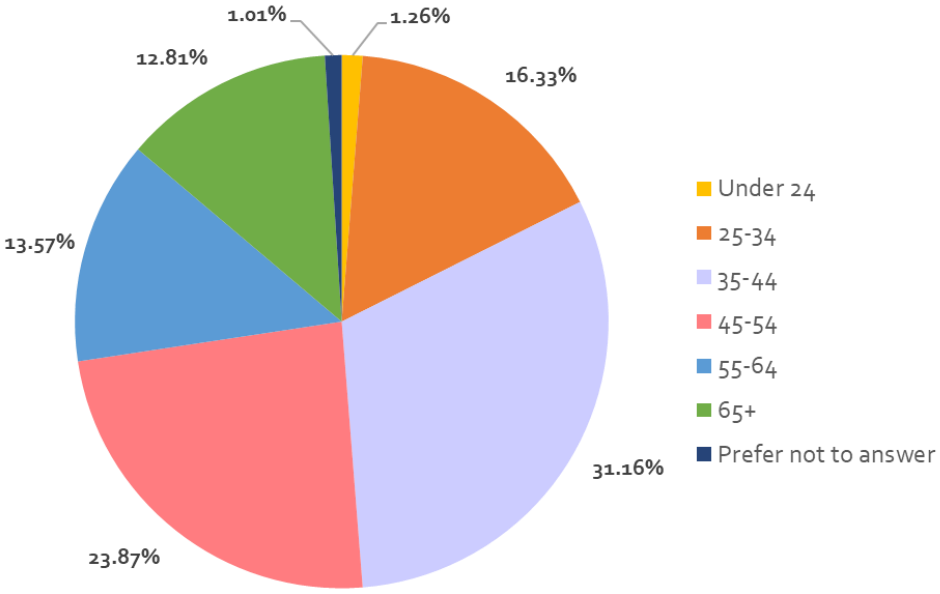
Participants were asked about:

- The importance they ascribe to Nelson's urban forest
- Which co-benefits are most valuable to them
- Their favourite urban forest spots in Nelson
- Their satisfaction level with the state of Nelson's urban forest
- Any specific concerns regarding the state of Nelson's urban forest
- Their degree of comfort with expanding the tree protection bylaw to private property trees
- The relative importance they place on various urban forest management priorities
- Areas of urban forest management they would be most interested in learning more about
- Their level of interest in obtaining trees to plant on their property
- How important they think it is to involve residents in decision-making around day-to-day activities like planting and pruning
- How important they think it is to involve residents in decision-making for long-term urban forest planning

### 2.4.1. Survey results

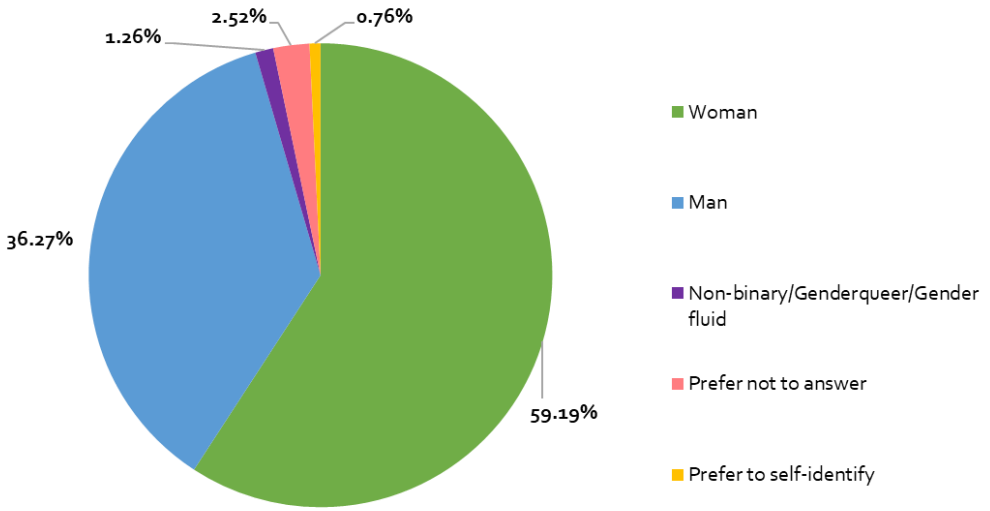
Question 1 asked for consent to participate in the survey.

Question 2: *Your age is . . .*




The age distribution of respondents was fairly diverse. This is beneficial as it allows for a representation of perspectives across a variety of ages. In relation to urban forest management, where one has to take into consideration the long lifespan of trees, it is important to understand different generations' perspectives, as tree planting decisions made today will have a significant impact on people and nature 25 years down the road.

Question 3: *What is your gender?*

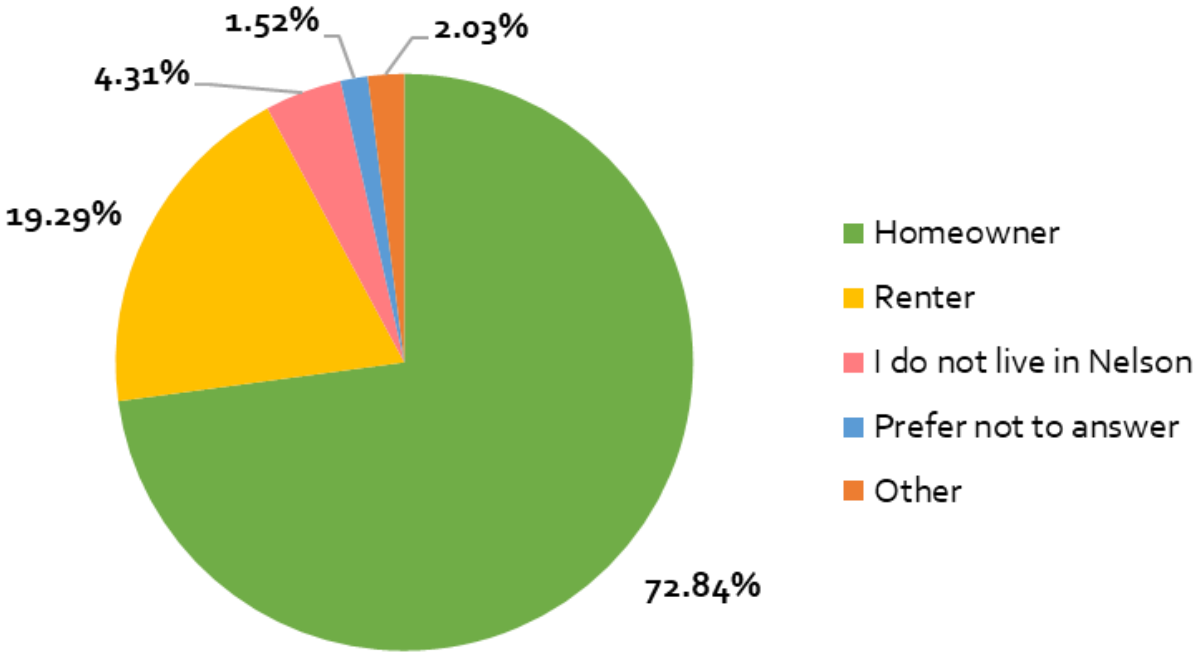



Over half of the survey respondents identified as women. Just over a third identified as men. A small proportion identified as non-binary/genderqueer/gender fluid or preferred to self identify.

## Question 4: *What is your preferred way to identify your race and ethnicity?*


62.25% of respondents chose to answer this question. The most common responses are shown in the above word cloud. The larger the font, the more frequently the answer was given. Singular mentions of 'Jewish' and 'Latinx' were also recorded.

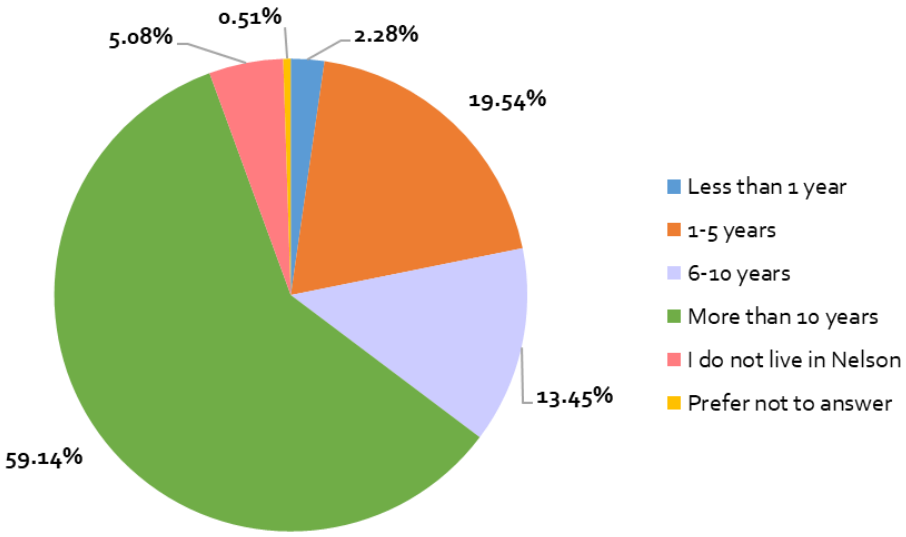
## Question 5: *Which of the following best describes your current living situation in Nelson?*




Additional responses included being a homeowner outside of Nelson, living in family home, not living in Nelson but coming to the city to recreate, shop, etc.

Just under three quarters of respondents are homeowners. When it comes to urban forest management, the advantage of being a homeowner is the ability to make landscaping decisions about your own property such as deciding whether or not to plant a tree or a shrub, and if so, which species. That doesn't mean that renters cannot contribute to urban forest management at their place of residency. It is worth having a conversation with one's landlord to discuss opportunities.

## Question 6: *If you live in Nelson, how long have you lived here?*



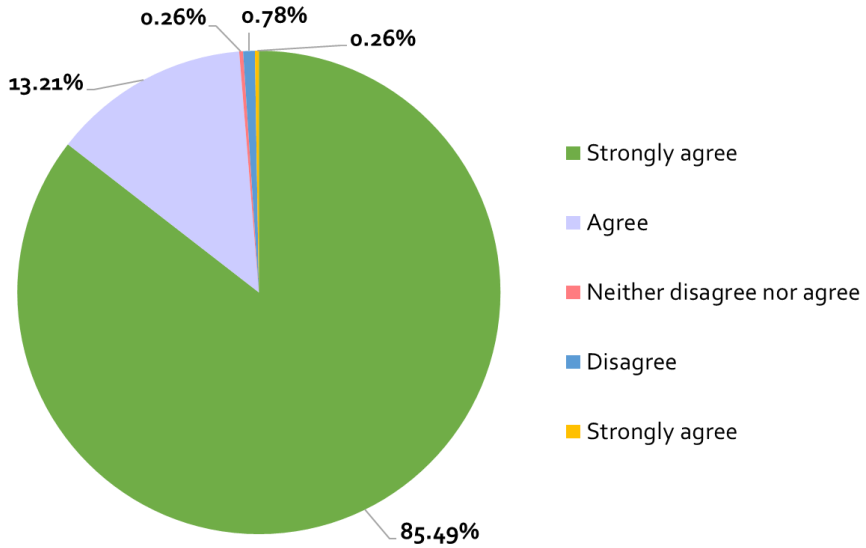

The intention behind this question was to better understand respondents' temporal frame of reference. As mentioned above, urban forest management involves long timeframes. Residents who have lived in Nelson for over 10 years may have a different perception of Nelson's urban forest than those who have not lived in the city for as long.

## Question 7: *Is there anything else you would like to share regarding your identity characteristics?*

48 respondents (12%) provided answers to this question.

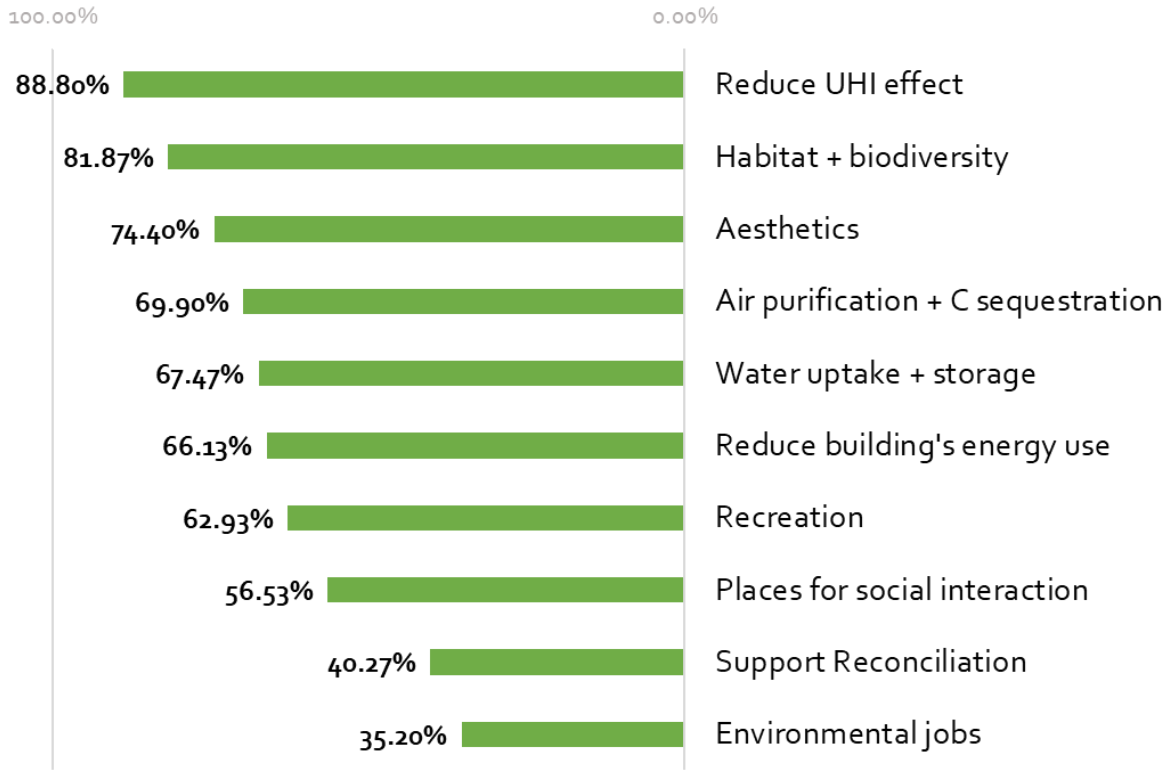
Responses were varied. Additional identity characteristics that respondents shared included their profession, their parental status, their relationship status, disability, their relationship to the City of Nelson, and why they feel a connection to forestry.

