Urban Forest Management Strategy

Town of White City, Saskatchewan

Acknowledgments

White City is located on Treaty 4 lands, the original lands of the Cree, Ojibwe, Saulteaux, Dakota, Nakota, Lakota, and the homeland of the Métis Nation.

White City respects and honours the Treaties that were made on all territories and is committed to moving forward in partnership with Indigenous Nations in the spirit of reconciliation and collaboration.

This strategy benefited from significant teamwork and cooperation from the staff of White City, as well as input from the community.

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Town of White City

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Executive Summary

Trees make the Town of White City ("town") a beautiful place to live, grow, and feel a sense of community. The town, which was once an open pasture field up until the 1950s, now has an urban forest that spans private and public land to provide numerous benefits such as improved air quality, shading, stormwater control, wildlife habitat, and beauty. Over 3,700 publicly owned trees comprise White City's urban forest and provide over $410,000 in ecological benefits annually.

Management of the entire urban forest requires input from both public and private landowners to optimize the ecological, economic, and social benefits as well as to reduce potential safety risks. The value of a tree appreciates over time, and the vast array of benefits trees offer to residents and the ecosystem in the long-term well surpasses the initial cost of installation and maintenance. However, urban stressors can degrade the lifespan of planted trees if unmaintained or ineffectively managed. To achieve a sustainable and productive urban forest, trees need to be proactively managed via regular maintenance and by selecting suitable planting locations and site-appropriate species. White City is seeking to improve its urban forestry protocols and maintenance levels to maximize the long-term benefits that trees provide.

The White City Urban Forest Management Strategy (UFMS) is the first of its kind for the town, providing a detailed and comprehensive plan for managing the urban forest in a way that meets industry standards while using a targeted, cost-effective approach. The 10-year strategy outlines the framework for changes to planning, regulation, education, and enforcement protocols associated with urban forest management. A community outreach program was conducted to foster public engagement as well as to identify the current issues, goals, and approaches the community wish to see in this plan. The UFMS seeks to address these issues while remaining flexible in nature to allow for updates in response to environmental, political, and social changes.

This strategy is structured as a stepping-stone to join the "Tree Cities of the World". This would enable the town to receive benefits and recognition for having a sustainable, growing urban forest which contributes to reducing climate emissions and improving the local environment.
The following resources and guidelines have been recommended within this UFMS to address the most pressing needs of the community at this time including:

- Tree planting guidelines
- Updated planting list of tree species
- Species diversity recommendations
- Bylaw amendment recommendations
- Pest management techniques
- Creation of a public tree inventory
- Public tree maintenance requirements
- Aging poplar management strategy
- Public education
- Identification of training gaps for urban forestry staff

1. Background

1.1 Historical Context

Southern Saskatchewan is unlike most other areas of the country in that it is a grassland ecosystem with very few natural trees. This area of flatland and wide-open skies earned it the nickname “the bald prairie”. Within the last century, efforts have been put forward to forest this previously treeless ecosystem. The prairie ecosystem’s limited ability to support trees is due to the harsh, arid climate and drastic seasonal temperature change. The local climate experiences an average high of 25.8°C in July and an average low of -20.1°C in January.

Historically, the largest factors affecting tree establishment in the prairies has been grass fires which were frequent enough to kill off establishing seedlings. Combining this with the climatic conditions, tree establishment was very difficult. With the development of towns and cities, man-made protection helps reduce the damage of fire around built-up areas. This is evident in towns like White City, which was an area previously used as a cattle pasture. When ownership changed in the late 1950s and residents started moving into the area, the town was born and so were the first tree planting efforts.

Aerial photographs of White City taken in 1980 (left) and 2021 (right).

It was well understood that even small hedgerows of trees function as shelterbelts to significantly moderate the cold of the winter and the heat of the summer by averting blowing wind, retaining moisture, slowing heat loss, and stopping blowing snow. Armed with this knowledge, settlers to the area were eager to start planting around their property and went in search of tree suppliers. In the early years of local tree nurseries, the demand was for a quick-growing tree that could establish well. Poplar hybrids were likely the first trees planted throughout the town to establish the initial tree cover [1]. An example of this is the Russian poplar (*Populus × petrovskiana*), a hardy but short-lived species that grows at incredible rates. In addition to poplars, tree nurseries also produced locally hardy species of Manitoba Maple, Green Ash, Northwest Poplar, Cottonwood, and American Elm — all natives of the prairie. These species are what dominated the first trees planted in the town, and many of these original plantings still stand today.

With relatively few tree species available, municipalities in the prairies are limited to planting fast-growing, short-lived trees. These species tend to have weak wood leading to broken branches and trunk splits which create safety hazards. Historically, poplars were planted along roadways as a windbreak and to offer shade relief with the intention of planting more desirable, long-lived trees in their shade to help the new trees establish. The more desirable trees were never planted, leaving the poplars to outgrow the space, and become a potential threat to homeowners and utilities. As a result, many older roads in White City are lined with large declining poplars. Relative to other urban centres in North America, the difficulties encountered with establishing trees in White City are great: temperature extremes, frequent drought, a high evapotranspiration (loss of water) rate, and soil chemistry limitations which all contribute to a stressful urban environment for tree growth. The town's soil textures are predominantly a mixture of sandy loam and fine sandy loam with a small area of clay soils. Pockets of saline soils occur sporadically throughout the town. These soils contain sufficient water-soluble salts to inhibit the uptake of moisture by plants, resulting in moisture stress and reduced plant growth [2].

Currently, White City is home to over 3,000 planted trees on town property. There are over 50 tree species with spruce, poplar, willow, ash, and elm being the most common types. The last half century of tree planting efforts has set the stage for the current issues faced by the urban forest and the management required. As many mature trees are reaching the end of their life cycle, planting new trees, managing declining trees, and maintaining existing healthy trees are essential actions to build a sustainable urban forest for many years to come.

1.2 Definition of an Urban Forest

An urban forest includes all of the publicly and privately-owned woody vegetation growing within an urban boundary. This includes individual trees and groups of trees located in natural areas, parks, backyards, on streets, and in commercial and industrial zones. The urban forest also supports a broader community of understory plants, wildlife, and micro-organisms, as well as the nutrients and water they require. Each of these elements, in addition to people and the built environment, have an influence on the health of the urban forest. Proper management of the urban forest requires the integration of the fields of arboriculture, forestry, landscape architecture, ecology, pest management, economics, planning, and sociology.

1.3 Purpose of the Urban Forest Management Strategy

The purpose of the Urban Forest Management Strategy (UFMS) is to provide White City with a comprehensive plan for effectively managing, sustaining, and ensuring the growth of the urban forest in an environmentally sound and cost-effective manner. The goal is to enhance the benefits of social, environmental, ecological, and economic returns of trees for all members of the community.

This UFMS focuses on all of the town owned trees along streets as well as those in parks and municipal properties and provides insight and guidance that can be applied towards private tree management. Like other municipalities located within the prairies, climate constraints including low precipitation and extremely cold winter temperatures limit the ability for many tree species to grow. This strategy is the first of its kind for the town and strives to provide an up-to-date assessment of the town's urban forest as well as planting and maintenance recommendations to manage White City's urban forest from 2021 to 2031.

1.4 Value Statement

The Town of White City values the urban forest as an essential component of a healthy and vibrant community. Trees on both private and public property contribute to the environmental, social, aesthetic, and economic benefits for all members of the community to enjoy. White City is committed to sustainable management of the urban forest as well as supporting community action to protect and enhance this resource for future generations.

1.5 Benefits of the Urban Forest

Urban forests are becoming increasingly more valuable in the current global landscape as they provide multiple environmental benefits that help mitigate the effects of climate change. Trees offer shade relief and aesthetic value, encourage physical activity, and improve the enjoyment of time spent outdoors. Trees also offer multiple environmental benefits including stormwater runoff mitigation, water retention and filtration and air purification. These benefits are compounded in a prairie climate by providing cooling shade in the summer and warming wind protection in the winter. With extreme temperature swings between seasons, it is particularly beneficial to mitigate harsh weather conditions with the use of trees.

In urban settings, the high level of concrete creates a heat island effect raising temperatures even more. As the surface area covered by hardscape increases, so does the ability of this hardscape to retain heat contributing to a warming effect in the urban setting. In summer, the urban heat island effect can increase heat-related illness and mortality, drive up energy demand, and increase air pollution and greenhouse gas emissions. By shading hard surfaces and cooling air temperature through evapotranspiration, trees act as an effective tool to mitigate the heat island

effect. Generally, only 10-30% of the sun's energy reaches the area below a tree during summer months. Additionally, studies have found that suburban areas with mature trees are 2-3°C cooler than suburbs without trees. With the increasing number and severity of forest fires occurring in the western provinces, trees help mitigate the harmful effects of smoke by acting as both a barrier and a filter, tempering the smoke that gets blown in from numerous fires across the country. Overall, the urban forest has the capability of providing a wide range of benefits which can contribute to the town's economic prosperity, social wellbeing, environmental health, and cultural vibrancy.

1.6 Threats to the Urban Forest

Trees that are part of an urban environment have to endure different stressors compared to those growing in a natural ecosystem. Forest trees are typically sheltered by nearby trees from environmental and biological factors such as wind and invasive species. In an urban setting, trees are normally planted alone and spaced out from other trees or buildings, exposing them to higher wind levels, greater temperature changes, and direct sunlight.

The difference in canopy cover is evident between new and old development areas. Effective management and planning enable municipalities to sustainably enhance their urban forest.

Both native and exotic pests pose a threat to the urban forest, and trees already under stress from other factors are often more susceptible to pest damage and infestation. This is exacerbated by the fact that urban trees suffer mechanical injuries and vandalism that cause wounds to trunks and branches, for instance from construction damage, or when used as an anchor for locked bikes. These open wounds weaken the tree and act as entry points for infection. Additionally, limited soil volume and growing space, soil compaction, and pollutants such as de-icing salt all reduce the quality of growing conditions for urban trees.

Regional climate models project an overall increase in average temperatures, more frequent droughts, and more intense summer storms [3]. In future decades, pests that previously could not have survived in the town due to the long, cold winter temperatures may be able to establish themselves. For instance, overwintering Emerald Ash Borer (EAB) is considered to be unable to survive temperatures under -30°C [4], therefore White City's current climate is able to maintain EAB population at low densities that are tolerable for ash trees to survive [5]. As temperatures warm, White City may become more habitable to EAB and other pests to a point where certain tree species cannot survive without insecticide treatments.

