CITY OF GRANDE prairie

City of Grande Prairie Urban Forest Strategy

December 2024

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Land Acknowledgement

The City respectfully acknowledges the Beaver, Cree, Dene, and Métis people as the original caretakers of these Lands and surrounding areas. We are grateful to live, learn, work and play on Treaty 8 territory within Turtle Island and acknowledge these Lands have been home to diverse and sovereign First Nations and Inuit Nations since Time Immemorial.

Executive Summary

The Urban Forest Strategy (UFS) aims to manage, preserve, and enhance Grande Prairie's urban forest, maximizing its environmental, social, and economic benefits to enhance quality of life for residents. Like many cities across Canada, Grande Prairie's urban forest faces various risks, including wildfire, invasive pests, improper maintenance, and climate change. Urbanization and development also pose significant threats, reducing tree canopy cover and fragmenting the urban forest. To mitigate these risks, a comprehensive management approach is needed, prioritizing preservation, planting and the integration of green spaces within city landscapes.

Grande Prairie's urban forest includes all publicly and privately owned trees and supporting vegetation within city limits. The City's tree inventory, completed in 2013, includes over 25,000 trees with 76 different species. The current canopy cover is estimated at 7%, comparable to other cities in Northern Alberta and is currently on target for its diversity of trees. The urban forest provides numerous ecosystem services, including improving air quality, regulating temperatures, and offering recreational opportunities. Public engagement revealed a strong appreciation among residents and stakeholders for the City's urban trees and parks, with a desire for a comprehensive approach to management.

The UFS provides a comprehensive plan for the responsible care and growth of the urban forest, engaging the community in stewardship and setting clear goals and objectives for the next 20 years and beyond. The vision is to have: **A beautiful, vibrant, and healthy urban forest that enhances the well-being and quality of life for generations to come.**

Key goals for Grande Prairie's urban forest are that it is:

- **Rooted in the Community** - Citizens, businesses, and the Indigenous community are engaged in the awareness, management, and celebration of the urban forest.
- **Proactively Managed** - The urban forest is proactively managed to mitigate against future threats, ensure public safety and maximize the benefits of the urban forest for all.
- **Growing for the Future** - Tree planting programs are implemented to support beautification and maintain a diverse, resilient urban forest.
- **Monitored** - Adaptive management principles are used to monitor outcomes of actions and make evidence-based decisions to respond to change.

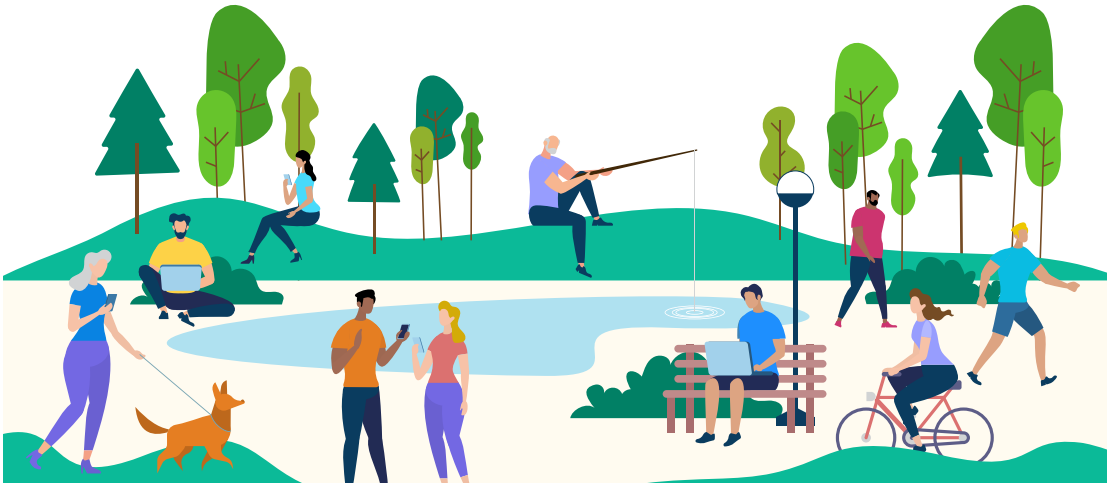
Key objectives to achieve these goals, each with supporting actions, include:

1. Developing and delivering education and outreach initiatives for staff and the public.
2. Continuing Indigenous engagement to incorporate Traditional Knowledge into urban forest management.
3. Establishing a tree protection policy to regulate the planting, maintenance, protection, and removal of trees.
4. Mitigating wildfire risk through vegetation management and public education.
5. Maintaining and conserving a diverse population of trees in a safe and healthy condition.
6. Keeping an up-to-date tree inventory to support data-driven decision-making.
7. Planning and coordinating tree establishment over multiple years to ensure sustainable urban forest growth.

Grande Prairie's Urban Forest Strategy provides a clear direction for managing, protecting, and growing the city's urban forest. By working together, City staff, community members, and businesses can ensure that Grande Prairie's urban forest remains healthy, vibrant, and thriving for generations to come.

1 Introduction

The City of Grande Prairie's 2022-2025 Strategic Plan highlights **quality of life** as the overarching strategic priority for the City, centered around "*fostering a community in which our residents love where they live and embrace their environment*."[1] Healthy urban forests play an important role in urban areas by providing ecosystem services such as improving air quality through pollution removal, regulating temperatures, and providing opportunities for physical and mental well-being. These green spaces offer recreational activities that reduce stress, promote mental health, and encourage physical exercise. They serve as gathering spaces for communities, fostering social connections, and enriching the urban environment with their aesthetic value.



The purpose of an Urban Forest Strategy (UFS) is to provide a comprehensive plan for the management, preservation, and enhancement of trees and green spaces within urban areas. It aims to maximize the environmental, social, and economic benefits of the urban forest by setting clear goals and objectives, offering a framework for responsible care and growth of the urban forest, and engaging the community in stewardship. This UFS was developed for Grande Prairie to provide a comprehensive and engaging plan that provides short-term direction and a long-term vision for managing, protecting and growing the City's urban forest for 20 years and beyond.

1.1 What is the Urban Forest?

The urban forest consists of all publicly and privately owned trees and supporting vegetation within the city limits. This includes trees and supporting vegetation in natural areas, parks, boulevards, backyards, commercial, and industrial areas. The urban forest is an integral part of the urban environment, and it provides numerous benefits to both the environment and the community.

Urban forestry is, "*the sustained planning, planting, protection, maintenance, and care of trees, forests, greenspace and related resources in and around cities and communities for economic, environmental, social and public health benefits for people.*"[2]

[1] *City of Grande Prairie Strategic Plan 2022 - 2025*

[2] *Tree Canada (n.d.). Canadian Urban Forest Strategy: 2019-2024*

1.1.1 Benefits of the Urban Forest

Urban forests provide a wide range of ecosystem services that improve the quality of life and are essential for the well-being of both humans and the environment. These services provide resources for livelihoods, help maintain environmental quality, and contribute to our physical and mental health. These services can be broadly categorized into four main types:

- **Provisioning Services**: These services involve the tangible products that ecosystems provide, such as food, water, fibers, and medicinal plants. For example, forests provide timber, wetlands filter and store water, and agricultural ecosystems produce crops and livestock.
- **Regulating Services**: Regulating services refer to the role ecosystems play in regulating natural processes and maintaining environmental conditions. Examples include the regulation of climate, disease control (e.g., through natural predators of disease-carrying organisms), and the control of erosion and flooding by wetlands and forests.
- **Supporting Services**: These services are essential for the production of all other ecosystem services. They include services like soil formation, nutrient cycling, photosynthesis, and habitat provision. Supporting services underpin the health and functioning of ecosystems.
- **Cultural Services**: Cultural services are the non-material benefits that people obtain from ecosystems. These include aesthetic and recreational benefits (e.g., hiking in a forest, birdwatching), cultural and spiritual values associated with natural landscapes, and the inspiration for art, literature, and traditions. Ecosystems also play a role in education and scientific research.

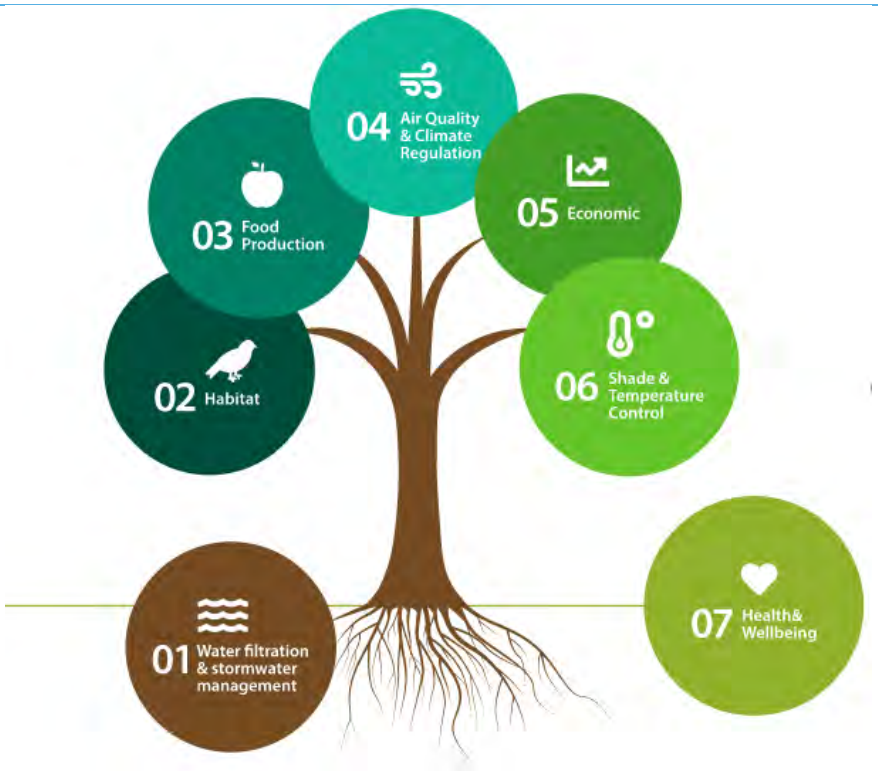


FIGURE 1 URBAN FOREST ECOSYSTEM SERVICE BENEFITS

1.1.2 Risks to Urban Forests

While urban forests provide many important benefits, there are a variety of aspects that can put these forests at risk in Canada. These include biotic and abiotic factors such as but not limited to: wildfire; invasive pests (insects and disease); damage to living trees through improper maintenance, direct injury or vandalism; and the stresses inflicted due to climate change. Many of these risks are not necessarily fatal on their own but the cumulative effects can result in weakening or loss of the urban forest.

One of the more pressing issues in Canada is urbanization and development, as the ever-expanding urban footprint often necessitates the removal of trees and green areas to make space for infrastructure and buildings. This not only reduces the tree canopy cover but also fragments the urban forest, making it less effective in providing ecosystem services.

To mitigate these risks and ensure the well-being of urban forests, a comprehensive management approach is needed. Sustainable urban planning should prioritize the preservation and integration of green spaces within city landscapes, promoting urban forests as essential components of a healthy urban environment. Implementing effective management practices, including proper tree care, diverse tree species selection, and regular maintenance, can enhance the resilience of urban forests against diseases, pests, and environmental stressors. Additionally, public education and community involvement can play a crucial role in raising awareness about the importance of urban forests and encouraging local residents to actively participate in their protection and restoration efforts, thereby fostering a more sustainable urban future.

2 Current State of Grande Prairie's Urban Forest

2.1 Demographics

The City of Grande Prairie is located approximately 450 km northwest of Edmonton with a population of over 68,000 people. Grande Prairie officially became a city in 1958 but its origins can be traced back to 1881 when it served as a Hudson's Bay trading post. The City experienced rapid growth after the discovery of oil in the area around 1947 and since its incorporation as a city, Grande Prairie's population has surged from 7,000 to 68,000 in 2023[3]. Grande Prairie is one of the youngest cities in Canada[4] and one of the fastest growing in North America[5]. This substantial pace of growth has placed decades of demand for development beyond the downtown core and its immediate surrounding neighbourhoods. Such demand places strain on the urban forest as green space is utilized for development.

[3] 2024 census data was not available at the time of this report.
[4] Statistics Canada. (2023). Age (in single years), average age and median age and gender: Census metropolitan areas, census agglomerations and census subdivisions [Data set].
[5] City of Grande Prairie. (2020). Economic Profile.

2.2 Ecological Context

Grande Prairie is located within the Peace River Parkland Natural Subregion[6]. This stands out as the province's smallest natural subregion. It is characterized by the presence of closed aspen and balsam poplar stands intermixed with grasslands, forming a parkland-like mosaic. This area's distinctiveness lies in the amount of "native prairie" within a predominantly forested landscape, a feature noted by early explorers and substantiated by current evidence[3].

The onset of agricultural development in the early 1900s significantly shaped the region, with approximately 70% of the area now under cultivation. Despite this transformation, the Peace River Parkland Subregion retains its unique ecological character, harbouring many species typically associated with the Grasslands Natural Region. The tree hardiness zones in this subregion typically range from 3a to 3b[7].

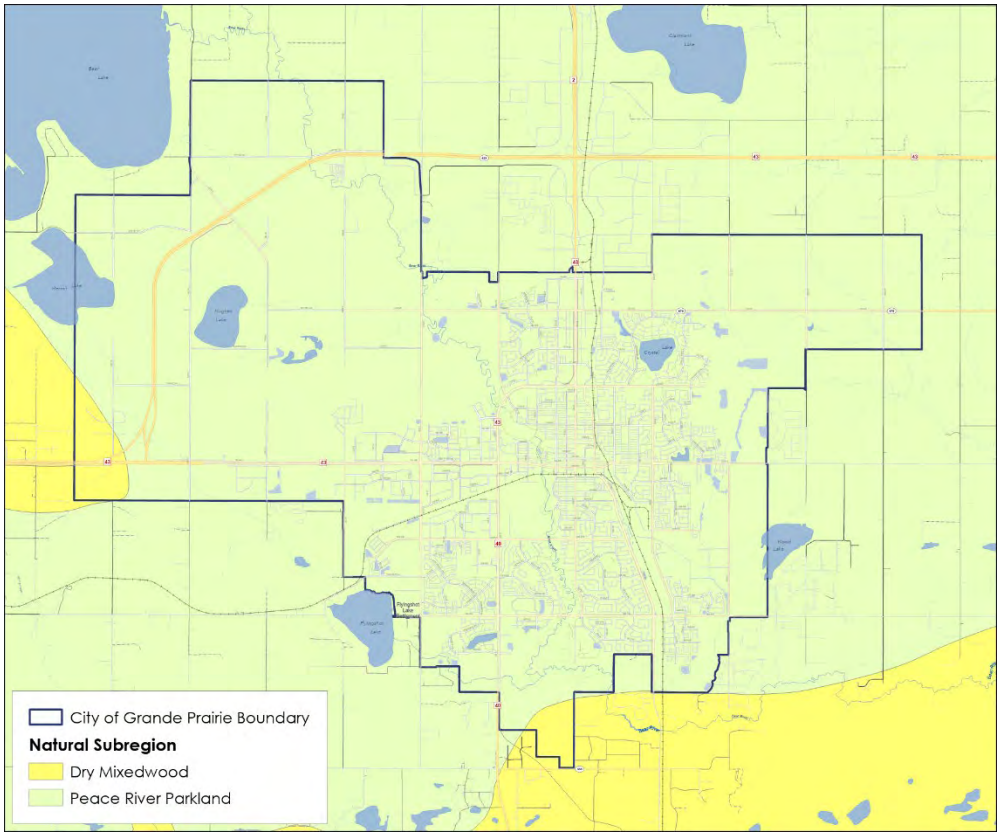


FIGURE 2 NATURAL SUBREGIONS IN GRANDE PRAIRIE

[6] Government of Alberta. 2020. Ecological site types and successional plant community types of the Peace River Parkland subregion.
[7] Natural Resources Canada. 2022. Plant Hardiness Zone by Municipality. http://www.planthardiness.gc.ca/?m=22&lang=en&prov=Alberta&val=G.

2.3 Key Features of Interest

2.3.1 Muskoseepi Park

Muskoseepi Park, which follows the Bear Creek Valley through the City, has a historical role as a gathering place, with Indigenous peoples often gathering in the area long before the initial trading post was established. As Grande Prairie expanded, the town evolved around the creek, with the park area remaining a central hub for community activities and events.

The tradition endures to this day, as Muskoseepi Park was formally inaugurated in 1986 by the Heritage Trust Fund. It continues to serve as the heart of the City, housing the museum, hosting various community events, offering a wide range of amenities, and makes up a significant and important portion of Grande Prairie's urban forest.

2.3.2 Heritage Trees

In 2008, the Heritage Tree Foundation of Canada released *Heritage Trees of Alberta*[8], a book that identifies 350 trees in Alberta that are deemed of particular interest based on qualities such as age, size, shape, history, special interest, etc. They may include individual trees, avenue groves, shelterbelts, tree gardens, arboretum and sites of botanical or ecological interest.