## Question 8: *Please indicate the degree to which you agree with this statement: Nelson's urban forest is an important asset for the local community.*




Almost all respondents consider Nelson's urban forest to be an important community asset.

## Question 9: *Please select which of the urban forest benefits are most valuable to you.*




Respondents were able to select as many or as few options as they wanted. The co-benefit that respondents appreciate the most about Nelson's urban forest is the role it plays in reducing the urban heat island (UHI) effect. This survey was available for a three-week period during which daytime outdoor air temperatures were in the mid thirty degrees Celsius on most days. It is possible that this may have influenced response rates relating to this particular co-benefit.

The co-benefit of providing wildlife habitat and supporting biodiversity was ranked second highest. This coincides with the distribution of priority co-benefits identified during the Nelson Next (2020) engagement process, where protecting ecosystems was also ranked as the second highest priority co-benefit.

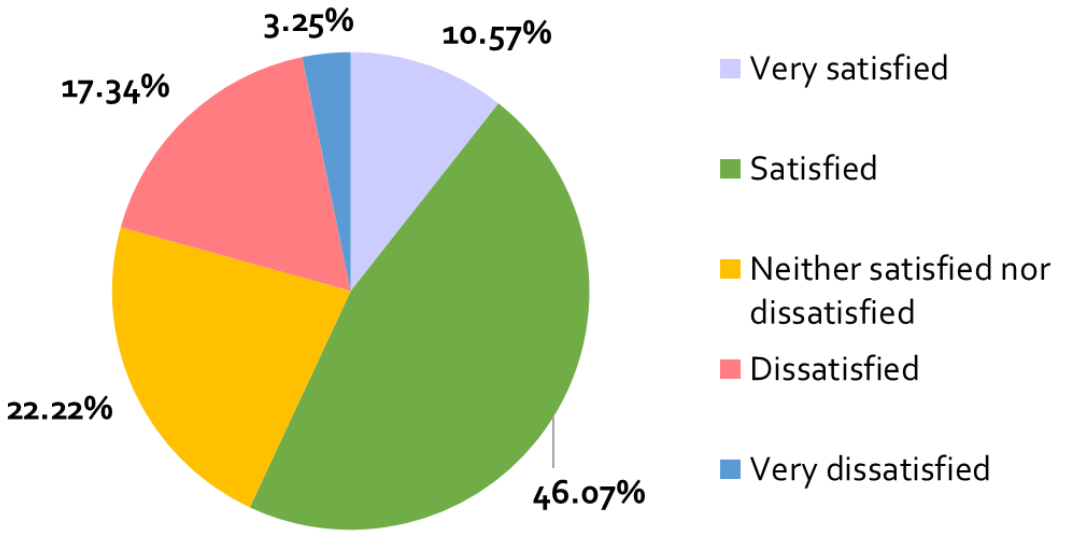
## Question 10: *What is your favourite urban forest spot in Nelson?*

281 participants (70.25%) provided responses.

Responses included Mountain Station, Art Gibbons Park, Lakeside Park, the Cemetery, Rail Trail, Gyro Park, Ward Street, Prince Phillip Park, personal backyards, Vernon Street's oak trees, Cottonwood Falls Park, Hendryx Street, and the trail leading to Red Sands beach. Others did not have a favourite spot and just appreciate Nelson's urban canopy as a whole.

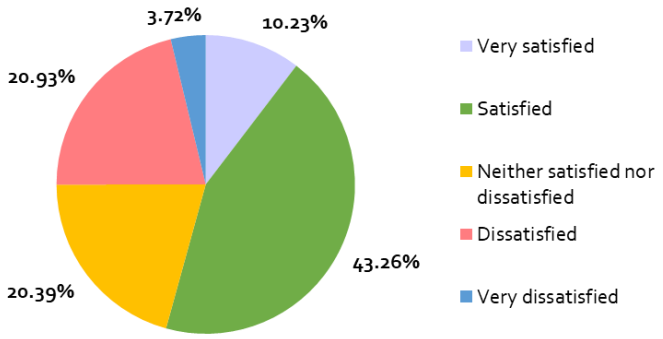
Reasons why these are favourite spots include overall accessibility, the shade that the trees provide, the maturity of the trees, peaceful and tranquil ambience, recreational opportunities, and the diversity of vegetation.

## Question 11: *How satisfied are you with the state of Nelson's urban forest (i.e., the distribution across the city, tree health and management, diversity of species, etc.)?*

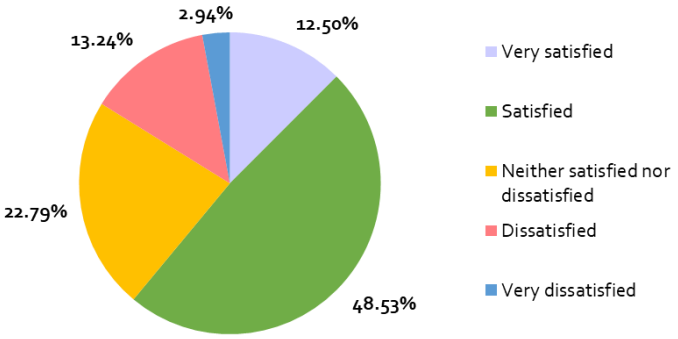



Overall, more than half of the respondents expressed that they were either very satisfied or satisfied with the state of Nelson's urban forest.

Respondents who have lived in Nelson for 10+ years




Respondents who have lived in Nelson 10 years or less



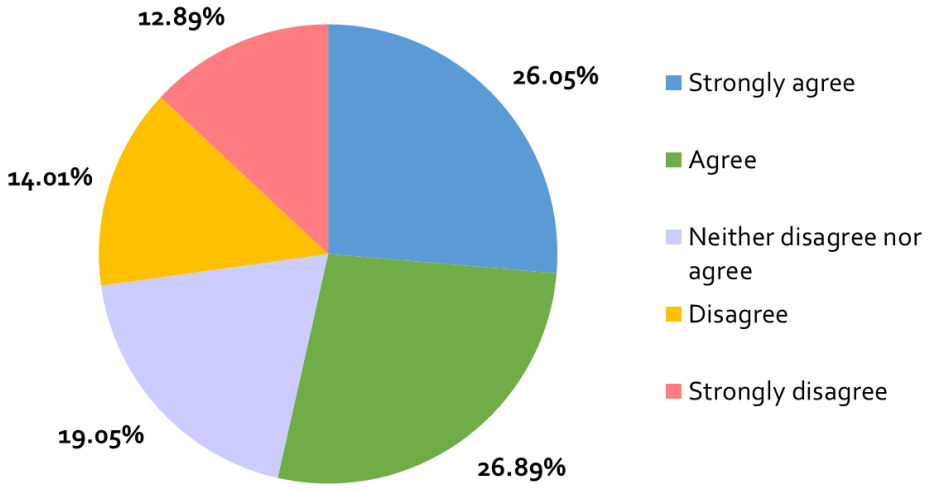

There were some slight differences in responses from participants who have lived in Nelson for more than 10 years and those who have lived in Nelson for 10 years or less. Long-term (10+ years) residents expressed a slightly lower satisfaction rate than shorter-term residents (10 years or less). The dissatisfaction rate was a bit higher among long-term residents as well.

## Question 12: *Do you have any specific concerns regarding the state of Nelson's urban forest?*

248 respondents (62%) wrote in to share specific issues that they perceive.

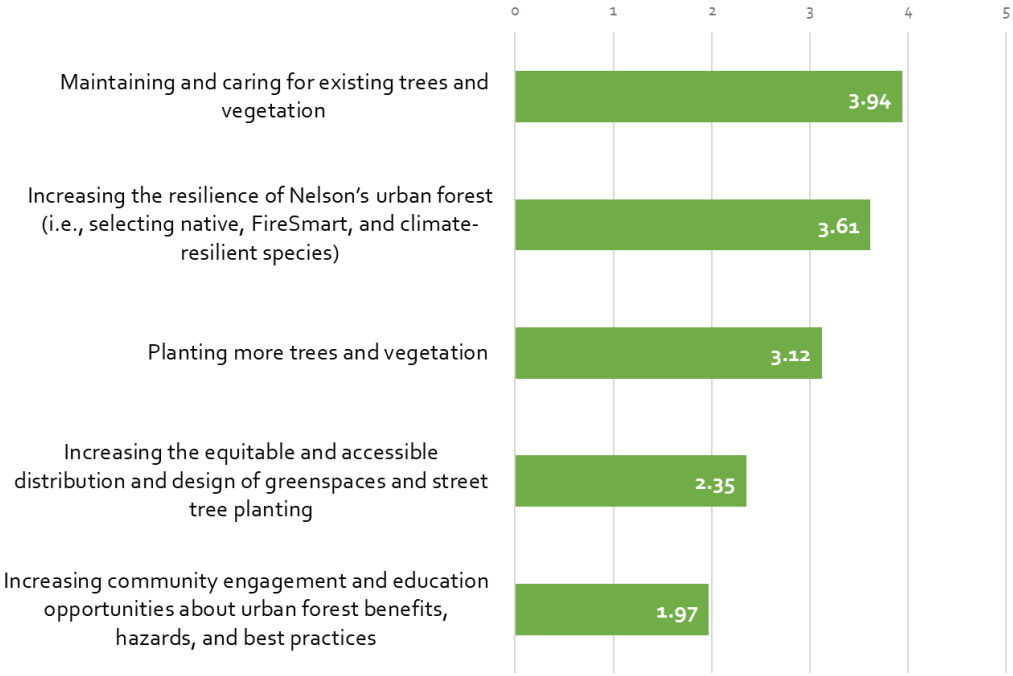
Logging around Mountain Station, lack of canopy in areas where people gather, fruit trees attracting wildlife, declining and aging urban canopy, wildfire risk, trees being lost as a result of development and infill housing, improper planting practices around power lines, and invasive species were some of the main themes repeated across responses.

## Question 13: *Please indicate the degree to which you agree with the following statement: Nelson's current Municipal Tree Bylaw should be amended to protect trees on both private and public property.*




More than half of the respondents expressed support for amending Nelson's *Municipal Tree Bylaw*. Given the generally higher proportion of urban canopy on residential property, compared to other zones, this option could be explored to safeguard significant trees on private property.

## Question 14: *Please rank the relative importance of the following urban forest management priorities.*

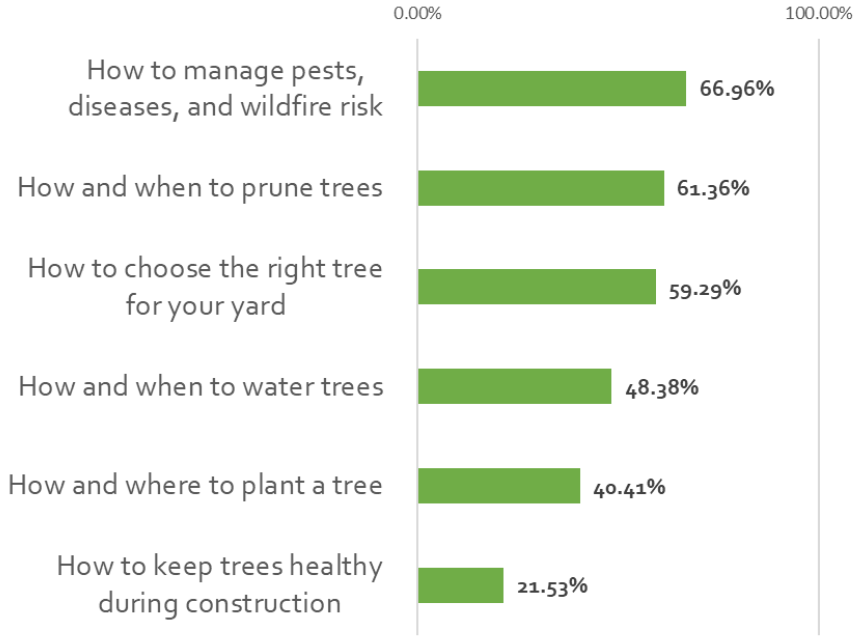



Maintaining and caring for the trees and vegetation that already exist within Nelson's municipal boundary was ranked as the highest priority. This is consistent with urban forest management best practices, which recommend maintaining existing trees for as long as possible due to the amount of time it takes for newly planted trees to reach maturity and begin to provide a noticeable level of co-benefits.

The second most popular priority was focused on increasing resilience, whether that be resilience against climate change, disease, or wildfire. These responses may be reflective of an increased awareness of the challenges that a climate uncertain future brings.