Emerald Ash Borer is a severe pest to Ash trees in North America.
It has not yet been detected in White City.

***Fungal diseases** weaken trees and make them more susceptible to failure and other pests.*

Expanding development and bylaw regulations limit potential planting and growing space which reduces the tree cover canopy potential. In White City, trees are not allowed to be planted within 20 feet of the road shoulder or sidewalk as this area is designated for drainage and flood prevention. This severely limits the available planting space for the town, as that right-of-way space is typically where street trees are planted. In White City, one of the largest manageable threats is water availability. Though the area receives between only 1 and 7 cm of precipitation

a month, public trees can be individually supplemented using a tree watering program. Without a thoroughly implemented maintenance schedule, trees can decline and die quite rapidly in prairie climates.

1.7 Tree-Related Issues

While trees provide many benefits to the community, they can also create issues. For instance, trees with split or broken limbs can pose a hazard to public safety or property. Hanging limbs can obstruct sightlines and traffic signs for motorists and pedestrians. The roots of certain tree species such as poplars and willows can invade leaky water or sewer pipes and cracked foundations causing additional damage. Trees growing in inappropriate locations such as easements and dikes or trees inappropriately planted in parks, buffers or streets can create problems. These trees can restrict access to easements, impair the integrity of dikes, cause heaving or deterioration to sidewalks and roadways, as well as problems to foundations and underground services. The dropping of leaves and fruit can clog culverts, storm sewers, catch basin grates, and interfere with drainage along roadways. Trees can also negatively affect the local environment by provoking allergic reactions due to tree pollen. Tree pollen production is highest in the spring; among the greatest pollen-shedding trees are ash, birch, maple, elm, and oak. In the winter, trees can inhibit snow ploughing and removal activities and increase the costs associated with winter road maintenance.

Some of the issues associated with trees can be mitigated through proper species selection and planting locations as well as infrastructure-based design solutions. Other problems are an inevitable result of having an urban forest. However, people are attuned to municipalities with trees and appreciate their invaluable benefits. Ultimately, to maximize ecosystem benefits and reduce tree-inflicted problems, trees need to be carefully planned for and managed.

2. State of the Urban Forest

2.1 Policy Context

Canada has some of the most stringent forest policies and regulations in the world. These have helped protect and preserve old growth trees and species at risk in both an urban and natural setting at various levels of government. The policies that impact forests can have broad reaching implications that apply not only to the trees themselves, but also animal habitat, rare species, watercourses, and pests. Therefore, these regulatory policies can directly or indirectly play a role in guiding the management of both urban and natural forests.

The relevant federal laws include:

- Species at Risk Act
- Migratory Birds Convention Act
- Plant Protection Act

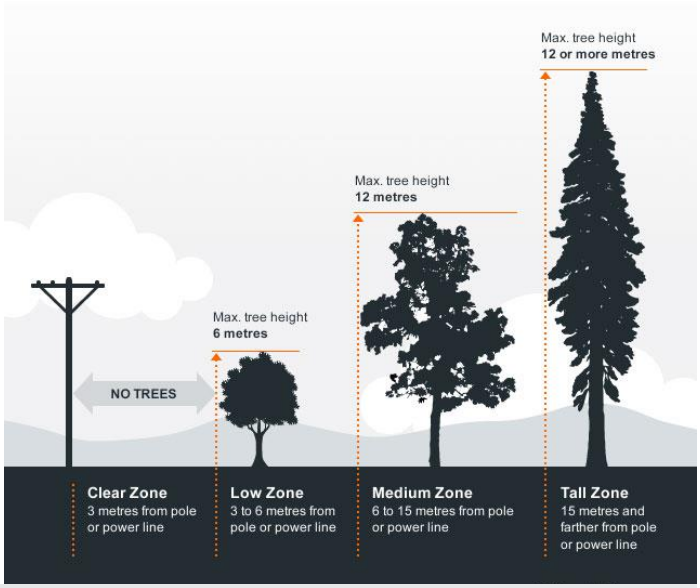
Additionally, pest management activities are regulated at all three levels of government. At the federal level, Health Canada's Pest Management Regulatory Agency (PMRA) regulates most acts and guidelines set out at a federal level affecting both the provincial and municipal regulations. Provinces and territories regulate registered pesticides including their sale, use, storage, transportation, and disposal, as long as the measures they adopt are consistent with conditions imposed under the Pest Control Products Act or other federal legislation.

In Saskatchewan, there are numerous forest protection bylaws and regulations in place to protect and enhance the province's forest industry. However, they do not directly apply to urban forests. One provincial regulation that does apply directly to urban trees is the seasonal ban on pruning elm trees. This was established to help curb the spread of Dutch Elm Disease (DED). Between April 1 and August 31 each year, it is illegal to prune elm trees [6]. The ban occurs at the time of year when the bark beetles that spread DED are most active. Fresh cuts from pruned trees can attract the tiny insects, increasing the chance of an infection.

White City does not have specific bylaws pertaining to the protection of public or private trees. The town does, however, adhere to SaskPower standards that directly affect the management and planning of urban forestry. Trees planted near power lines, for example, are managed by SaskPower and a pruning and planting guideline recommends structural pruning objectives for local species as well as planting distances from power lines. SaskPower also has a recommended planting list of tree and shrub species as well as clearance zones to help plan and manage new plantings.

Another regulation that indirectly affects urban trees is a planting ban within rights-of-way for streets with ditch landscaping. The regulation is outlined in the Zoning Bylaw Section 3.2.5 (Ditch Landscaping and Maintenance Requirements) and states: "ditch area landscaping is the sole responsibility of the homeowner and shall be landscaped using grass only." This prohibits residents from planting within roughly the first 20 feet from the road shoulder to allow for proper water flow and storm drainage. This was recommended due to the soil limitations resulting in poor drainage that let water flow over the soil rather than being quickly absorbed.

	Tree/Shrub common name(s)	Height
Low Zone (up to 6 metres in height)	Buffaloberry	2-4.5 m
	Sand cherry	1-3 m
	Lilac (most varieties)	3-4 m
	Dogwood	1-3 m
	Honeysuckle	2-5 m
	Cranberry	2-5 m
Medium Zone (up to 12 metres in height)	Eastern Red Cedar	5-10 m
	Siberian crab apple	3-9 m
	Acute willow	6-12 m
	Choke cherry	3-7 m
Tall Zone (12 metres or more in height)	Cottonwood, poplar, hybrid poplar	up to 30 m
	Spruce	up to 30 m
	Birch	20-26 m
	Pine	20-26 m
	Siberian larch	15-26 m



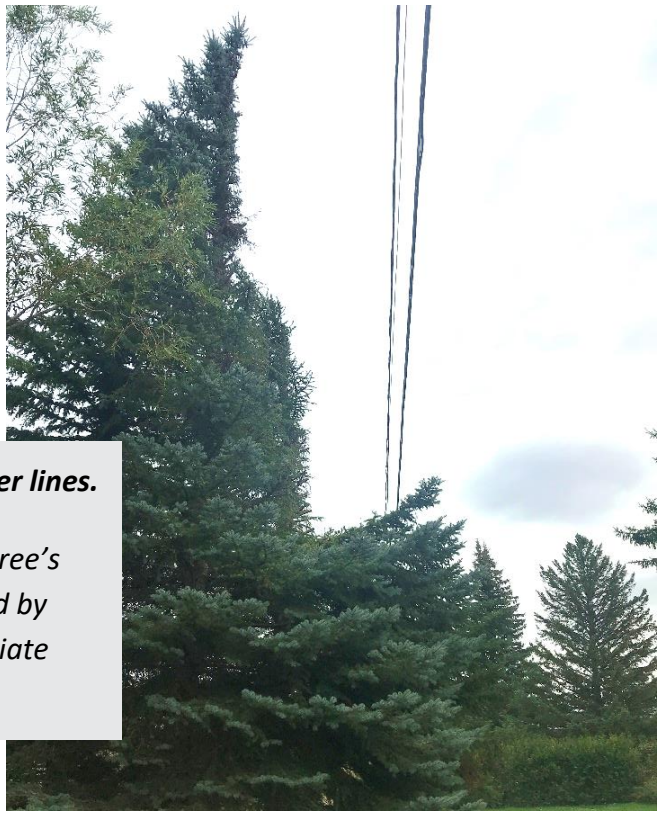
Planting guidelines provided by SaskPower to ensure trees and power line safety.

2.2 Service Levels

White City is a quickly developing commuter town just east of Regina which provides a great deal of potential for growth. With the current trends in population growth, more stressors will be placed on the urban forest which will require further inputs from the town to manage and expand the existing canopy. At the same time, the need to invest into tree maintenance and planting is crucial to meeting the long-term recreational and quality of life demands for White City's young, family population.

Like other small municipalities, there are no positions dedicated solely to urban forestry. Instead, several full-time and seasonal staff conduct broad maintenance work of public infrastructure includes parks and street rights-of-way. The public works staff works closely with the Manager of Public Works and the Planners and are responsible for most tree-related activities including spring bed preparation, planting, mulching, weed control, fertilizing, tree maintenance, and watering. There are two full time staff that work on urban forestry-related matters, an operations technician and one other field worker. Additionally, they are assisted by a seasonal employee who works on general tasks in the summer months as well as contractors as needed. Volunteers also assist in tree planting events.

As of 2021, the Town began a 4-month student internship dedicated to these urban forest related services, plus the task of watering all trees on the two-year watering program. They have also contributed to the design of new beautification areas with recommendations on what type of trees and shrubs to plant.



Crown pruning of a spruce tree under power lines.

This type of pruning severely declines a tree's lifespan. This situation can be prevented by planting suitable species at the appropriate distance from utility lines.

Table 2.2 Current service levels for tree planting and maintenance.

Activity	White City (in-house)	Contracted out
Pruning	All pruning that can be done at the ground level using hand tools is done by town staff.	Pruning that is considered dangerous is contracted out.
Branch removal	Lower branches are removed by town staff. Larger branches that pose a safety risk are sometimes removed by town staff (Public Works).	Branches that are out of reach or pose a safety risk to cut are normally contracted out for a tree climber or bucket truck.
Tree planting	This is done by town staff on town property. On private property it is done by homeowners.	This is not done by contractors unless specified in a new build where new trees would be planted on private property.
Planting on the pipeline	This is done by town staff once the required permits are obtained to plant, work and move equipment in this area.	This is rarely done by contractors. A spruce tree row was planted around an Enbridge station in one instance.