Within the City of Grande Prairie, four locations of heritage trees were identified and recognized in this publication and three remain intact today:

- Muskoseepi Cottonwoods [*10329 – 101 Ave*]
- Veteran's Land Act (VLA) Trees [*106 Ave from 98 St to 100 St*]
- Spruce Hedge [*9832 - 105 Ave*]

The City recognizes the value of these trees, as it takes considerable time for trees to mature in Grande Prairie's climate, and they are recognized as a point of community pride. These locations are monitored regularly with maintenance as required (i.e., yearly pruning).

[8] *Heritage Trees of Alberta*. Heritage Tree Foundation of Canada. Tuner Valley. 2008.

2.4 Grande Prairie's Tree Inventory

2.4.1 Grande Prairie's Canopy Cover

Canopy cover is a commonly used metric that is a basic measure of the extent or cover of the forest within the urban limits. There are multiple methodologies for assessing canopy cover including using models (e.g., i-Tree Canopy), imagery analysis (e.g., satellite), and LiDAR[9].

Modelling tools such as i-Tree Canopy are simple to use that can provide a quick assessment but have a large margin of error and do not output mapping layers that can be used for other analysis (e.g., identifying potential planting areas). Imagery analysis can be used to detect and map tree crowns through machine learning processes. Spectral signatures can also be used for species classification. This approach can be limited by the resolution of the imagery used, shadows that may "hide" trees and seasonality of acquisition (leaf on vs leaf off). LiDAR analysis has the advantage of being able "see through" shadows and is currently considered the best practice for canopy mapping[9] (Figure 3). It is more data intensive in terms of storage and processing, but canopy cover is just one of many LiDAR derivative products that can be used by municipalities (e.g., 3D visualization, terrain mapping, line of sight mapping, flood modeling, building footprints, etc.).

FIGURE 3 EXAMPLE OF LIDAR DETECTED AND DELINEATED TREE CROWNS USED TO MAP CANOPY CLOSURE IN MUSKOSEEPI PARK

Current canopy cover was calculated as part of this strategy using the City's LiDAR data. Canopy cover has been estimated at 7% for the City (6% when including the Rural Service Area which features large spaces of agricultural land) (Figure 4). The canopy cover results are comparable to other cities in Northern Alberta:

- Fort Saskatchewan – 8% (LiDAR analysis);
- Edmonton - 10% (i-Tree Canopy model);
- St. Albert - 13% (LiDAR analysis).

[9] U.S. Department of Agriculture.(2019). Urban tree canopy assessment: A community's path to understanding and managing the urban forest.

However, caution should be applied when comparing and interpreting results between jurisdictions. Different methodology, data resolution, and local ecological context, amongst other factors, can yield differences in results. Historically, Grande Prairie is recognized as a prairie ecosystem within the forested landscape of northern Alberta. Tree stands are interspersed with grasslands, forming a mosaic.

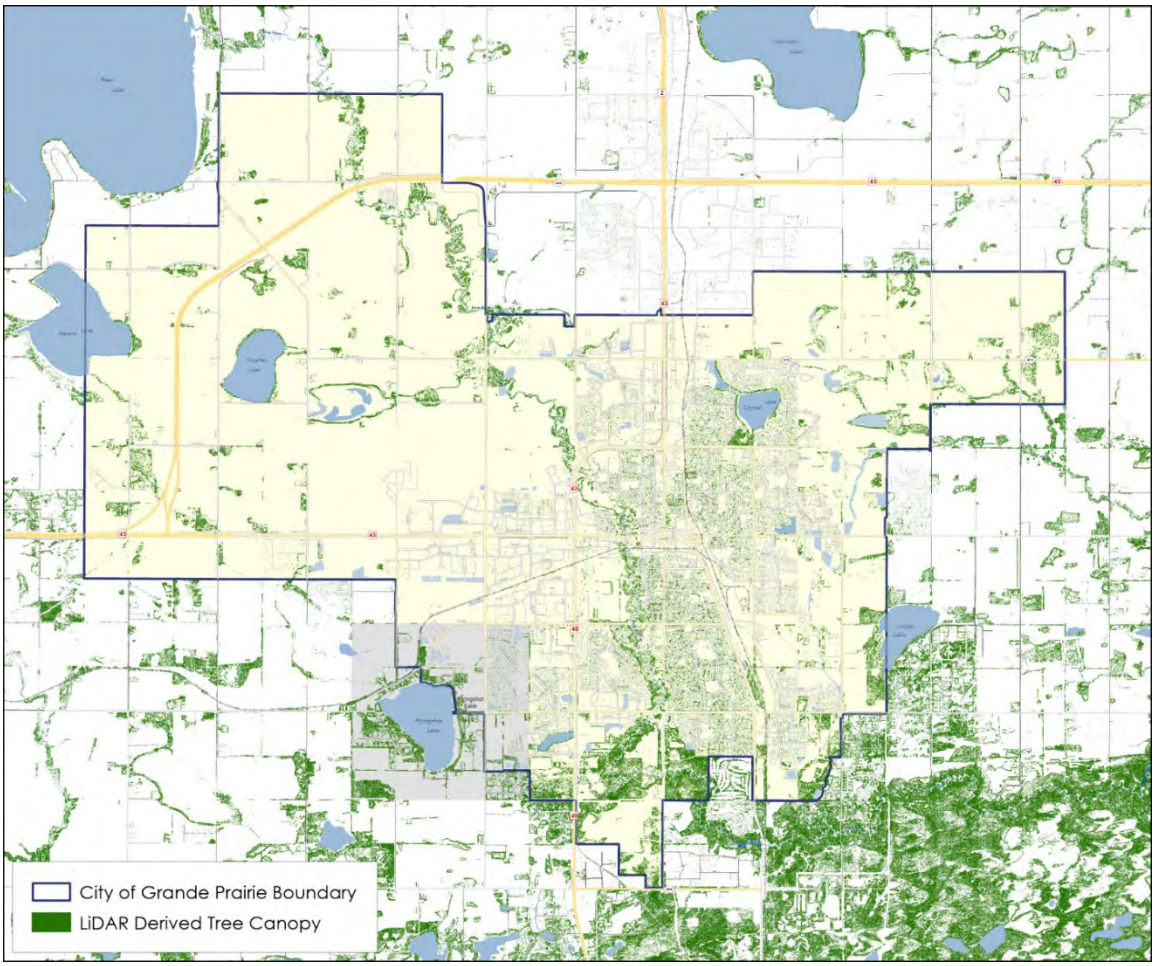


FIGURE 4 MAP OF LIDAR DERIVED TREE CANOPY COVER

2.4.2 Grande Prairie's Tree Inventory Diversity

Tree diversity is a key indicator of healthy and resilient urban forests[10]. A diverse urban forest provides a wider array of environmental benefits over the long-term[11] and increases the aesthetic value through varied canopy structures and seasonal changes. It is also more resilient to threats like pests, diseases, and climate change.

Indicator measures of diversity include tree species distribution and structural size distribution. The City's public tree inventory was used for this assessment. It was completed in 2013 with periodic updates since. In total, the public tree inventory includes over 25,000 trees with 76 different species making up 28 different genera. While the urban forest is made up of all vegetation, municipal inventories often only consist of species intentionally planted within parks, boulevards, and green spaces. Ground-based tree inventories can be resource intensive to collect but provide a wealth of information for managing individual trees[12] and are therefore primarily focused on planted trees.

When an urban forest relies heavily on just a few species, it is vulnerable to catastrophic losses if a new pest or disease emerges that targets those species (e.g., Dutch Elm disease). A common target used in urban forestry is that no genus makes up more than 20% of the population[13]. Genus is used as many pests will affect multiple species within the same genus (e.g., Emerald ash borer can be found in Green Ash, Black Ash and White Ash).

In the City's public tree inventory, the dominant genera are Spruce (*Picea*), Ash (*Fraxinus*) and Elm (*Ulmus*). Figure 5 below illustrates the current genus distribution. No genus makes up more than 20% of the inventoried tree population which aligns with the City of Grande Prairie Design Manual recommendations and current best practices in urban forestry.

The percentage of Ash (*Fraxinus spp.)* and Elm (*Ulmus spp.)* combined is 30%. These two genera are particularly at risk of invasive pests and disease. Despite making up a significant portion of the population, this distribution is lower compared to other jurisdictions such as Edmonton (44%) and Saskatoon (48%). This is an important accomplishment for Grande Prairie's urban forest. It showcases the current biodiversity of the urban forest, which is key to preventing widespread loss of forest due to threats like insects and disease.

[10] Barron, S., Sheppard, S.R.J., and Condon, P.M. (2016). Urban forest indicators for planning and designing future forests. Forests. 7 (208).
[11] Kenney, W.A., van Wassenaer, P.J.E., and Satel, A.L. (2011). Criteria and indicators for strategic urban forest planning and management. Arboriculture & Urban Forestry 37 (3): 108-117.
[12] Ma.B. et al. (2021). A global basis of urban tree inventories: what comes first the inventory or the program. Urban Forestry & Urban Greening. 60.
[13] Santamour, F. (1990). Trees for urban planting: diversity, uniformity and common sense. Proceedings of the 7th conference of the Metropolitan Tree Improvement Alliance. 7:57-65

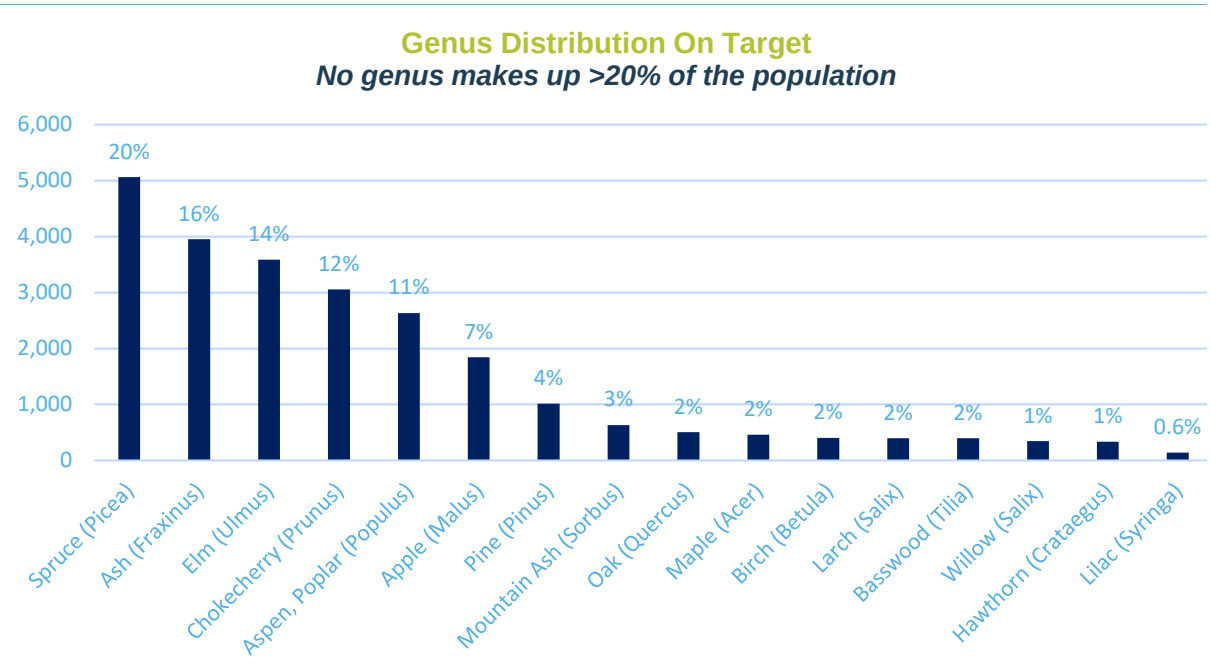


FIGURE 5 GENUS DISTRIBUTION FOR SPECIES MAKING UP GREATER THAN 0.5% OF THE POPULATION (2013)

The three most common tree species in the City's public tree inventory are American Elm (*Ulmus americana*), Colorado Spruce (*Picea pungens*), and Green Ash (*Fraxinus pennsylvanica*). Of the top 10 occurring species, two are spruce, two are ash and two are poplar. For a complete listing of species, refer to Appendix I - Grande Prairie Tree Species Inventory - Summary.

The total tree inventory (boulevard & park) is approximately 75% deciduous trees and 25% coniferous (Figure 6). While the City does not specify a mix for boulevards, it does call for park tree distribution to be approximately 60% deciduous and 40% coniferous. The current inventory demonstrates that the City is meeting this target mix with 56% deciduous and 44% coniferous in city parks.

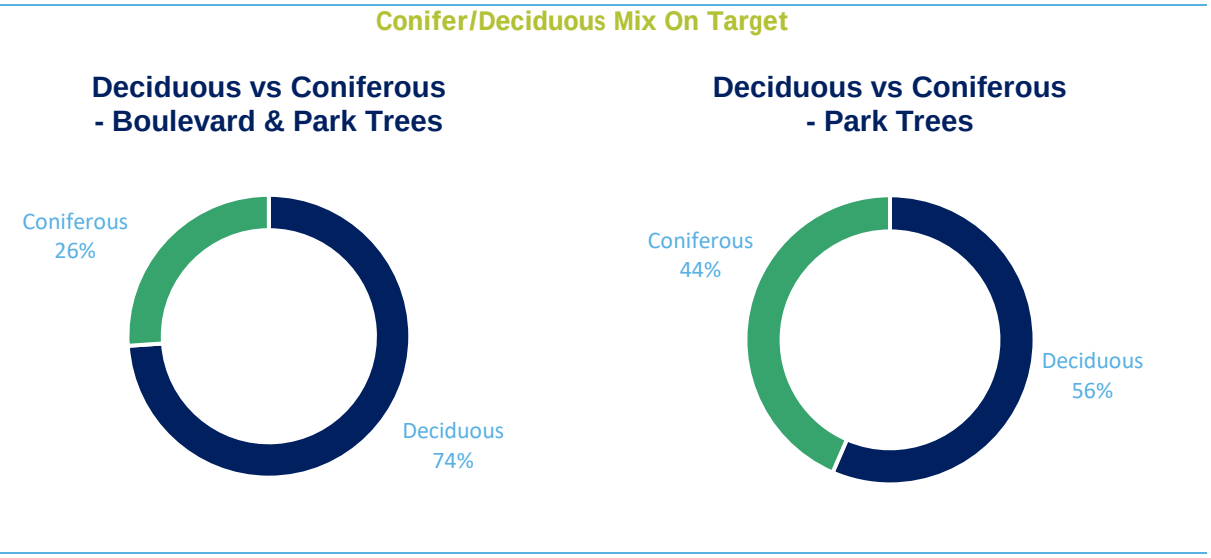


FIGURE 6 DECIDUOUS AND CONIFEROUS PERCENTAGES FOR THE TOTAL INVENTORY AND PARK TREES

2.4.2.1 Grande Prairie's Tree Size Diversity

Measures of tree size diversity include diameter and height. The overall size distribution of the inventory can have important functional, management, and planning implications.

Tree diameter is a metric included in the City's public tree inventory and can be used to assess maturity of trees. Figure 7 illustrates the size distribution of trees numerically and geographically. The majority of the measured trees are in the smaller, younger size classes found in many of the newer developing neighbourhoods. The larger trees can be found in more established areas of the city.