Interestingly, increasing community education and engagement opportunities ranked lowest on the priority list. This may be because this option implies less action. Regardless, this is valuable information for the City, as it demonstrates what residents would like to see the City do the most.

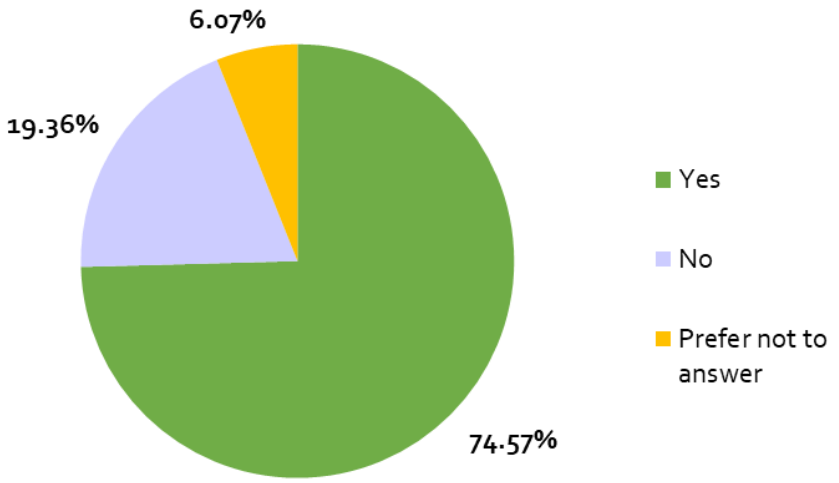
## Question 15: *Please select which of the following areas you would be most interested in learning more about.*




Respondents were allowed to choose as many of the options as they wanted. Responses to this question were consistent with those to Question 14. Learning more about managing pests, diseases, and wildfire risk aligns with both increasing resilience as well as caring for existing vegetation. How and when to prune trees is in line with the maintenance and care of current vegetation.

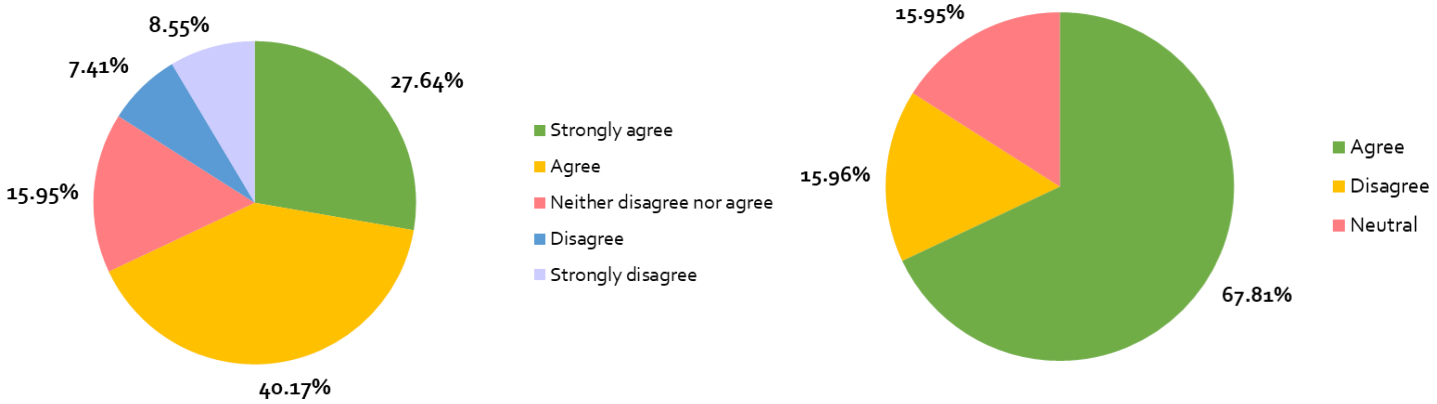
Keeping trees healthy during construction was the option that respondents showed the least interest in. This may be due to the fact that the average homeowner may not carry out many of their own construction projects. This option may have ranked higher among developers or other professionals who are often involved in construction projects. Damage to tree roots, stems, and crowns is a common, and unfortunate, downside of construction, leading many municipalities to establish prescriptive tree protection zones whenever construction is set to occur around significant trees.

## Question 16: *Would you be interested in obtaining trees for planting on your boulevard or on your private lot?*



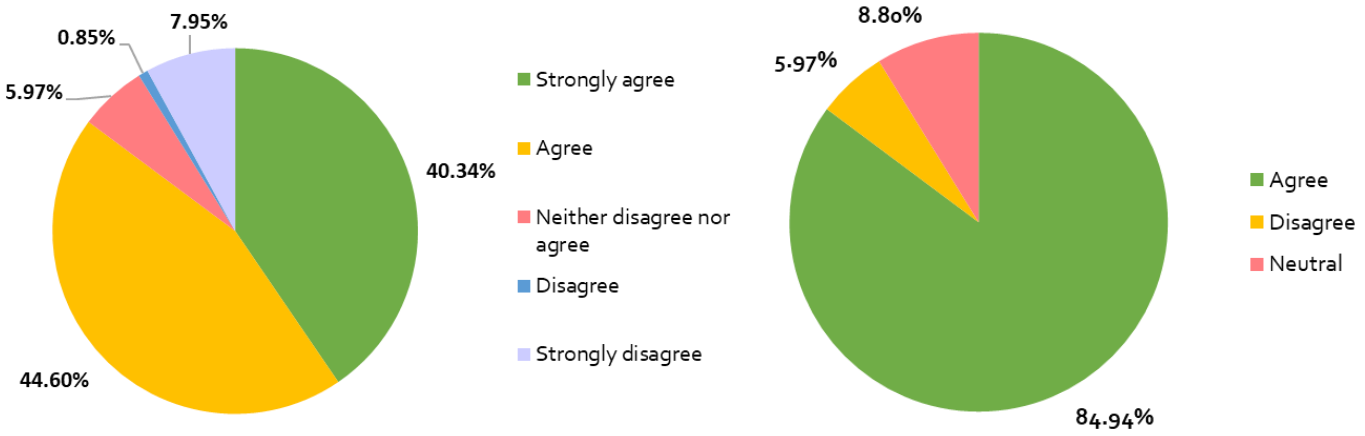

Three-quarters of respondents expressed interest in receiving trees to plant in their yard or on the boulevard next to where they live. While the City of Nelson may not be able to cover all tree planting costs, there are options to subsidize planting costs for residents. And again, any tree planting that does occur should be done in a way that ultimately improves Nelson's resilience by being cautious to not contribute to risks such as wildfire, transmission line interference, and water scarcity.

## Question 17: Please indicate the degree to which you agree with this statement: *It is important to involve residents in the decision-making around day-to-day urban forest management (planting, protection, pruning, etc.).*




When combining the 'strongly agree' and 'agree' responses into a collective category of 'agree', the majority of respondents believe that they should be involved in day-to-day urban forest management decisions. Less than a fifth of respondents did not think this is necessary. Roughly the same number of respondents felt neutral about the need to be involved.

## Question 18: Please indicate the degree to which you agree with this statement: *It is important to engage and consult the public when developing a long-term planning strategy for Nelson's urban forest.*




When combining the 'strongly agree' and 'agree' responses into a collective category of 'agree', 85% of respondents believe that they should have a say in long-range urban forest management decisions. This is a noticeably higher amount of residents compared to the those in favour of being involved in short-term urban forest management (68%), as shown in the previous question. Additionally, the amount of respondents who disagree or who have a neutral stance was halved. These results seem to indicate stronger emotions pertaining to the preservation of the urban forest for the benefit of future generations.

## Question 19: How would you rank the relative importance of the following objectives for urban forest management in Nelson?


The sentiment of safeguarding Nelson's urban forest also stood out in the responses to this question. '*Preserving the urban forest for the benefit of future generations*' was ranked highest of the six objectives, displaying intergenerational motivations among the respondents. The second most popular objective is achieving fair urban forest cover and access across Nelson. The objectives pertaining to procedural, recognitional, and epistemic equity were the least popular popular, with a couple of respondents expressing that it was difficult to understand the differences between the three options. These themes of equity are emerging in nature-based solutions research and project implementation and will likely influence the evolution of urban forest management best practices over the coming decades.

## Question 20: Is there anything else you want us to know?

114 participants (28.5%) provided responses to this open-ended question.

Common themes in responses included FireSmarting private properties, supporting the idea that the urban forest is a community asset, being aware of future risks to the urban forest (disease, pests, growing conditions, etc.), the need for more education for youth, the need for more education on fruit tree management, stronger enforcement of the tree bylaw, creating funding opportunities for tree planting, considering hiring an urban forest professional, identifying priority and practical areas for tree planting (parking lots, etc.).

### 2.4.2. Summary of survey results

- Survey respondents are most interested in preserving the existing urban forest before planting new trees. This will need to be reconciled with the need for housing and development. Striving to retain as many trees as possible, except for situations in which it is unsafe to do so, is encouraged in other municipalities' urban forest management plans too.
- The fact that respondents showed the least interest in the urban forest management priority of increasing education and engagement might be an indication of a lack of awareness of what constitutes education and engagement and how that can influence residents' ability to participate and contribute to urban forest management. On the other hand, it may also signal that residents would still prefer the City to handle the majority of urban forest management efforts.
- Respondents felt more strongly about being involved in long-term than short-term urban forest management decision-making. The City of Nelson can use this feedback to tailor their urban forest engagement approaches to the preferences of residents.
- Respondents indicated strong support for including the protection of trees on private property in the Municipal Tree Bylaw.
- Popular education initiatives would involve pest, disease, and wildfire risk management on private property. The City could look into collaborating with local organizations of knowledge to provide these initiatives.
- A note about the design and distribution of the survey: The engagement survey was open to all members of the public. This means that the survey results are likely subject to sampling bias, as respondents with a keen interest in urban forest management may have been more likely to participate in the survey. Future urban forest management engagement in Nelson could aim to select a more random sample of participants to increase the representativeness of the results.

### 2.4.3. Recommendations

| |
|---|
| Recommendation 21: Only a very small percentage (1%) of respondents were under the age of 24. Taking additional steps to engage the younger generation around urban forest management could instill a greater awareness of climate adaptation strategies in each new generation. |
| Recommendation 22: Consider implementing an Adopt-A-Tree program like Kaslo and other municipalities (Neighbourwoods project in New Westminster). The survey demonstrated that there is interest in increasing planting on private property. |
| Recommendation 23: Consider amending the Municipal Tree Bylaw to protect significant trees on private property as well. There appears to be some support for this and is worth exploring through further community engagement. |
| Recommendation 24: Respondents expressed the most interest in learning more about pest, disease, and wildfire risk management. Hosting a collective workshop on these topics might be worthwhile, whether internally through the City or through a consultant or other expert organization. |
| Recommendation 25: Promote reduction of bear and wildlife attractants via WildSafeBC resources (Appendix A). |

## 2.5. Economic valuation and resources

This section will examine both the value ascribed to Nelson's urban canopy as well as some of the funds that are allocated to urban forest management. Understanding the economic value of urban forest services and management makes it easier to incorporate it into municipal accounting systems. The Municipal Natural Assets Initiative (MNAI) is a great resource for learning more about natural asset inventorying and valuation. As an organization, they specialize in supporting and guiding local governments in "identifying, valuing, and accounting for natural assets in their financial planning and asset management programs" (MNAI, 2017).

### 2.5.1. The value of Nelson's urban forest

An i-Tree Canopy assessment was carried out to better understand Nelson's land cover distribution and the benefits that the urban canopy provides.

What is i-Tree Canopy?

i-Tree Canopy uses Google Maps satellite imagery to conduct land cover analyses. The land cover analysis only requires a shapefile of the area for which one wants to carry out the land cover analysis. Once the shapefile is uploaded to i-Tree, random points are generated consecutively within the boundary. The i-Tree user has to assign each point a land cover classification. There is a default list of land cover types, however, these can be adjusted to suit the context of location that is being assessed. It is recommended to plot at least 500 to 1,000 datapoints to increase the accuracy of the land cover estimates. Once the desired amount of points has been plotted, i-Tree calculates the financial value of benefits attributed to carbon dioxide uptake, air pollution reduction, and stormwater management support. In a nutshell, i-Tree Canopy is very user-friendly, does not require extensive urban forestry experience to conduct the analysis, and produces statistically significant results.

#### *2.5.1.1. i-Tree Canopy Land Cover Analysis*

In total, 1,000 datapoints were plotted within Nelson's municipal boundary (Figure 12). The default land cover types included in i-Tree Canopy are: Grass/Herbaceous, Tree/Shrub, Impervious Buildings, Impervious Other, Impervious Road, Soil/Bare Ground, and Water. To better fit the context of Nelson, the Water category was renamed to Kootenay Lake and the category of Terrestrial Water Body was added, to account for any non-Kootenay Lake water datapoints. The category Forested Area was added, to allow for differentiation between trees in the forested areas around Nelson's perimeter and those found in street, yard, and park settings within the City. Subsequently, the Tree/Shrub category was renamed to Street/Yard Tree/Shrub.