Tree maintenance near power lines	Not done by town.	Done by SaskPower.
Pest monitoring	Not done by town.	Not done by contractors.

Staff Qualifications

Currently, there are no staff who hold arboriculture or forestry qualifications. This includes International Society of Arboriculture (ISA) and Tree Risk Assessment Qualification (TRAQ). ISA certification ensures that staff have the knowledge and competency to conduct proper tree care while TRAQ certification promotes the safety of people and property by providing a standardized and systematic process for assessing tree risk.

2.3 Community Engagement

A public outreach program was conducted through the Town of White City in the autumn of 2021. Its objective was to gain an understanding of the community's perception of trees. This included questions on new plantings, potential bylaws for tree protections, and ecosystem benefits.

Most residents agreed that trees provide a source for local food.

Overall, the community[1] responded quite favourably towards trees with 98% of the population responding that they felt trees were important to them. Most respondents recognized the ecosystem benefits of trees, particularly for their value to aesthetics and wildlife, air quality improvement, and climate change mitigation.

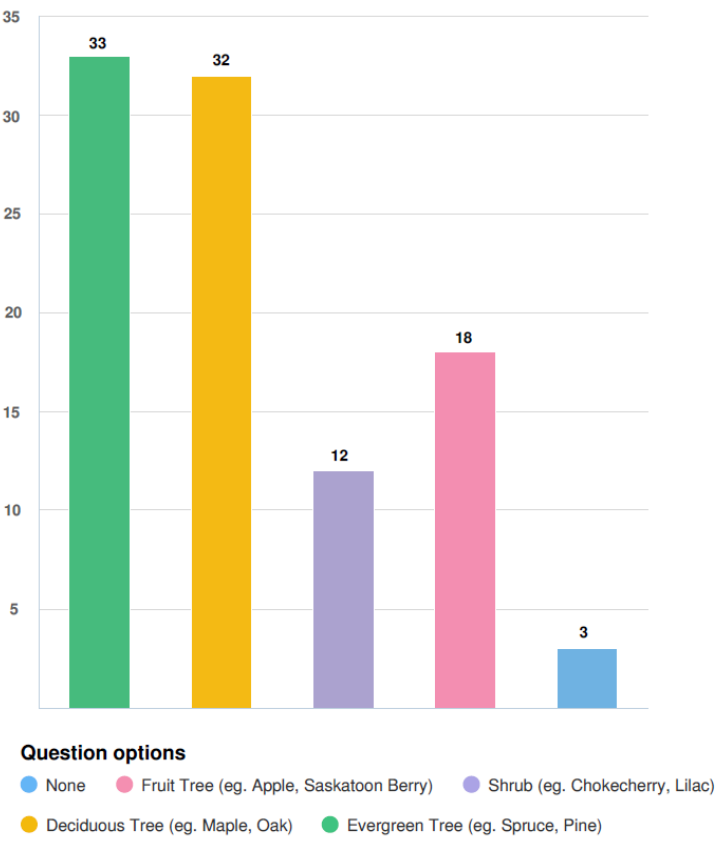
This sentiment was consistent throughout the results with 88% believing that more trees should be planted in parks and 87% being in favour of planting more public trees along roads. The community also felt that more money should be spent on urban forest and park care with 74% in favour.

In terms of private trees, most respondents (68%) were in favour of planting trees on private property and 65% were in favour of planting trees on their property if some of the cost of these trees was subsidized. The community was generally against implementing a permit to remove certain trees on

[1] The survey was completed by almost 3% of the population which provides a 90% confidence that the answers given are representative of the entire population.

private property with only 16% in favour of the idea. Opinions were split as to whether property owners should be required to plant a new tree following the removal of a healthy tree. Also, most respondents preferred the planting of a large-growing deciduous or coniferous tree over a smaller shrub or fruit tree.

Overall, the community was in favour of expanding the urban forest by investing more money into tree care and planting more trees throughout the town. Currently, there are no plans to implement a private or public tree bylaw in the town. However, the town may explore some regulations that align with the community's openness to compensating the removal of healthy, privately-owned trees with the planting of a replacement tree.

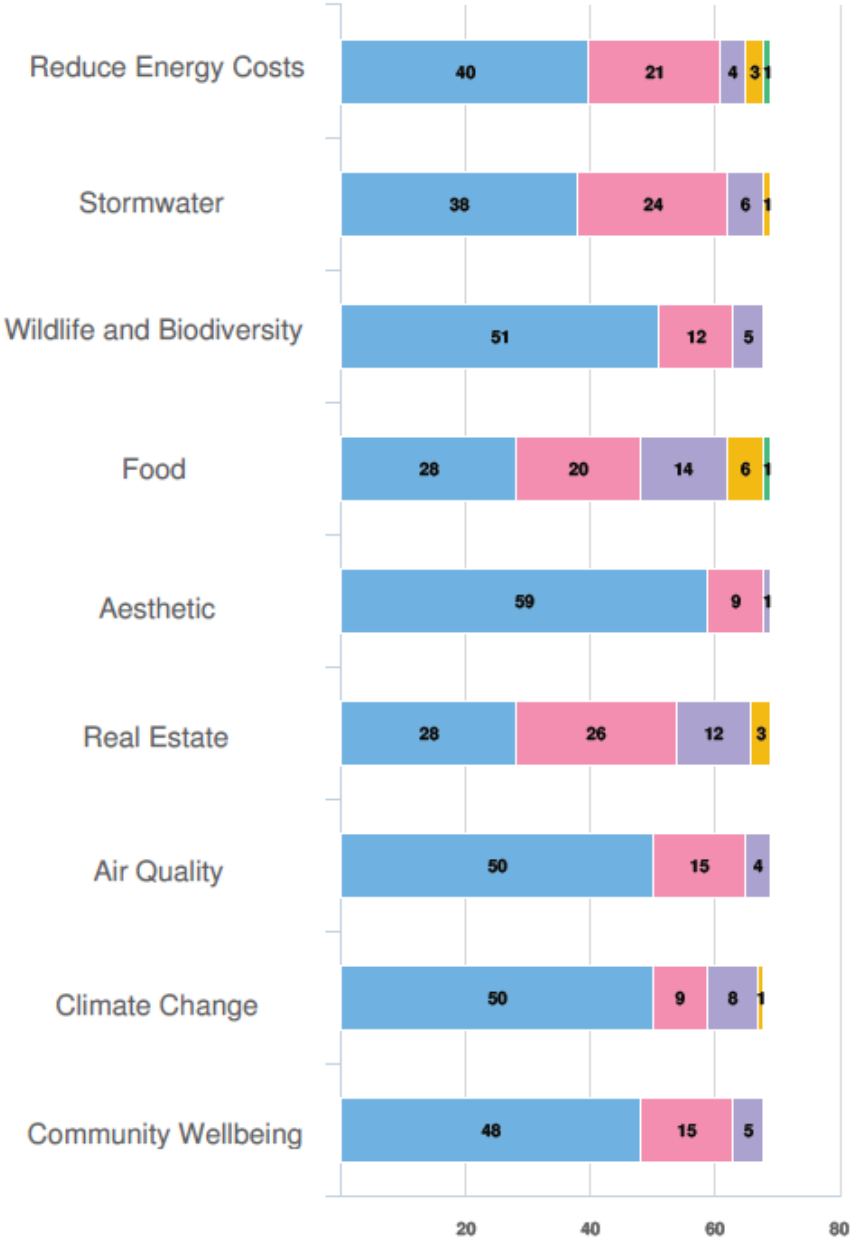


Community response to which type of tree they would prefer to plant. *Most respondents preferred the planting of a large-growing trees.*

Recurring themes among community comments can be summed up into these main concerns:

1. Major pruning and maintenance required on large, potentially hazardous trees.
2. Private landowners should be required to have trees on their properties.
3. Healthy trees should not be removed from town or private property.
4. Wind breaks are needed along roads and the pipeline.
5. The town is lacking trees in green spaces.
6. Tree maintenance and upkeep should be developed further, i.e. mulch and watering.
7. If homeowners already have trees and shrubs on their property the town should not force more upon them.
8. The pace of removal of dead or severely declining trees is lagging behind.

Community Perspective on Ecosystem Benefits Derived from Trees



Trees can increase residential property values between 3% and 15%. Mature, well-placed trees add the greatest value [7].

A sample survey response from the community outreach program. *The community was asked to rank the benefits of trees from strongly disagree to strongly agree for those listed. The community overwhelmingly agreed with the array of social, ecological, and economic values trees provide.*

2.4 Stakeholders and Partnerships

The town currently has few partnerships with local industry and stakeholders for the purpose of environmental initiatives. The town works with the Garden Club for the beautification of green spaces including selecting, ordering, and helping to plant all the flowers and shrubs each year for pot planting and flower bed areas.

It would be beneficial to partner with a local arboriculture company to help with high-risk removals as well as to solidify partnerships with nurseries to increase planting across the town and potentially offer a discount tree program for residents.

A few nation-wide organizations that should be explored for tree planting partnerships include:

- Tree Canada
- A Living Tribute
- Natural Resources Canada 2 Billion Trees Program
- Tree Cities of the World

The town is in the process of seeking certification as a Tree City of the World. This international program is a partnership with the non-profit organization Arbor Day Foundation. Joining this initiative would provide direction, assistance, and worldwide recognition for the community's dedication to its urban forest. The program provides a framework for a healthy, sustainable urban forestry program for municipalities. To receive recognition, White City would have to meet the list of five core standards laid out in the program. Currently, White City meets 4 of the 5 criteria for recognition.

White City's current standing in regards to the 5 core standards of the Tree Cities of the World.

