

City of Prince George
Tree Protection
Bylaw No. 6343, 1995

Rationale and Recommendations for Updates

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Executive Summary

Over half of the world's population lives in cities, and this number is expected to grow. Increased rates of urbanization present unique challenges to local governments attempting to balance new residential development, viable infrastructure, and climate change. Municipalities have the power to create bylaws that regulate land use. The City of Prince George's Tree Protection Bylaw No. 6343, 1995 was enacted to "allow the local government to prohibit and/or regulate" tree removal. Despite its title, this bylaw contains many limitations and shortcomings with regard to tree protection. Examples of tree protection bylaws and programs from other jurisdictions in North America will be explored in this report and recommendations will be made.

Trees can be found all through the city, yet not all trees have equal protection under this bylaw. The Protected Areas in the current bylaw need to be expanded to protect trees within more riparian areas and all development zones. Expanding the application of the bylaw is important for retaining the urban canopy and maintaining the health of the citizens and ecosystems of Prince George.

The list of recommended tree species to replace/plant in Prince George does not correlate with the local climate, and even includes some invasive species. The absence of human benefits from green infrastructure is noticeable in the bylaw and must be amended. The growing population of Prince George must be reflected in the city's bylaw and landscape. The bylaw's language needs to reflect the many values that trees provide and truly advocate for urban forest health.

Recommendations

Recommendation	Actionable Item	Supporting Information
Catalogue the extent of the Prince George urban forest for more effective urban planning	<i>Use remote sensing data, citizen involvement, or other methods to create an inventory of all trees within Prince George.</i>	Page 7
Identify sensitive areas throughout the city, including private property.	<i>Implement a city wide biological survey with relevant professionals.</i>	Page 9
Protect potentially sensitive areas in new developments in the city.	<i>Require biological surveys for new development to identify important ecosystem services.</i>	Page 9-10
Protect urban wildlife and maintain tree health.	<i>Implement seasonal restrictions on all tree removal within city limits, including private property.</i>	Page 10, 16
Protect and manage the entirety of the urban forest of Prince George.	<i>Expand section 4.1 to include all land use zones in the city, including on private property.</i>	Page 10-11
Update the Recommended Tree List with certified arborists and City planners	<i>Take time and care to create a well tailored Recommended Tree Species List to Prince George with certified arborists and City planners.</i>	Page 13-15
Add a Tree Care section to the Bylaw to include seasonal maintenance and tree retention through the care of certified arborists	<i>Work closely with arborists to expand how a Tree Care section in the Bylaw for Prince George would look to include active seasonal maintenance and tree retention followed through by certified arborists.</i>	Page 15-16
Recognize Prince George as an urban heat island (UHI).	<i>Make proactive steps in providing resources to Prince George residents. This includes</i>	Page 17-18

	<i>expanding the tree canopy cover.</i>	
Acknowledge how increased greenspace and green infrastructure will impact the physical and mental health of residents.	<i>Reduced stress and improvement of social contact are reported to increase for residents of cities with diversified green infrastructure. Consider how updating the tree protection bylaw will aid in the health of residents.</i>	Page 18
Maintain or increase the current level of urban forest canopy	<i>Implement local policy surrounding development that holds developers accountable for replanting trees that were removed through a two-for-one tree replacement requirement</i>	Page 18-20
Implement local policy and relevant professionals to track and utilize collected funds for reimbursement or redistribution.	<i>Require a security deposit for the replacement of trees and their maintenance. Where a tree cannot be replaced on the property, require cash in lieu, with the money going towards the planting and maintenance of city trees.</i>	Page 18-20
Require consultation with professionals with horticulture, planting design, and arboriculture expertise to review significant development applications.	<i>Hire a recognized arborist for the city with relevant professional experience to assess significant development applications.</i>	Page 18-20
Develop procedures for ensuring that tree protection and management bylaws are enforced.	<i>Encourage collaboration and education with community members and arborists to ensure bylaws are enforced effectively.</i>	Page 18-20
Ensure accessibility of the Tree Protection Bylaw in order to increase adherence to the bylaw	<i>Make the bylaw available in languages other than English or French (Carrier/Dakelh, Punjabi, German, Tagalog, etc.)</i>	Page 23

Introduction

Over half of the world's population lives in cities and this number is expected to grow. Increased rates of urbanization present unique challenges to local governments attempting to balance viable infrastructure, services, affordable housing, and climate change. Once a city is built, the land use patterns and physical form can remain for generations. This can lead to unsustainable sprawl if long-term strategic planning is not implemented properly. Ecological, social, and economical values relating to the city must be considered.

The City of Prince George Tree Protection Bylaw No. 6343, 1995 (henceforth “Tree Protection Bylaw”), as its title suggests, alleges tree protection. However, as this report will point out, the bylaw is ill-equipped to achieve this objective. Currently, the bylaw is anthropocentric (i.e., human-focused); the legislation is primarily a guide on how to cut trees within Prince George rather than a policy for tree protection though it could be misinterpreted that policies guiding ‘responsible extraction’ of resources (the trees), is a form of protection. As the realities of climate change become clear with climate disasters increasing in intensity, frequency and unpredictability, climate change, its effects, how to mitigate and adapt to these effects, can no longer be an ‘afterthought’ for modern day policy and policymakers. By extension, Prince George’s trees can no longer be viewed from the anthropocentric lens that is evident in the current Tree Protection Bylaw. Instead, policy based on ecocentric values is essential for greenhouse gas emission reduction, ecosystem health and human health. It is also important for those with business interests: “Ecocentrism is important for natural resources sustainability as it has a wider scope and also long-term and future effects toward the natural environment.” (Humaida 2020) Herein lies the motivation and intended purpose of this report. Bylaws desperately need to “reflect the interconnected and combined realities of social and ecological systems” (Earley 2022) which must be done by integrating ecological values with policy language that reflects these values.