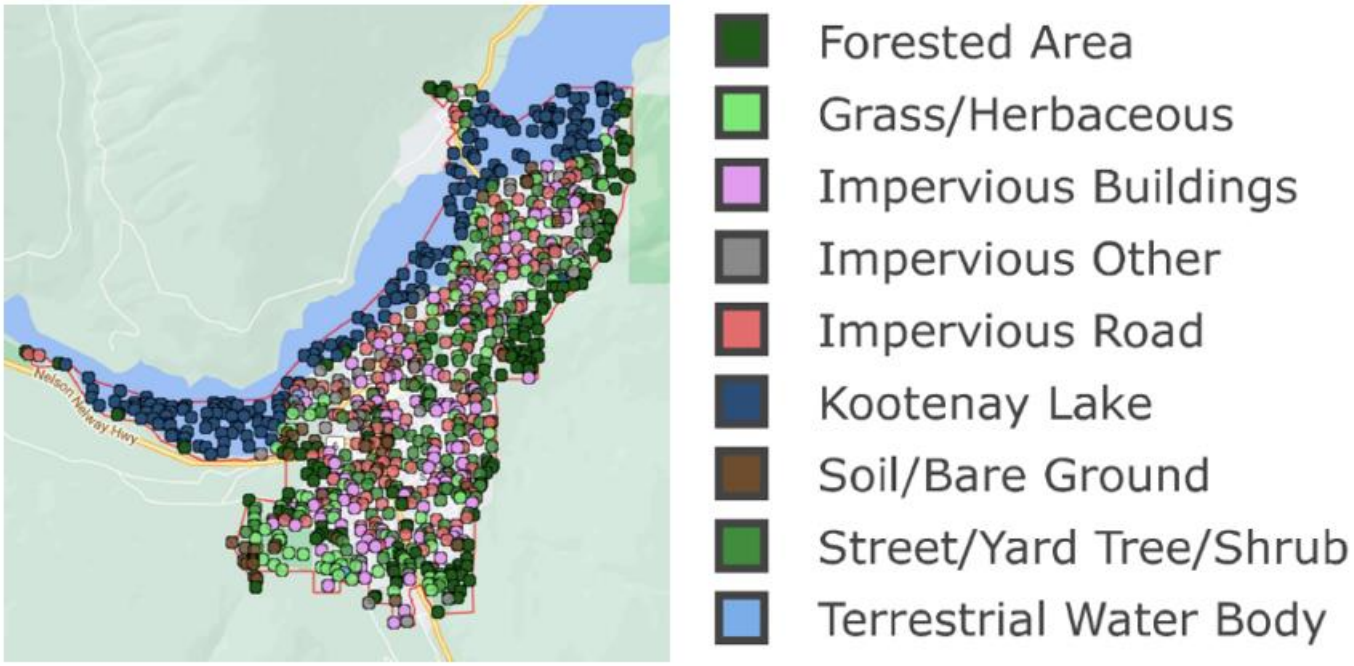



Figure 12. *Data points and their assigned land cover type. Due to the large amount of area that Kootenay Lake occupies even within the municipal boundary, it was distinguished as its own land cover class, to allow for distinction between it and smaller terrestrial water bodies within Nelson. There appears to be a higher concentration of Grass/Herbaceous, Street/Yard Tree/Shrub, and Forested Areas around Nelson's edge.*

"By putting a dollar value on such ecosystem services as energy savings, carbon reduction, air quality improvement, stormwater management, and various health benefits, i-Tree assessments can help persuade decision-makers that maintaining and growing the urban forest is not an optional amenity for prosperous times, but an integral element of the city's basic infrastructure to sustain human health and well-being" (Leff, 2017).

The land cover analysis revealed that Nelson's Street/Yard Tree/Shrub category contained around 17% of the total datapoints (Figure 13). Forested Area hovered around 14% of datapoints. Combined, the impervious surface categories (Impervious Buildings, Impervious Other, Impervious Road) had about 33% of total datapoints. Grass/Herbaceous cover was approximately 11%. A high percentage of datapoints fell under the Kootenay Lake category due to Nelson's boundary extending far into the west arm of Kootenay Lake. Soil/Bare Ground had the second lowest percentage, after Impervious Other, at around 5% cover. The i-Tree Canopy results suggest that Nelson's canopy cover is approximately 31% (the total of the Street/Yard Tree/Shrub and the Forested Area datapoints). However, further GIS analysis would need to be conducted for more accurate results.

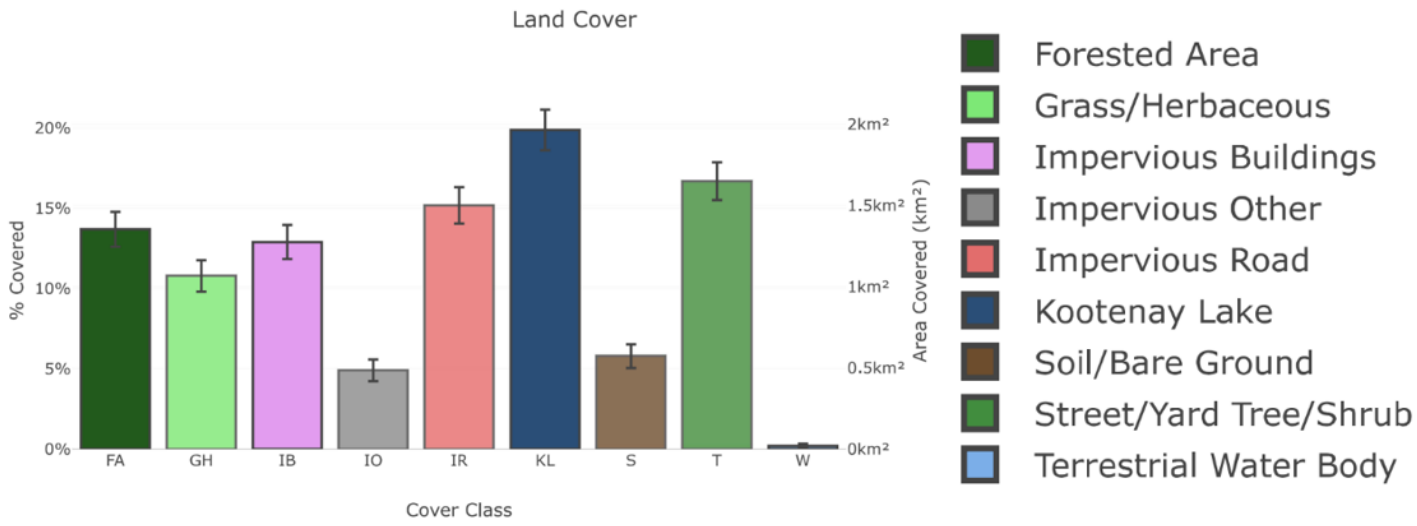



Figure 13. *Bar graph comparing the percent coverage of the different land cover classes found in Nelson. Nelson covers an area of 7.2 km² and an estimated 17% is covered by street and yard trees and 14% by forested areas, suggesting a total of 31% canopy cover.*

### *The value of Nelson's urban canopy's environmental services*

Based on the land cover analysis, i-Tree Canopy subsequently calculates estimates of carbon sequestration rates, air quality improvement, and hydrological benefits. Economic values of each benefit are also calculated.

When it comes to carbon sequestration, it is estimated that Nelson's urban forest sequesters around 920 tonnes of carbon annually (Table 4). The value of the sequestration is estimated to be around $236,000 per year, with a standard deviation of plus or minus $11,000 per year. The amount of carbon already stored in Nelson's urban forest is estimated to be around 23,000 tonnes in total and valued at just under $6,000,000.

The air quality improvement benefits that Nelson's urban forest provides are estimated to be worth just under $26,000 per year (Table 4). This value is based on estimates of the rate of removal of a variety of air pollutants. These pollutants are carbon monoxide (CO), nitrogen dioxide ($NO_2$), ozone ($O_3$), sulphur dioxide ($SO_2$), particulate matter less than 2.5 microns (PM2.5) and greater than 2.5 microns but less than 10 microns (PM10). These six pollutants are defined as criteria pollutants by the U.S. Environmental Protection Agency (EPA). I-Tree originated in the U.S., hence the ties to a U.S. regulatory agency. The removal of $O_3$ has the highest economic value, coming in at just over $16,000 per year. The second highest air quality improvement value is the removal of PM10.

The last environmental service that i-Tree Canopy generates estimates for is hydrological benefits (Table 4). Hydrological benefits are represented as Avoided Runoff. i-Tree Canopy models the tree physiological processes of evaporation, interception, transpiration, potential evaporation, and potential evapotranspiration to arrive at the Avoided Runoff calculation. This is why these processes do not have an economic value assigned to them. Overall, the just over $8,000 annual benefit of avoided runoff may seem trivial, yet it still merits consideration. Every little bit of service delivery, including natural service delivery, has the potential to increase the efficiency of a municipality's service delivery capacity.

The total estimated annual benefits (excluding the $5,935,865 value of carbon already stored in Nelson's urban forest) amount to $270,473. Including the value of the accumulated carbon storage would increase the annual estimated benefit value of Nelson's urban canopy to $6,206,338.

Table 4. *i-Tree Canopy carbon sequestration, air pollutant removal, and hydrological benefit estimates (i-Tree Canopy, 2024).*

| Carbon Sequestration Estimates | | | | | | |
|---|---|---|---|---|---|---|
| **Description** | **Carbon (t)** | **± SE** | **$CO_2$ Equiv. (t)** | **± SE** | **Value (CAD)** | **± SE** |
| Sequestered annually in trees | 920.46 | ±44.05 | 3,375.01 | ± 161.52 | 236,359 | ±11,312 |
| Stored in trees (Note: this benefit is not an annual rate) | 23,116 | ±1,106.31 | 84,759.22 | ±4,056.48 | 5,935,865 | ±284,084 |
| **Air Quality Improvement Estimates** | | | | | | |
| **Description** | | **Amount (kg)** | **± SE** | | **Value (CAD)** | **± SE** |
| Carbon monoxide (CO) removed annually | | 304.51 | ±14.57 | | 179 | ±9 |
| Nitrogen dioxide ($NO_2$) removed annually | | 1,523.28 | ±72.90 | | 56 | ±3 |
| Ozone ($O_3$) removed annually | | 16,195.76 | ±775.11 | | 2,828 | ±135 |
| Sulphur dioxide ($SO_2$) removed annually | | 1,521.40 | ±72.81 | | 10 | 0 |
| Particulate matter less than 2.5 microns (PM2.5) removed annually | | 800.38 | ±38.31 | | 5,919 | ±283 |
| Particulate matter greater than 2.5 microns and less than 10 microns (PM10*) removed annually | | 5,755.16 | ±275.44 | | 16,976 | ±812 |
| **Total** | | **26,100.49** | **±1,249.14** | | **25,968** | **±1,243** |
| **Hydrological Benefit Estimates** | | | | | | |
| **Description** | | **Amount (Ml)** | **± SE** | | **Value (CAD)** | **± SE** |
| Annual avoided runoff | | 2.53 | ±0.12 | | 8,146 | ±390 |
| Evaporation | | 208.44 | ±9.98 | | N/A | N/A |
| Interception | | 209.49 | ±10.03 | | N/A | N/A |
| Transpiration | | 323 | ±15.46 | | N/A | N/A |
| Potential evaporation | | 1,584.88 | ±75.85 | | N/A | N/A |
| Potential evapotranspiration | | 1,584.88 | ±75.85 | | N/A | N/A |

"The economic benefits of street trees often correlate with physical tree variables such as trunk diameter and leaf surface area" (Mullaney et al., 2015). This is demonstrated in Figure 14 to the right.

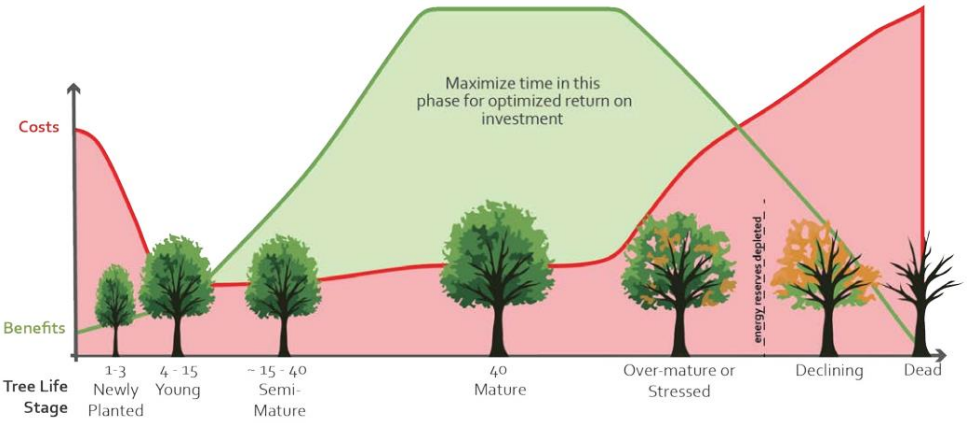



Figure 14. *Tree benefits versus costs curve over the course of a tree's lifespan (City of Kelowna, 2024).*

## 2.5.2. Current urban forest management budget

The economic valuations presented in the preceding section reflect a larger movement to **"make nature count"**, as expressed by the Municipal Natural Asset Initiative. Knowing how much natural service delivery is worth in financial terms makes it easier to integrate them into accounting systems. Doing so legitimizes natural assets and puts them on a more level playing field with traditional assets, which can lead to greater sums of money being allocated to nature-based solutions projects. This section goes over some elements of the budget that Nelson has currently allocated to the management of its urban forest. The information presented here is not exhaustive. Rather, it provides a snapshot of two specific budgets: The City's annual tree planting budget and Nelson Hydro's vegetation management budgets. It was outside of the scope of this project to investigate the economic resources that the City allocates to urban forest management in a more comprehensive way.

The following is an overview of different budgets associated with Nelson's urban forest management. These budgets are not official 'urban forest management' budgets. They are a collection of budgets that influence how Nelson's urban forest is managed.