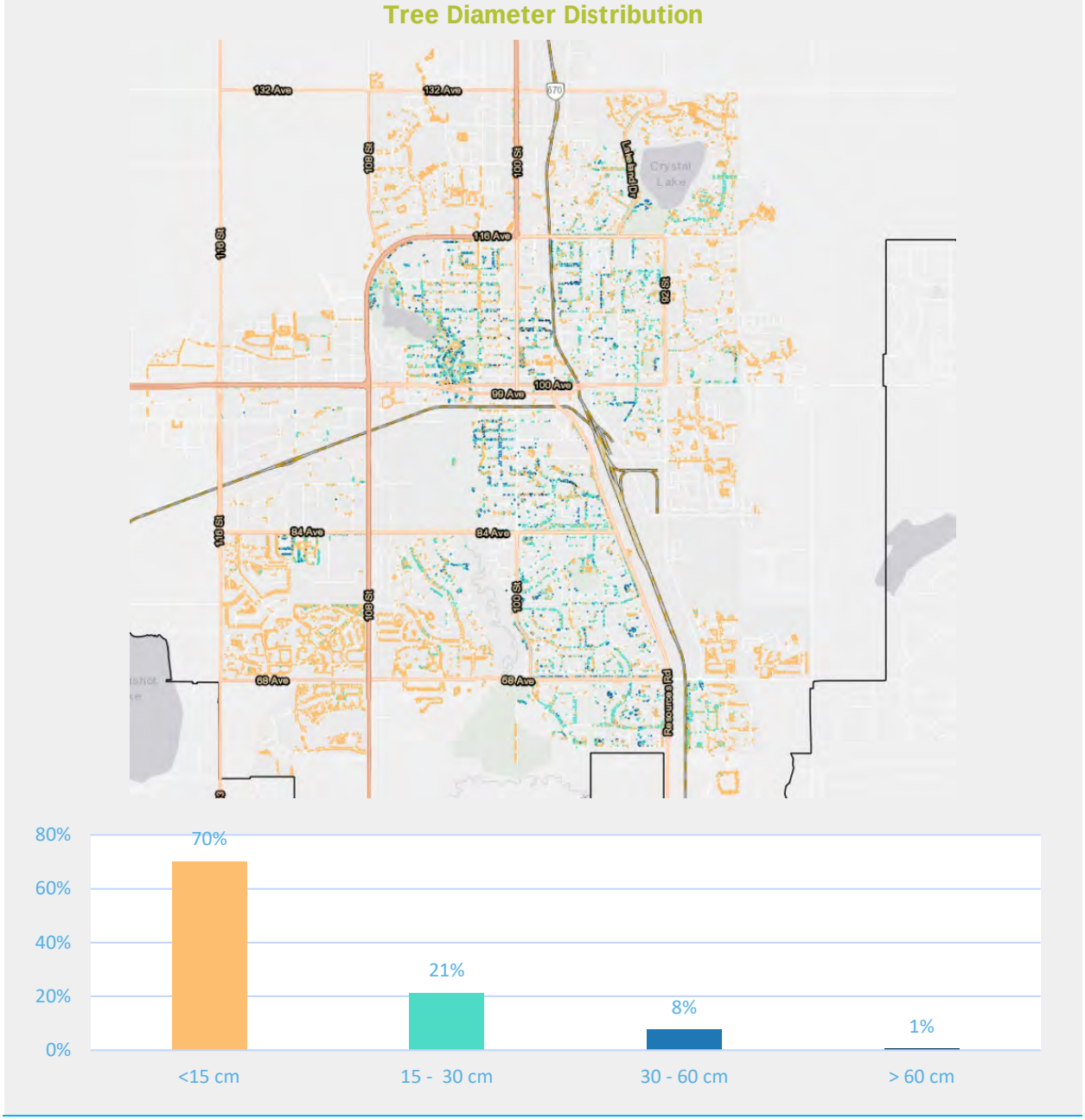


FIGURE 7 GRANDE PRAIRIE'S PUBLIC TREE INVENTORY TREE DIAMTER DISTRIBUTION

Tree height is another size metric that can be indicative of canopy structural diversity. Tree height is not a metric captured in the City's tree inventory however, canopy height was derived from the LiDAR analysis which can provide a structural height distribution for all trees in the City's urban forest. Furthermore, the LiDAR canopy height can be overlayed on top of the City's tree inventory to assign a LiDAR derived tree height to each measured tree.

The current average tree height is 5m with the tallest tree being an 18m White Spruce in Muskoseepi Park. The species with the tallest average heights are Serbian Spruce (12m), Butternut Walnut (10.5m) and Plains Cottonwood (10.5m). Similar to the diameter distribution, the majority of trees are in the smaller size classes (Figure 8). Taller trees are found in natural areas, more established neighbourhoods and along South Bear Creek.

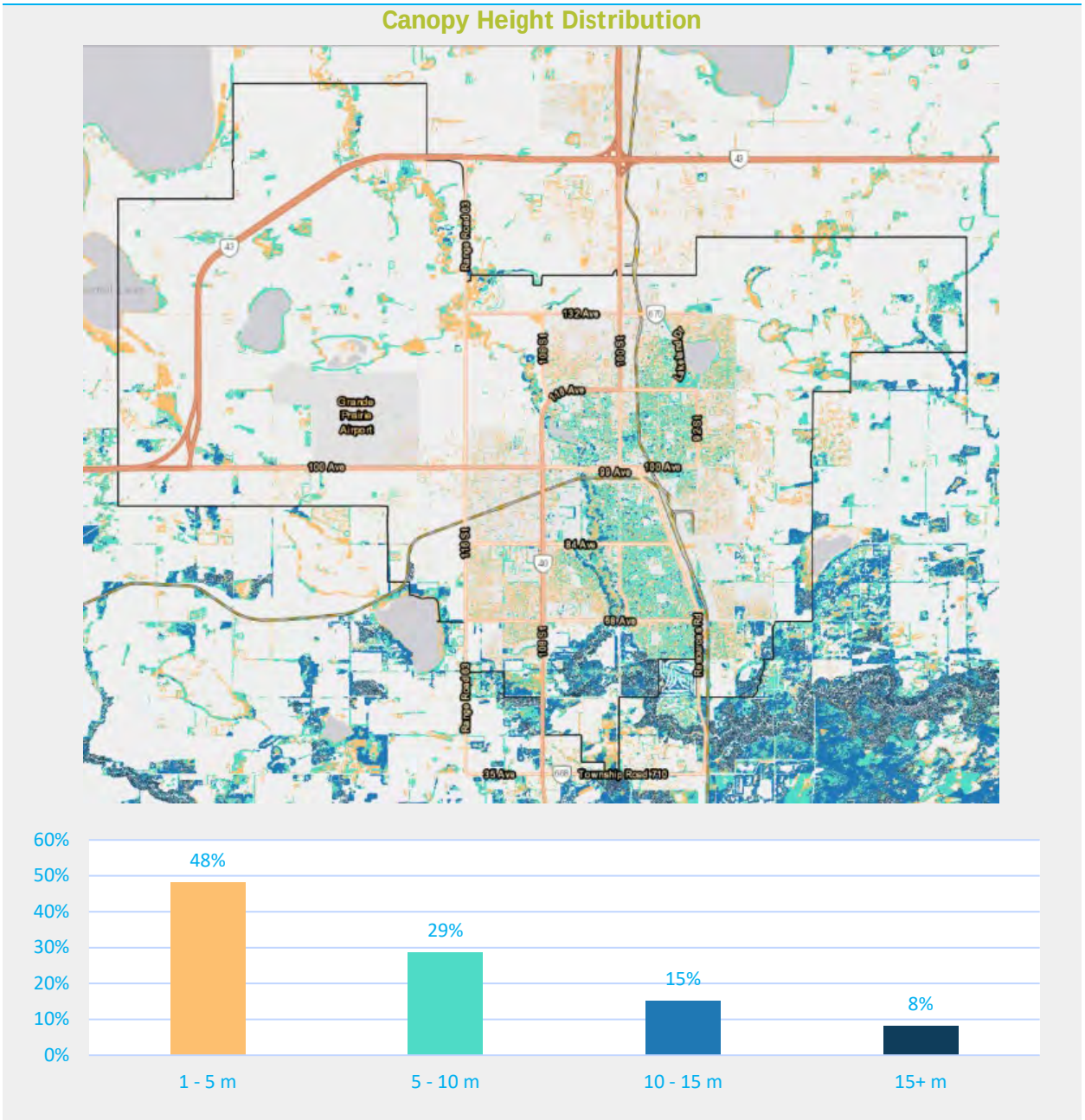


FIGURE 8 GRANDE PRAIRIE'S TREE CANOPY HEIGHT DISTRIBUTION (LIDAR DERIVED)

The size distribution patterns, with a high proportion of younger, smaller trees, are indicative of a youthful population[14]. In the short-term, maintenance activities such as watering and mulching will be important to recruit these younger trees into large size classes. As the population enters a maturing distribution pattern over the medium to long term, a greater proportion of maintenance activities will be spent on pruning, hazard assessment, etc.

2.4.3 Forest Health

Overall, the trees inventoried by the City are in good health condition for both foliage and wood. Wood condition health was a bit lower with a higher percentage of fair compared to the foliage ratings (Figure 9).

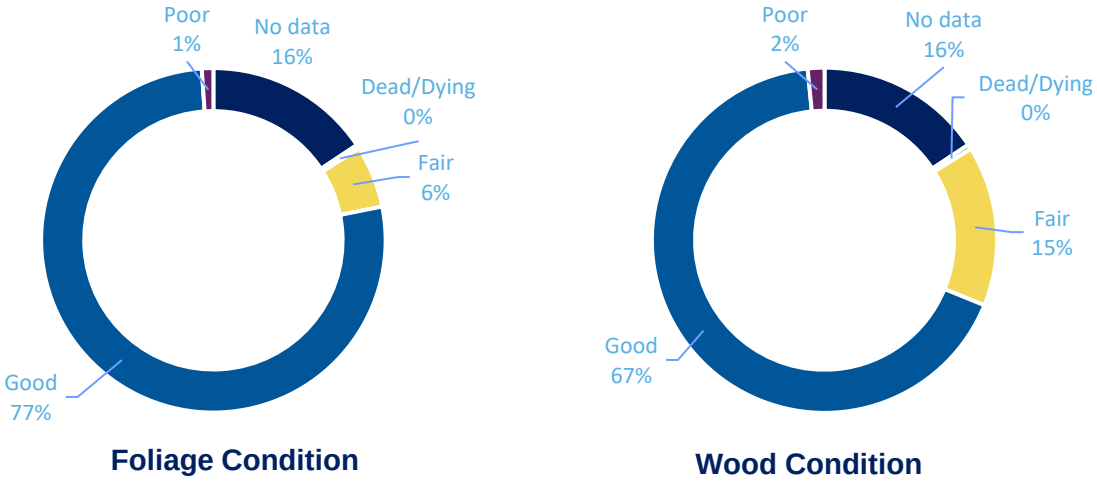


FIGURE 9 FOLIAGE AND WOOD CONDITION

2.5 Risks to Grande Prairie's Urban Forest

Urban forests face a range of threats that can impact their health and sustainability. Urban forests across Canada are vulnerable to many of the same threats, however the magnitude of the threats will vary by region given different local environmental, geographical, and social factors. In Grande Prairie, the following urban forest threats are present:

2.5.1 Wildfire

Conifer trees, such as pines and spruces, are often more flammable than many deciduous trees due to their resin and sap content, needle-like leaves, and the presence of flammable material in dead branches. The accumulation of dry, needle-like leaves on conifers and their dense branching structure can provide ample fuel for wildfires, while the evergreen nature of conifers and their conical crown shape can facilitate the spread of fire through the canopy. In Grande Prairie, the largest continuous patches of forest fuels are south of the City limits.

Within the City, management of fuels near structures, education about building materials and landscaping around buildings are all important components of a FireSmart program. A FireSmart program is a community-based approach to reducing the risk of wildfires in wildland-urban interface

[14] Morgenroth, J., Nowak, D.J., and Koeser, A.K. (2020). DBH distributions in America's urban forests – an overview of structural diversity. Forests. 11 (2)

areas, where urban development meets natural forested or grassland areas. The program is about identifying risks to structures and creating space that firefighters can use to protect structures.

To mitigate the risk of a wildfire entering the community, the City and County of Grande Prairie constructed a firebreak south of the community during the fire season of 2023. Within the community, a Wildfire Mitigation Strategy was developed in 2019, and FireSmart fuel thinning projects have also been completed in forest stands adjacent to some neighbourhoods. These projects remove dead and down woody material to create space between the tree crowns to reduce fire intensity and fire spread. The City should continue FireSmart efforts within high-risk areas of the urban forest, and consider a balance between maintaining the forest integrity with protecting nearby neighbourhoods and critical infrastructure.

2.5.2 Climate

Climate change has significant and multifaceted impacts on urban forests, which play a crucial role in mitigating the effects of global warming and enhancing the resilience of cities. Rising temperatures associated with climate change can stress urban trees, making them more susceptible to pests and diseases. Extended periods of drought can lead to water stress, reduced growth, and even mortality in trees. Additionally, increased temperatures can alter the timing of flowering and leafing, disrupting ecosystems and affecting the availability of resources for wildlife that depend on urban forests.

Grande Prairie is naturally an area of mixed forest and grasslands, which is an indicator of conditions that are challenging for tree growth. Continued warming temperatures and arid conditions will stress trees further and potentially lead to more grass dominated plant communities (Table 1). Despite a projected increase in annual precipitation, the availability of that moisture for plant growth may be limited due to heavy precipitation events that lead to significant runoff, instead of slower events that promote infiltration.

TABLE 1 SUMMARY OF PROJECTED CLIMATE CHANGE VARIABLES (RCP 8.5) FOR GRANDE PRAIRIE[15]

Climate Variable	1991 – 2020	2021 – 2050	2051-2080
Annual Mean Temperature (°C)	2.5	4.0	5.8
Days with Max Temperature > 30 °C	3	8	17
Annual Precipitation (mm)	433	450	461
Standardized Precipitation Evapotranspiration Index (Jun, Jul, Aug)	-0.225	-0.3095	-0.5565
Frost Free Days	131	144	164

Extreme weather events, such as tornados, storms, and wildfires, are becoming more frequent and intense due to climate change. These events can cause severe damage to urban forests, resulting in the loss of valuable tree canopy cover and the disruption of ecosystem services like air purification and temperature regulation. Moreover, heavy rainfall associated with climate change can lead to soil erosion and flooding in urban areas, further jeopardizing the health of urban forests.

[15] Source: Climatedata.ca

Climate change also has indirect impacts on urban forests by altering the distribution of invasive species and changing the composition of local ecosystems. Invasive species that thrive in warmer conditions may outcompete native tree species, reducing biodiversity and ecosystem stability. Additionally, changes in temperature and precipitation patterns can affect the availability of suitable habitats for wildlife that rely on urban forests for food and shelter. To address these challenges, cities must prioritize proactive urban forest management strategies, including planting climate-resilient tree species, improving soil quality, and implementing sustainable water management practices, to ensure the long-term health and vitality of their urban forests in a changing climate.

2.5.3 Pests

Natural processes, such as insect infestations and disease outbreaks, are integral components of forest ecosystems. By causing tree death, these agents help to regulate forest structure and promote regeneration in natural forests. Natural forests and trees have evolved with these natural agents and have created defence strategies. Natural agents can become pests when populations increase beyond the balance in which the ecosystem can sustain.

With an increasingly global economy, goods are being shipped from around the world. The transfer of materials provides opportunity for diseases and pests to move. As an example, Emerald Ash Borer is native to east Asia but was detected in Southern Ontario and the Northern United States in 2002. It was believed to have arrived within wood packaging. Similar climatic conditions and tree genus (e.g., maple and spruce groups) are found around the world. These trees and forests have developed their own defences to those pests. When introduced into a new area, these pests can move quickly due to the presence of new food sources and inadequate defences. It is difficult to predict what new and invasive pest may arrive in Canada and how they will impact trees and the urban forest. The best defence is diversity of trees at the genus level so that the urban forest can withstand impacts to one species or genus.

The City of Grande Prairie has created a robust pest monitoring program within the Integrated Pest Management Strategy that effectively conveys the risks associated with invasive pests. A monitoring schedule and active identification of pests of most concern to the city is identified within the document. Pests of concern are Emerald Ash Borer, Bronze Leaf Disease, and Dutch Elm disease. These pests would affect both planted and natural tree species within Grande Prairie and are killing agents. For more information about these pests, refer to Natural Resources Canada's database of Trees, Insects and Diseases of Canada's Forests[16].

2.5.4 Anthropogenic:

Anthropogenic impacts on urban trees refer to the effects of human activities on trees in urban environments. Urban trees play a crucial role in enhancing the quality of life in cities by providing numerous environmental, social, and economic benefits. However, they are also vulnerable to various negative impacts caused by human actions. As a growing city, the threats listed below are potential challenges to Grande Prairie's urban forest.

Construction and Development: Urban expansion and development often lead to the removal of trees to make way for buildings and infrastructure. While some cities have regulations in place to protect trees during construction, the loss of mature trees can have long-term negative effects on urban canopy cover. Excavation and construction activities often disturb the root systems of urban trees. Cutting or damaging tree roots can compromise the tree's stability and ability to absorb water and

[16] Trees, insects and diseases of Canada's forests (nrcan.gc.ca)

nutrients from the soil. Road and path development can increase compaction in soils and prevent roots from spreading and accessing nutrients and water.

Poor Maintenance: Inadequate or improper pruning practices can harm urban trees. Over-pruning can weaken trees by removing too many branches, while incorrect cuts can lead to disease and decay. Inconsistent or inadequate watering practices, such as over- or under-watering, can harm urban trees. Drought stress and root rot are common problems associated with improper irrigation. The City of Grande Prairie recommends property owners understand their obligations in tree care but does not currently have any specific maintenance standards for private trees. Residents are encouraged to contact 311 prior to performing any tree maintenance or removal for information on tree ownership and care. The Parkland Bylaw C-1310 outlines the City's responsibility to care for public trees, including Boulevard trees in front of resident's homes, and prohibits any unauthorized cutting or harming of city owned trees by the public.

Application of chemicals and fertilizers: In regions with cold winters, the use of de-icing salts on roads and sidewalks can result in an increase in soil salinity, which can damage tree roots and leaves. Salt-stressed trees may exhibit leaf scorch, reduced growth, and increased susceptibility to pests and diseases. Grande Prairie utilizes a salt/sand mix for ice control on roads. The impact of salts can create larger problems in areas that store run off from parking lots and roadways.