Through review of the Tree Protection Bylaw and secondary research (peer reviewed academic sources, grey literature, and case studies), this report highlights some of the limitations of the Prince George’s Tree Protection Bylaw and offers suggestions that will see the bylaw succeed in tree protection for the betterment of the city. We start by defining the urban forest and

its importance to city planning. We then identify the need for an expansion of the area affected by this bylaw, followed by the importance of tree retention and replacement species regulation. We then explore the benefits of tree retention and regulation to urban liveability. Tree protection bylaws and other tree protection strategies in other jurisdictions are explored. Lastly, the language of the existing tree protection bylaw is reviewed and compared to bylaws in other jurisdictions. This report can serve as a reference for policy makers when reviewing the Prince George Tree Cutting Bylaw as well as the Official Community Plan.

The Urban Forest

The urban forest is the complete collection of all trees, on public and private property, in an urban area (4TH SPACE Concordia University, 2020). The urban forest influences many things in an urban environment, providing habitat, enhancing quality of life, and performing innumerable ecosystem services for the city, such as cooling (Fuller et. al. 2022), flood mitigation (Tourbier 1994), air filtration (Grote et. al. 2016), and carbon sequestration (Dyson et. al. 2019). These services save the city money through disaster mitigation, most notably from floods and fires¹. While many trees in the urban forest are on city land, along streets and in parks, almost half of the urban forest is on private property (Concordia University 2020). This integral part of the city's ecology and infrastructure is omitted by the bylaw in its current form, which limits the government's understanding of the city's function. Because of the importance of the urban forest to the city, all trees in the urban forest should be catalogued and managed by the city². This city involvement would allow for more intelligent infrastructural planning, as well as the ability to monitor ecosystem health within the city. A catalogue of the complete urban forest can be done through LIDAR technology (Münzinger et. al. 2021), citizen involvement (Concordia University 2020), or other methods.³

¹ It is estimated that in 2020, \$2.4 billion was paid in insurance costs related to natural disasters (BIV Staff, 2021). These costs will only increase with the effects of climate change.

² There has been extensive research into the benefits of city involvement in the urban forest, described in *The Urban Forest: Cultivating Green Infrastructure for People and the Environment*, by Pearlmutter et. al. (2017).

³ Other cataloguing methods, while potentially more extensive and accurate, tend to be more invasive, entailing city trespass on private property. More information can be found in "Conducting Urban Ecology Research on Private Property: Advice for New Urban Ecologists," by Dyson et. al. (2019).

One of the major knowledge gaps in Prince George government is the lack of information about the urban forest. There is minimal information about the urban tree canopy cover, the species composition, the age distributions of trees, growth and death rates, and the rate of tree removal. This limits effective urban tree management. The number of Tree Protection Bylaw permits issued is not a comprehensive source. The Canadian Forest Service and the UBC Faculty of Forestry recommend the following basic model (Figure 1) to determine the value of the urban forest (Hotte et al. 2015). The specific criteria and indicators of this model could be developed by local foresters, arborists, and city planners within Prince George.

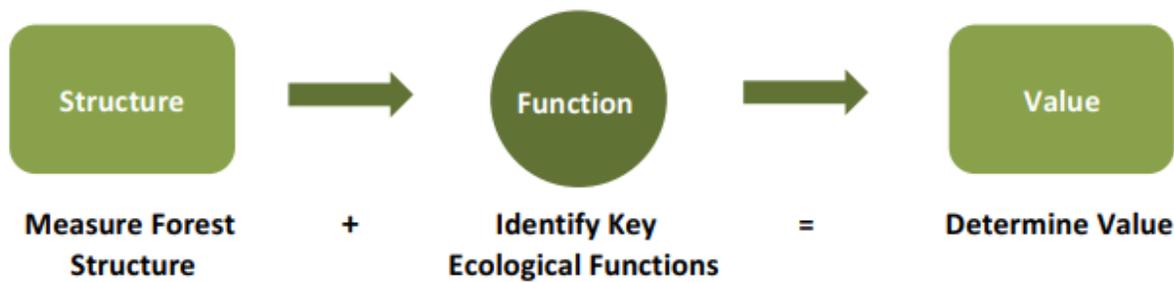


Figure 1. Basic model used to determine the value of the local urban forest. (Hotte et al. 2015)

A shift from managing individual city trees to managing urban forests is required to reap the large-scale, social and ecological benefits of trees in Prince George.

Expansion of affected areas

The expansion of areas affected by the tree protection bylaw is vital to human and ecosystem health, and natural biodiversity in and around Prince George. Application of tree protection throughout Prince George is important for maintaining ecosystem health, the retention of the urban canopy, and the health of the citizens of Prince George.

Riparian Areas

Riparian zones⁴ are among the most biodiverse ecosystems on earth, yet only make up around two percent of the earth's surface (Albert et al. 2020). Riparian zones are also disproportionately chosen for human development, and are consequently critical areas to conserve (Warren et al. 2015). Revision of protected areas to include more riparian areas in the tree protection bylaw will greatly reduce the negative effects urbanization has on freshwater ecosystems. Currently, under the City of Prince George Bylaw No. 6343, riparian areas are protected in agricultural, outdoor recreation, and low-density residential developments,⁵ as well as commercial, industrial and institutional developments.⁶ The bylaw does not protect trees within higher density developments, where the effects of tree removal are amplified (Nyelele et al. 2021) and where the largest portion of urban expansion is seen. Moreover, protected riparian areas which are independent of the bylaw largely fall outside of Official Community Plan planned development areas (see Appendix A), which raises concerns about other sensitive riparian zones that may be within planned development areas. Implementing restrictions on tree removal in urban areas and on private property will reduce the effects caused by deforestation and improve quality of life for the citizens of Prince George while also lowering the environmental impact of urban expansion.