- Annual tree planting/replacement budget: $5,000
- Nelson Hydro's 2024 City vegetation management budget: $160,588
- Overall annual Parks budget: $1,520,000
    - Of this sum, $350,000 are paid to non-profit organizations in the form of cultural grants
    - The remaining Parks budget of $1,190,000 covers all labour, materials, supplies, and external contracts to maintain Nelson's parks and greenspaces
    - $105,477 is allocated to a general tree planting and pruning budget
    - $27,000 is allocated to equipment, material, and subcontractors
- 2024 cemetery maintenance budget: $288,000

Combined, these budgets amount to $1,973,588.

### 2.5.3. Summary of economic valuation and resources

Nelson's urban canopy is estimated to provide active environmental service benefits that amount to roughly an eighth of the total budgets spent on tree and greenspace maintenance in the City on an annual basis. Including the inactive service of accumulated carbon storage in Nelson's urban canopy would shift the ratio of benefits to costs to 3:1. Additionally, the i-Tree Canopy tree benefit calculations do not include estimates of less tangible benefits, such as human mental and physical wellbeing derived from the presence and experience of the urban forest.

Appendix B provides a selection of grants that the City of Nelson could apply for.

### 2.5.4. Recommendations

**Recommendation 26:** Consider carrying out a willingness-to-pay survey to assess residents' willingness to have their taxes increased in order to increase the budget for urban forest management. Willingness-to-pay surveys have been a part of urban forest strategy engagement for several BC municipalities, such as the Township of Langley.

**Recommendation 27:** Consider hiring a consultant, such as the Municipal Natural Assets Initiative, to carry out a financial natural asset assessment of Nelson as a whole or specifically of the value of its urban forest.

## 2.6. Nelson's urban forest components

To recap, Tree Canada defines urban forests as:

*[...] the trees, forests, greenspaces, and related living, non-living, and cultural components in areas extending from the urban core to the urban-rural fringe.*

(Bardekjian, 2018)

Understanding the individual categories of vegetation and ecosystems that make up the larger urban forest is important for urban forest management (Figure 15). Nelson's urban forest is predominantly made up of individual trees and greenspaces. Larger patches of forest that aren't disturbed by regular human activity mainly exist near to or outside of the municipal boundary.

This section provides an overview of Nelson's three urban forest components:

- Trees (on public and private property)
- Parks
- Forests


Figure 15. *The different components that make up the larger urban forest*.

### 2.6.1. Trees

The category of *Trees* can, broadly speaking, be broken down into two subcategories: Boulevard trees and private yard trees. Park trees will be discussed in the *Parks* section.

#### *2.6.1.1. Boulevard trees*

Some of Nelson's streets are heavily treed while others are not. This is influenced by a number of factors, including neighbourhood age, available boulevard planting space, and the presence of overhead utility lines. According to the Municipal Tree Bylaw (2012), the City is responsible for the management of trees on public property, such as boulevards.

Due to the exposed location of boulevard trees, they are often subject to harsher living conditions. Boulevard trees often outgrow their planting spaces,

are more exposed to harmful substances (i.e., road salt, higher concentrations of air pollution, etc.), and are more at risk of being defaced or harmed than trees growing in more sheltered areas, such as parks or backyards. To gain a better understanding of the composition of Nelson's boulevard trees (species and structure), an inventory was carried out.

#### 2.6.1.1.1. Boulevard tree inventory

323 boulevard trees on several streets around the downtown area were inventoried in late May and early June. The datapoints were collected using the geo-referencing software Fulcrum. Data collected included species, diameter at breast height (DBH), and estimates of tree height and canopy spread. Uncertainties around species identification were discussed with two City arborists. Tree health assessments were not carried out as the inventory was not carried out by a licensed arborist. Getting a licensed arborist or forestry student to conduct a city-wide tree inventory is a recommendation for future urban forest data collection.

The inventory was conducted along the following streets: Vernon Street, Baker Street, Herridge Lane, Victoria Street, Silica Street, Carbonate Street. Additionally, the intersecting portions of Kootenay Street, Stanley Street, Ward Street, Josephine Street, Hall Street, Hendryx Street, and Cedar Street were also inventoried (Figure 16). The two main analyses, described below, were species composition and structural composition.


Figure 16. *Datapoints of Nelson's boulevard trees in the downtown area (green dots) (Fulcrum, 2024).*

Species composition

The downtown tree inventory only provides a snapshot of species diversity and composition for one part of Nelson (Figure 17). Other neighbourhoods in Nelson likely have a different boulevard tree composition. The surveyed area makes up roughly one tenth of Nelson's street network. Within the inventoried area, more than half (64%) of the boulevard trees were one of three species (Norway maple, red oak, or honey locust). However, the overall species diversity was not low, with a total of 33 species being recorded. Future tree planting could prioritize evening out the abundance of dominant species and ensuring that new trees being planted are of a more climate resilient variety.

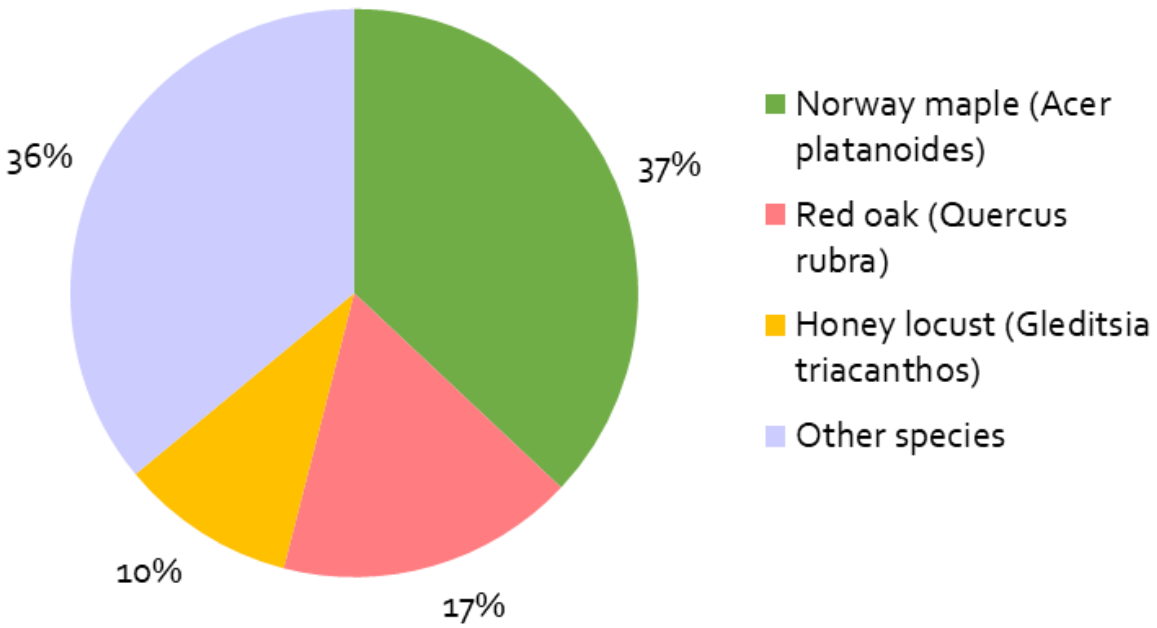



Figure 17. *Tree species composition for several streets in Nelson's downtown area. The three most abundant species are Norway maple (Acer platanoides) with 37%, red oak (Quercus rubra) with 17%, and honey locust (Gleditsia triacanthos) with 10%.*

## Structural composition

The distribution of diameter at breast height (DBH), which is measured at 150cm off the ground, is a common indicator of urban forests' structural diversity (Morgenroth, Nowak, & Koeser, 2020). Understanding the structural composition of an urban forest can inform current policy (such as tree protection bylaws), planning (such as replanting budgets), and management (such as maintenance prioritization) decision-making (Morgenroth, Nowak, & Koeser, 2020). In addition, knowledge of the current state of Nelson's urban forest allows for more accurate projections of future changes. This is especially relevant in the face of changing plant hardiness zones in the face of climate change.

Figure 18 highlights three common structural distribution types. A Type I – Youthful Population distribution has a high proportion of young trees with small DBH. The distribution curve exhibits an exponential decrease with each increase in DBH class. A Type II – Maturing Population distribution is the next step up from a Type I distribution, characterized by a comparatively higher proportion of trees entering the mid-sized DBH classes. A Type III – Mature Population distribution has a fairly even distribution of trees across all DBH classes. To assess the distribution of the surveyed trees, datapoints were assigned to one of 11 DBH classes, based on the approach used by Morgenroth, Nowak, & Koeser (2020). The 11 DBH classes are: ≤7.6, 7.7–15.2, 15.3–22.8, 22.9–30.4, 30.5–38, 38.1–45.6, 45.7–53.2, 53.3–60.8, 60.9–68.4, 68.5–76, and >76 cm.

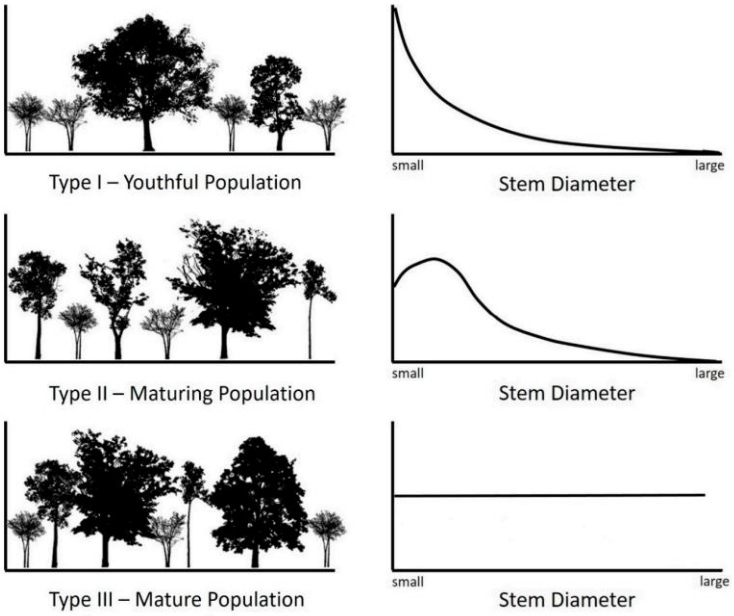



Figure 18. *The three common types of structural distributions of urban canopies (Morgenroth, Nowak, & Koeser, 2020).*

The DBH distribution of the surveyed trees resembles the curve of the Type II – Maturing Population distribution type (Figure 19). However, this distribution is shifted to the right, suggesting a shift towards an older population of trees. It is also worth pointing out that the DBH class with the highest percentage (18%) of trees, compared to any of the other classes, is 76 cm and greater. Most of these larger trees are Norway maples that line the residential streets around the downtown area (for example, Carbonate and Silica Street). The sharp uptick in very mature trees suggests that there is a need to proactively plant young trees in available places to increase the overall resilience of Nelson's urban forest.

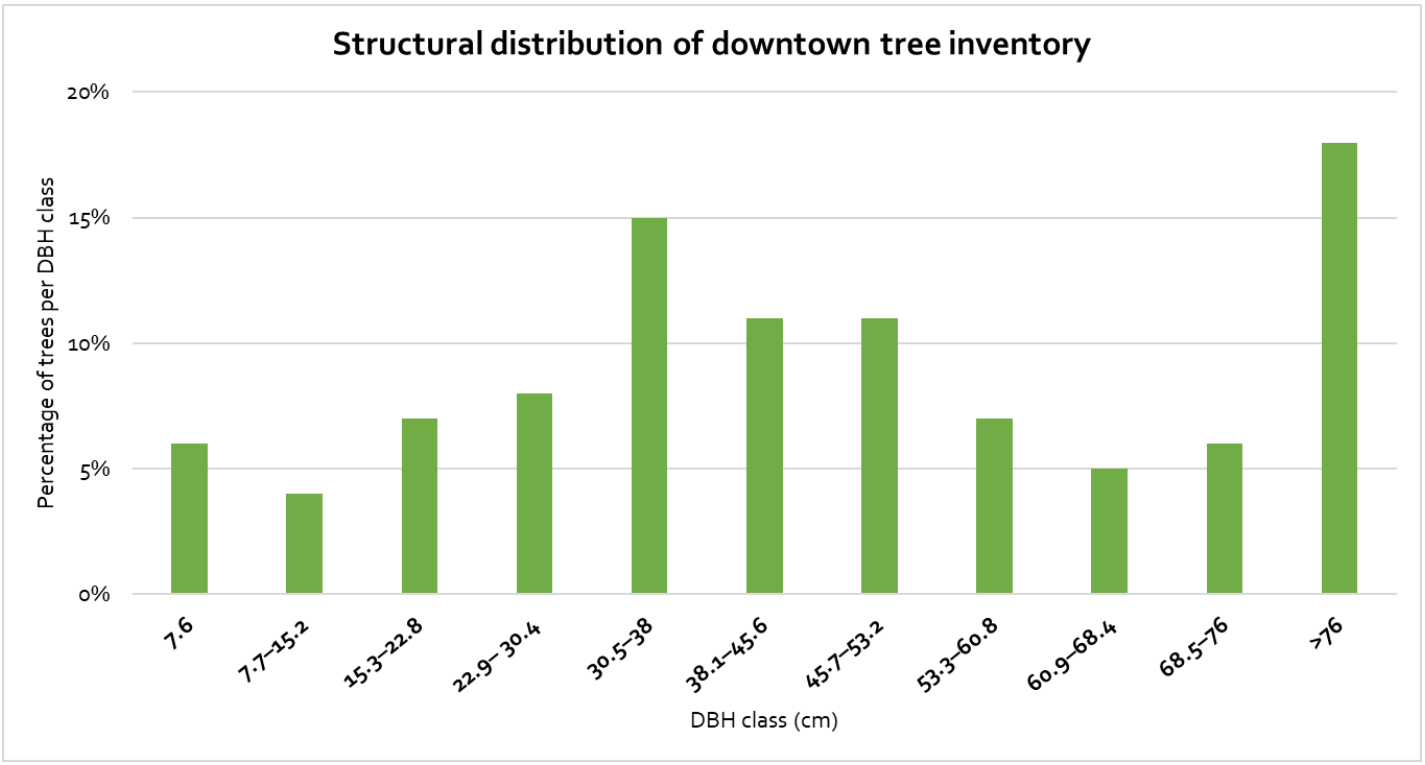



Figure 19. *A bar chart showing the percentage of surveyed trees in each DBH class.*

#### 2.6.1.1.2. Recommendations

**Recommendation 28:** Increase tree age and size diversity via consistent new and replacement tree planting.

**Recommendation 29:** Develop a long-term planting plan to increase street tree species diversity of the downtown area.

**Recommendation 30:** Carry out street tree inventories of the rest of Nelson's neighbourhoods to better understand the species and structural diversity of those areas.