Herbicides and fertilizers can play important roles in urban forest management when used judiciously, including improved tree health, resilience, and accelerated growth. However improper use or over reliance can pose risks including non-target species impacts, soil degradation, and cost inefficiencies.

Encampments: An emerging issue in many cities, including Grande Prairie, are the impacts of encampments within urban forest stands. Potential risks to the community are ignition of wildfires, deforestation, litter, and public safety concerns. The issues surrounding homelessness are complex but the effects on the urban forest can have damaging and lasting impacts.

Efforts to mitigate these anthropogenic impacts on urban trees include proper planning and management of urban forests, implementing tree protection ordinances, promoting sustainable development practices, and educating the public about the value of urban trees and how to care for them. Urban forestry programs and initiatives are essential in maintaining healthy and vibrant urban tree populations.

2.6 Summary of Current Management

Grande Prairie's Parks Operations manages the urban forest on all public lands within the City. Parks Operations maintains both living and non-living park infrastructure, collaborating with internal and external stakeholders for safe, clean, and environmentally responsible upkeep of all public greenspace in the community.

The urban forest on private lands is under the responsibility and care of property owners. A call-line (311) is in place for resident service calls related to tree management on private properties. Parks Operations limits private tree work to ownership confirmation of trees, assistance with tree

identification, assistance with field level pest/disease diagnosis, and guidance on best practices for pruning, planting, and ongoing maintenance.

For staffing, the City currently has a Parks Biological Manager, one Lead Hand, two Arborists, and two seasonal staff. This team is responsible for maintaining the city's urban forest, which includes over 25,000 trees (public inventoried trees) across the city. In a report on Municipal Tree Management in the United States, average staffing levels for tree management are higher than what the City currently has in place. According to this report, cities with a population size of 50,000 to 99,999 people typically employ around 6 full-time staff members[17].

However, it's essential to note that population size is not necessarily a direct indicator of capacity required for tree management. The City of Fredericton, which has a similar population size to Grande Prairie, employs 8 full-time staff and 7 seasonal workers (students) in their urban forest management program. This suggests that the city recognizes the importance of having a dedicated team to manage its urban forest, particularly given its high level of canopy cover at approximately 63% (44% excluding the rural area). In contrast, Fort Saskatchewan (8% canopy cover) has a much smaller population of 28,000, but its tree and shrub maintenance program still employs 6 full-time equivalents (including shrub maintenance), indicating that even smaller cities can benefit from investing in urban forestry.

It can be difficult drawing comparisons between jurisdictions based on the number of staff alone. Division of duties amongst departments and use of third-party contractors can affect the interpretation of the level of staff required. Moreover, the staffing levels in cities in Canada are likely influenced by various factors, including the size and complexity of their urban forest inventories, climate conditions, and community expectations. For example, a city with a high level of canopy cover like Fredericton may require more staff to maintain its tree population, whereas a city with a smaller canopy cover like Fort Saskatchewan may require fewer staff but still need specialized personnel for tasks such as pruning and planting.

Considering these factors, the City of Grande Prairie could benefit from reassessing its staffing levels to ensure that they align with the needs of its urban forest in a fast-growing city combined with a youthful tree demographic discussed previously. This might involve hiring additional full-time staff or seasonal workers to support proactive maintenance activities and new planting projects. By doing so, the City can improve the health and resilience of its urban forest, enhance its aesthetic appeal, and provide a range of benefits for residents and visitors alike.

The City has several plans, policies and bylaws that currently exist to help manage the urban forest. These have been summarized in Table 2.

[17] International City/County Management Association.(1994). Municipal Tree Management in the United States: Staffing.

TABLE 2 ASSOCIATED PLANS, POLICIES, AND BYLAWS

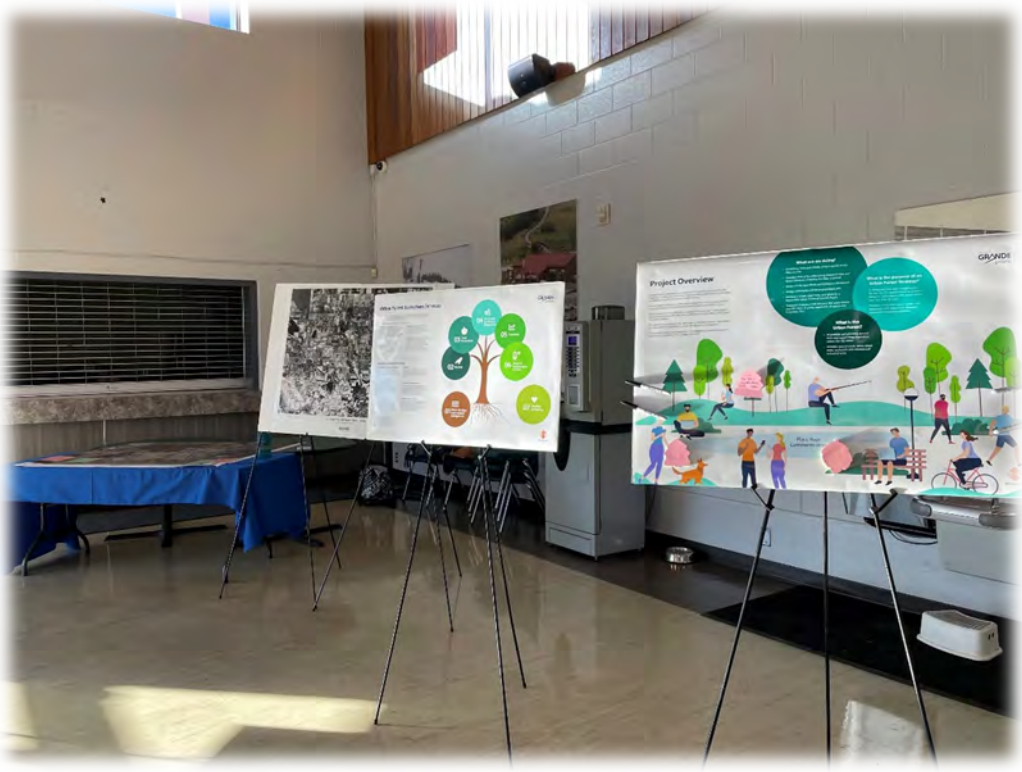
Plan, Policy, Bylaw	Relation to the Urban Forest
Tree Management Plan (2007)	This plan initially defined the City's vision and provided recommendations to strengthen the urban forest. The purpose of this plan was to begin the urban forest strategy process by defining the urban forest and its management needs. The Tree Management Plan provides the planning team background on Grande Prairie's urban forest including the benefits, threats, initial recommendations, the tree management program resources, and available inventory data at that time.
Muskoseepi Park Master Plan (2009)	Muskoseepi Park is Grande Prairie's central greenspace. This master plan guides all future development, land management and programming for the park with a goal of balancing public access and natural areas conservation.
Parks and Open Spaces Master Plan (2012)	This plan helps guide the development of parks and open spaces to maintain and enhance the landscape elements. This plan includes tree planting, Area Structure Plan content, and future park and trail connectivity recommendations, along with the suggestion of adopting a Tree Preservation or Tree Removal Bylaw. The Parks and Open Spaces Master Plan also recommended the creation of an Urban Forest Strategy.
Integrated Pest Management Plan (2013)	This plan outlines Grande Prairie's current pest management programs and recommends future initiatives. It focuses on reducing the need for pest control by concentrating on improving the overall urban forest. This plan also recommended the creation of a Tree Protection Bylaw.
Construction Manual (2022)	This manual includes specific requirements for tree and shrub preservation and protections that are near construction. These include the involvement of the Parks Department to identify plant limits, root systems, and protection measures. It also provides further specifics on landscape materials and installations.
Design Manual (2022)	This document specifies the minimum design standards required by the City. This includes the Landscaping Plan requirements which specify the location, size, and species name of all trees to be planted. Planting Plans are also required as needed. Guidelines are provided for setbacks, soil requirements, species mixes, and caliper size, among others. There is also an approved Plant Materials List that provides information on site considerations and minimum spacing based on landscaping category.
Municipal Development Plan (2024)	As a requirement of the Municipal Government Act, this is the City's most significant strategic policy document directing the location and type of new land uses and development. Many City plans are supported by, or provide input into, this plan including the Tree Management Plan, the Muskoseepi Park Master Plan, and the Construction and Design Manuals.
Edible Landscape Policy (212)	This policy provides background and guidance on incorporating edible plants into the City landscape.

Plan, Policy, Bylaw	Relation to the Urban Forest
The Fees, Rates and Charges Bylaw C-1395	This bylaw establishes the tree compensation rates for the City based on caliper size. The fees are reviewed and updated annually as required.
The Parkland Bylaw C-1310	This bylaw prohibits the removal, cutting, or destroying of any tree, or the placement of any signage or structures to be attached to or on a tree in a Parkland. The Director may also close any Parkland as required to protect trees and vegetation from any damages.
The Use of Public Lands Bylaw C-1078	This bylaw prohibits any unauthorized tree planting or placing any election signage on trees on Public Land.
City of Grande Prairie Land Use Bylaw C-1260	This bylaw regulates the use and development of land within the City. It specifies Development Permit conditions, Landscape Plans, and planting requirements. Landscaping securities are established here as a condition of development permits. The full security is released after 2-years having passed and an inspection by the Development Authority. If the landscaping is not completed within the specified time period, the City may use the security to complete the project with any insufficient funds being placed as a debt on the developer.

3 What was Heard During Engagement

Public engagement is vital when developing an Urban Forest Strategy because it ensures inclusivity, transparency, and the incorporation of local knowledge. By involving the community, the strategy benefits from a wide range of perspectives and builds trust through transparency. Residents' input enhances the strategy's effectiveness while helping increase education, awareness, and securing long-term support.

In preparation of this Urban Forest Strategy, meetings were conducted with City staff, City Council, and Indigenous community representatives in addition to a public online survey and open house. A survey was sent to City staff and Council prior to their sessions. Overall, session attendees expressed a high regard for the city's urban trees and parks and collectively highlighted the significance of a comprehensive approach to urban forest management, balancing the various factors of a growing city while striving to strengthen and enhance the city's green spaces. Key values of the urban forest that emerged through the engagement include beautification, well-being, and quality of life.



Key takeaways from the engagement activities are summarized below (Figure 10). Further details can be found in Appendix IV - Engagement Results.

Opportunities

- **More trees on public land** – In the public survey, planting new trees on public land was ranked as the highest action the City can take to improve the urban forest.
- **More public information and education** – There is a desire from the public for more education from the City on the urban forest such as how to care for trees and use the forest.
- **Indigenous inclusion and reconciliation** – The Indigenous community indicated that there is opportunity to use the urban forest as a tool towards reconciliation and incorporate Traditional Ecological Knowledge into urban forest management.
- **Expand collaboration among City departments** – There exists good collaboration between city departments that can be expanded upon to further the management of the urban forest and ensure efficient planning and design.

Considerations

- **Resources for proactive management** – A shift to more proactive management to maintain public safety and enhance the urban forest will require an evaluation of resources and capacity.
- **Public safety, disease, wildlife** - Vandalism and disease were two of the most prominent concerns from the public survey. Continuing to identify and remove or remediate hazard trees is important to maintain public safety. Additional considerations for urban forest management include visibility along streets, impacts to wildlife, and accessiblily.
- **Right tree, right place** – There are many factors that need to be considered when selecting trees to plant. Items raised include site considerations such as ecological factors (e.g. soil, shade, wind, wildfire), proximity to infrastructure (e.g. utilities) and other land use needs (e.g. road expansion, snow removal, open recreational space).
- **Protection policies for trees** – This was ranked in the top three actions the City could take to improve the urban forest.

FIGURE 10 SUMMARY OF OPPORTUNITIES AND CONSIDERATIONS BROUGHT FORWARD DURING ENGAGEMENT ACTIVITIES

The public engagement process for the Urban Forest Strategy revealed a strong appreciation among residents and stakeholders for the City's urban trees and parks, with a desire for a comprehensive approach to management. Key values identified include beautification, well-being, and quality of life. The engagement process also highlighted opportunities and considerations for urban forest management, which have shaped this strategy.

4 Strategy

A comprehensive UFS has been developed for Grande Prairie to ensure the long-term sustainability and growth of the City's trees and green spaces. This strategy sets a long-term vision supported by goals and objectives that provides a framework for responsible management and engages community members to participate in urban forest stewardship. By providing clear direction this UFS maximizes the environmental, social, and economic benefits of Grande Prairie's urban forest to enhance the quality of life for its citizens.

4.1 Visions for Grande Prairie's Urban Forest

A vision statement is common practice in urban forest strategies in Canada and they contain elements that describe the urban forest and how it is valued. This provides an anchor for what the urban forest is to be and connecting to the City's strategy. The following vision has been prepared for Grande Prairie's urban forest:

A beautiful, vibrant, and healthy urban forest that enhances the well-being and quality of life for generations to come.

4.2 Strategic Goals

Strategic goals are broad statements that spell out general outcomes of what needs to be achieved to realize the vision. The goals statements for the UFS have been carefully developed based on the current state analysis and what was heard during the engagement activities. These goals are purpose-driven, long-term and forward focused (Figure 11).

FIGURE 11 UFS STRATEGIC GOALS

4.3 Objectives & Actions

Objectives are the specific outcomes to help achieve the strategic goals and are supported by a set of actions listed below each objective. The actions are sub-grouped into an implementation sequence of short (1-5 years), mid (5-10 years), and long (10+ years) term timeframes.

Rooted in the Community

Objective 1 - Develop and deliver education and outreach initiatives for staff and the public

There is a desire from the community for more education and information on the urban forest.

Short Term Actions:

1. Develop public education materials (digital and print):
   - "How to use the forest" materials/videos to educate on safe exploration and use of the urban forest;
   - Tree care materials/videos & demonstration events for planting and maintenance of trees;
   - Review and promote existing edible landscaping map and materials.
2. Engage with community groups, businesses, and forest industry to support public education and involvement.
3. Celebrate and promote external forest initiatives like Alberta Forest Week (May) and National Forest Week (September).

Mid Term Actions:

4. Explore incentive programs for active tree maintenance on private land (residential, commercial, and/or industrial property). Incentive programs could include:
   - Free tree give-aways;
   - Partnering with businesses to provide discounts or rental programs for tree management tools;
   - Holding beautification contests.

Rooted in the Community

Objective 2 - Continue Indigenous Engagement

Continuing regular engagement with the Indigenous community to help incorporate Traditional Knowledge into urban forest management.

Short Term Actions:

1. Continue regular meetings with the Indigenous community to build relationships and gather Traditional Knowledge.
2. Engage and identify Indigenous ceremonial or cultural spaces in the urban forest.

Mid Term Actions:

3. Work with the Indigenous community to incorporate Traditional Knowledge into urban forest management practices (e.g., growing/maintaining edible landscapes, native species selection).

Proactively Managed Adaptive Management

Objective 3 - Establish a Tree Protection Policy

Tree protection policies or by-laws are often put in place to regulate the planting, care, maintenance, protection, and removal of trees. This is a common practice in many jurisdictions and while Grande Prairie has some current policies and by-laws related to the urban forest, there can be a lack of clarity and consistency when dealing with trees over multiple documents.

Short Term Actions:

1. Complete a draft policy for public trees.
2. Engage on the draft policy with the City's interdepartmental working group, then finalize.
3. Implement and enforce the policy.

Mid Term Actions:

4. Review policy effectiveness and adapt.

Long Term Actions:

5. Explore policy expansion to private trees.

Proactively Managed

Objective 4 – Mitigate Against Wildfire Risk

The threat of wildfire continues to grow for many communities. Urban forest management can be a tool to help mitigate against the threat of wildfire.

Short Term Actions:

1. Continue working with the Grande Prairie Fire Department to apply for FireSmart funding and implement the wildfire mitigation strategy (e.g., vegetation management, public education).
2. Follow best practices and update a wildfire mitigation strategy every 5 years.
3. Review design guidelines for fire-resistant tree species (species that accumulate minimal dead vegetation, and have water-like sap with low amounts of resin such as poplars, maples, and ashes).
4. Establish and support ongoing community-based programs that educate and engage residents in ongoing wildfire mitigation efforts. Education and outreach programs (funding available through FRIAA) and leveraging materials developed by FireSmart Alberta to support homeowners in building a FireSmart community such as fire-resistant landscaping, home ignition zone education, and the neighbourhood recognition program which can help augment the City's vegetation management actions.

Proactively Managed Growing for the Future Adaptive Management

Objective 5 – Maintain and conserve a diverse population of trees in a safe and healthy condition

Diversity will support beautification, provides a greater range of ecosystem services and reduces vulnerabilities to biotic and abiotic factors.