Riparian areas are very vulnerable to change. Changes in water flow can greatly impact the ability for these systems to function in their ecosystems. Some changes caused by urbanization that have been recorded are the reduced ability for trees to retain water throughout the summer (Solins et al. 2020), and the reduced reproduction of plants in riparian environments (Warren et al. 2015). Trees have been recorded to lose more water throughout the summer months in areas of urban development, due to the decrease in soil capacity for water retention (Solins et al. 2020). This is caused by deforestation, as well as an increase in impermeable surfaces such as asphalt and roofs, which in Prince George is largely housing developments. This decrease in available water can create drier forests, which increases wildfire risk. The decrease in

⁴ Riparian zones are defined by the Government of Canada as “the strip of moisture-loving vegetation growing along the edge of a natural water body” (2020). This includes areas surrounding creeks, rivers, lakes, wetlands, etc.

⁵ The bylaw protects trees within 15 meters from the top of bank within these areas. Low density residential development refers to developments of 17 or less units per hectare.

⁶ The bylaw protects trees within 30 meters from the top of bank within these areas.

water retention causes greater runoff into existing channels, increasing flow, which not only causes accelerated erosion, but can also prevent native plants from reproducing in these systems. Many plants reproduce through waterways, and this reproduction is hindered through increased flow (Warren et. al. 2015). This increased flow can therefore decrease plant cover, further increasing erosion in these areas, and reducing soil water retention. Often, invasive plants can take advantage of this well, which can cause biodiversity loss in these ecosystems. Regulating tree removal and therefore retaining tree coverage will reduce these effects, improving biodiversity and ecosystem health, as well as creating a safer, more climate resilient city.

Intact riparian areas also provide many services to the city (figure 2), including stormwater management (Tourbier 1994), cooling (Fuller et. al. 2022), and forest fire protection (Fairfax and Whittle 2020). It should also be considered that restoration of riparian ecosystems is much more challenging than maintenance of these ecosystems, and that the more forested and riparian environments that are left intact, the more effective the ecosystem services provided will be (Bateman et al. 2014). More protection for trees within any riparian areas within the City of Prince George should be a priority for the review of this bylaw.

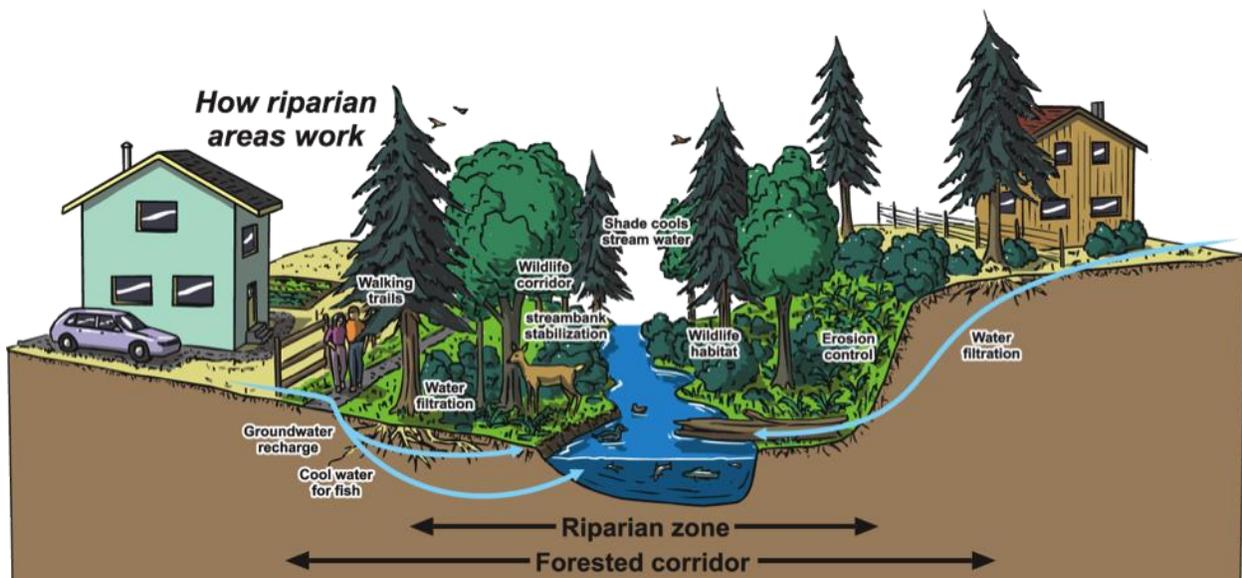


Figure 2. This graphic shows the various services provided by intact riparian areas, including groundwater recharge, erosion control, and cooling. One other effect not shown here is flood water mitigation. Image from <https://www.pngkit.com/bigpic/u2q8y3u2i1a9e6u2/>

Private Property

One of the most significant limitations of the Tree Protection Bylaw is the scope of ‘Protected Areas’ (s. 4.1). These protected areas are primarily outside of developed areas and areas of planned development. This is very limiting given the tree canopy that exists within other zones, including street boulevards and yards. The protections within the bylaw should extend across the entire jurisdiction of the city, including private property.

The expansion of the bylaw into private property would not set precedent for local government involvement on private property. Under section 8 of the Community Charter, the local government has the fundamental power to impose requirements that protect the natural environment and public health. The City of Prince George has many provisions within its bylaws that dictate what can or cannot happen on private property (Zoning Bylaw No. 7850 – City of PG 2007) and there are other cities in North America that legislate private tree protection (see Community Profiles section).