**Recommendation 31:** Develop a heritage tree registrar to better track the health and location of these trees.

**Recommendation 32:** Carry out a City-wide boulevard tree inventory to better understand species and structure distribution on a municipal scale. To accomplish this, the City could think about the different stakeholder and collaborator groups who might be able to help out with this.

**Recommendation 33:** Track all new plantings and removals. It is also recommended to log the coordinates of new and removed trees using software such as Fulcrum or Esri to make the management of this asset more robust.

**Recommendation 34:** Prioritize young tree structural pruning to ensure stronger limb growth into maturity. This can reduce risk related to tree limb decay and damage throughout a tree's lifetime.

### *2.6.1.2. Private trees*

No quantitative observations could be made about Nelson's backyard tree composition and distribution. Although urban forestry includes trees and vegetation on private property, there is often a lack of information on this component as it is not commonplace for municipalities to track what happens on private property. Yet private property, particularly residential property, tends to contribute the most to the overall urban canopy coverage due to residential zoning often accounting for more than half of any given municipality's land area. There are different ways in which municipalities can become more involved in private property tree management. This is especially relevant in the context of climate change, where the urban forest is community asset that can support climate adaptation efforts.

#### 2.6.1.2.1 Recommendations

**Recommendation 35:** Add specific tree planting and replacement requirements into design guidelines for new developments. The Green Bylaws Toolkit (2021) provides examples of how this can be done.

## 2.6.2. Parks

This section will provide an overview of the state of Nelson's parks. The following section will cover forests and more natural stands. Parks and forests are being assessed separately due to the difference in the degree of maintenance and the services they provide. Despite being less naturalized spaces than forest stands, parks still serve as ecological hubs that promote connectivity. Additionally, their provision of recreational and social opportunities for residents makes them valuable community assets. On top of this, the provision of regulatory services, such as stormwater management and localized temperature regulation, can take pressure off engineered infrastructure systems during intense weather events.

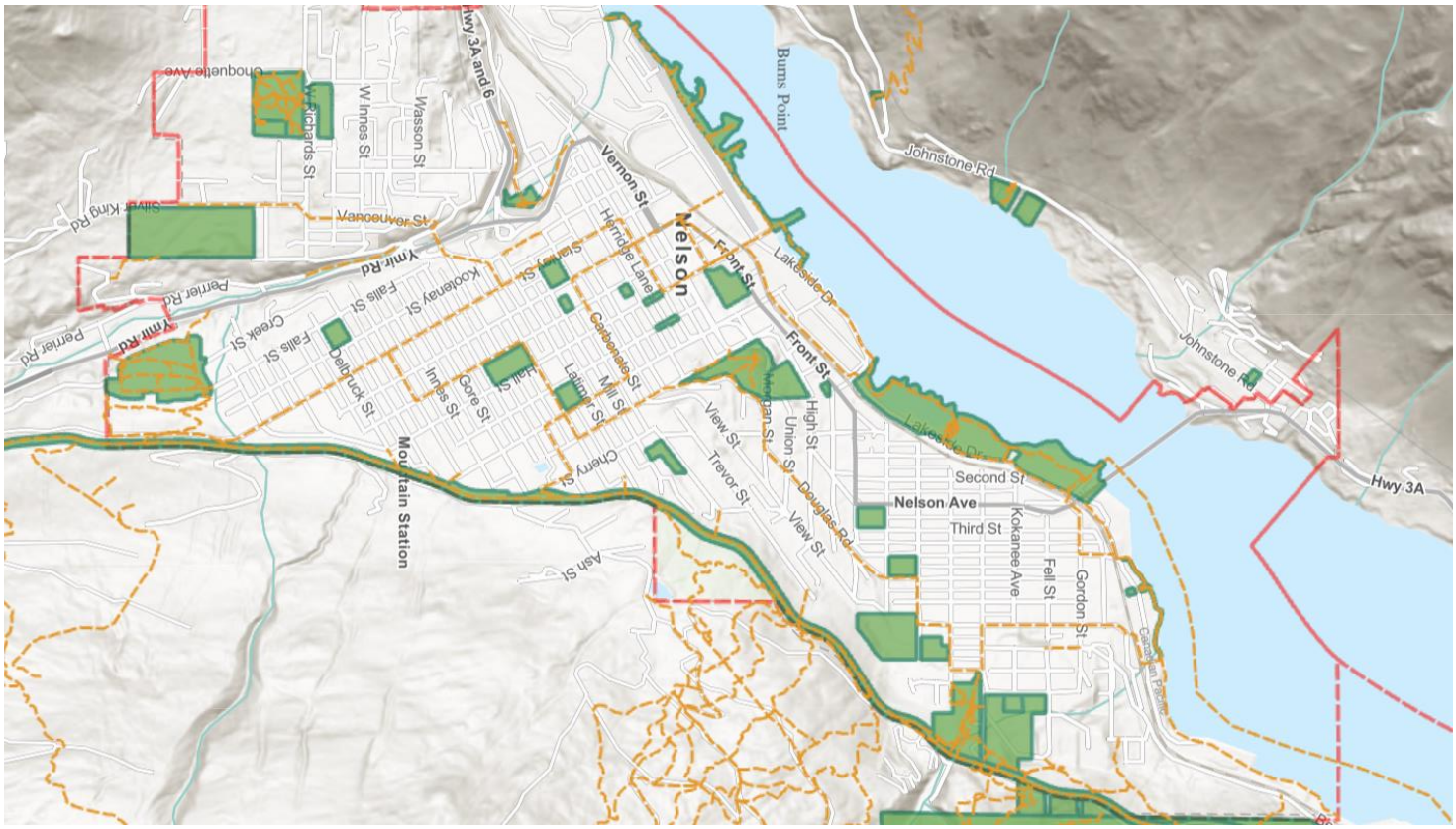



Figure 20. *Image of RDCK Interactive Map with the Trails and Parks and Community Services layers on (RDCK, 2024).*

Below is an overview of the parks listed on the City's Parks page, plus some others. Not all of the parks and community service areas shown in Figure 20 were able to be assessed. Longtime City of Nelson arborist, Peter Steffler, kindly provided some comments on the tree health conditions for the parks listed below.

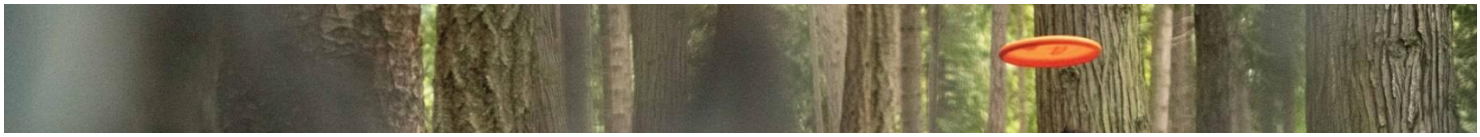


Figure 21. *Image of Art Gibbon Park (Nelson and Kootenay Lake Tourism, n.d.).*

Art Gibbon Memorial Park (also referred to as Rosemont Park): Art Gibbon Memorial Park includes a sizeable and mature, but modified, forest stand. Walking trails, a skateboard park, a bike park, and a 9 hole disc golf course result in high levels of human activity. The non-forested area does not have the best soil conditions for tree growth whereas

the forested area exhibits natural soils that are supportive of the vegetation growing in that section of the park. The only potential downside is that the soils are fairly shallow to the bedrock underneath, making the forest stand more susceptible to drought and disease as climate change progresses. This park is also discussed in the next section on *Forests*.

Figure 22. *Image of Cottonwood Falls Park (Nelson and Kootenay Lake Tourism, n.d.).*

Cottonwood Falls Park: Cottonwood Falls Park exhibits a range of beautiful landscaping features, stewarded by the Nelson Izu-shi Friendship Society. Cottonwood Creek provides beneficial hydrological processes for this park.

Figure 23. *Image of Davies Street Park (Nelson and Kootenay Lake Tourism, n.d.).*

Davies Street Park: Despite having been an industrial site for decades, the trees growing in this park are doing well. At the time of planting, additional steps, such as widening the planting pits, were taken to increase their chances of survival.

Figure 24. *Image of Gyro Park (Tripadvisor, 2016).*

Gyro Park: Climatic extremes, particularly drought, pose a problem for Gyro Park. While climatic extremes affect all aspects of an urban forest, Gyro Park's situation is exacerbated by its geologic reality: shallow soils over bedrock and, on top of that, being located on a rocky outcrop. Trees are lost every year as a result of these more challenging growing conditions. Drought-resistant plant choices are especially important for any new planting in this park.

Figure 25. *Image of I.O.D.E. Park (City of Nelson, n.d.).*

I.O.D.E. Park: I.O.D.E Park, located at the upper end of Hall St., recently underwent some upgrades. These upgrades include regraded crushed limestone pathways, enhanced erosion control through terracing and retaining walls made from park rocks, and new sod to secure additional topsoil. The park now features a variety of new plantings, such as native trees, shrubs, flowers, and grasses as well.

Figure 26. *Image of Lions Park in Uphill (Nelson and Kootenay Lake Tourism, n.d.).*

Lions Park (Uphill): Lions Park in Nelson's Uphill neighbourhood has high quality soils (loamy to silty loam) that are conducive to sustained tree growth. However, despite the supportive growing conditions, tree vandalism has been found to be a problem in this park.

Figure 27. *Image of Queen Elizabeth Park (Nelson and Kootenay Lake Tourism, n.d.).*

Queen Elizabeth Park: Queen Elizabeth Park is primarily intended for baseball use. While there are trees growing around its perimeter, the rest of the park does not contribute to Nelson's urban canopy cover. Nonetheless, it is a permeable surface in the City, which contributes to stormwater uptake.

Figure 28. *Image of Rotary Lakeside Park (Nelson and Kootenay Lake Tourism, n.d.).*

Rotary Lakeside Park: This is a very well-visited park, snaking along the lakeshore. The vegetation growing in this park has ample growing space. There are several mature trees growing along the promenade. These mature trees experience canopy dieback every year, which is to be expected for trees that age. There are other trees, such as the sweet chestnut to the southwest of the bathhouse, that aren't faring as well. As a whole, however, the trees growing in this park are in decent shape. However, there is a possibility that park-wide fertilizer applications may damage tree health in the long run.

Figure 29. *Image of Seventh Street Park (Metcalfe, 2020).*

Seventh Street Park: The soil conditions of Seventh Street Park are not ideal for tree growth. However, the trees in the park were planted accordingly, thereby increasing their chances of survival over the years.

#### *2.6.2.1. Recommendations*

Recommendation 36: Providing educational materials, such as plaques to stick in the ground next to trees to identify the tree species and perhaps the donor if the tree is a memorial tree, has been suggested by residents.

Recommendation 37: Urban forest walks, along streets and park trails, are a low-barrier activity that connect residents to the urban forest and increase their appreciation for and knowledge of it. These walks can be City- or resident-led.

## 2.6.3. Forests

While there are patches of more densely treed areas within Nelson that can be considered forests, they all experience some form of regular human disturbance. Several forest stands within Nelson's municipal boundary were visited. With forested areas, it's important to consider ownership. Not all of the forested areas that were visited overlapped with Parks spaces on the RDCK map. It can be more difficult to enforce certain forest management practices on private land than on public land. Funding can often be a significant barrier against performing forest management on privately-held land.

Local ecologist, Greg Utzig, provided insights on the state, age, and composition of the different stands. You can find the descriptions of each forested area below.

### Forested area next to Nelson Memorial Cemetery Park

The Cemetery Trail that loops through the second-growth forested area gets good use. The disturbance from human activity means that this is a modified environment. It was mentioned that outdoor education programs also make use of this trail. Outdoor education can be a really effective way to boost feelings of stewardship in people.

Overall, the forest stand appears to be in a healthy, seral (intermediate) stage. Some of the larger trees are estimated to be up to 150 years old.

In terms of connectivity, this stand connects fairly directly to Nelson's surrounding forested landscape, only being intercepted by the Rail Trail up above. The forest here has a lot of natural area value, especially in terms of quality of wildlife habitat. Deer and bears, as well as smaller animals benefit from places like this.

The species composition is reflective of the 'Kootenay mix', which comprises species such as Douglas fir, western red cedar, hemlock, lodgepole pine, and birch. Pacific yew grows in this forest as well, preferring the shaded understory. Although not an endangered species, Pacific yew is deemed rare.