Standard	Description of Standard	White City's Standing
1) Establish Responsibility	The city has a written statement by city leaders delegating responsibility for the care of trees within the municipal boundary to a staff member, a city department, or a group of citizens — called a Tree Board.	The town has Public Works staff whose responsibility includes the planning and caring for the urban forest with a goal of expanding and maintaining this valuable resource.
2) Set the Rules	The city has in place a law or an official policy that governs the management of forests and trees. These rules describe how work must be performed — often citing best practices or industry standards for tree care and worker safety —	The town does not have any laws or official policy that governs the management of forests and trees. The general opinion of the community is not in favour of a private tree bylaw that regulates trees on their own property.

	where and when they apply, and penalties for noncompliance.	
3) Know What You Have	The city has an updated inventory or assessment of the local tree resource so that an effective long-term plan for planting, care, and removal of city trees can be established.	Completed along this UFMS was a full inventory of every public tree on streets and parks. The findings (species diversity, maintenance recommendations, tree locations, etc.) are all incorporated into a long-term plan as part of this UFMS.
4) Allocate the Resources	The city has a dedicated annual budget for the routine implementation of the tree management plan.	The town is in the process of expanding the urban forest staff and allocating resources to its success. With the new tree inventory, additional staff and manhours are recommended to meet the maintenance needs of the existing forest as well as the plans for its growth.
5) Celebrate Achievements	The city holds an annual celebration of trees to raise awareness among residents and to acknowledge citizens and staff members who carry out the city tree program.	The town involves the community in tree planting events and works closely with residents with the local gardening organization. The town is interested in creating a tree voucher program for residents.

As “Set the Rules” is the last remaining criteria in applying for certification as a Tree City of the World, it will be important to assess the opinions of the residents as well as long-term planning considerations. To balance contrasting opinions and priorities, the town could incorporate guidelines for pruning and removal of trees on private property following industry best practices in addition to creating a public tree policy that regulates the maintenance and protection of public trees along streets and within parks. This would put the onus on the town to ensure the maintenance and protection of its trees, where feasible, by viewing trees as an essential aspect of municipal infrastructure. Implementing a public tree bylaw would result in the expansion of the urban forest staff to accommodate the maintenance needs of the forest as well as to enforce the protection standards.

3. Tree Inventory and Analysis

3.1 Tree Inventory Background

Keeping an up-to-date inventory of municipally owned trees is an important part of managing an urban forest. A complete inventory provides a database consisting of information (e.g. tree location, diameter, health condition, etc.) describing each individual tree. It functions as a tool to assess the health of the forest and map out the condition of existing trees as well as to track changes over time following inventory updates. Inventories provide the ability to map the spread of new pests and forecast patterns of decline, as well as to schedule pruning, watering, and removal operations.

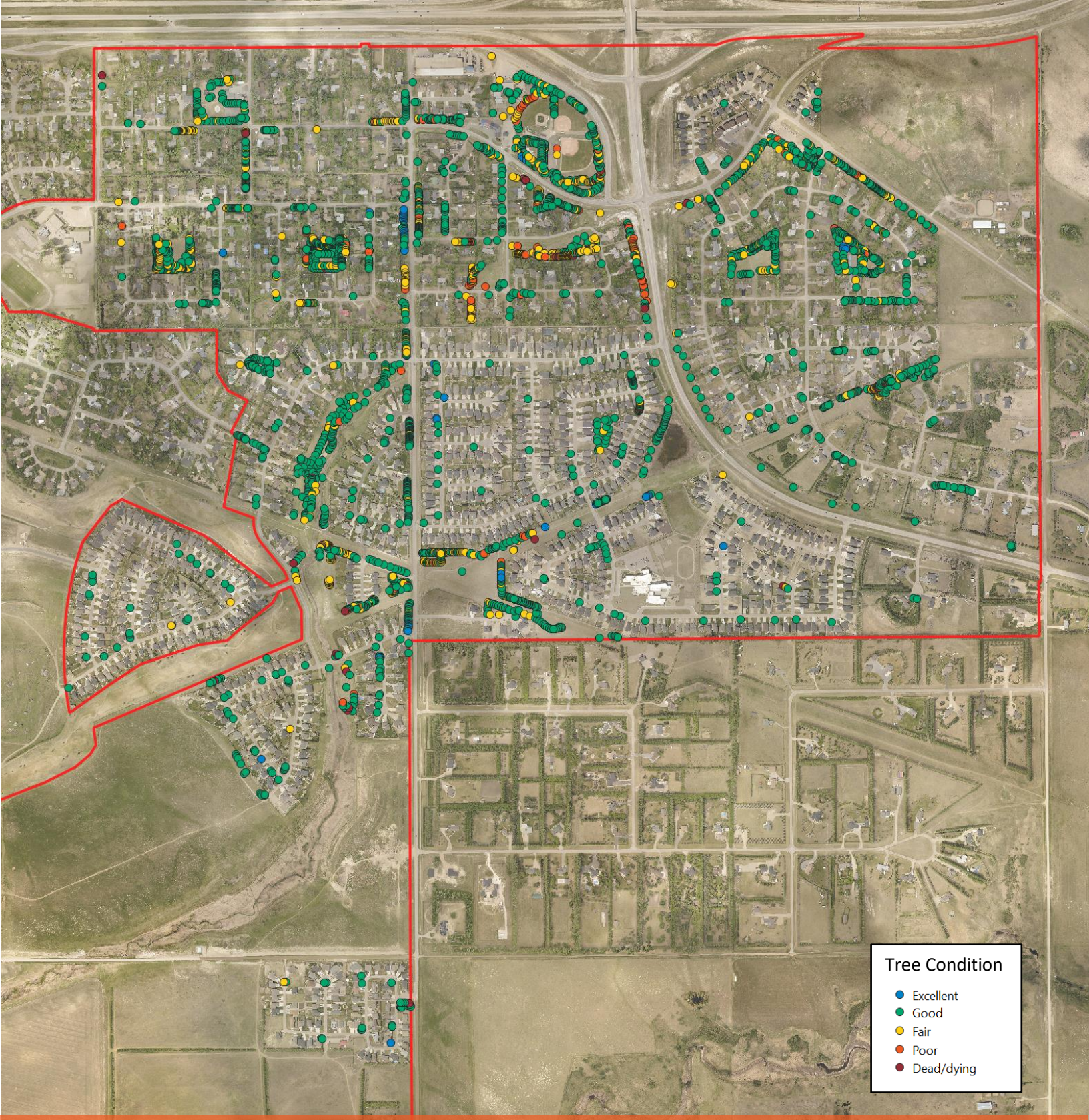
White City's extensive tree inventory includes 3,308 trees on public land in both streets and park land. The inventory was conducted by DRG in August 2021 and recorded the species, diameter, condition, maintenance recommendation, and location of all town-owned trees within maintained areas. Trees on private property, laneways, and naturalized areas were not collected. Most laneways were already clear of trees as the town prunes back any branches or new trees that interfere with access. Spontaneously growing trees in natural areas were only recorded when they were of significant size or near to pathways, roads, or houses where they may cause potential injury or damage. Some clusters and rows of trees were collected as single points, particularly if they were not regularly maintained by the town or if they were small plantings by residents. It is estimated that including these areas and tree clusters would add an additional 400 trees. Trees growing across property lines shared with the town were included as "boundary" trees.

3.2 Urban Forest Profile

White City has a total of 3,308 inventoried trees and 155 stumps. 2151 trees are located in parks, and the remaining 1157 trees are along streets within the town-owned right-of-way. A total of 53 unique species across 26 genera (closely related groups of species) were recorded.

Species Composition

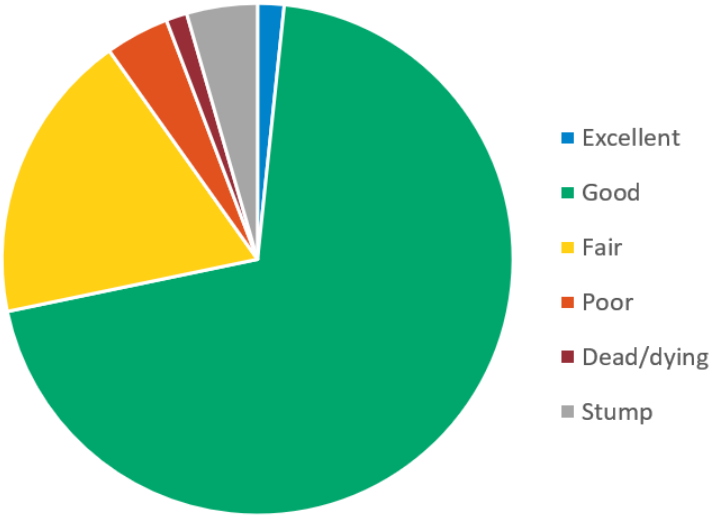
The majority (70%) of trees are deciduous trees that drop their leaves in the winter, while the remaining are needle-bearing conifer trees. The two most common species groupings are spruce and poplar, which combined make up just over half (52%) of all inventoried trees. Ash, elm, and maple represent an additional 12%, 8.5%, and 7.1% of trees, respectively. The remaining 21 genera combined represent 20% of all inventoried trees.



Aerial view of White City with all inventoried trees mapped. *The tree points are coloured based on their assessed overall condition. Stumps have been excluded.*

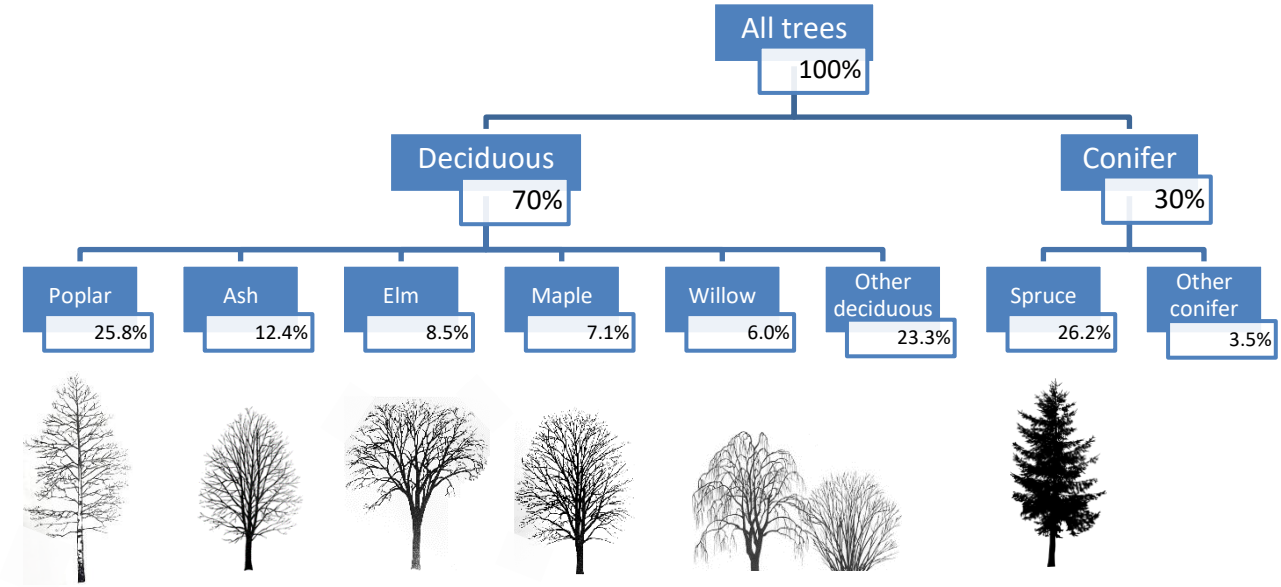
The overall condition of all 3463 inventoried trees and stumps.