Urban trees provide many ecological and social benefits to the local community. Because the collective urban forest adds value to the lives of citizens, the collection of trees that make up the forest should be better protected. The bylaw should extend into private property because trees provide benefits to the community as a whole. Kapinsky suggests that conservation of urban trees can only be gained through collective action (2015). Local community groups and ENGOS have led the charge in other jurisdictions by implementing tree protection programs (see Winnipeg in Community Profiles section); however, leadership from local government is a crucial enabler of action. The concept of the urban forest and its value must be supported by institutionalized processes within local government (Burch 2010). Strong leadership that supports the health of the urban forest will eventually lead to a paradigm shift and foster innovation within the government structure. As Burch notes, this leadership should not replace public participation, but it should “push the municipality in a policy direction that benefits the greatest proportion of individuals” in the city (2010).

The bylaw’s application area needs to cover the entire city because the value and services derived from individual trees on a piece of property do not exclusively benefit the property owner. The individual trees that make up the urban forest improve air quality, reduce noise

pollution, sequester carbon, and provide many other values to all residents. The values described above are often external from the market and undervalued, though research and innovation are ongoing to monetize urban forest services (Hotte et al. 2015). One example of the commodification of urban forest function is the “moderation of the urban heat island effect” (Hotte et al. 2015). The shade and microclimate regulation provided by municipal trees reduces building energy use (air conditioning), resulting in lower energy bills. Trees boost the aesthetic quality of neighbourhoods and thus increase property values (Hotte et al. 2015). This is another reason all trees within the city limits need to be included in the bylaw’s application area. The Tree Protection Bylaw’s protected areas (s. 4.1) should be expanded to include all zones under the zoning bylaw.

Tree Retention and Replacement

The urban forest is an exceedingly complex socio–ecological system that presents many management challenges. Although tree planting and natural regeneration are occurring in cities, net tree cover is on a general decline in urban areas (Lavy & Hagelman 2019). In the United States, it is estimated that 4 million trees are lost each year in urban areas (Nowak & Greenfield 2012). The rates of deforestation and new development differ substantially from the ecological processes of urban forests and trees (Lavy & Hagelmann 2019), which is important to consider in long-term strategic planning. Trees take much longer to grow than houses do to go up.

As development occurs within the forested interior of British Columbia, tree cover will decrease to make space for development. Urbanization, specifically the development of new residential neighbourhoods, will alter the tree cover of Prince George. As tree cover changes, so will the associated ecosystem services and their effects on the environment and human health (Hotte et al. 2015). The inclusion of tree retention objectives in future residential development is important for the continuation of current benefits gained from the tree canopy. Tree canopy goals, such as a minimum percent cover by neighbourhood, should be established by a suite of professionals (arborists, foresters, biologists, engineers, and planners) alongside City Council and Staff.

Defining Replacement Trees

In the Tree Protection Bylaw (City of Prince George 1995), a replacement tree is defined as such: “any tree required to be planted, pursuant to this Bylaw, to replace a tree cut down in contravention of this Bylaw.” There is no regulation of species type for replacement trees; there is, however, a tree replacement/planting recommendation list to act as a guide under the Trees and the Urban Forest section on the City of Prince George website (Trees and the Urban Forest | City of Prince George, 2017). While the tree recommendation list does include and recommend some native tree species, it includes many Eastern Canadian and United States variety trees that do not correlate with Northern BC’s climate and includes invasive species, such as Russian Olive⁷ (Invasive Species Council of BC).

This report acknowledges Prince George’s urban environment as one that requires resilient trees to withstand salting in the winters, stand as wildfire barriers, bear resilience and pest resistance. Although these are important factors to consider when choosing a tree recommendation list, this list should highlight Northern British Columbia native tree species as a priority to promote native biodiversity within the urban setting. Tables 1 & 2 below are recommended starts of the revision of the PDF document table provided by the City of Prince George for recommendations of the replacement and planting of trees (Boulevard, Residential or Natural Areas Recommended Tree List 2019); included in Tables 1 & 2 are non-invasive trees and a few native trees that are coniferous/evergreen and shade/ornamental which should be added to the Tree Recommendation List for the updated Tree Protection Bylaw.

It is recommended for the benefits of Prince George to implement a list of adequate tree species selection under Section 11 of the Tree Protection Bylaw to suit the urban environment setting and mitigate urban environmental issues accordingly. Tree species can be selected to create “nature-based solutions” for unique issues that can arise (i.e., creating tree canopies to offset urban heat islands, wildfire protection, flooding, etc.) (Amini Parsa, Salehi, & Yavari 2020). Tree species can be selected for the urban environmental setting of Prince George to not just be ornamental, but to also serve functional purposes (Amini Parsa, Salehi, & Yavari 2020).

⁷ On the Invasive Species Council of BC website (Invasive Species Council of BC), there are dedicated pages to invasive plant species within British Columbia. This website provides lists of alternative plant options as well.

Revisions done in consultation with certified arborists on City staff and City planners are highly recommended.

Table 1. Evergreen/Coniferous tree species recommended for planting in Prince George, BC.

Latin Name/Common Name	Area of Recommended Planting⁸	Salt Tolerance	Bear Resistance
Subalpine Fir <i>Abies lasiocarpa</i>	N, R	Low	High
Rocky Mountain Juniper <i>Juniperus scopulorum</i>	P, R	Low	High
Weeping Larch <i>Larix decidua</i>	P, R	High	High
Siberian Larch <i>Larix decidua</i>	N, R, S	High	High
White Spruce <i>Picea glauca</i>	N, P, R	High	High
Douglas Fir <i>Pseudotsuga menziesii</i>	N, R	Low	High

Table 2. Shade/Ornamental tree species recommended for planting in Prince George, BC.