Short Term Actions:

1. Continue working with internal departments to identify and address safety issues within the urban forest.
2. Maintain staff training on maintenance and best practices
3. Explore efficiencies or increase maintenance resources including personnel to transition to a proactive management approach.
4. Review design and tree selection guidelines considering beautification objectives, resilience, and Indigenous Knowledge.
5. Continue to monitor and report on tree health and species distribution.
6. Establish partnerships with post-secondary or research institutes for ongoing research or trials to study tree success based on climate change.

Proactively Managed Adaptive Management

Objective 6 - Maintain an up-to-date tree inventory

An up-to-date tree inventory supports data-driven decision making to address short term priorities, facilitate long-term sustainability planning, risk management, and community engagement.

Short Term Actions:

1. Retain external resources to complete a public tree inventory update.
2. Work with the GIS Department to leverage GIS tools for efficient field data collection to keep the tree inventory up-to-date.
3. Work with the GIS Department to roadmap geospatial technology that can be integrated to efficiently manage urban forest assets and activities (e.g., maintenance records).

Mid Term Actions:

4. Explore solutions for gathering citizen data on tree health (e.g., Neigbourwoods Program in municipalities in Ontario).

Rooted in the Community Growing for the Future

Objective 7 - Tree establishment is planned and coordinated over multiple years

A multi-year tree establishment plan will help foster sustainable urban forest growth to help achieve the long-term vision of the urban forest while in the short-term helping to efficiently plan and allocate resources.

Short Term Actions:

1. Review completed tree planting plan analysis (Appendix V - Planting Plan Analysis) and engage with the interdepartmental working group to develop a multi-year tactical plan for public land.
2. Engage with businesses and community groups on opportunities to contribute to planting on public land.

Mid Term Actions:

3. Review progress on the multi-year tactical plan, adjust priority analysis as needed, and continue to implement.
4. Explore naturalization opportunities to expand natural forest cover on edges of existing stands in areas previously under a turf maintenance regime.

5 Conclusion

Grande Prairie is a young and growing community that values its urban forest as a key contributor to beautification, well-being, and quality of life. This Urban Forest Strategy provides short-term direction and a long-term vision for managing, protecting, and growing the City's urban forest for many years to come. With this strategy and by working together, City staff, community members, and businesses, can ensure that Grande Prairie's urban forest is healthy, vibrant, and thriving for generations to come.

TABLE 3 URBAN FOREST STRATEGY SUMMARY

Vision for Grande Prairie's Urban Forest: ***A beautiful, vibrant, and healthy urban forest that enhances the well-being and quality of life for generations to come.***				
Objectives	**Rooted in the Community**	**Proactively Managed**	**Growing for the Future**	**Adaptive Management**
Develop and deliver education and outreach initiatives for staff and public *(4 actions)*	✓			
Continue Indigenous engagement *(3 actions)*	✓			
Establish a Tree Protection Policy *(5 actions)*		✓		✓
Mitigate against wildfire risk *(4 actions)*		✓		
Maintain and conserve a diverse population of trees in a safe and healthy condition *(6 actions)*		✓	✓	✓
Maintain an up-to-date tree inventory *(4 actions)*		✓		✓
Tree establishment is planned and coordinated over multiple years *(4 actions)*	✓		✓	

Appendix I - Grande Prairie Tree Species Inventory - Summary

The City's tree inventory was completed in 2013 with periodic updates since. 76 different species have been identified making up 28 different genera.

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
American Elm (*Ulmus americana*)	3464	14	Boulevards and Collector Roads. No more than 20% of any design plan combined with *Fraxinus*.	City Maintained, Private Front Yards	5
Colorado Spruce *(Picea pungens)*	3289	13	Boulevards and Collector Roads	City Maintained, Private Front Yards	6
Green Ash (*Fraxinus pennsylvanica*)	2293	9	Boulevards and Collector Roads. No more than 20% of any design plan combined with *Ulmus*.	Private Front Yards, City Maintained	5.5
Apple (*Malus spp.)*	1844	7	Municipal Reserves, Parks	Private Front Yards, No Data	3.2
White Spruce (*Picea glauca*)	1754	7	Boulevards and Collector Roads, Municipal Reserves, Parks, Naturalized Areas	City Maintained, Private Front Yards	6.4
Schubert Chokecherry (*Prunis virginiana* 'Schubert')	1621	6	Boulevards and Collector Roads. No more than 5% of any boulevard planting.	Private Front Yards, City Maintained	3.5
Black Ash (*Fraxinus nigra*)	1554	6	No planting on City property currently (prevent cottony psyllid).	Private Front Yards, City Maintained	3.8
Northwest Poplar (*Populus x jackii* 'Northwest')	1267	5	Boulevards and Collector Roads	City Maintained, Boulevards	8.5

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
Mayday (*Prunus padus*)	1031	4	Boulevards and Collector Roads No more than 5% of any boulevard planting.	Private Front Yards, City Maintained	3.9
Swedish Poplar *(Populus tremula* 'Erecta'*)*	655	3	None	City Maintained, Private Front Yards	6.3
Showy Mountain Ash *(Sorbus decora)*	634	3	Municipal Reserves, Parks	Private Front Yards, City Maintained	4.4
Bur Oak (*Quercus macrocarpa*)	469	2	Boulevards and Collector Roads	City Maintained, Private Front Yards	3.6
Scots Pine (*Pinus sylvestris*)	404	2	Boulevards and Collector Roads	City Maintained, No Data	4.7
Siberian Larch (*Larix sibirica*)	396	2	Boulevards and Collector Roads	City Maintained, No Data	4.7
Paper Birch (*Betula papyrifera*)	394	2	No planting on City property currently (prevent bronze birch borer).	Private Front Yards, City Maintained	4.8
Manitoba Maple *(Acer negundo)*	382	2	Boulevards and Collector Roads (male clones only)	Private Front Yards, City Maintained	5.8
Lodgepole Pine (*Pinus contorta latifolia*)	378	2	Boulevards and Collector Roads, Naturalized Area	City Maintained, Private Front Yards	5.2
Trembling Aspen (*Populus tremuloides*)	342	1	Municipal Reserves, Parks, Natural Areas	City Maintained, No Data	5.7
Hawthorn (*Crataegus spp.)*	332	1	Boulevards and Collector Roads	City Maintained,	4.2

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
				Private Front Yards	
Amur Chokecherry *(Prunus maackii)*	200	1	Boulevards and Collector Roads	Private Front Yards, City Maintained	4
Hybrid Linden *(Tilia spp.)*	186	1	Boulevards and Collector Roads	No Data, City Maintained	3.1
American Linden (*Tilia americana*)	164	1	Boulevards and Collector Roads	City Maintained, Private Front Yards	3.5
Laurel Leaf Willow *(Salix pentandra)*	156	1	Boulevards and Collector Roads	City Maintained, Private Front Yards	5.9
Balsam Poplar (*Populus balsamifera*)	143	1	Naturalized Areas	No Data, City Maintained	7.1
Tower Poplar (*Populus x canescens* 'Tower')	142	1	None	Private Front Yards, City Maintained, Industrial	6.7
Japanese Tree Lilac *(Syringa reticulata)*	141	1	Municipal Reserves, Parks, Ornamental Shrubs	No Data, City Maintained	3.8
Siberian Elm (*Ulmus pumila, Ulmus mandshurica*)	123	0.5	Boulevards and Collector Roads. No more than 20% of any design plan combined with *Fraxinus*.	City Maintained, Private Front Yards.	6
Plum (*Prunus spp.*)	119	0.5	Boulevards and Collector Roads, Municipal Reserves and Parks. Diversified trees for use in Park Sites only, Wild Plum for Natural Areas.	City Maintained, Private Front Yards	3.2

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
Ohio Buckeye (*Aesculus glabra*)	105	0.4	Boulevards and Collector Roads.	No Data, City Maintained.	2.5
Sandbar/Coyote Willow *(Salix exigua)*	103	0.4	Naturalized Areas.	City Maintained, Boulevards.	6.7
Hybrid Poplar (*Populus spp.)*	80	0.3	Boulevards and Collector Roads (male clones only and must be hardy to Zone 3).	City Maintained, Boulevards.	6.4
Ponderosa Pine (*Pinus ponderosa*)	68	0.3	Boulevards and Collector Roads.	City Maintained, No Data.	3.9
Swiss Stone Pine *(Pinus cembra)*	65	0.3	Boulevards and Collector Roads.	City Maintained, No Data.	3.5
White Ash (*Fraxinus americana*)	64	0.3	Boulevards and Collector Roads (male clones only). No more than 20% of any design plan combined with *Ulmus*.	No Data, City Maintained	2.5
Wolf Willow (*Elaeagnus commutate*)	58	0.2	Naturalized Areas, Ornamental Shrubs.	No Data, City Maintained.	4.6
Silver Maple 'Silver Cloud' *(Acer saccharinum* 'Silver Cloud'*)*	48	0.2	Boulevards and Collector Roads.	Private Front Yards, No Data.	4.1
Jack Pine (*Pinus banksiana*)	46	0.2	Boulevards and Collector Roads, Naturalized Areas.	City Maintained, Private Front Yards.	5.1
Hybrid Ash (*Fraxinus spp.*)	43	0.2	No planting on City property currently (prevent cottony psyllid).	Private Front Yards, City Maintained.	3.6

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
Sour Cherry (*Prunus cerasus*)	43	0.2	Not specifically listed but many cherry varieties included in the edible shrub recommendations.	City Maintained, No Data.	5
Russian Olive (*Elaeagnus angustifolia*)	42	0.2	Municipal Reserves and Parks.	City Maintained, Private Front Yards.	4.8
Pin Cherry (*Prunus pensylvanica*)	41	0.2	Municipal Reserves and Parks, Naturalized Areas.	No Data, City Maintained.	5
Douglas Fir (*Pseudotsuga menziesii*)	38	0.2	None.	City Maintained, No Data.	2
Little-Leaf Linden *(Tilia cordata)*	29	0.1	Boulevards and Collector Roads.	No Data, City Maintained.	3.8
Mountain Pine (*Pinus uncinate*)	29	0.1	Municipal Reserves and Parks.	No Data, City Maintained.	2.7
'Majestic Skies' Northern Pin Oak	28	0.1	Diversified Trees for Parks.	No Data, City Maintained.	2.5
Ure Pear (*Pyrus ussuriensis* 'Ure')	24	0.1	Municipal Reserves and Parks.	No Data, Private Front Yards.	5
Mongolian Linden (*Tilia mongolica*)	17	0.1	Boulevards and Collector Roads.	No Data, City Maintained.	3.4
Balsam Fir (*Abies balsamea*)	15	0.1	Diversified Trees for Parks, Naturalized Areas.	No Data, Private Front Yards.	4.3
'Lace' Weeping Willow *(Salix babylonica* 'Lace'*)*	14	0.1	Diversified Trees for Parks.	No Data, City Maintained.	5.7

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
Hybrid Maple *(Acer spp.)*	13	0.1	None.	No Data, City Maintained.	7.5
Norway Spruce (*Picea abies*)	13	0.1	Municipal Reserves and Parks.	City Maintained, No Data.	6.6
Austrian Pine (*Pinus nigra*)	12	0.05	None.	No Data, City Maintained.	7
Butternut Walnut (*Juglans cinerea*)	11	0.04	None.	No Data, City Maintained.	10.5
'Prairie Horizon' Manchurian Alder	9	0.04	Diversified Trees for Parks.	No Data, Private Front Yards.	Not Available
Amur Maple (Acer ginnala)	8	0.03	Municipal Reserves and Parks.	Private Front Yards, City Maintained.	2
Northern Red Oak *(Quercus rubra)*	8	0.03	Diversified Trees for Parks.	No Data, City Maintained.	Not Available
River Birch (*Betula nigra*)	8	0.03	Municipal Reserves and Parks. Recommended substitution for white barked birches.	City Maintained, Private Front Yards.	5
Golden Willow *(Salix alba* 'Vitellina'*)*	7	0.03	Municipal Reserves and Parks.	City Maintained, Private Front Yards.	4.3
Hackberry (*Celtis occidentalis*)	7	0.03	Recommended substitution for white barked birches.	City Maintained, Private Front Yards.	7
Eastern White Pine *(Pinus strobus)*	6	0.02	Diversified Trees for Parks.	City Maintained, Private	6.3

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
				Front Yards.	
Amur Corktree (*Phellodendron amurense*)	5	0.02	Diversified Trees for Parks.	No Data.	6
Hybrid Willow *(Salix spp.)*	5	0.02	None.	City Maintained.	2
Norway Maple (*Acer platanoides*)	5	0.02	None.	No Data.	Not Available
Bristle Cone Pine *(Pinus longaeva)*	4	0.02	None.	City Maintained.	Not Available
Catalpas (*Catalpa spp.*)	4	0.02	None.	City Maintained, No Data.	Not Available
Limber Pine (*Pinus flexilus*)	4	0.02	Diversified Trees for Parks, Naturalized Areas.	No Data, City Maintained.	4
Plains Cottonwood (*Populus deltoides var. occidentalis*)	4	0.02	Municipal Reserves and Parks.	City Maintained, Private Front Yards.	10.5
Red Maple (*Acer rubrum*)	3	0.01	None.	No Data, Private Front Yards.	Not Available
Black Walnut (*Juglans nigra*)	2	0.01	None.	City Maintained, No Data.	Not Available
Serbian Spruce (*Picea omorika*)	2	0.01	None.	City Maintained.	12
Beech (*Fagus*)	1	0.004	None.	City Maintained.	Not Available
Black Spruce (*Picea mariana*)	1	0.004	Naturalized Areas.	City Maintained.	4
Locust (*Robinia spp.*)	1	0.004	None.	City Maintained.	Not Available

Tree Species	Number of Trees	% of the Species	Design Manual Use Recommendations	Common Planting Locations	Average Height (m)
Red Pine (*Pinus resinosa*)	1	0.004	None.	City Maintained.	Not Available
Tamarack (*Larix laricina*)	1	0.004	Boulevards and Collector Roads, Naturalized Areas.	Private Front Yards.	8
Tatarian Maple 'Hot Wings' *(Acer tataricum* 'GarAnn'*)*	1	0.004	Boulevards and Collector Roads.	No Data.	Not Available

Appendix II – Ecosystem Services Assessment

The City of Grande Prairie, like any urban environment, benefits from a range of services provided by its natural surroundings. These services, often referred to as ecosystem services, include a multitude of tangible and intangible benefits offered by the environment, particularly the urban forest within the city. This section reviews some of the contributions of the urban forest to Grande Prairie's well-being, environment, and economy. From purifying the air we breathe to mitigating the effects of climate change, reducing energy costs, and promoting physical and mental health, the urban forest is an asset that plays a role in shaping the quality of life in the City.

To complete this assessment, priority ecosystem services were identified through background research and through the stakeholder engagement process. Respondents to engagement surveys were asked what the most important benefits provided by the urban forest were. A summary of some of the values and ecosystem services is categorized and shown in Table 4. The list of identified ecosystem services is not a comprehensive list of benefits people derive from the urban forest. Many other benefits could include, food, aesthetics, community well-being, erosion control, recreation and tourism, and more.

TABLE 4 IDENTIFIED VALUED ECOSYSTEM SERVICES

Ecosystem Services	Description
Biodiversity	Grande Prairie's urban forest supports a diverse array of plant and animal species, offering crucial habitats and creating wildlife corridors that enable the movement and survival of various organisms. They enhance urban biodiversity, helping to preserve and promote the coexistence of wildlife within city limits.
Cultural Values	Grande Prairie's urban forest provides spaces for human connection with nature and each other. Historical value is enriched by preserving heritage trees and landscapes. Grande Prairie's urban forest offers opportunities for recreation, improving well-being through outdoor activities. It's aesthetic appeal enhances the visual and sensory experience of urban living.
Water Regulation	Grande Prairie's urban forest plays a vital role in stormwater management by absorbing and slowing the flow of rainwater, reducing the risk of flooding and minimizing soil erosion.
Climate Regulation	Grande Prairie's urban forest helps mitigate the heat island effect by shading and cooling urban areas, creating more comfortable environments during hot weather. Their canopy provides shade for buildings particularly in downtown areas, reducing the energy demand for air conditioning. In the winter, trees act as windbreaks, lowering wind speeds and minimizing heat loss from structures.
Air Quality Regulation	Grande Prairie's trees are natural air purifiers, capturing pollutants such as particulate matter and gases while releasing oxygen into the atmosphere. This process improves air quality in urban settings, benefiting public health and reducing the impact of pollution.
Carbon Sequestration	Grande Prairie's urban forest stores carbon through the growth and development of trees, contributing to the reduction of greenhouse gas emissions. This carbon sequestration helps combat climate change, providing cleaner air and a more sustainable environment.

The Ecosystem Service Selection Criteria, which can be viewed through the EcoServices Network public website[18], was leveraged to identify primary indicators of ecosystem services. Table 5 shows the associated indicators chosen to align with the Ecosystem Services valued by the City of Grande Prairie and its residents.