Most trees were (75%) were in good to excellent condition.



Comparing Street vs Park Trees

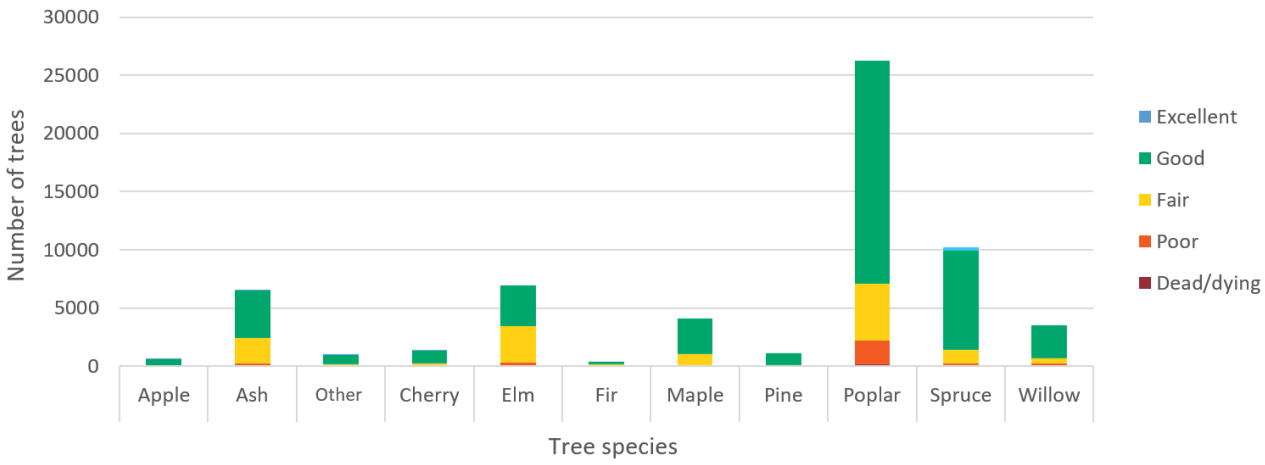
Some of White City's older streets are lined with aging poplars, as historically these were planted as a windbreak and to offer shade relief with the intention of planting more desirable trees in their shade. Conifers have also been planted as windbreaks, for their attractive winter foliage, and to dampen noise emitted along the major roadways. The five most common species grouping of trees along streets were: spruce, poplar, ash, maple, and willow. Most of the lindens (84%) and all 5 inventoried oaks were found along streets rather than in parks.



Breakdown of White City's inventoried tree population by type and species group[2].

[2] Silhouette photos adapted from: Petrides, G. A., & Wehr, J. (1998). *A Peterson Field Guide to Eastern Trees: Eastern United States and Canada, Including the Midwest.* HarperCollins.

The five most common species grouping in parks were: spruce, poplar, ash, elm, and maple. Most of the inventoried elms (81%) and birches (82%) were located in parks rather than streets. Streets had 82.8% of trees in good or excellent condition compared to only 71.1% in park trees. The proportion of trees requiring maintenance did not vary significantly between street and park trees (12.3% vs 16.2%, respectively).



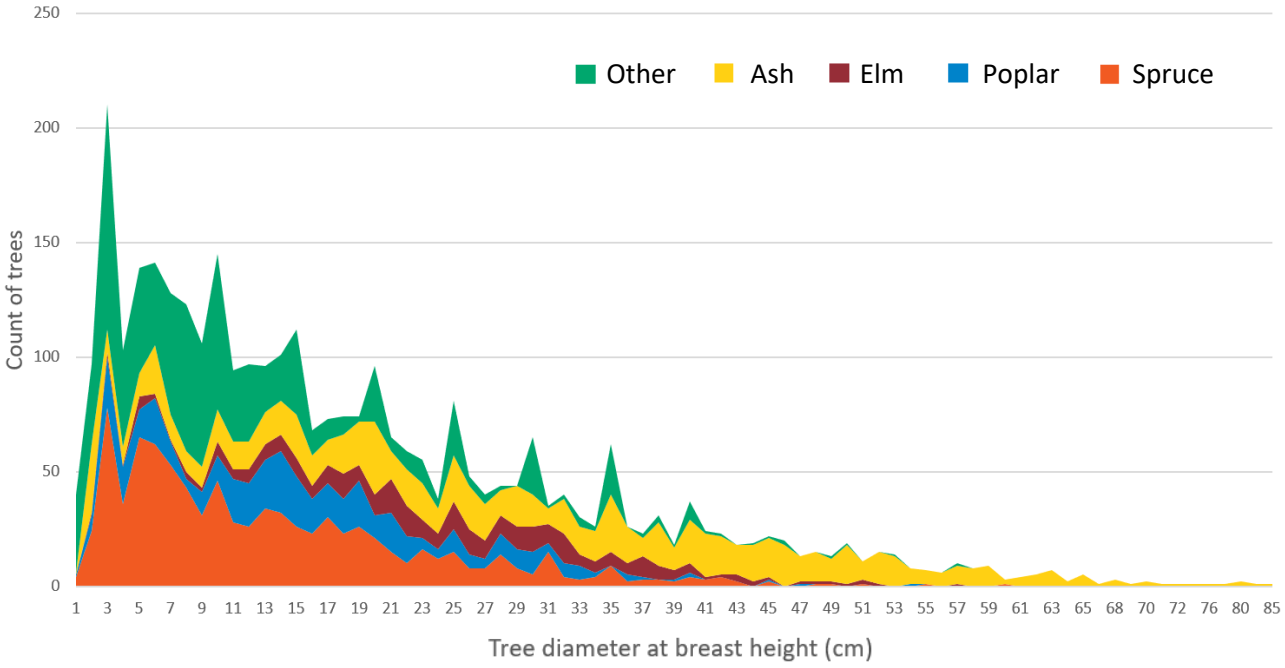
Tree species by condition for the 10 most common species as well as all other species combined.
Poplars and elms had the highest proportion of trees in poor or worse condition.

Size Distribution

The average diameter of White City's public trees is 19.1 cm. The largest recorded tree, a poplar along Lipsett Street, measures 85 cm in diameter. All 42 trees measuring 60 cm or greater are poplars, except for one willow.

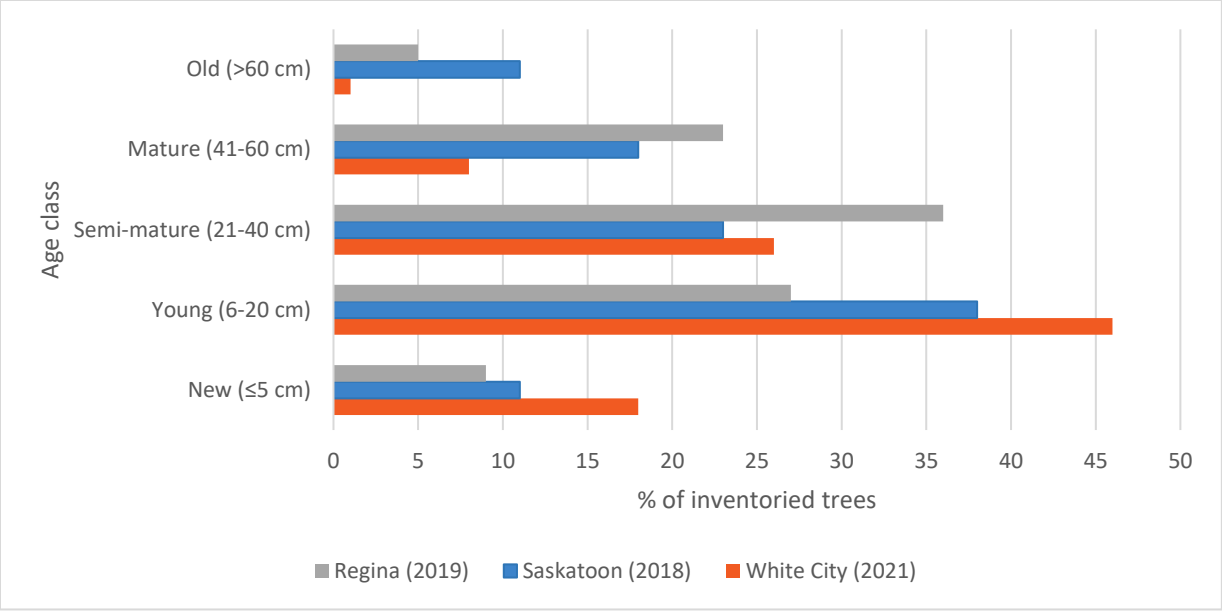
The ideal tree size distribution across a municipality is generally considered to be 40% juvenile (0-20cm), 30% small (21-41cm), 20% medium (42-61cm), and 10% large (>61cm) [8]. Compared to this ideal, juvenile trees are highly overrepresented in White City's urban forest while large trees are underrepresented. However, these ideals are not well suited to a prairie climate where trees generally do not thrive, and shorter-lived species are more common. Furthermore, the town's tree population skews younger due to the recent development of the town and the extensive number of newly planted trees inventoried as well as climatic limitations. The tree size distribution was also compared to age classes described in Saskatoon's Urban Forestry Management Plan. Even in this regional comparison to Regina and Saskatoon, White City's inventory is weighted towards smaller trees.

Large, healthy trees provide disproportionally high ecosystem services and benefits compared to small trees. Since it takes many years for the benefits of trees to exceed the costs of planting and maintenance, one key urban forest management principle is typically to maintain and protect existing mature trees.