Latin Name/Common Name	Area of Recommended Planting⁷	Salt Tolerance	Bear Resistance
Red Maple <i>Acer rubrum</i>	B, R	Low	High
Paper Birch <i>Betula papyrifera</i>	N, R	Medium	High
Weeping Birch <i>Betula pendula</i>	B, P, R	Low	High
Butternut <i>Juglans cinera</i>	B, R, *	Medium	High
Swedish Columnar Aspen <i>Populus tremula</i>	B, N, R	Medium	High
Linden sp. (various)	B, P, R	Medium	High

⁸ B - Boulevard N - Natural Area P - Planter/Small Yard R - Residential * - Bowl Area/Sheltered Site

Elm <i>Ulmus Americana</i>	B, R	Low	High
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Tree Care

Tree maintenance and care is often underfunded in municipalities and is regularly one of the first cuts to operating budgets (Vogt, Hauer, & Fischer 2015). Maintaining the health of urban trees through proper care facilitates a network of the urban environment/ecosystem and is important for establishing a thriving community of not only humans, but wildlife as well (Elmendorf 2008). An area that is touched on in Section 8 of the Tree Protection Bylaw (City of Prince George 1995) is the removal of trees that are considered to be damaged, dead and nuisances, however, there are reasons that an arborist may want to remove trees from an area based on assessment. Tree removal should be regulated differently according to season. This regulation is critical for ecosystem health and strength in urban environments. Birds, for example, rely on trees for nest building and reproduction, and trees within the urban environment are especially important for resident birds in North America, where the majority of birds live in open forested environments, a habitat that can be provided by urban forests (Valiela et. al. 2007). In the Northern Rockies nesting zone, in the middle of which Prince George finds itself, nesting time is from late April to mid-August (Government of Canada 2018). Tree cutting during this period can have drastic effects on bird populations. In fact, resident bird species in the United States and Canada dropped by 30% between 1966 and 2005⁹ due largely to habitat loss from land use changes and urban development (Valiela et. al. 2007). It is therefore important to regulate and conserve all trees in the urban environment to ensure habitat continuity for ecosystem health.

Ensuring the protection of the urban canopy and environment goes beyond arborist upkeep. Under the Trees and the Urban Forest section of the City of Prince George’s website, it is stated that , “herbicides can ... damage or kill trees, as trees are just larger versions of broad-leaved weeds. Never use herbicides in hot weather or apply under a canopy” (2017) The website also states: “keep trees healthy by keeping grass away from the tree base. It reduces root

⁹While resident bird species populations in the United States and Canada dropped by 30% between 1966 and 2005, the population of migrant bird species between the United States and Canada dropped by 19%. In contrast, the population of neotropical migrant bird species increased by 20%. This shows that development in northern regions is more consequential to bird species health than development in southern regions (Valiela et. al., 2007).

compaction from mowers, eliminates the chance of damage from string trimmers, and reduces competition for water and nutrients.” If the Trees and Urban Forest section of the City of Prince George state these on their website, tree care should be an additional section of the Tree Protection Bylaw to allow for the regulation of tree care and maintenance as seen fit by certified City staff arborists.

Urban Liveability

Understanding the human benefits to urban green infrastructure and greenspaces is crucial for a reassessment and improvement of the Tree Protection Bylaw. The absence of urban liveability and human benefits from green infrastructure is noticeable in the bylaw and should be amended. It is expected that 2.5 billion or more people will reside in cities by 2050 (Weber & Schneider 2021). As the capital of Northern British Columbia, there is a responsibility to consider how this steady migration will impact Prince George’s relationship with the environment. Statistics gathered by the province of British Columbia predicted Prince George’s population to be 115,074 by the year 2032 (BC Stats 2022). Since 2012, there have been 3,379 housing starts in Prince George, with 665 of those occurring last year (BC Stats 2022) The growing population of Prince George must be reflected in the city's bylaw and landscape. The city has a responsibility to put forth policies surrounding tree retention. The human benefits to an updated tree protection bylaw can be summarized into four main factors: demographic representation; equity, diversity, and inclusion; access to green infrastructure; and human health. Further, acknowledging racialized and low-income residents of Prince George and their relationship with the environment is an area of growing concern and crucial when amending the Tree Protection Bylaw.

Demographic Representation

Fostering active community engagement and participation is vital in order to retain young residents of Prince George for the long-term. Recognizing Prince George as a community for young people will allow these demographics to have a positive relationship with their environment. When reassessing the Tree Protection Bylaw, it is worth considering how the

livelihoods of young people can be improved by increased access to urban green space and green infrastructure.

It is not far-fetched to assume that a large majority of young people have positive feelings towards the environment and social justice related issues. For young people around the world, including Prince George, “concerns about climate change have become a full social movement” (Raducu 2020 p. 455). The impacts of climate change will be felt most by “children and future generations” (p. 454). It is vital that the voices of younger generations are considered within conversations of urban green space and infrastructure. A study conducted by Boulianne and Ohme found that Canadian youth have “higher levels of environmental concern” compared to youth in France, Great Britain, and the United States (2022, p. 774). Young environmental activists recognize the urgency of living in a climate-resilient community. It is crucial that Prince George can become that type of community.

Equity, Diversity, and Inclusion

Restructuring the Tree Protection Bylaw means putting equity, diversity, and inclusion at the forefront of urban green development and infrastructure. Low-income and racialized residents are disproportionately impacted by the lack of green infrastructure in the city of Prince George. For example, populations with varying incomes may respond differently to increased greenspaces and an updated tree protection bylaw. A report conducted by *Journal of Environmental Economics and Management* found that residents with higher incomes who are exposed to annual pollutants are “willing to pay more for a new neighbourhood park” (Labbe 2021). In the city of Vancouver, for example, “affluent neighbourhoods of Vancouver’s West Side” has tree canopy cover “more than four times that of Strathcona”, a low-income neighbourhood (Labbe 2021). Residents across British Columbia, including Prince George, who live below the poverty line are not provided or guaranteed proper tree canopy cover. The impact of low tree canopy cover exposes these residents to a number of heat-related risks. Lower tree canopy cover in low-income neighbourhoods is a social and environmental injustice and must be acknowledged.