TABLE 5 GRANDE PRAIRIE ECOSYSTEM SERVICE AND INDICATOR LIST

Ecosystem Service	Indicator(s)	Data Source
Biodiversity	Species Intactness	ABMI Intactness
Cultural Values	Historical Resource Value (HRV) area percent in treed areas relative to HRV area in non-treed areas	Provincial Historical Resources Data
Water Regulation	The capacity of the urban forest to store water as a measure of flood protection	i-Tree Canopy Model
Climate Regulation	Heat Island Effect reduction	Satellite Imagery, LiDAR Canopy Cover
Climate regulation	Carbon sequestered	i-Tree Canopy Model
Air Quality Regulation	Air pollution filtration	i-Tree Canopy Model

Biodiversity – Species Intactness

Species intactness is one indicator available for measuring biodiversity. Species intactness modeling is a valuable tool for measuring and monitoring biodiversity.

The Alberta Biodiversity Monitoring Institute (ABMI) species intactness index measures how much the abundance of a species in a certain area has been affected by human activities[19]. It ranges from 0 to 100, with 100 indicating that the species' current abundance matches what it would be in an undisturbed environment. Any value below 100 shows a deviation from this ideal state. The greater the deviation from 100, the larger the impact of human activities like agriculture, urban development, and roads on that species' abundance. An overall biodiversity intactness combines all modeled species into a single index for each 1 km^2 grid cell. For more information on ABMI species intactness, see the ABMI website.

The values for the 1 km^2 grid cells within the City of Grande Prairie ranged from a low of 39 to a high of 76 relative species intactness. The intactness levels have been categorized into four groups, very low, low, medium, and high relative intactness.

[18] Ecoservices Network. (2023). Retrieved from: www.ecoservicesnetwork.ca.
[19] Alberta Biodiversity Monitoring Institute. (2014). Species Intactness.

TABLE 6 RELATIVE SPECIES INTACTNESS FOR THE CITY OF GRANDE PRAIRIE

Relative Species Intactness	Percent Area
Very Low (0-25)	0.0%
Low (26-50)	26.0%
Medium (51-75)	73.8%
High (76-100)	0.1%

By quantifying the impact of human activities on species intactness, it can help inform policy decisions.

Cultural Values – Historical Resource Values

Treed areas in urban environments often hold cultural and historical significance. These green spaces can be repositories of collective memory and cultural heritage, offering a glimpse into the past and connecting us to our roots. Here are a few ways in which treed areas can be culturally and historically significant:

- **Indigenous Heritage**: Many urban areas are located on lands with deep Indigenous history. Treed areas may contain culturally significant plants, trees, and landscapes that have been integral to the traditions and practices of Indigenous communities. These areas may hold spiritual and ceremonial value, making them crucial for preserving cultural heritage.
- **Historical Relics**: Urban forests may house historical relics or remnants of the past, such as old structures, gravestones, or archaeological artifacts. These sites are windows into the history of the area and offer opportunities for research and education.
- **Botanical Significance**: Trees and plants in urban forests can have cultural significance. Some species may have been introduced by different cultural groups and continue to be cultivated as a connection to their heritage. These plants often have traditional uses or represent cultural practices.
- **Recreational and Community Gathering**: Treed areas often serve as locations for community events, gatherings, and festivals. These spaces can foster a sense of belonging and shared cultural experiences, contributing to a city's identity and cultural richness.
- **Art and Interpretation**: Urban forests offer a canvas for art installations, sculptures, and interpretive displays that convey cultural narratives and historical context, providing a unique platform for cultural expression.
- **Education and Awareness**: Treed areas are valuable spaces for educating the public about local history and cultural diversity. Interpretive signs, guided tours, and educational programs can help residents and visitors connect with the cultural heritage of the area.
- **Interconnectedness**: Urban forests often connect to the larger landscape, including nearby historical sites, parks, and recreational areas, forming an interconnected web of cultural and natural spaces.

Alberta Culture and Tourism, as per the Historical Resources Act, is responsible for examining, preserving, and safeguarding Alberta's historical assets for its people. The Listing of Historic Resources is a crucial tool in this effort, identifying lands with existing or potential historical

resources, which benefits developers and regulatory bodies by helping them assess potential impacts on historical resources before initiating projects.

Approximately 32.5% of the City of Grande Prairie is covered in some level of Historical Resource Value (HRV) area, and of that, 8.3% is treed area. In non-HRV area, 4.8% is treed, suggesting a positive correlation between treed areas and HRV or culturally significant areas.

Beyond the Historical Resource Values dataset, the Muskoseepi Park areas has a historical role as a gathering place for Indigenous peoples. During the engagement session with Indigenous community members, it was identified that there is opportunity to use the urban forest for reconciliation and identify ceremonial or cultural spaces within the urban forest.

In summary, treed areas in urban environments can serve as repositories of cultural and historical significance, shedding light on the City's past. Recognizing and preserving these areas is essential for maintaining cultural diversity, fostering respect for Indigenous traditions, and promoting a deeper understanding of the history and cultural identity of a community.

Water Regulation – Stormwater management

Avoided water runoff from an urban forest refers to the reduction in the volume and speed of rainwater or stormwater flowing over impervious surfaces like roads and buildings, primarily as a result of the presence of trees and vegetation in an urban environment. This reduction in runoff occurs because urban forests, with their tree canopies and root systems, absorb, store, and slow down rainfall. By intercepting and managing stormwater, urban forests help prevent flooding, erosion, and the pollution of water bodies, thereby mitigating the negative impacts of urbanization on local hydrology and water quality.

In urban areas where managing runoff is challenging, trees act as green infrastructure by directing rainfall to different parts of the hydrologic cycle. This process involves losses through canopy interception, transpiration, improved infiltration, and potential benefits related to deeper percolation and water table management via tree roots. These losses occur on varying time scales, with canopy interception loss being relevant during and shortly after storms, while transpiration helps manage soil moisture between storm events.

The type of forest plays a crucial role in determining canopy interception rates. In closed-canopy forests globally, it has been observed that interception loss typically accounts for around 18-29% of total precipitation in hardwood forests and approximately 18-45% in coniferous forests, with the specific percentage varying based on the characteristics of the forest stands[20].

Trees can store up to 380 Litres of water until it becomes saturated after about 2.5 cm to 5 cm of rain. When considering the combined effect of numerous trees in a community, this interception and redistribution of rainwater becomes significant. The urban forest has the potential to reduce annual runoff by an estimated 2 to 7 percent, resulting in cost savings through the use of smaller drainage and retention systems[21]. When trees are integrated with other natural landscaping practices, it's possible to reduce as much as 65 percent of stormwater runoff in residential areas, and in some cases, even retain 100 percent of the rainfall on-site.

Using the i-Tree Canopy model, Grande Prairie's total urban forest has an avoided run-off estimate of 282 mega litres per year, the equivalent of 112 Olympic-sized swimming pools.

[20] Berland et al. (2017). The role of trees in urban stormwater management. Landscape and Urban Planning, 167-177
[21] Tree City USA Bulletin.(2010). How trees can retain stormwater runoff. Arbor Day Foundation. Nebraska City.

Climate Regulation – Heat Island Reduction

Urban forests help with climate regulation by reducing heat islands and limiting cooling effects in winter through their natural features and processes:

- **Heat Island Reduction**: Urban trees provide shade and cooling through their canopy, reducing the "heat island" effect in cities. Their leaves and branches block sunlight and provide evaporative cooling, which lowers surface and air temperatures, making urban areas more comfortable during hot weather.
- **Wind Reduction**: In winter, urban forests act as windbreaks, reducing wind speed and wind chill in exposed urban areas. This helps limit heat loss from buildings, making them more energy-efficient and reducing heating demands during cold weather.

The presence of trees in urban areas enhances local microclimates, contributing to a more balanced and comfortable environment, which, in turn, reduces the energy required for heating and cooling buildings, thus lowering greenhouse gas emissions and energy costs.

Average summer surface temperatures were assessed using Landsat imagery for the City of Grande Prairie (Figure 12).

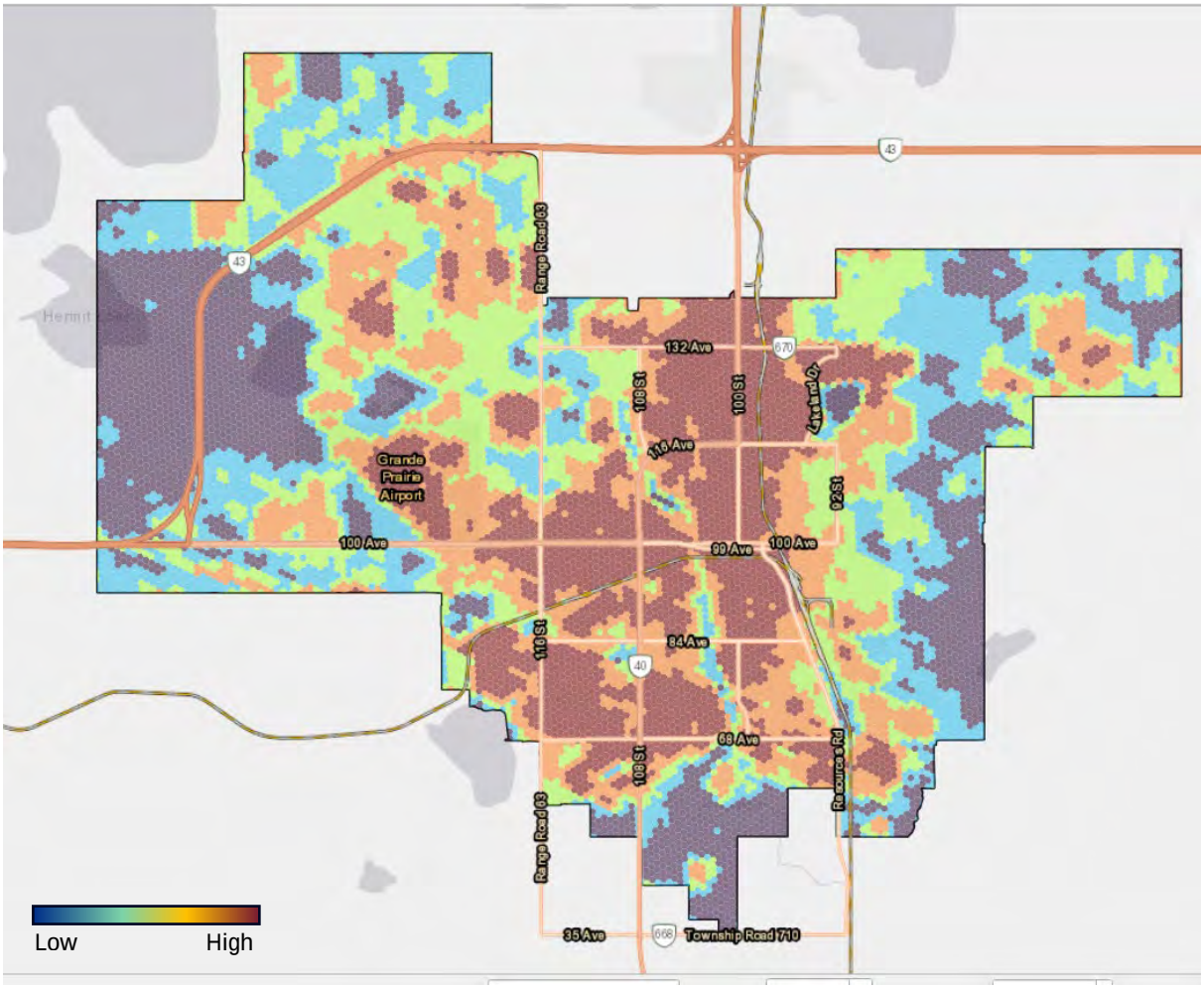


FIGURE 12 RELATIVE AVERAGE MAXIMUM SUMMER SURFACE TEMPERATURES MEASURED FROM SATELLITE IMAGERY

Figure 13 Table 7 shows the results of the heat island analysis in which areas of the city were spatially analyzed based on maximum temperatures and tree cover. Areas with the lowest tree cover received a score of 1 to 5 on a continuous scale, where 5 indicated no tree cover present and 1 indicated full tree coverage. Areas also received a score of 1 to 5 on a continuous scale for the average daily maximum for the summer months where 1 was the lowest relative temperature and 5 was the highest. The two scores were added together to create a Heat Island Index where the score ranged from 2.2 to 10.

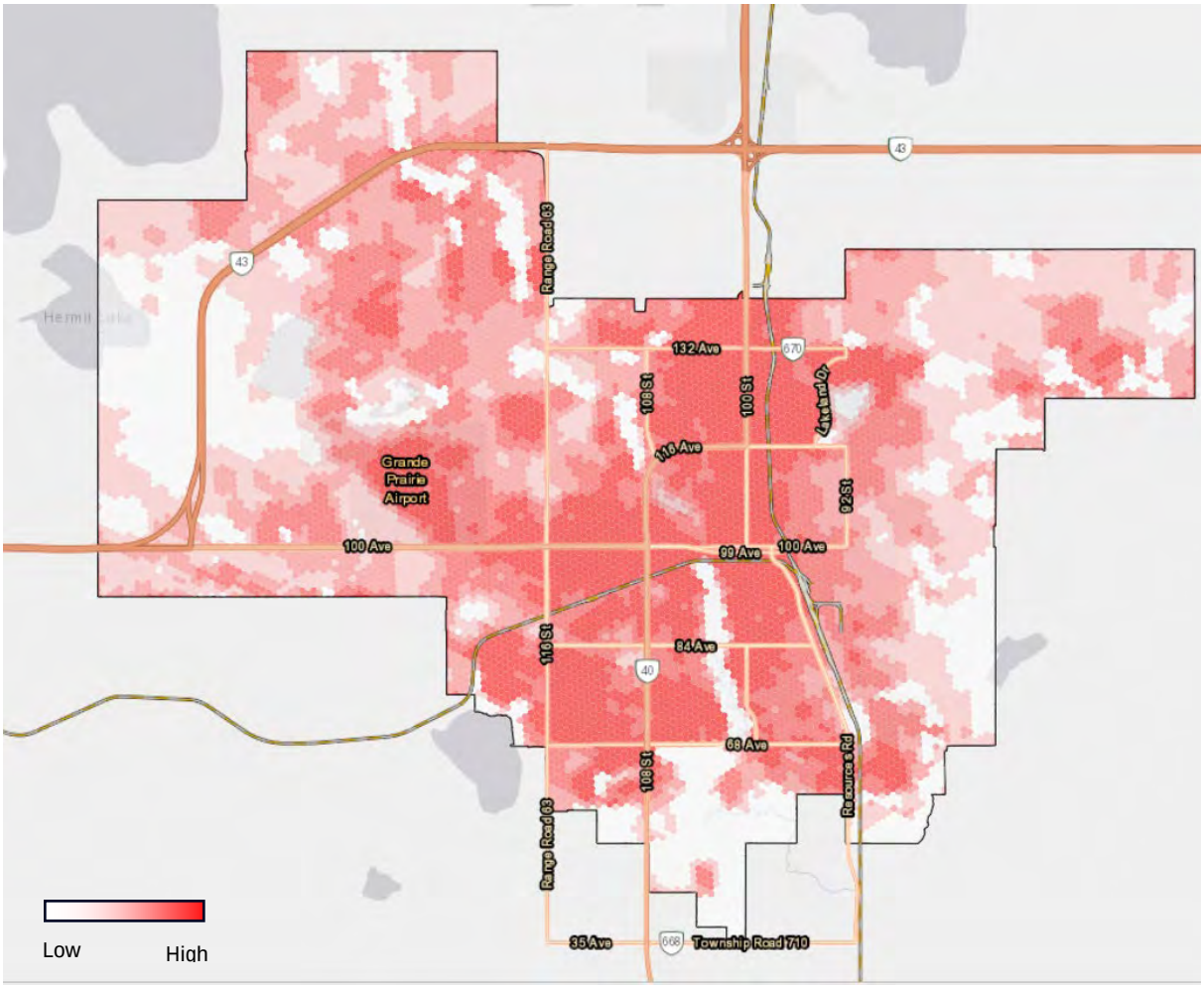


FIGURE 13 HEAT ISLAND INDEX

TABLE 7 HEAT ISLAND PERCENT AREA IN THE CITY OF GRANDE PRAIRIE

Heat Island Index	Percent Area (%)
Low	6%
Medium	45%
High	48%

Tree canopy cover percentage can serve as a valuable indicator. By quantifying the extent of tree cover in urban areas, we can gauge the potential cooling effect and mitigation of heat islands. As the analysis shows for Grande Prairie, it is important to maintain tree assets in areas like the downtown core despite the challenging environment for growing trees. Higher tree canopy percentages correlate with increased shading, reduced surface temperatures, and enhanced overall urban microclimate. Monitoring changes in tree canopy cover over time can help evaluate the effectiveness of urban forestry initiatives and guide targeted interventions to combat the urban heat island effect. This indicator offers a practical and visually informative means of assessing the impact of urban tree planting and preservation efforts on heat island reduction.