Climate change increases the vulnerability of the forest to diseases, infestations, and wildfire. Hot, dry summers increase susceptibility to leaf miners, as trees' natural defense mechanisms are weakened. Cedar and hemlock will likely experience the most stress from climate change, in the form of drought.

Fire is a potential threat to this stand. Fire treatment could involve taking out smaller growth and creating at least 2m of space in between individual tree canopies. In doing so, the bulk canopy density and the ease with which a fire could spread would be reduced. At the same time, opening up the canopy too much could be conducive to fire spread as it allows for wind to pass through a stand more easily. Additionally, opening the canopy up too much can also lead to an increase in understory growth as a result of increasing the amount of sunlight that reaches the ground. This additional growth will then need to be factored into future fire treatment plans. Striking the right balance in preventative approaches would likely be an ongoing process

### Mountain Station

This forest stand hosts a mix of bike and walking trails. The canopy is a bit more open and the topography a lot steeper. Due to the open canopy, there was a lot more groundcover growth. This forested area was more dominated by aspens, with almost no presence of Douglas fir. Like the forest next to the Memorial Cemetery Park, this stand is also strongly connected to the surrounding forested landscape outside of Nelson's municipal boundary.

Cedar grove by Red Sands Beach

There is a trail that leads through this thin, sliver-shaped area suggesting that is also a fairly modified ecosystem due to regular human activity. This stand is dominated by red cedar (*Thuja plicata*). The largest cedars growing in this grove are likely around 150 years old. The proximity to water has likely influenced the cedar dominance, as cedars are a water-loving species.

Art Gibbon Memorial Park (also known as Rosemont Park)

This is a heavily modified ecosystem due to the network of trails and the 9 hole disc golf course nestled in the forest itself. The trees themselves have been modified through the removal of branches lower down on the trunks. This was likely done to prevent discs from getting caught on the branches. There is also very little understory growth, likely due to human foot and wheel traffic.

Red cedar and white pine are the dominant species growing in this stand. As a forest, it is still a valuable wildlife refuge, just more so for species living higher up in the canopy than down on the ground. Art Gibbon Memorial Park is insular (not directly connected to the surrounding forested landscape). Although it's ecosystem service provision is cut off from other forests, it's insular nature makes it that much more of a valuable hub for local biodiversity and contributes to overall habitat connectivity across Nelson.

#### *2.6.3.1. Recommendations*

Recommendation 38: Identify opportunities to subsidize fire treatment costs for private landowners whose property exists just outside of Nelson's municipal boundary. The fire treatment on these properties has a significant influence Nelson's overall wildfire risk mitigation.

# Section 3. Summary of recommendations

## Section 2.1. Geography, ecology, and climate

**Recommendation 1:** Plant climate resilient species that are suited to the projected plant hardiness zone 8 (The Columbia Basin Trusts' *Adapting Community Tree Management to Climate Change* is a good resource to consult).

**Recommendation 2:** Apply FireSmart treatments to the forests surrounding Nelson. This will require collaboration with regional, provincial, and private stakeholders.

**Recommendation 3:** Continue and grow municipal FireSmart program to educate and encourage more residents to take up FireSmart landscaping on their own properties.

**Recommendation 4:** Continue education around water conservation on private property through water storage facilities as well as drought-resistant plant selection to reduce municipal water use.

## Section 2.2. Policies, plans, and strategies

**Recommendation 5:** Consider amending the Municipal Tree Bylaw to protect trees on private property as well as public property.

**Recommendation 6:** Provide clearer specifications for what is considered a 'significant tree'. For example, provide specific diameter at breast height (DBH) measurements or list specific species that are under protection. Establish replacement tree criteria as part of a tree protection bylaw.

**Recommendation 7:** Consider making concrete references to the urban forest in the OCP update.

**Recommendation 8:** Identify priority areas for tree planting, such as along active transportation routes, to contribute to other climate adaptation and mitigation targets.

**Recommendation 9:** Continue exploring the potential for green roofs in Nelson. Any green roof planning should also include considerations for biodiversity benefits, such as establishing connectivity corridors throughout the City. This will require professional ecological expertise.

**Recommendation 10:** Create a heritage tree registrar with geo-referenced datapoints that can be uploaded to Nelson's interactive Heritage map to serve as a visual tool for the City and the public.

**Recommendation 11:** Establish a municipal canopy cover target (30% is considered fairly standard) to work towards over the next 25 years. A more thorough canopy cover analysis will need to be done first to determine the current canopy cover percentage. Hiring an environmental consultant who specializes in urban forest management plans is recommended for this step.

**Recommendation 12:** Consider establishing a tree fund from tree removal permit fees.

**Recommendation 13:** Incorporate minimum soil volume guidelines into landscape design standards for street tree planting via design guidelines.

## Section 2.3. Stakeholders and collaborators

**Recommendation 14:** Collaborate with academic institutions, such as Selkirk College. Explore the potential to integrate further research on Nelson's urban forest into student or other research projects.

**Recommendation 15:** Establish an urban forestry interest group. Survey respondents who were interested in receiving updates about Nelson's urban forest management provided their emails. These contacts could be a

starting point for assembling a group of likeminded individuals who care about the management of the urban forest.

**Recommendation 16:** Create an Urban Forestry webpage on the City of Nelson website to share information with the public.

**Recommendation 17:** Continue engaging with local First Nations, Metis, and non-local Indigenous Peoples to ground Indigenous worldviews in the management of Nelson's urban forest. Indigenous worldviews are grounded in stewardship, which is a perspective that is key to sustainable urban forest management.

**Recommendation 18:** Citizen science groups have had success in supporting urban forest management. These groups can provide continuous data collection services which can be useful in future evaluations of changes to urban forest management practices.

**Recommendation 19:** Consider establishing a municipal urban forester position.

**Recommendation 20:** Local schools could apply to Tree Canada's *Greening Canada's School Grounds Grant* (Appendix B).

## Section 2.4. Local perspectives

**Recommendation 21:** Only a very small percentage (1%) of respondents were under the age of 24. Taking additional steps to engage the younger generation around urban forest management could instill a greater awareness of climate adaptation strategies, such as urban forest management, in each new generation.

**Recommendation 22:** Consider implementing an Adopt-A-Tree program, such as the Village of Kaslo has done. The survey demonstrated that there is interest in increasing planting on private property.

**Recommendation 23:** Consider amending the Municipal Tree Bylaw to protect significant trees on private property as well. There appears to be support for this, making it worth exploring through further community engagement.

**Recommendation 24:** Respondents expressed the most interest in learning more about pest, disease, and wildfire risk management. Hosting a collective workshop on these topics might be worthwhile, whether internally or with the support of a consultant or other knowledgeable organization.

**Recommendation 25:** Promote reduction of bear and wildlife attractants via WildSafeBC resources (Appendix A).

## Section 2.5. Economic valuation and resources

**Recommendation 26:** Consider carrying out a willingness-to-pay survey to assess residents' willingness to have their taxes increased in order to increase the budget for urban forest management. Willingness-to-pay surveys have been a part of urban forest strategy engagement for several BC municipalities, such as the Township of Langley.

**Recommendation 27:** Consider hiring a consultant, such as the Municipal Natural Assets Initiative, to carry out a financial natural asset assessment of Nelson as a whole or specifically of the value of its urban forest.

## Section 2.6.1.1.2. Boulevard trees

**Recommendation 28:** Increase tree age and size diversity via consistent new and replacement tree planting.

**Recommendation 29:** Develop a long-term planting plan to increase street tree species diversity of the downtown area.

**Recommendation 30:** Carry out street tree inventories of the rest of Nelson's neighbourhoods to better understand the species and structural diversity of those areas.

**Recommendation 31:** Develop a heritage tree registrar to better track the health and location of these trees

**Recommendation 32:** Carry out a City-wide boulevard tree inventory to better understand species and structure distribution on a municipal scale. To accomplish this, the City could think about the different stakeholder and collaborator groups who might be able to help out with this.

**Recommendation 33:** Track all new plantings and removals. It is also recommended to log the coordinates of new and removed trees using software such as Fulcrum or Esri to make the management of this asset more robust.

**Recommendation 34:** Prioritize young tree structural pruning to ensure stronger limb growth into maturity. This can reduce risk related to tree limb decay and damage throughout a tree's lifetime.

### Section 2.6.1.2.1. Private trees

**Recommendation 35:** Add specific tree planting and replacement requirements into design guidelines for new developments. The Green Bylaws Toolkit (2021) provides examples of how this can be done.

### Section 2.6.2.1. Parks

**Recommendation 36:** Providing educational materials, such as plaques to stick in the ground next to trees to identify the tree species and perhaps the donor if the tree is a memorial tree, has been suggested by residents.

**Recommendation 37:** Urban forest walks, along streets and park trails, are a low-barrier activity that connect residents to the urban forest and increase their appreciation for and knowledge of it. These walks can be City- or resident-led.

### Section 2.6.3.1. Forests

**Recommendation 38:** Identify opportunities to subsidize fire treatment costs for private landowners whose property exists just outside of Nelson's municipal boundary. The fire treatment on these properties has a significant influence Nelson's overall wildfire risk mitigation.

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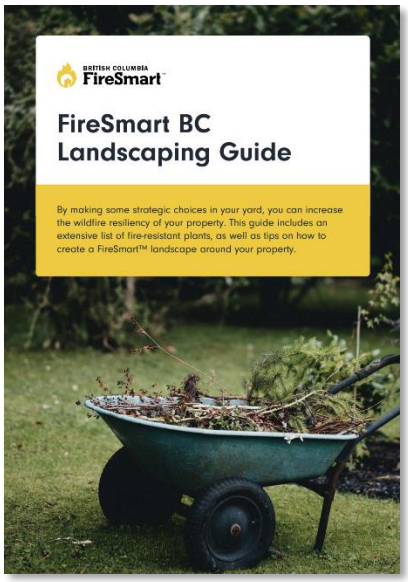
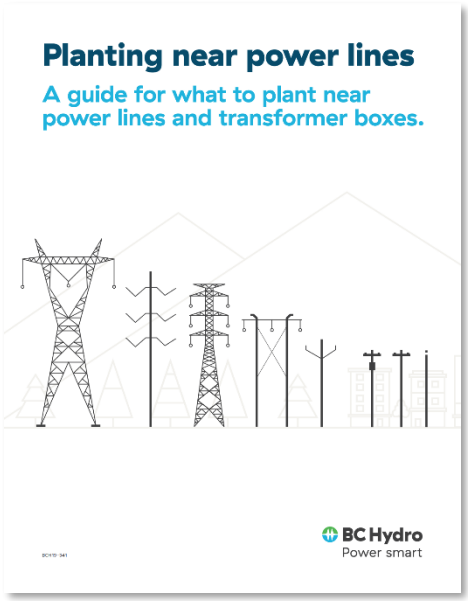
# Appendix A: Planting guidelines info sheet

*Where* and *what* to plant are perhaps the most foundational questions in urban forestry. In Nelson, urban forest management has to exist within various "spheres" that each have their own planting and landscaping guidelines. Some major spheres include FireSmart, power line safety, wildlife awareness, and climate resilience. Below is a snapshot of some of the main considerations from each of their guidelines. Each image is linked to the respective document.

## FireSmart

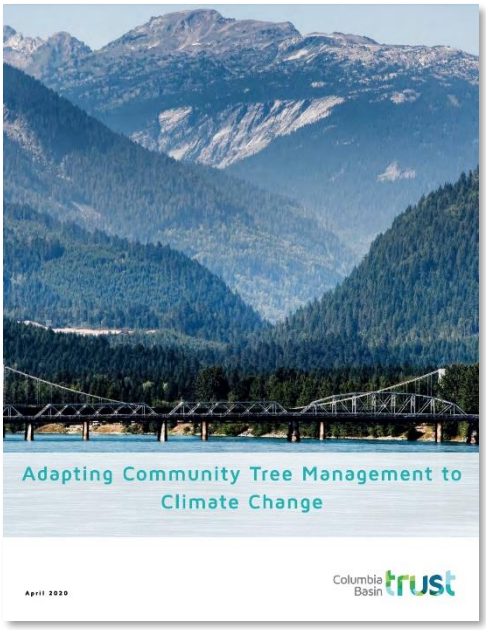



## Power line safety




## Wildlife awareness


## Climate resilience



# Appendix B: Urban forest grant options

Growing Canada's Community Canopies (GCCC) grant provided by the Green Municipal Fund (GMF) is funded through the Government of Canada's 2 Billion Trees program. GCCC funding addresses common barriers to urban canopy expansion, such as insufficient staff capacity, knowledge gaps, and financing. They offer funding for tree planting projects and strategic planning projects. The tree planting funding has two application windows: from now until July 12, 2024 and again from July 13 to October 15, 2024). Successful applicants of tree planting funding will also be eligible to receive urban forest coaching. Planting would begin in Spring 2025 or Fall 2025, respectively. The strategic planning funding will become available in Winter 2025.

Tree Canada's Greening Canada's School Grounds grant offers up to $10,000 to cover the cost of buying and planting trees and shrubs, site preparation, tree maintenance, planting materials, and developing educational materials. Funding is available to a range of educational institutions, such as elementary or primary schools, high schools, universities, colleges and training centers across Canada. Grant applications open in early October and close in early December. Successful applicants will be notified the following March.