Access to Urban Green Infrastructure

Greenspaces are central to the success and development of emerging towns and cities (Aziz et al. 2019). A loss of urban greenspace will result in the “degradation of aesthetics” for the City of Prince George (Slawsky et. al. 2019, p. 3). Degradation of aesthetics in the context of greenspaces refers to “litter, trail maintenance, and perceived naturalness of the space (Slawsky et. al. 2019, p. 3). The protection of nature and green infrastructure will provide a “positive influence of nature and greenspace on [the] quality of urban residents and tourists” as well as foster community interest in these spaces” (Kitheka et. al. 2022, p. 621). Residents of Prince George deserve to live in an area that priorities urban green infrastructure. By increasing access to infrastructure, residents of all demographics will feel a sense of community and resiliency.

Urban heat islands (UHI) “exacerbates the heat-related risk associated with global warming, increasing morbidity and mortality of urban residents” (Baah-Acheamfour et. al. 2016, p. 1115). The heat waves of the last few years have “demonstrated that increasing the magnitude and extent of urban heat islands will have significant social, ecological, and technological impacts” (Li et. al. 2012, p. 887). Urban heat islands occur in cities of many sizes and locations across the globe (Griffin 2022). Recognizing Prince George as an urban heat island is a crucial step in updating the Tree Protection Bylaw. Heat-island effects are typically felt in areas with “dark or tarred surfaces; these areas often have less shade” (Labbe 2021). Modelling suggests that residents living in a “dense tree canopy” experience “temperature reductions upwards of 17C” (Slawsky et. al. 2019, p. 3). Residents with limited tree canopy are at risk of illness and death as rising summer temperatures have changed the landscape of Prince George, and other cities across British Columbia. Green infrastructure provides residents with necessary shade and cooling for the surrounding urban ecosystems when heat waves occur.

Human Health

Living in a greenspace or community that effectively regulates tree-cutting results in “a wide range of health outcomes, including good self-reported health” (Boudier et. al., 2022, p. 2). Diverse greenspaces and green infrastructure will “play a substantial role in sequestering carbon and mitigating increases in atmospheric greenhouse gas emissions” (Baah-Acheamfour et. al., 2016, p. 1115). Acknowledging how Prince George residents with asthma, rhinitis, and other

respiratory illnesses are affected by reduced trees is important, as exposure to poor air quality and pollution impacts health-related quality of life.

Exposure to greenspaces and green infrastructure leads to improved “behavioural factors (encouraging physical activity), social factors (fostering social contact), direct mental health effects (decreasing stress) or correlated environmental factors (lower air pollution, noise and heat)” (Houden et. al. 2018, p. 2). These spaces are necessary to “foster prosperity and quality of life for all” (Zhaoyang et. al. 2020, p. 2). Improving the physical and mental health of Prince George residents by protecting and expanding tree canopy cover will aid in community resiliency and livelihood.

Community Profiles

Across other communities, a variety of policies and programs have been implemented to address the issue of expanding the urban tree canopy. While tree protection policies vary, common themes can be found throughout.

Kamloops, British Columbia

When looking at communities close to home, we have the best opportunities to learn. A prime example is in Kamloops, British Columbia. There are a variety of bylaws, programs and practices outlined in their “Urban Forest Management Strategy” that highlights some useful and important practices for maximizing sustainability and protection of urban tree canopy. In the 2010 Sustainable Kamloops Plan, they have incentivized local food security through the use of edible plants in landscapes, including fruit trees instead of decorative softwoods. These guidelines also encourage using tools such as incentive programs, regulations for the retention of existing trees, and planting of new trees within current and future development areas. Additionally, Tree Protection Bylaw 24-35 outlines the protection of existing trees by requiring tree cutting permits for tree removal or damage to trees. The bylaw also outlines conditions for denying a permit, and a requirement to replace and maintain a tree in the same location (with security deposit). The Urban Forest Management Guide also outlines some sample regulations for other communities to use.

Cincinnati, Ohio

Urban tree management can provide opportunities for revenue generation through local tax structures. A unique system has been implemented in Cincinnati, Ohio, where an annual assessment is used to collect a levy for the control, planting, maintenance and overall care of shade trees across the city. Currently, this regulation is unique to Ohio, and is guided and endorsed at a state level. The Urban Forestry Assessment, implemented by the City of Cincinnati in 1981, required property owners to pay \$0.05 per linear foot of frontage along a public right-of-way. The assessment follows the same process today and applies equally to every sector, including private, public, nonprofit, and government-owned land. As of 2018, this levy has seen an increase to \$0.21 per-square-foot to cover the inflation costs of maintenance and additional tree plantings to address canopy loss caused by the tree-killing Emerald Ash Borer beetle, and achieving Cincinnati's increased urban canopy cover goals. These goals, outlined in Cincinnati's 2018 Sustainability Plan, aim to expand the citywide tree canopy to at least 40 percent and to ensure that canopy cover is at least 30 percent in all residential neighbourhoods. Property owners see the annual levy as an individual item on their property assessment. For example, "the typical situation is a 50-foot property frontage times 21 cents plus a county admin fee, [and] there are some cases where property owners have up to three sides with the right-of-way; however, the average homeowner pays \$15 each year." (Urban Forestry Specialist Robin Hunt).

Winnipeg, Manitoba

Another useful tool to emphasize the importance that tree planting and maintenance exists in Winnipeg, Manitoba. *Trees Please Winnipeg* is a resident-run initiative that started in 2019, focusing on working together to call attention to the urban forest crisis and the need for sustainable investment strategies for urban forests. The pledge is endorsed by a variety of municipal electorates in the most recent election, including recently elected mayor, Scott Gillingham. The pledge aims to accomplish three main goals: 1) "for every 1 public tree lost, the city should be replanting at least 2 new trees, and watering those trees adequately so they survive & thrive"; 2) "Fund a 7-year pruning cycle (the industry standard)"; and 3) "require that tree protection best practices be incorporated into all construction projects to prevent damage and loss of trees." Winnipeg, home to the largest urban elm forest in North America, is at serious risk

for impact to their urban tree canopy due to irresponsible tree practices in the city, which has lost 14,000 urban shade trees since 2015 (City of Winnipeg 2017). The three goals of the Trees Please Winnipeg initiative can vastly aid in the impact that development has on the urban tree canopy of our community.