Climate Regulation – Carbon Sequestration

The urban forest ecosystem service of carbon sequestration involves the capacity of trees and vegetation in urban areas to absorb and store carbon dioxide (CO_2) from the atmosphere as they grow. This helps to reduce greenhouse gas emissions, mitigate climate change, and improve air quality in urban environments. It plays a vital role in offsetting human-made carbon emissions, making urban forests a valuable tool for climate change mitigation. The i-Tree Canopy tool was used to provide an estimate of annual carbon sequestration and carbon stored in trees. It is estimated that Grande Prairie's total urban forest sequesters 13,579 tonnes of CO_2 equivalents every year (Table 8) which is approximately the yearly emissions of 4,200 vehicles in Canada[22].

TABLE 8 ESTIMATES OF CARBON SEQUESTERED AND STORED IN TREES USING THE I-TREE CANOPY TOOL[23],[24]

Description	Carbon	CO_2 Equivalent
Carbon sequestered annually in trees (tonnes / year)	3,700	13,579
Stored in trees (tonnes)	154,000	565,180

Air Quality Regulation – Air Pollution Filtration

The urban forest ecosystem service of air quality regulation refers to the capacity of trees and vegetation in urban environments to enhance and maintain the quality of the air. This service is achieved through several mechanisms:

[22] Natural Resources Canada Greenhouse Gases Equivalencies Calculator
[23] i-Tree Canopy assumptions include using climate conditions from other jurisdictions to approximate Alberta conditions.
[24] i-Tree Canopy makes assumptions about the species, age, heights, and condition of trees in the analysis.

- **Air Pollution Filtration**: Trees capture and absorb airborne pollutants such as particulate matter, nitrogen dioxide, sulfur dioxide, and ozone through their leaves and bark. This helps to remove harmful contaminants from the atmosphere, improving air quality.
- **Oxygen Production**: Trees release oxygen into the atmosphere through the process of photosynthesis, which benefits the air quality by increasing oxygen levels, making the air more breathable for humans and wildlife.
- **Carbon Sequestration**: Urban trees store carbon dioxide (CO_2) as they grow, which reduces the concentration of this greenhouse gas in the atmosphere. This is particularly important in mitigating climate change and improving overall air quality.
- **Noise Pollution Reduction**: While not directly related to air quality, trees can help buffer and reduce noise pollution in urban areas, creating a more pleasant and healthier living environment.

Overall, the air quality regulation ecosystem service provided by urban forests contributes to improved public health, enhanced environmental quality, and a more sustainable and livable urban environment. It underscores the importance of preserving and expanding green spaces within cities to mitigate air pollution and its associated health risks.

Table 9 provides an estimate of some of the pollutants removed by the total urban forest area in the city using the i-Tree Canopy tool.

TABLE 9 ESTIMATES OF ANNUAL POLLUTION REDUCTION FROM TREES USING THE I-TREE CANOPY TOOL[25],[26]

Pollutant Description	Estimated Amount (kg/yr)
Carbon Monoxide removed annually	471
Nitrogen Dioxide removed annually	16,500
Ozone removed annually	101,122
Sulfur Dioxide removed annually	10,585
Particulate Matter less than 2.5 microns removed annually	9,896
Particulate Matter greater than 2.5 microns removed annually	36,907

[25] i-Tree Canopy assumptions include using climate conditions from other jurisdictions to approximate Albertan conditions.
[26] i-Tree Canopy makes assumptions about the species, age, heights, and condition of trees in the analysis.

Appendix III - Potential Funding Programs

This list is intended to provide an overview of current funding sources and ideas for potential environmental projects that could be of interest to the City of Grande Prairie to support enhancement of the urban forest. This is not an exhaustive list of funding sources nor a guarantee of project viability. When assessing funding for tree programs, it is critical that the City considers current operational capacity for adding tree assets. Funding for trees is often readily available; however, ensuring that critical personnel and equipment like arborists and watering trucks are in place will ultimately determine the long-term survivability of those investments.

2 Billion Trees Program
Funding agency: Government of Canada, Municipal Climate Change Action Centre
Deadline: Ongoing
Funding priorities: Tree planting, afforestation, and reforestation.
Funding: Variable
Link: https://www.canada.ca/en/campaign/2-billion-trees/2-billion-trees-program/

Alberta Community Partnership
Funding agency: Government of Alberta
Deadline: Multiple, fall to winter annually
Funding priorities: New or enhanced regional services, improved municipal capacity to respond to priorities, intermunicipal collaboration.
Funding: Varies annually, approximately $50,000.00
Link: https://www.alberta.ca/alberta-community-partnership

Climate Action and Awareness Fund
Funding agency: Government of Canada
Deadline: TBD
Funding priorities: Engaging youth in climate change activities, creating jobs in the climate field, promoting research around climate change.
Funding: Up to $3,000,000.00
Link: https://www.canada.ca/en/services/environment/weather/climatechange/funding-programs/climate-action-awareness-fund.html

Disaster Mitigation and Adaptation Fund
Funding agency: Infrastructure Canada
Deadline: TBD
Funding priorities: Building or improving infrastructure that mitigates climate impacts, including green infrastructure.
Funding: Minimum $1,000,000.00
Link: https://www.infrastructure.gc.ca/dmaf-faac/index-eng.html

EcoAction Community Funding
Funding Agency: Environment and Climate Change Canada
Deadline: TBD
Funding priorities: Varies each year, but usually water or climate related. Requires partnership with a non-profit.
Funding: Up to $100,000.00 per project
Link: https://www.canada.ca/en/environment-climate-change/services/environmental-funding/ecoaction-community-program.html

Environmental Impact Grant
Funding agency: Alberta EcoTrust
Deadline: 2025 grant stream application dates to be announced December 2024
Funding priorities: Innovative or community-led climate, water, and/or biodiversity projects.
Funding: $50,000.00 - $100,000.00
Link: https://albertaecotrust.com/grants/environmental-impact-grant

FireSmart Alberta
Funding agency: Forest Resource Improvement Association of Alberta
Deadline: Biannually in the fall and spring
Funding priorities: Community resilience and preparedness to wildfire.
Funding: Variable
Link: https://friaa.ab.ca/programs/friaa-firesmart/

Land and Biodiversity Program
Funding agency: Alberta Innovates
Deadline: Ongoing
Funding priorities: Innovative ways to minimize urban or industrial footprint, improve remediation, reclamation, or restoration, or improve conservation or biodiversity.
Funding: Variable
Link: https://albertainnovates.ca/funding/land-and-biodiversity-program/

Municipality Sustainability Initiative
Funding agency: Alberta Municipal Affairs
Deadline: Ongoing
Funding priorities: Planning or development of publicly available recreation trails, facilities, or opportunities in Alberta.
Funding: Variable, in the millions
Link: https://www.alberta.ca/municipal-sustainability-initiative.aspx

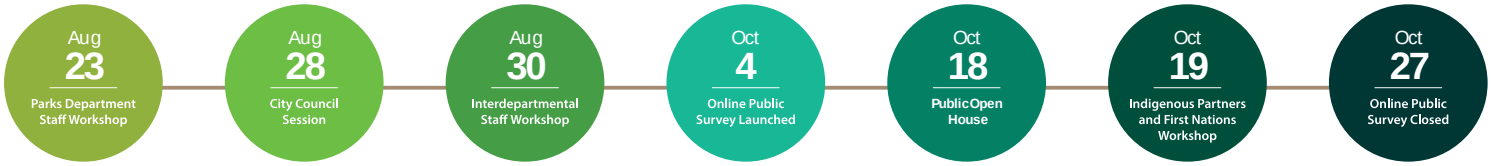
National Adaptation Strategy & Hydrologic Prediction and Innovation
Funding agency: Environment and Climate Change Canada
Deadline: TBD
Funding priorities: Climate data collection, climate prediction, flood and hazard mapping, hydrologic prediction.
Funding: $325,000.00 – $800,000.00
Link: https://www.canada.ca/en/environment-climate-change/services/environmental-funding/climate-hydrotechnical-science-funding.html

Watershed Resiliency and Restoration Program
Funding agency: Government of Alberta
Deadline: TBD, Spring/Summer 2025
Funding priorities: Preserving riparian areas, floodplains, and important water courses through stewardship, awareness, and understanding.
Funding: Varies annually but likely $30,000.00 – $50,000.00
Link: https://www.alberta.ca/watershed-resiliency-and-restoration-program

Appendix IV - Engagement Results

In preparation of this Urban Forest Strategy, meetings were conducted with City staff, City Council, Indigenous community representatives along with a public online survey and open house. A survey was sent to City staff and Council prior to their sessions. This Appendix summarizes key takeaways from each session.

Meetings and Engagement



Parks Department Staff Workshop (August 2023)

A meeting was held with 12 representatives from the City Parks department, during which the results of the pre-session survey were presented and discussed. Several key points of feedback included:

- There is a strong desire for improved public education resources to help residents grasp the broader significance of the City's urban forest that highlights the multifaceted benefits of trees beyond aesthetics.
- A tree protection policy is needed to safeguard the City's urban forest by providing more enforcement measures with potentially stronger penalties that place a higher value on the trees.
- In addition to education and policies, maintenance and the tree inventory emerged as other critical priorities. Participants recommended developing a pruning schedule to enhance the City's use of preventative maintenance.
- Planning was a topic of concern, with a particular emphasis on the aging natural stands in the City and drought. Succession planning was suggested as a means to future-proof these areas. Drought preparedness and the role of species selection and maintenance programs in potential mitigation were also discussed.
- Enhancing interdepartmental collaboration was proposed across various areas, particularly for wildfire management and selecting suitable planting sites.

Overall, the consensus among the Parks representatives present in the session was that the City's primary focus should be the establishment of protective policies, followed by the implementation of more extensive public education campaigns.

Interdepartmental Staff Workshop (August 2023)

Held with 15 representatives from Parks, Communications, Intergovernmental Affairs, Geographic and Information Technology Services, Transportation, Corporate Facilities Management, Grande Prairie Fire Department, Enforcement Services, Planning & Development, Engineering Services, Legal, Events and Entertainment, and Insurance and Risk Management. Discussion focused on developing a common goal for the City's urban forest, balancing development with preserving and increasing the number of trees and the need to increase interdepartmental collaboration. Key points of feedback included:

- Grande Prairie's urban forest plays a vital role in providing extensive mental and physical health benefits beyond aesthetics. However, concerns were raised about wildlife management in the city as increasing wildlife habitat can lead to challenges when large

animals like cougars, bears, or moose enter urban areas, necessitating coordinated management across multiple City departments and external agencies.

- Additional resources for educating the community on the comprehensive benefits of trees, including their monetary value, can help garner support for stricter landscape guidelines, protection policies, and developer requirements and potential penalties.
- Developing a clear vision for the City's urban forest is essential to ensure that all stakeholders have a unified understanding of the City's objectives, and the impact future projects could have on the forest.
- Careful consideration must be given to the selection of tree species and their planting locations to avoid future tree removals. Inappropriate species choices can result in trees interfering with utilities, posing safety concerns, and incurring additional maintenance costs.
- Increasing the number of trees through expanded planting programs is a complicated endeavour. Proper planning and design are critical to prevent the need for future tree removals, especially in cases where critical infrastructure projects like road expansion, development or maintenance are involved.
- Participants discussed the potential for alternative landscaping in specific areas that may not be suitable for trees. For instance, boulevards could be landscaped with low maintenance alternatives while still maintaining aesthetic appeal.

Overall, the interdepartmental workshop mirrored the priorities outlined in the Parks workshop. The focus remains on developing a robust tree policy, expanding educational resources for the public including developers, and promoting increased collaborations among City departments.

Council Working Session (August 2023, April 2024)

Initially met with City Council to discuss the concerns and opportunities surrounding the City of Grande Prairie's urban forest. A second session was held to go over the engagement results (including the online survey) and the potential recommendations to be included in this strategy. Key points of feedback included:

- The potential of sponsorship and funding opportunities to fund the urban forest and possibly provide for experimentation opportunities for the City to explore different species or management techniques.
- Naturalizing areas with intent. Naturalizing a previously maintained area takes planning and management to have a successful natural area establish.
- The best approach to mitigating any future wildfires for the City.
- How the City's visual appeal can be enhanced, particularly along major arterial roads entering and throughout the city, with increased tree planting.

Through the meetings with City Council, the feedback received encompassed the potential for sponsorship and funding to support the urban forest, including opportunities for experimentation with various species and management techniques. Additionally, there was discussion around the naturalization program, wildfire management strategies and increasing the City's canopy cover for more visual appeal. The second meeting gave City Council an opportunity to preview the action items and recommendations proposed for the Urban Forest Strategy.

Online Public Survey (October 2023)

The online survey was open to the public from October 4 to October 29, 2023. 151 responses were received primarily from residents and recreational users in Grande Prairie. Survey results made it clear that respondents greatly value the urban forest, recognizing its multifaceted contributions to the environment and well-being of the community. The forest's contribution to health, environmental sustainability, and the City's visual appeal is highly regarded with the importance of maintenance and conservation emphasized to ensure its long-term health and vitality. Key points of feedback from the survey included:

- Increased maintenance and enhancement of the existing forest is needed to address issues such as lacking tree diversity, disease susceptibility, and the removal of dead or dying trees.
- Concerns were raised about invasive species, pests and diseases, vandalism and development on public property. Disease control and pruning pose challenges for homeowners lacking resources so more education could help address this.
- Increased community engagement emerged as a recurring theme with respondents expressing a desire for more information on tree species, planting and care best practices, how to utilize the urban forest and certification regulations for tree maintenance and removal companies. Collaborative efforts with local clubs, organizations, and businesses were suggested to host events and provide incentives for tree-related activities.
- Planting new trees on public land was the most important action for better urban forest management. Suggested ways of achieving this included: increasing the replacement of removed trees, more trees in new developments, and more planting in grassy lots and neighbourhood parks.
- Residential parks and streets were ranked as priority areas for urban forest enhancement followed by natural areas and large regional parks.
- If a tree protection policy is introduced, it should focus on developer requirements, requiring more trees to be planted after development and greater retention of trees during development with rules and penalties established for tree removal by developers or incentives for the retention of trees. Neighbourhoods with mature trees are highly valued with several respondents wishing their newer neighbourhoods had more trees and green spaces.
- The urban forest needs to consider a holistic approach to urban forest management. Considerations extend beyond tree planting and maintenance, encompassing aspects such as wildfire risk mitigation, reducing wind effects, aesthetics, impacts on wildlife populations, noxious weed management and adaptability.

The survey results provided valuable insights and ideas that helped form the urban forest strategy and its' recommendations. The feedback received demonstrated residents' investment in the urban forest and willingness to collaborate with the City to create a healthy urban forest that enhances the well-being and quality of life for everyone.

Public Open House (October 2023)

A public open house was held on October 18, 2023, in Grande Prairie. 26 people attended and were able to provide City staff and Silvacom representatives any thoughts and feedback along with questions they had about the Urban Forest Strategy. A large city map was available for attendees to place markers on areas they enjoy within the urban forest as well as any areas they viewed as needing improvement. There was also information on the strategy, urban forest ecosystem services, a map from the 1950's and an area to leave anonymous comments if desired. All attendees were encouraged to fill out the online survey.

Community members in Grande Prairie highly value their urban trees and parks like Muskoseepi and neighbourhood parks throughout the city. They expressed satisfaction with the existing green spaces and recreational areas but emphasized the need for further enhancements and improvements. Various suggestions and concerns raised by residents focused on enhancing the urban forest and included a wide range of ideas. Some of the feedback received included:

- Increasing the presence of songbirds.
- Proactive succession planning for tree replacement.
- Making aesthetics more of a priority for Grande Prairie. This included utilizing a variety of tree species, planting more trees along major roadways and boulevards and increasing the number of deciduous trees in parks.

- Concerns were brought up about private tree regulations and increasing wildlife in the City such as coyotes and cougars.
- Dealing with the overgrowth of invasive plants such as caragana.
- Improving public awareness of tree maintenance and species selection best practices including using Certified Arborists and having more information available on tree care, species selection and planting locations for residents.
- The need to incorporate FireSmart practices within the Urban Forest Strategy.
- Focusing on proactive long-term planning rather than being reactionary.
- Increasing the City's resources and staffing to support the growing number of trees, especially if increasing plantings.
- Ensuring an Urban Forester or Certified Arborist is employed in the City's Parks Department.
- Planning to continue and increase connectivity of the urban forest areas and parks throughout the City, especially with the new annex land to the northwest.
- Developing a tree protection policy or bylaw to regulate tree preservation and removal.

This feedback highlights the importance of a well-rounded approach to urban forest management, balancing aesthetics, wildlife, preservations, and public education.