Size distribution of all inventoried trees by trunk diameter. *The 4 most common species are featured.*

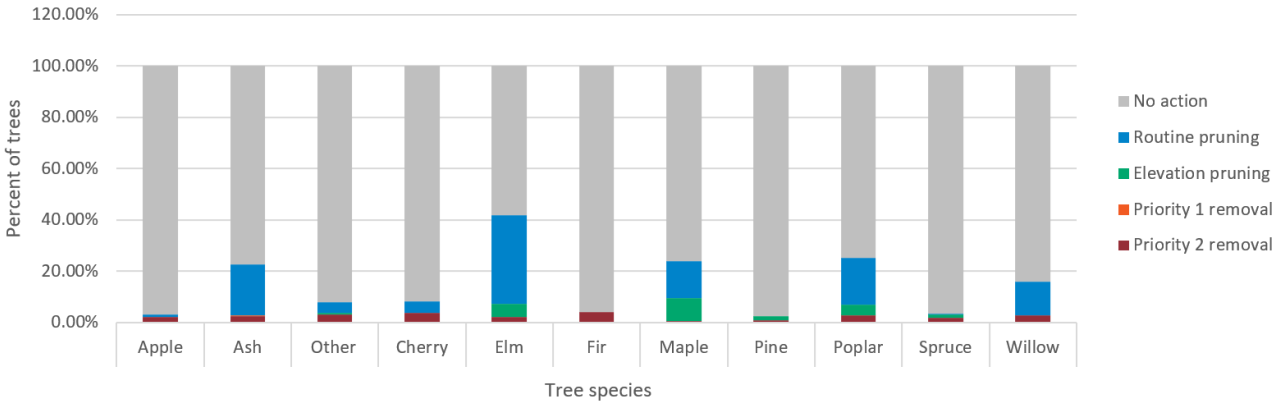
In the case of White City, the number of species capable of reaching the mature and old age classes are few, and are mostly limited to fast growing, short-lived species (such as poplar, Siberian elm, and willow). These are not ideal to meet long-term, sustainable urban forest goals since these species tend to be problematic as they mature. Nevertheless, efforts should be made to preserve long-lived species such as spruces and maples and prevent premature decline of all trees.



Age class distribution *of the inventoried tree population for White City, Saskatoon, and Regina.*

Tree Maintenance

490 trees (15%) of trees were recommended for either removal or pruning. Of these, elms had the most frequent maintenance recommendation at 41% followed by poplars at 20%. Comparatively, only 3% of spruce trees were recommended for pruning or removal. This is likely due to the upright form of spruce trees, characteristic of most conifers, which has a dominant central leader and reduces the likelihood of having large lateral branches that may either die off or interfere with town infrastructure. Another reasoning for the lack of maintenance required for spruce trees is their small size; many were recently planted. Overall, most of the maintenance recommendations were for routine pruning to remove deadwood and 105 trees were recommended for removal.



Tree species by recommended maintenance for the 10 most common species as well as all other species combined. *Elms were the most likely species to be recommended for maintenance or removal (41%), while pines were the least (2%).*

3.3 Urban Forest Benefits

Analyzing the inventory metrics allows us to place a value on the existing trees in the town. The Council of Tree and Landscape Appraisers' Guide for Plant Appraisal is the most informative and comprehensive alignment of current knowledge of the approaches, processes, and methods of plant valuation, and is supported by the ISA. Plant appraisal is the assessment of the value or replacement cost of a site's landscape elements such as trees. We have simplified the assessment metrics for White City to standardize valuation of town trees. The Guide's formula assesses trees based on their diameter, health, functional limitations (immediate limits to the tree's growth), and external limitations (environmental or societal limits to the tree's growth i.e. regulations). This is compared to a comparable replacement size, cost, and installation fee for a nursery specimen of a given species to estimate how much value is accrued by maintaining a tree over the period of time it takes to grow from a nursery specimen to its current size. Altogether, White City's existing public trees are appraised at an estimated $3,285,347. This is the assessed value of the standing trees and contains the full replacement cost if the trees were removed. Trees are an appreciating investment. Therefore, over time and with continued maintenance the appraised value of the urban forest will continue to increase.

Beyond this appraised value are also the ecosystem benefits trees provide throughout their lifetime. This includes the ongoing return each tree gives in terms of pollutant extraction from the air, storm water mitigation, and carbon sequestration. The savings provided by the largest inventoried tree in White City, a single 85 cm poplar, equals $60.16 in annual ecosystem benefits and 2053 gallons of water saved. Assessing the entire public tree inventory using TreeKeeper's iTree-based canopy modeling estimated that the town is provided $410,085 in annual ecological benefits. This includes energy reductions of 447,479 kilowatt-hours (kWh) for cooling in the summer and 38,545 Therms saved from reducing natural gas use in the winter. Additionally, 3,141,215 gallons of water have been saved annually from reductions of stormwater runoff and greenhouse benefits of 45,301 lbs of carbon sequestered annually. As the urban forest continues to grow and expand, these benefits will also increase.

These benefits can be increased if planners and developers were to plan with trees in mind and implement the right species of trees for the right location. The Town of White City currently has regulations in place that forbid planting trees in the town-owned right-of-way. This is done to make maintenance easier and prevent build-up of material in the ditches that might cause flooding. The compacted hard soil makes water flow over the surface of the ground rather than being absorbed resulting in this regulation. If town bylaws were to permit establishing flood-tolerant tree species like alder and black ash in the right of way, these trees could mitigate storm water flooding as well as create their own soil reducing the dry compacted soil currently in this area.

4. Urban Forestry Goals

These four overarching goals provide a path forward to guide the management of this valuable resource. Achievable actions and recommendations have been selected as a framework to improve the status of the urban forest over the next 10 years.

Manage and monitor trees for health and safety

Plant suitable trees to grow the urban forest

Enhance existing trees through improved maintenance and regulations

Engage the community to respect, connect with, and invest in the urban forest

4.1 Objectives and Actions

Manage and monitor trees for health and safety

Objective	Actions	Timeframe
Provide an up-to-date comprehensive inventory of White City's public trees	1. Re-inventory all trees on a 5-year cycle.	Ongoing
Maintain trees on a proactive pruning and removal schedule based on inventory data	2. Prune trees as needed from high to low priority on a 7-year cycle.	Ongoing
	3. Structurally prune new tree plantings.	Ongoing
	4. Monitor hazardous and declining trees in poor condition.	Ongoing
Implement the poplar management strategy	5. Implement poplar management guidelines and recommendations.	Short-term

Plant suitable trees to grow the urban forest

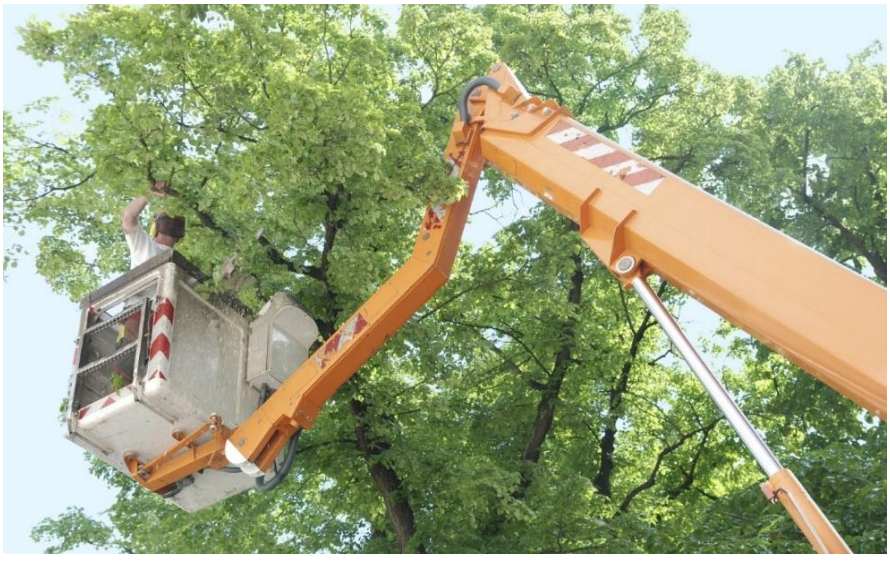
Objective	Actions	Timeframe
Develop a planting plan to optimize tree cover and ecosystem benefits across the town	6. Identify priority areas for planting along roads, pipelines, green spaces.	Short-term
	7. Select hardy species and cultivars that will thrive in the local climate.	Short-term
	8. Monitor tree health to select species and cultivars that have a high survivability.	Medium-term
	9. Conduct a bylaw review of landscaping and development policies regarding where trees can be planted.	Medium-term
	10. Create a public tree bylaw or policy aimed at maintaining and protecting existing trees.	Short-medium term

Objective	Actions	Timeframe
Partner with local nurseries to create a suitable tree supply	11. Select good quality stock and establish tree size minimums for town planting.	Short-term
	12. Create a discounted tree program for residents to plant on private property.	Medium-term
Update tree planting and maintenance procedures to optimize tree health	13. Implement the use of watering bags[1] for new public plantings.	Short-term
	14. Implement best practices for new plantings eg. watering, fertilizing, soil remediation, mulch application.	Short-term
Collaborate with development industry to create tree planting requirements	15. Implement minimum tree planting requirements for developers on private property.	Medium-term

[1] Watering bags (eg. Treegator) are a method of watering young trees by wrapping a bag around the lower trunk of a tree. These bags are filled with water (up to 20 gallons) and provides a slow, controlled release of water into the root zone. Their use lowers watering frequency by 50% saving time spent watering by 80%.