While Prince George is a unique community that boasts a unique cultural and environmental ecosystem, it is important to consider and utilize collaboration with other jurisdictions to develop achievable goals and programs that best benefit the current residents and generations to come. These recommendations come from the ideals that tree protection and maintenance is something that should have strict procedures in place to ensure that proper guidelines are followed, as well as ensuring there are guidelines available for development professionals surrounding tree procedure in city development. These recommendations will allow Prince George to flourish as a sustainable hub for Northern British Columbia while keeping the best interests in mind for both the residents and developers of Prince George.

Purpose & Language

The current City of Prince George Tree Protection Bylaw is limited by the presence or absence of certain terminologies and definitions, focusing on the anthropocentric, or human focused, aspects of tree removal as opposed to the ecocentric, or environment focused, aspects of tree protection. The City of Kamloops and the Town of Gibsons are two valuable case studies that employ sophisticated language in their bylaws to ensure tree protection, offering lessons to be learned. These municipalities face similar financial constraints that are present in Prince George, as we see the City continue to prioritise development over environment. Despite these constraints, both Kamloops and Gibsons tree protection bylaws are steps ahead and can be used as positive guidance for the review of the Tree Protection Bylaw in Prince George.

Lessons from Kamloops

The Kamloops bylaw opens with an *Interpretation* section which states, “unless otherwise defined herein, all words or expressions used in this bylaw shall have the same meaning as defined in the Local Government Act, the Community Charter, the Interpretation

Act, or any successor legislation when used in this bylaw.” (City of Kamloops 2017). This acknowledges the relationship between the different municipal and provincial legislations. Recognizing the local and global factors influencing municipal affairs is often a challenge for local governments:

“New realities with regard to resource scarcity, climate change, and the fragile global economy are just a few of the external conditions that have rendered the previous models of municipal leadership and organizational culture incongruous with the scale of change required to follow a sustainable development path” (Burch 2010).

These ‘previous models of municipal leadership’ can be seen in Prince George whereby policy obligations differ, and sometimes even contradict one another. Communication between departments and standardization of terminology reduces these instances of policy makers working in a vacuum. Therefore establishing an ‘*Interpretation*’ section in the Tree Protection Bylaw where definitions have similar meanings across all documents should ease movement in the same direction.

The ‘*Definition*’ section in the Kamloops bylaw also includes the term Tree Damaging Activity which means, “any activity or action that causes a Tree to die or to decline in health to the extent that it will die sooner than it would have had the activity or action not occurred” (City of Kamloops 2017). With this definition, legislators in Kamloops illustrate the presence of an ecological perspective through their recognition that human activities can both directly and indirectly affect trees. By recognizing the term ‘tree damaging activity’, legislators can attach further protections to trees. In Kamloops:

“Excessive pruning, crown raising, or topping of a Tree or pruning a Tree in a manner not in accordance with the Standards for Tree Care Operations as set out in the most recent edition of American National Standards Institute Publication (ANSI) A300, as amended or replaced from time to time” (City of Kamloops 2017).

Here, animal and plant species dependent on the trees in these areas are safeguarded as the tree structure that they depend on is protected from needless human interference. Including

sections similar to the ones discussed in the reviewed bylaw above would aid in the understanding of the Tree Protection Bylaw, and in doing so make it more effective.

Lessons from Gibsons

Gibsons has a commendable tree protection bylaw. Opening with a *‘Purpose’* section it illustrates awareness of the innumerable values trees have: “This Bylaw is enacted for the purposes of regulating the damaging, removal and replacement of trees within the Town of Gibsons and to preserve the overall ecological function of the Urban Forest” (Town of Gibsons 2020). A purpose section is important. It acts as a clear guide for policy makers, currently and those to come, of what the intention of the document is. Under the *‘Definition’* section of Gibsons bylaw, the term *‘WILDLIFE TREE’* is introduced, which refers to “any standing dead or live Tree having special characteristics that provide valuable habitat for the conservation or enhancement of wildlife, as determined and classified by the Director, in accordance with criteria contained in the *Wildlife/Danger Tree Assessor’s Course Workbook – Parks and Recreation Sites*” (Town of Gibsons 2020). The inclusion of such a term is a preeminent example of legislation reflecting ecological values. Policy entrenched in anthropocentrism (such as Prince George’s Tree Protection Bylaw) is unable to protect, let alone recognise a tree that serves no immediately apparent purpose to humans. Following a similar structure and wording to the tree protection bylaw of Gibsons would help preserve the habitat and ecosystems in and around Prince George.

Bylaw Accessibility

Finally, but still of significant importance, having the bylaw available in multiple ethnic languages will improve comprehension, adherence, and community support. Translation into Indigenous languages such as Dakelh (Carrier), spoken by the Lheidli T’enneh in Prince George, is important. In this way, the Lheidli T’enneh could find new avenues to ensure the survival of their languages, as well as encourage their participation in the legislation enforced in their lands. Collaboration and consent from the Lheidli T’enneh every step of the way cannot be stressed enough, though there are valid arguments that suggest disinterest in having Canadian legislation represented in their language. The lawyer and judge, Mary-Ellen Turpel, argues “everything has

to be adjusted to fit the terms” of the dominant, colonial form of rule that is the Constitution. By accepting the Constitution, which is based on Western (non-Indigenous) concepts and ideologies, “one is acknowledging the colonial power as the overarching, supreme law” (Aki-Kwe/Mary Ellen Turpel 1991). Other languages to consider include but are not limited to Punjabi, German, and Tagalog. The availability of the bylaw in prominent ethnic languages will increase accessibility and adherence to the Tree Protection Bylaw, increasing the overall effectiveness of this bylaw.