Indigenous Partners and First Nations Session (October 2023)

A session was held with 6 Indigenous Partners to engage in a dialogue about the urban forest Strategy. Various important concerns and opportunities were discussed along with the history of Grande Prairie's forest, and future opportunities for increased Indigenous involvement. Some of the key discussion points included:

- Concerns included the increasing presence of tent cities and unhoused population in city parks along with wildlife populations which raise safety concerns for users especially those with children. There are also concerns around the use of herbicides or pesticides and their affect on ecosystems and preparedness for any future wildfires.
- The session emphasized the need for a better understanding and respect for the land and ecosystems. This could involve planting tree species that are native to the Grande Prairie area and implementing soil protection measures during development. These techniques could help contribute to land regeneration and reduced maintenance costs.
- Recommendation to include more Indigenous Scientists and Traditional Ecological Knowledge when developing future iterations of the Urban Forest Strategy and any other natural areas or parks management plans.
- The urban forest can be a great tool for reconciliation and incorporation of Indigenous Culture. Potential future spaces could be more medicinal plant species cultivation, educational signage, and Sacred Land for Indigenous peoples to host ceremonies and facilitate intergenerational learning (similar to what the City of Edmonton has recently completed).

Overall, this session mirrored many concerns discussed during the public open house including the need of a well-rounded all-encompassing approach to urban forest management, balancing the City's needs with the ecosystem's.

Key Takeaways

The engagement sessions and online survey provided valuable insights and feedback. Common desired components for the urban forest strategy included:

- **Residents of Grande Prairie enjoy the urban forest as a place to connect with nature within the city, especially the Bear Creek valley.**
- **Improved public education resources to inform residents on the benefits of the urban forest beyond aesthetics.**

- **The need for a public tree protection policy to safeguard the urban forest and balance development with tree preservation.**
- **Increase maintenance and resources for public trees to support a growing city.**
- **Plan for the aging of natural stands.**
- **Address potential threats such as drought and wildfire with species selection or maintenance programs.**
- **Increase interdepartmental collaboration for planning and design to prevent future tree removals due to infrastructure projects.**
- **Recognize the interdependence of ecosystems within the city and aim for a holistic urban forest strategy that goes beyond a singular focus on trees.**
- **Incorporate Indigenous knowledge and Traditional Ecological Knowledge in the future urban forest initiatives.**

Appendix V - Planting Plan Analysis

As Grande Prairie continues to grow and evolve, maintaining a vibrant and resilient urban forest is crucial to enhancing the quality of life for residents, supporting local biodiversity, and mitigating the impacts of climate change. Trees provide numerous benefits, including improving air and water quality, reducing stormwater runoff, and creating shaded public spaces that foster community engagement and social connection. As explored in the Urban Forest Strategy, Grande Prairie's canopy cover is currently 7% presenting opportunity for further expansion.

This planting plan analysis is a supportive component of the Urban Forest Strategy to help plan and coordinate tree planting activities over multiple years that will enhance and maintain a diverse and healthy tree population. The purpose of this plan and supporting analysis is to identify short, medium, and long-term opportunities for tree planting projects across the City.

To develop the plan, an analysis of canopy cover was completed by neighbourhood (Table 10). This provides an initial assessment of distribution of canopy cover across the city identifying potential areas for canopy enhancement. Business parks and industrial area tend to have the lowest canopy cover (~1%) while residential neighbourhoods with a population of at least 100 residents have a canopy cover ranging from 1% to 19%.

The canopy cover analysis was used to identify areas of low canopy cover on City-owned property as a mechanism to identify potential opportunities by neighbourhood that the City could target for planting projects. Low canopy cover area was defined as ground currently without tree coverage that could potentially host a tree. This analysis was completed by selecting the "ground" classification from the LiDAR data and creating a 3m buffer around buildings, water bodies, roads and existing trees. The remaining space was considered as low canopy cover. It is important to note that this area does not indicate specific locations of where trees can be planted but the opportunity presented by low canopy cover. Additional considerations include underground and overhead utilities, soil conditions, and other land use activities.

TABLE 10 CANOPY COVER ANALYSIS BY NEIGHBOURHOOD (SORTED ASCENDING BY CANOPY COVER)

Neighbourhood	Total Area (ha)	Canopy Cover	City Owned Low Canopy Cover Area (ha)
Urban Rail Business Park	34.76	0%	0.00
Trader Ridge	62.98	0%	0.29
Airport	483.22	0%	0.00
West Terra	59.28	0%	0.00
Westgate West	64.84	0%	0.00
Brochu Industrial	60.52	0%	0.05
Centre West Business Park	59.12	0%	0.51
Vision West Business Park	61.39	0%	4.36
Railtown	13.37	0%	0.00
Albinati Industrial	34.06	1%	0.03
Westgate East	64.60	1%	1.72
Northgate	98.05	1%	0.24
Northridge	120.00	1%	2.07

Neighbourhood	Total Area (ha)	Canopy Cover	City Owned Low Canopy Cover Area (ha)
Fieldbrook	58.20	1%	0.22
Crystal Landing	38.46	1%	1.01
Gateway	61.05	1%	5.62
Creekside	32.04	1%	0.00
Mountview Business Park	51.02	1%	0.00
Royal Oaks	125.26	1%	2.14
Cobblestone	62.06	1%	1.21
Countryside North	33.40	2%	1.26
Copperwood	63.96	2%	1.45
Richmond Industrial Park	316.49	2%	13.88
Airport Industrial	120.20	2%	0.00
Riverstone	89.29	2%	1.18
Westpointe	82.64	2%	2.52
Trumpeter Village	23.87	2%	0.00
Swan City	19.40	2%	0.00
Kensington	117.35	2%	2.31
Lakeland	16.84	2%	0.22
Meadowview	40.45	3%	0.00
Crystal Heights	89.00	3%	2.87
Central Business District	80.29	3%	1.79
Pinnacle Ridge	101.21	3%	6.56
West Mountview Industrial	61.55	3%	0.00
Signature Falls	62.96	3%	4.33
Easthaven	63.58	3%	0.00
College Park	71.65	3%	0.06
West Carriage Lane	128.26	5%	0.00
Arbour Hills	185.38	5%	4.00
Bear Creek Highlands	256.61	5%	0.00
Mission Heights	183.73	6%	5.89
Crystal Lake Estates	111.76	6%	5.70
O'Brien Lake	123.95	6%	5.62
Hidden Valley	232.80	6%	7.90
Countryside South	45.45	6%	1.41
Eagle Estates	64.30	7%	0.04
Ivy Lake Estates	35.92	7%	2.94

Neighbourhood	Total Area (ha)	Canopy Cover	City Owned Low Canopy Cover Area (ha)
Country Club West	38.86	7%	1.97
VLA Montrose	59.43	7%	0.71
Avondale	123.58	8%	5.05
Fairway	11.74	8%	0.00
Smith	49.96	8%	0.65
Crystal Ridge	93.15	9%	2.92
Southview	24.65	9%	1.28
Stone Ridge	69.93	9%	1.65
Hillside	90.41	10%	3.10
Mountview	96.50	11%	3.45
Highland Park	102.69	13%	3.42
Patterson Place	95.65	13%	3.60
Country Club Estates	64.17	13%	2.44
Kennedy	10.80	13%	0.00
South Patterson Place	117.28	13%	3.19
Summerside	136.49	18%	1.63
Swanavon	48.88	19%	0.43
Hockey Estates	30.08	24%	4.23
Nordhagen	2.95	29%	0.00

Short-term plan

In the public survey completed for the Urban Forest Strategy, respondents ranked residential parks and streets as the most important areas to focus on urban forest enhancement (Figure 14).

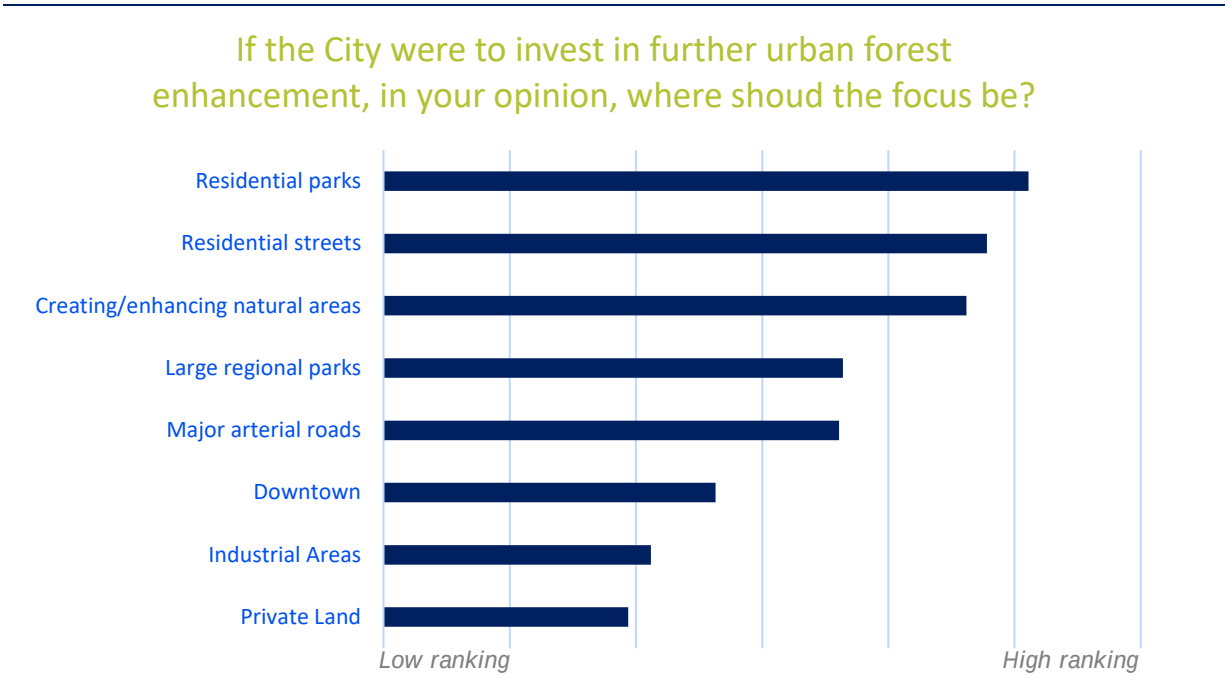


FIGURE 14 PUBLIC SURVEY RESULTS ON WHERE TO INVEST IN URBAN FOREST ENHANCEMENT

Based on these survey results and the low canopy cover area analysis, neighbourhoods can then be prioritized in the short-term for tree planting projects. Plotting the residential neighbourhoods on a matrix based on their relative population (2021) and current canopy cover can aid in the identification of neighbourhoods to focus on in the short term (relative high population with relative low canopy cover and a high amount of city owned property) (Figure 15).

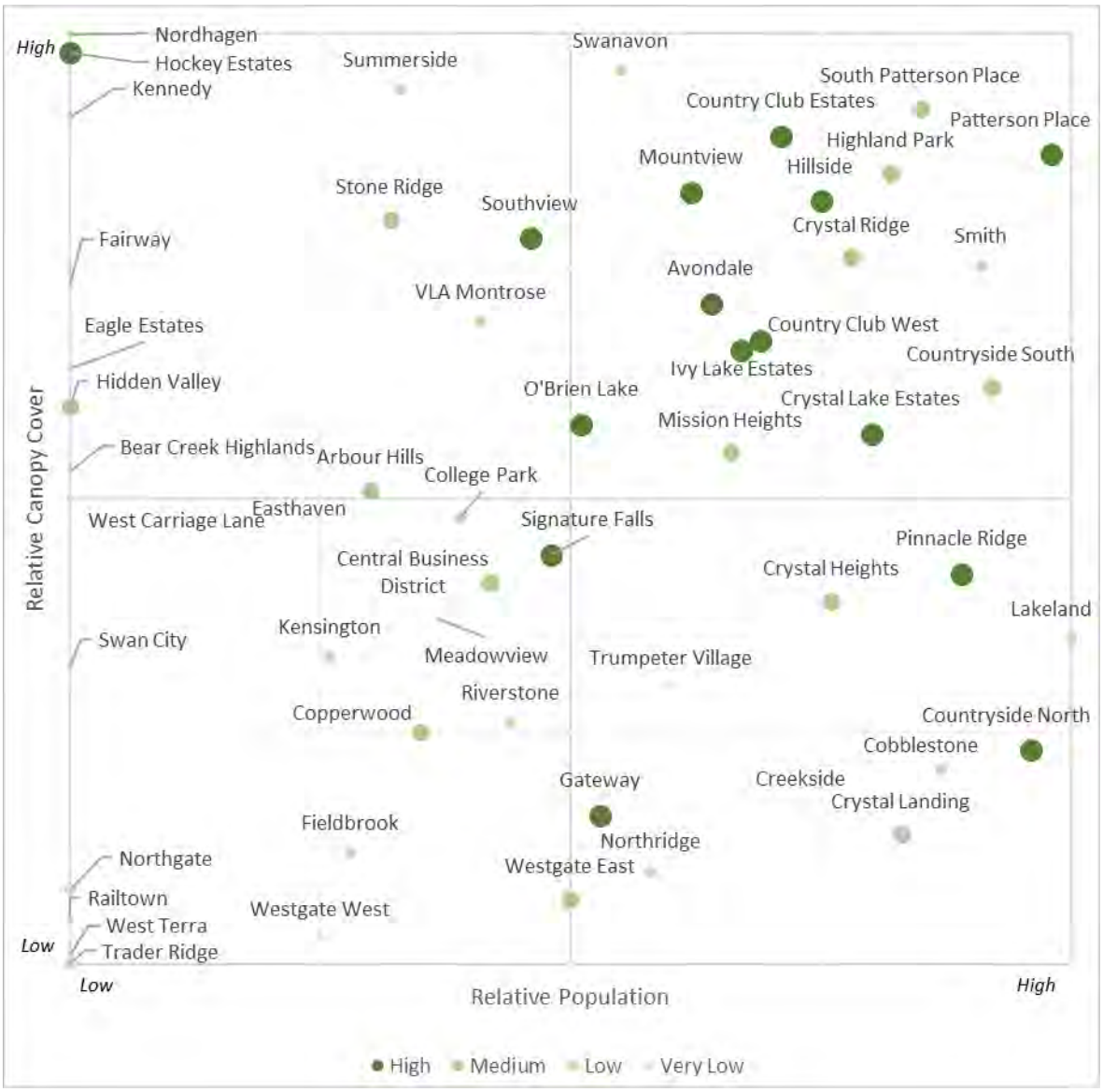


FIGURE 15 RESIDENTIAL NEIGHBOURHOOD RELATIVE ASSESSMENT

In the short-term, this relative assessment analysis highlights Pinnacle Ridge, Countryside North, Crystal Heights, and Crystal Landing as neighbourhoods that have opportunity for urban forest enhancement through tree planting projects in residential parks and along residential streets. As previously discussed, additional considerations when selecting specific tree planting locations include underground and overhead utilities, soil conditions, and other land use activities. Furthermore, some neighbourhoods may be young and current low canopy cover may be a factor of small trees that have yet to grow and fill in canopy cover. Ground assessment should be undertaken to refine specific tree planting project plans. The following maps depict the city owned low canopy cover areas in these neighbourhoods for consideration.

FIGURE 16 PINNACLE RIDGE CITY OWNED LOW CANOPY COVER AREA

FIGURE 17 COUNTRYSIDE NORTH CITY OWNED LOW CANOPY COVER AREA

FIGURE 18 CRYSTAL LANDING CITY OWNED LOW CANOPY COVER AREA

FIGURE 19 CRYSTAL HEIGHTS CITY OWNED LOW CANOPY COVER AREA

Medium-term plan

The low canopy cover analysis should be updated to reflect changes in population, neighbourhood development progress, city property ownership, and canopy cover. This can be used to prioritize another set of neighbourhoods based on similar criteria to continue to enhance and balance canopy cover across residential areas.

Creating and enhancing natural areas was the third highest ranked response on where the City can invest to enhance the urban forest (Figure 14). To achieve this, the City can explore naturalization opportunities to expand natural forest cover on edges of existing stands in areas previously under a turf maintenance regime. Naturalization focuses on using native tree species and shrubs that can be used to integrate an area with its natural forest surroundings. This technique can be used to create more habitat, connectivity, and reduce maintenance costs like mowing. Communication and public education may be needed to support this approach. There are many locations particularly within

South Bear Creek that could be considered for this approach. The low canopy cover area analysis approach can be used to further identify specific project areas.

Finally, neighbourhoods with low canopy cover and limited city-owned property with low canopy cover (e.g., Creekside) could be targeted for private tree programs or incentives.

Long-term plan

In the long-term, the canopy cover analysis can be updated and used to focus on areas in business and industrial parks. These areas currently have low canopy cover (Table 10) and could be targeted to connect with adjacent residential or rural areas. Implementing tree planting programs with businesses and industrial parks can have a lasting impact on local ecosystems and communities. By partnering with companies to plant and maintain trees on their properties, organizations can not only promote sustainability and increase the City's canopy cover, but also create opportunities for employee engagement, community outreach, and corporate social responsibility initiatives.

City of Grande Prairie Planting Plan Priority Analysis

City Boundary

City Owned Property & Reserves:
Low Canopy Cover

- Short-term
- Medium-term
- Long-term

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