Enhance existing trees through improved maintenance and regulations

Objective	Actions	Timeframe
Increase resilience to pests, invasive species, and pathogens	16. Train Public Works staff on emerging pests and management techniques.	Short-term
	17. Create pest monitoring program using best practices for known threats to the urban forest.	Medium-term
Review the current procedures for handling service requests	18. Implement guidelines for what trees the town will address under service calls.	Short-term
	19. Streamline larger requests by training staff to remove larger branches/ trees without contracts.	Medium-term
Staff training to enhance the work capacity and quality	20. Hire or train existing staff member to be ISA certified.	Short-term
	21. Hire or train existing staff member to be TRAQ certified.	Medium-term
	22. Train staff on best management practices for tree maintenance procedures.	Short-term



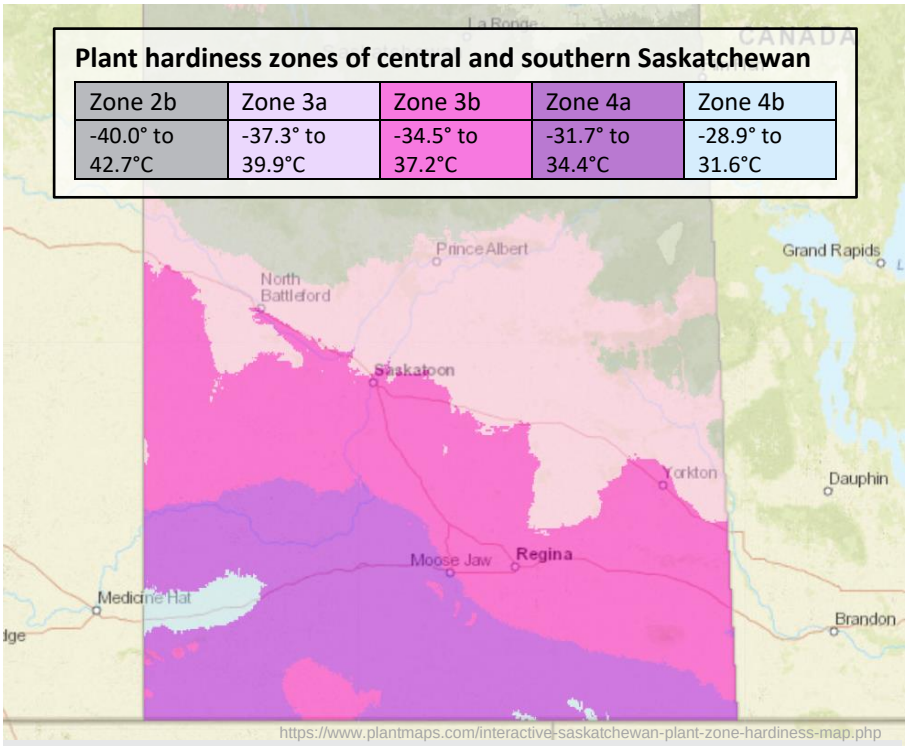
Engage the community to respect, connect with, and invest in the urban forest

Objective	Actions	Timeframe
Educate the community on urban forest improvement	23. Implement guidelines for proper pruning, watering, and maintenance for privately owned trees.	Short-term
	24. Educate the public on tree species selection and landscaping.	Short-term
	25. Create an education and outreach program for the community to engage in planting on public property.	Short-term

5. Plan Implementation

5.1 Planting Guidelines and Species List

White City has a harsh, prairie climate that does not readily support trees, however human intervention can alter growing conditions to promote tree growth and survival. For instance, site conditions could be altered by adding soil amendments or fertilizers or providing a watering program or planting additional wind breaks. Additionally, the town falls within Hardiness Zone 3b [9] as defined by its typical coldest winter temperatures, therefore trees should be selected which are plantable within this zone. This management strategy includes basic guidelines for public plantings as well as a compatible planting species list (Appendix B).



White City is located in Zone 3b. The zones define a minimum range of temperatures that a plant can survive safely in that zone.

General planting recommendations for both public and private landowners include:

- Plant trees at the proper depth by leaving the root ball taper above ground.
- Stake trees that require time to establish but no longer than 1-2 years.
- Apply watering bags using at least 1-2 gallons per tree per week for the first two years.
- Do not water the trunk directly as this can cause trunk rot, instead, water the area around the base of a tree.
- Prune recent plantings to encourage a healthy structure and form while trees are young.
- Do not pile mulch against the trunk and apply no more than 5-10cm of natural mulch.

We recommend that the town consider adapting the landscaping regulations that prevents planting within 20 feet of a road in the town right-of-way. ***This is an area that is a quality planting space that could offer shade, wind reduction, noise reduction, and privacy.*** With careful selection of flood tolerant species such as alder, planting could be conducted in the rear 10 feet of the right-of-way on town property. This would not only encourage expansion of the urban forest but would also contribute to stormwater mitigation.

5.2 Monitoring Pests and Diseases

Pest management is an active monitoring and mitigation process that aims to prevent the establishment of pests and diseases. Currently, White City does not actively monitor or manage any pests. Due to its harsh climate and small size, the town has a generally lower threat level than comparable sized towns that are less remote. Across Saskatchewan, there are currently only three provincially managed pests: emerald ash borer, Dutch elm disease, and mountain pine beetle. Other insects and diseases, including native species, identified in the province that may cause harm to trees include bacterial wet wood infection, blights, canker growths. For White City, prevention and early detection, coupled with a rapid, efficient response, is the most applicable action to minimize damage caused by these unwanted pests.

It is recommended that these three main pests be actively monitored through the town, as new pests emerge and pose a threat to the health of the urban forest they too should be managed and monitored. The town should invest in public engagement aimed at educating residents on the proper identification of the main pests of concern and creating an online resource to learn these pests as well as a contact for residents to submit pictures and locations of suspected pest sightings.

Dutch Elm Disease (DED)

This disease is normally spread through tiny elm bark beetles from elm to elm via tree root systems or by contaminated tree pruning tools. The fungus blocks the elms' water and nutrient conducting system. This disease can affect any elm species and can kill over several seasons or sometimes in as little as three weeks. While DED has caused catastrophic die-off to the native American Elm, Siberian Elms, which are the most common elm found within White City, have shown a resistance to this disease but can still be infected. Breeding programs have also been successful in creating cultivars and hybrids of American elms with resistance to Dutch elm disease. There are no known cures for DED-infected elm trees. The only management tool once a tree has been infected is a complete removal of the specimen including the stump down to 10 cm under the soil level followed by a herbicide treatment.

The regulation outlines the following recommendations [10]:

- Prune elms before or after the ban period to keep them healthy and better able to resist all types of disease, including DED.
- Remove unhealthy and dead elm wood cuts, reducing places for beetles to breed and the risk of infection.
- Elm showing signs of DED (wilting, yellowing leaves on one or several branches near the top of the tree, usually beginning in late June) should be reported to the local municipality.
- Remove and dispose of DED-infected elms promptly, including during the ban period.

Emerald Ash Borer (EAB)

EAB is a metallic green, flat-headed wood-boring beetle that originates from Asia, but has recently become established in North America. Due to the lack of natural predators, it has aggressively attacked and killed healthy ash trees. Adult beetles emerge from infested trees in May and early June and lay their eggs which hatch within a few weeks and begin feeding under the bark layer of the tree. Presence of EAB can be identified through "D" shaped exit holes in the bark and is associated with crown dieback. It typically takes 2-3 years to kill an infected tree. The only treatment available is to inject the trees with insecticide every few years. Management options for this pest include firewood transport bans, branch sampling, public education, tree disposal and comprehensive tree inventories. In order to effectively manage EAB and maintain overall tree canopy, prevention and early detection should be prioritized to avoid outbreaks [11].

Mountain Pine Beetle

Though pine trees are uncommon in White City's landscape, this beetle is a significant threat to pine forests in the province. Mountain Pine Beetle is native to Western North America and normally attacks overmature, stressed, or injured pine trees but in epidemic levels can kill millions of hectares of healthy forest and can last more than 10 years. It is a wood-boring inse straight, vertical tubes under the bark filled with boring dust and insect droppings [12].

https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/forest/MPBLandscape292.jpg

https://www.inaturalist.org/observations/6377234

Mountain Pine Beetle *is the most significant threat to pine forests in Saskatchewan's north.*

5.3 Tree Maintenance and Removals

Following the 2021 inventory, White City has 109 trees recommended for removal. These include 36 poplars, 16 spruce, 13 ash, 10 cherries, and 10 willows. The recommended timeline to handle these removals is within 1-2 years, as possible failure in some cases could cause property damage

Large, declining trees like these poplars near houses and along roads and marked trails are high priority for maintenance and removal work.

require immediate action due to their hazard potential have been designated as Priority 1 removals. Smaller trees capable of being removed by town staff should also be dealt with in the short term, to address potential hazard trees as well as to make space for new trees in the place of failed plantings.

The use of a bucket truck could cost between $1,000-$2,000 per day and possibly more depending on the complexity of the tree removal. Most contractors can remove one to three mid-sized trees in a day depending on complexity. Therefore, the removal of these trees will be fairly costly, and the town should budget for these removals in the next 1-2 years.

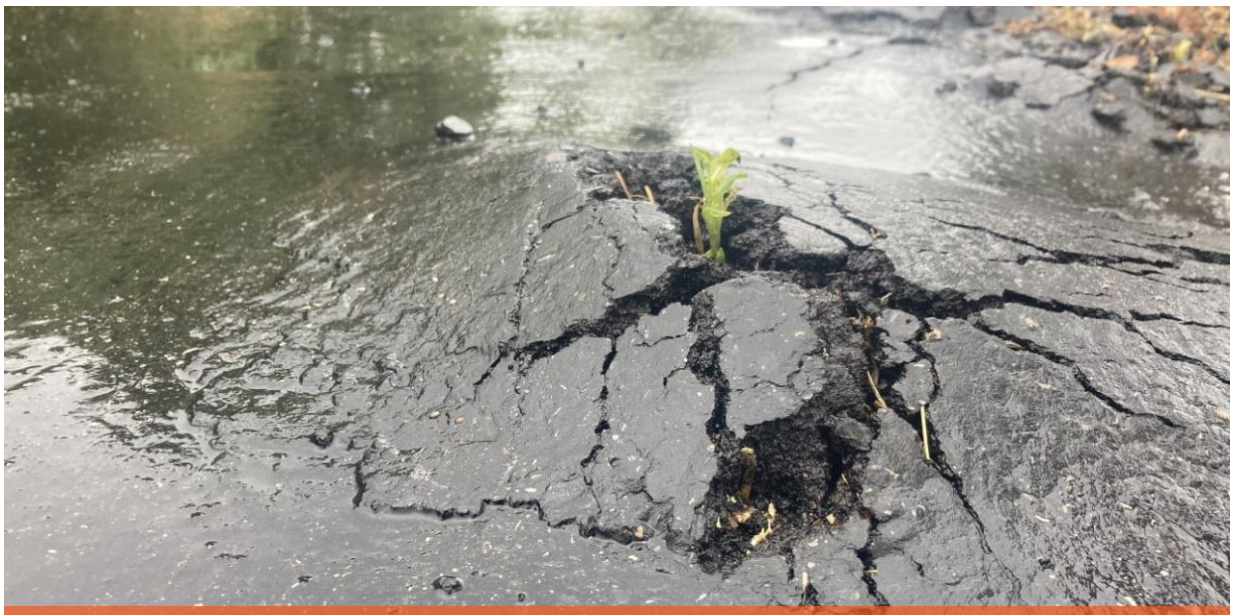
Pruning Recommendations

White City has 385 trees that are recommended to have maintenance pruning. 139 poplars are recommended to have either elevation or routine pruning. Elevation pruning is recommended to reduce the height or reach of branches for utility line clearance, or light obstruction, or to raise low hanging branches interfering with roads or walkways. Routine pruning is recommended to remove deadwood or reduce the likelihood of branch failure by improving structure and form. After poplars, elms are the second species most in need of maintenance with 107 trees recommended for pruning. These two species, which are the 2nd and 6th most common public trees, account for most (64%) of the maintenance pruning recommended in the inventory. This was expected due to the fast-growing nature and weak structure of these species, as well as their capability to reach tall heights.