The inclusion of multiple languages is necessary to create a bylaw in which a community can truly engage and discuss all of its merits, which is the hallmark of democracy. Through the incorporation of these language suggestions, the city of Prince George will find itself closer to having a tree protection bylaw centered around true tree protection.

Conclusion

The City of Prince George Tree Protection Bylaw needs to be updated for the health and safety of its ecosystems and citizens. Through the implementation of these recommendations, Prince George will become a healthier, more appealing, and more climate resilient city. The cataloguing of the Prince George urban forest will allow the city to more accurately make decisions concerning climate change, infrastructure, and citizen safety. Expanding the areas affected by the tree protection bylaw, as well as expanding existing protected areas, will further facilitate decision making at a city level, while improving the health of the ecosystems and citizens of Prince George. Improving the current guidelines concerning tree replacement and management will protect and maintain the level of canopy within the city. This will have benefits for human health, urban green infrastructure, and equity concerning tree distribution within Prince George. While this may seem daunting, there are lessons that can be learned from other cities, and existing tree bylaws that can be a basis to work from. The use and addition of ecocentric language will make this bylaw effective at what it claims to do: protect trees. This bylaw can also be made more accessible by providing versions in various languages. The implementation of these recommendations for the City of Prince George Tree Protection Bylaw is critical for the city as it faces climate change, and will improve the city's reputation and climate resilience into the future.

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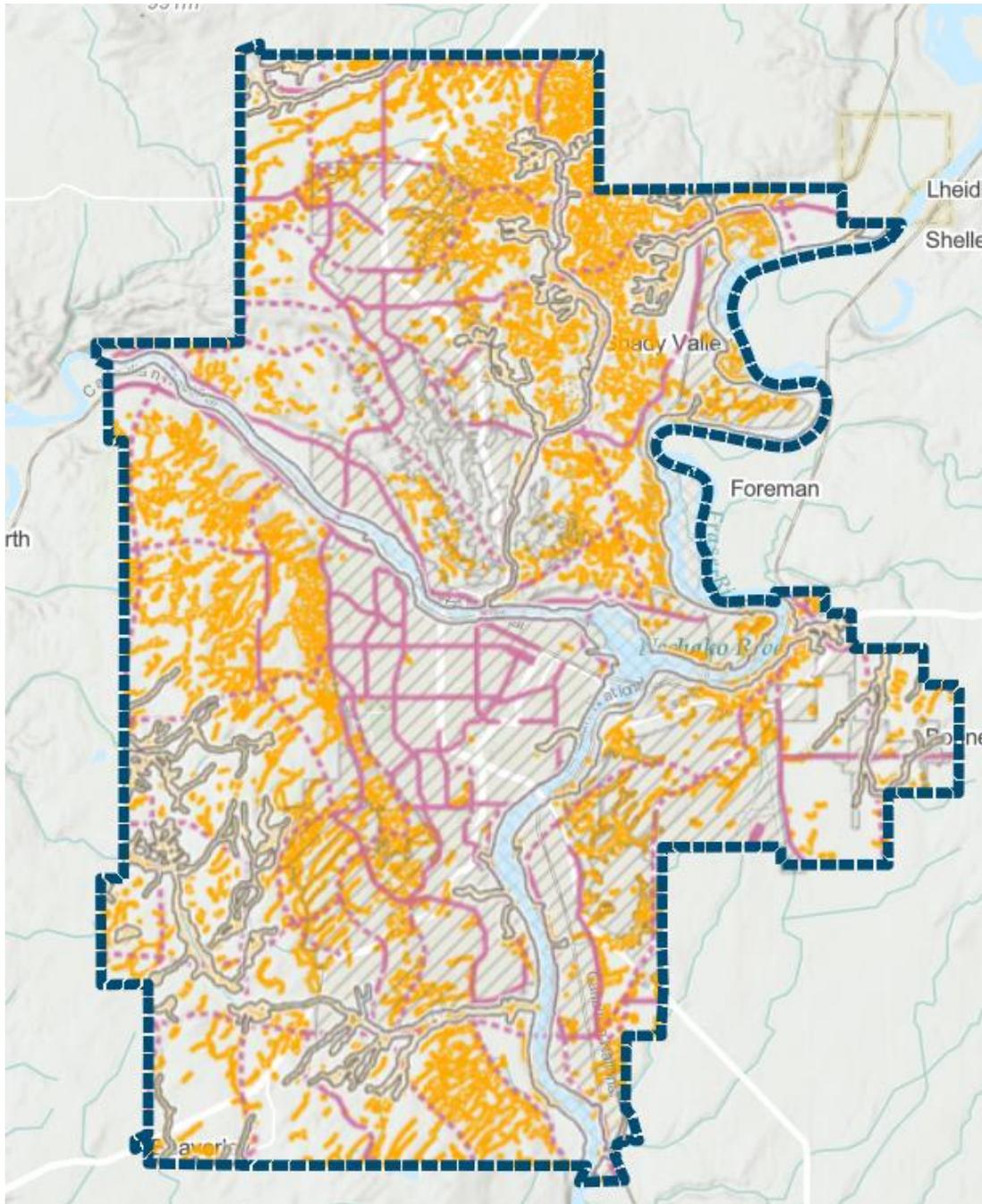
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Appendix A



Description: Riparian areas (in orange) can be seen throughout the city of Prince George, while protected riparian areas (outlined in dark grey) fall largely outside of current and planned urban areas (in light grey) and transportation (in purple). (pgmap.princegeorge.ca)