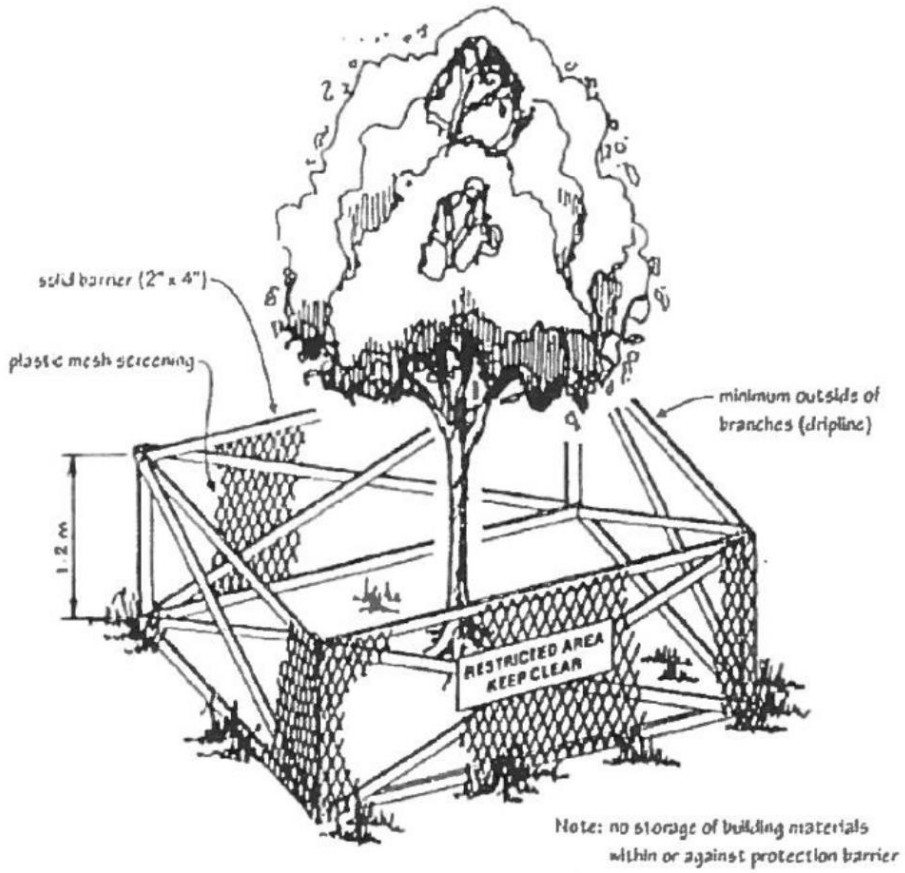
Tree Canada's Edible Trees grant offers up to $10,000 to cover the cost of buying and planting edible trees and shrubs, site preparation, tree maintenance, planting materials, and developing educational materials. Funding is available to educational institutions, Indigenous communities, community groups or gardens, food banks, community housing projects, municipalities, or other groups interested in planting edible trees on publicly accessible sites. Grant applications open in early October and close in early December. Successful applicants will be notified the following March.

Tree Canada's Treemendous Communities grant offers up to $10,000 to cover the cost of buying and planting trees and shrubs, site preparation, tree maintenance, planting materials, and developing educational materials. Funding is available to a range of projects including heat island mitigation projects, biodiversity corridors, stormwater retention, invasive species control, riparian planting, park and street tree plantings, and more. Canadian municipalities, Indigenous communities, business improvement associations, non-profit organizations and community groups are eligible to apply. Grant applications open in early October and close in early December. Successful applicants will be notified the following March.

Tree Canada's National Greening Program for landowners supports tree planting on private property where there is a need for forest rehabilitation, afforestation, or ecosystem restoration. Detailed information on property eligibility can be found via the link.

Tree Canada's Operation ReLeaf provides funding to municipalities, Indigenous communities, and environmental organizations to support tree planting in areas that have experienced significant tree loss from natural disasters and the effects of climate change.

# Appendix C: Example of a tree protection barrier classification system (City of Surrey)




Tree Protection Barrier

Tree Protection Distance Table

| Trunk Diameter (cm) | Minimum Protection Req'd Around Tree (distance from trunk in metres) |
|---|---|
| 20 | 1.2 |
| 25 | 1.5 |
| 30 | 1.8 |
| 35 | 2.1 |
| 40 | 2.4 |
| 45 | 2.7 |
| 50 | 3 |
| 55 | 3.3 |
| 60 | 3.6 |
| 75 | 4.5 |
| 90 | 5.4 |
| 100 | 6.0 |

Tree Protection Barrier Detail

Source: *City of Surrey (2006)*

# Appendix D: Silva Cells

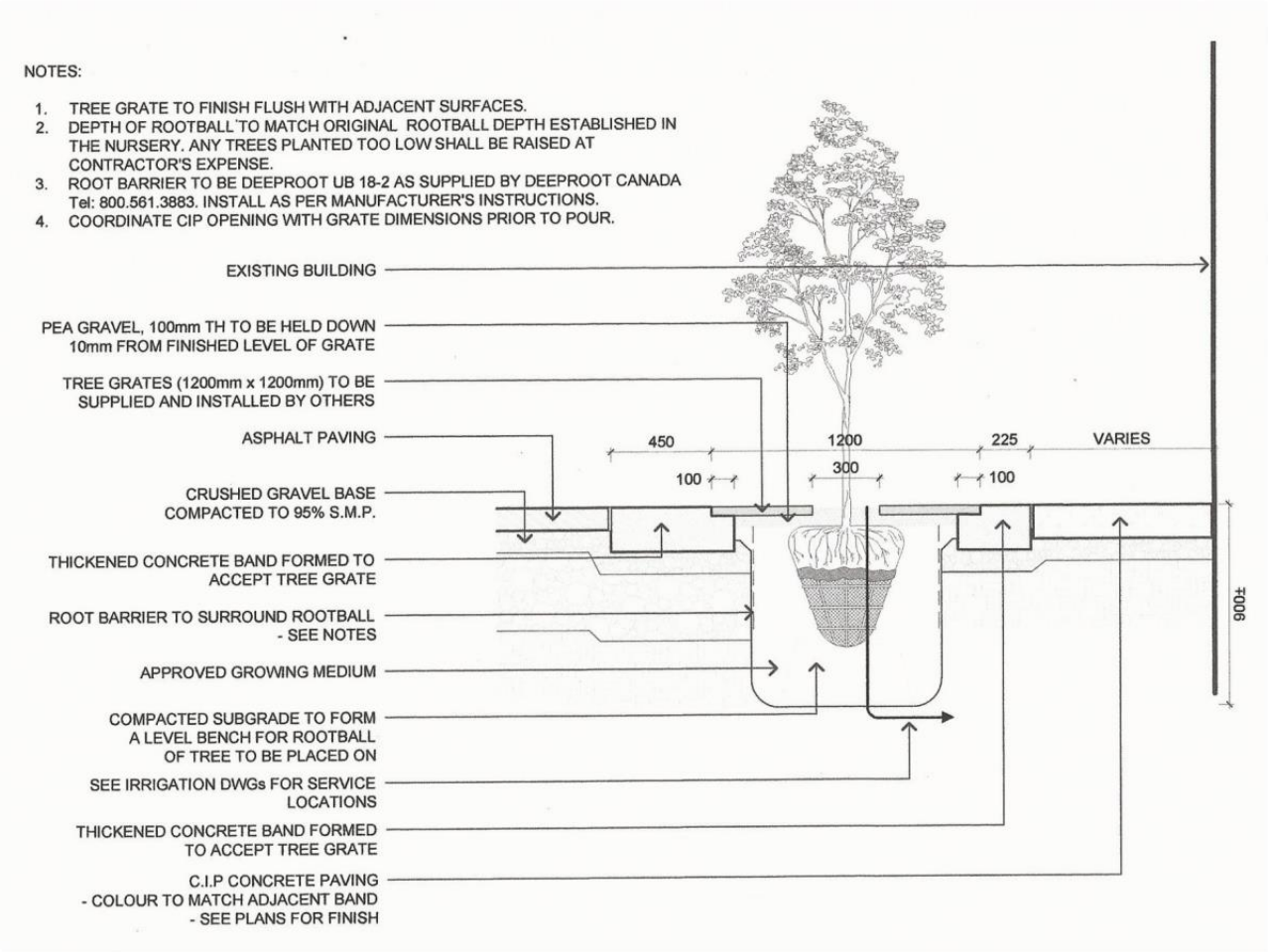



**Figure 50: Hall Street design plan for tree grate finish design with DeepRoot barrier system to be augmented by a Silva Cell-Type System (MMM Group, 2015)**



Hall Street design plan for tree grate finish design with DeepRoot barrier system to be augmented by a Silva Cell-Type System. Source: City of Nelson Downtown Urban Design Strategy (2017).

# Appendix E: Diagram of suitable tree planting locations depending on urban setting

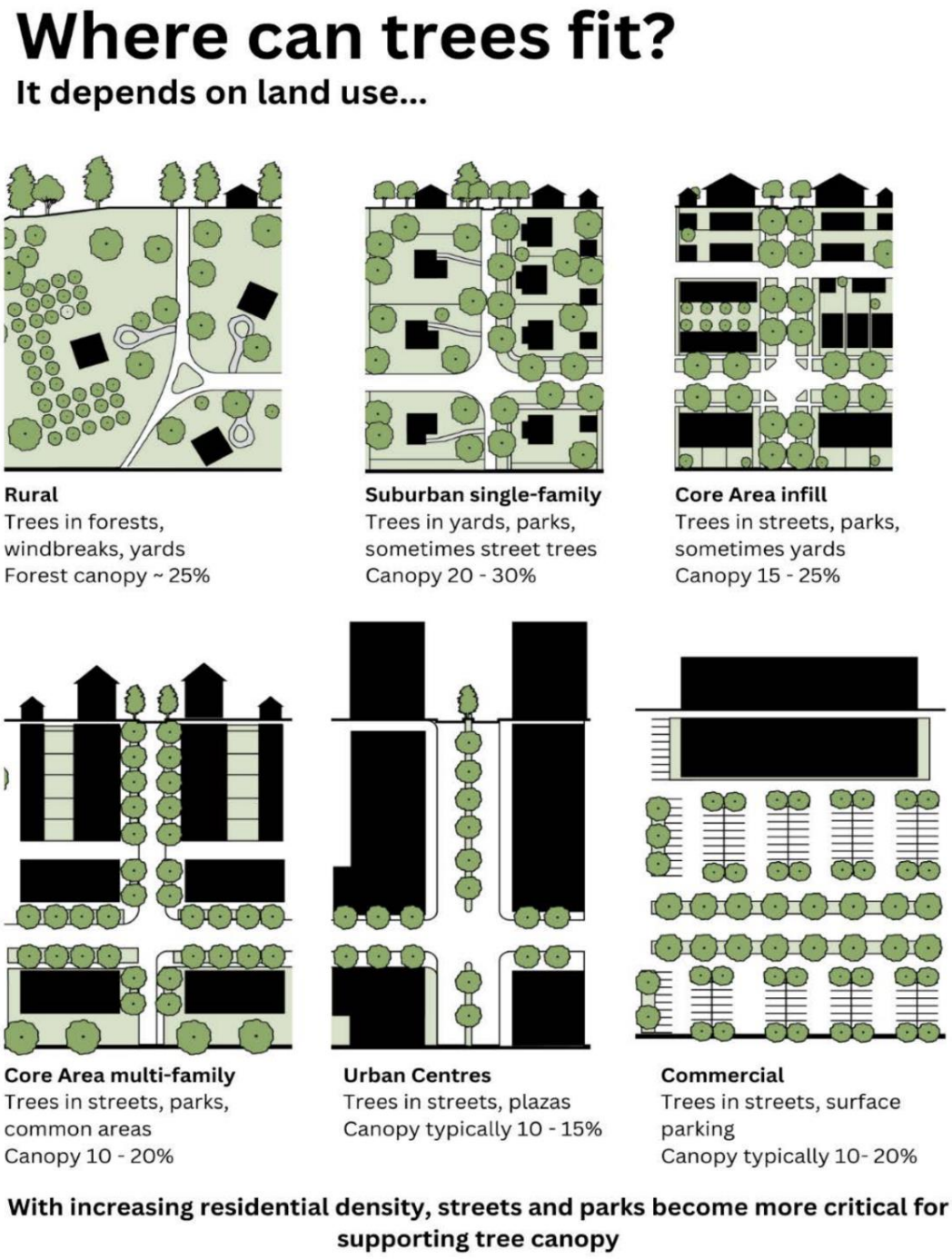



Figure 19. Appropriate tree location and canopy coverage based on different land uses.

Source: *Kelowna UFS Draft (2024)*

# Appendix F: Suggestions for utilities and street tree arrangements

Figure 1: Move underground utilities under bike lanes

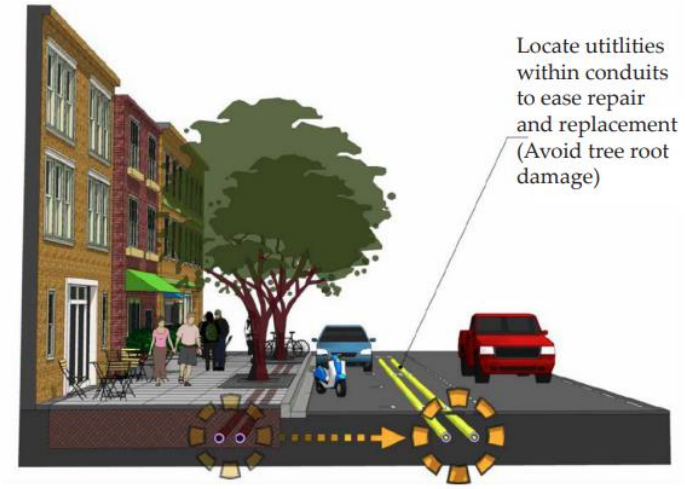



Figure 2: Move underground utilities under sidewalk, move trees into road bumb outs


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

Source: *Cullington (2008)*