Like the removal of high priority trees this activity of pruning trees across the town is equally expensive. An estimated cost cannot be given for this work due to the complexity and variable nature of the job. Some trees are accessible from the ground and would take 15 minutes with a hand saw while others would require a full day of work with a bucket truck. The work should be done on a priority basis based on the condition of the trees. Trees in poor to fair condition that can be saved or preserved with pruning should be done first followed by good condition trees.

Stump Removals

During the tree inventory, 155 tree stumps were recorded and recommended for removal. These stumps are located in areas that could result in a tripping or safety hazard, as well as those in areas that are potential planting sites for new trees. To minimize costs to the town, stump removal should be done in-house by town staff with the use of a stump grinder. Additionally, stumps of certain species like poplar and willow have energy-rich roots that have a high capability of shooting out abundant epicormic shoots from the stump or below ground roots. This has been observed across the town where freshly paved trails have been cracked within a single season due to new root sprouts. One solution is to install a root shield at the edge of the intended growth area for the tree. This is a solid plastic barrier that is installed underground vertically, to direct root growth away from infrastructure or other unwanted areas. This option is expensive with an estimated cost of $65 per foot. The barriers are available in 18-36-inch-deep rolls and can last up to 100 years below ground.



A shoot from an underground willow root is seen breaking through a recently paved asphalt walkway.

It is not always possible to prevent a stump from sprouting but some practices have shown to be effective at helping manage the situation.

1. Stump grind and plant a tree over top of the old stump.
2. Stump grind and apply salt to the existing stump, this option will make tree growth in this area difficult and limit the ability of grass and other desirable plants to grow.
3. Stump grind and apply a herbicide to the stump.
4. Establish a root shield barrier.

5.4 Future Maintenance Planning

It is important to understand species-specific limitations in terms of lifespan, form, size, and growing requirements when considering long-term urban forest management. A tree inventory can be utilized to estimate the remaining lifespan of most trees based on their species, condition, and size. Regina's urban forest management plan [13] suggested the estimated average age span of local trees in a prairie ecosystem. While the lifespans are based on shelterbelt plantings in Saskatchewan, they provide a valuable estimate of the most common species based on local climatic factors.

Species	Longevity
Ornamental	25 – 40 years
Poplars	12 – 50 years
Other Deciduous	45 – 60 years
Elm	60 years
Ash	60 years
Coniferous	70 – 80 years
When these longevity estimates are compared to the average age of inventoried trees, it is possible to identify those trees that may need replacement in the next ten years.	

When assessing the status of White City's urban forest, we can refer to historical records which show some plantings are reaching or surpassing their estimated growing age. The large row of poplars along White City Drive, for example, is between 40-50 years old suggesting that within the next 10 years almost all of these trees may have to be replaced. Understanding the life cycle of these trees can provide foresight helping to manage and implement new trees for the future.

5.5 Poplar Management Strategy

In recent years, the aging poplar population has seen a rapid decline causing damage to property and increasing the risk of future incidents. As managing trees of this size can be costly and time consuming, it is essential to outline feasibility for management goals. Considering that the recent inventory has identified all of the trees located on town property, this will help address ambiguity surrounding ownership and will provide a clearer picture of the time and money required for the town to manage the trees in its ownership. However, some of the poplars planted along town roads are on private property. This will require cooperation with private landowners to put a management strategy into action.

Three options are available ranging from inaction to widespread removal:

1) Do nothing

This option of doing nothing would result in the eventual decline and failure of these large trees potentially resulting in costly fixes for the town or for private property. The do-nothing approach would be conducted by allowing the remaining poplars to age and decline while removing hazardous branches or eventually removing the tree if it is deemed an immediate hazard. This approach is reactive in nature.

2) Remove all of the large poplars

Removing trees of this size is costly and time consuming. Due to the small size of the town's urban forestry department and resource availability it would be very difficult to accomplish this task. Outside contractors with specialized equipment and expertise would have to be used to fell these trees due to the location of utilities and private property to help prevent the risk of damage occurring.

This option would be carried out by removing all trees in fair condition with structural issues as well as all trees in poor or worse condition. It is also recommended that private landowners be encouraged to do the same. This would be followed up by multiple removals each year as

the trees decline. After the first round of removals the nearby remaining trees would become exposed to more of the elements resulting in faster decline. This would speed up the necessity for removals both increasing the cost and the loss of trees. This option is costly for both public and private landowners.

3) Deadwood and structurally prune the poplars for weight reduction

This option could be the most complicated approach but would also retain the most canopy cover while reducing risk. This option would remove the upper portion of the crown, both reducing the height of the tree and chance of full tree failure. Poplars have a tremendous ability to resprout and would be able to sucker and sprout from the newly cut limbs. This may reduce the remaining life expectancy of these trees by opening multiple wounds, but this approach would reduce their hazard potential.

While the trees are re-sprouting, it is an optimal time to plant tolerant hardwoods that can grow in the shade of the poplars and establish under their cover. Once these new trees become well established the remaining poplars can be removed. This option is the most costly but viable option to retain and replace the existing poplars. It would give the newly planted trees a high chance of success and result in a staged approach that would extend the time until the larger trees require complete removal.

6. Future of the Strategy

The key purpose of this strategy is to assess the current urban forest and to encourage changes that work towards expanding and enhancing the urban forest and its benefits. Over the next ten years as the strategy is implemented, progress towards the objectives should continuously be tracked and recorded. In order to carry out the actions outlined in the UFMS, the town should review the progress annually and adjust their parks and street tree budget accordingly. The UFMS should be formally reviewed every 5 years to provide a public summary on its progress and adapt actions to both a changing climate and development of the town.

References

[1] Schroeder, W.R. “Reflections on Prairie Poplar”. Website: http://www.poplar.ca/upload/documents/regina-16/presentations/agm-2016-schroeder.pdf

[2] “Salinity Class” Website: https://soilsofsask.ca/soil-survey-soil-characteristics/salinity-class.php

[3] “Climate Change Impacts on the Prairies”. https://www.prairiesrac.com/climate-impacts/

[4] Venette, R. C., & Abrahamson, M. (2010). Cold hardiness of emerald ash borer, Agrilus planipennis: a new perspective. United States Department of Agriculture, Forest Service.

[5] DeSantis, R. D., Moser, W. K., Gormanson, D. D., Bartlett, M. G., & Vermunt, B. (2013). Effects of climate on emerald ash borer mortality and the potential for ash survival in North America. *Agricultural and Forest Meteorology*, 178, 120-128.

[6] “Protect Your Trees: Don’t Prune Elm Trees From April 1 To August 31”. 2021. Website: https://www.saskatchewan.ca/government/news-and-media/2021/march/26/protect-your-trees-dont-prune-elm-trees-from-april-1-to-august-31

[7] *Wolf, K.L. 2010. Community Economics - A Literature Review. In: Green Cities: Good Health (www.greenhealth.washington.edu). College of the Environment, University of Washington.*

[8] Richards, N.A., 1983. Modeling survival and consequent replacement needs in a street tree population. *J. Arboric.* 5.11:251-255.

[9] Natural Resources Canada: “Plant Hardiness Zones”. 2021. Website: http://planthardiness.gc.ca/

[10] “Forest Pest Fact Sheet”. 2017. Website: https://publications.saskatchewan.ca/api/v1/products/24497/formats/31458/download

[11] “Forest Pest Fact Sheet”. 2017. Website: https://publications.saskatchewan.ca/api/v1/products/76997/formats/86288/download

[12] “Forest Pest Fact Sheet”. 2018. Website: https://publications.saskatchewan.ca/api/v1/products/77004/formats/86295/download

[13] “The Regina Urban Forest Management Strategy”. 2000. Website: https://treecanada.ca/wp-content/uploads/2017/11/THE-REGINA-URBAN-FOREST.pdf

Appendix A – Appraisal Methodology

To calculate total tree replacement value we used the ISA "The Guide for Plant Appraisal" We calculated average condition by species and used these metrics to calculate a total tree value. The factors used are described below:

Functional limitation was standardized at 70% trees with a higher functional limitation are assessed at a higher value due to the lack of structural and limiting obstacles to their growth. White City does not have an abundance of hardscape around the town and with the average location of town trees in rights-of-way without sidewalks as well as open-growing within parks. We assessed every tree with the same value.

External Limitations were assessed at 40%, this is because of the poor climatic conditions of the town for tree growth. Historically the area had very few trees due to natural grass fires, large temperature swings in the summer/winter, frequent droughts and heavy winds.

Tree Health conditions were assessed as 4 categories, Excellent was assessed at 70%, Good was assessed at 60%, Fair was assessed at 50%, poor was assessed at 30% and dead or dying was assessed at 10%. These values were given across the board to standardize the approach we used and simplify the assessment. Most of the trees in White City are in fair condition due to the climatic stressors. This was taken into account when assessing the health of the trees while on site.

Appendix B – Additional Resources

Guidelines for Public Tree Planting

These guidelines are expected to be updated and changed as the Urban Forest Management Strategy is implemented and a better understanding of compatible species for the area as well as planting sites are gained. These guidelines assume that the current bylaw is amended to permit planting in the town right of way, where feasible.

Site Considerations

- Tree planting locations will be determined on a site-specific basis. As a goal, no less than one tree should be planted for each lot. Larger lots and corner lots may have more than one tree.
- Since large trees contribute more to the environment and the neighbourhood than small ones, the largest tree that is suitable for the location is to be planted, considering eventual size at maturity.
- Plantable space may include the boulevard in front of, or rear of, the sidewalk (where present).
- Tree locations may be staggered and/or grouped where appropriate to make the best use of available planting and growing space. All trees are to be planted on town property.
- For streets with wide public right-of-ways without sidewalks, plant trees at least 3m behind the curb, preferably 4m if property lines allow.
- Prospective planting sites should be protected from soil compaction, prior to and after planting.

Guidelines for Planting Near Utilities

- No tree is to be planted closer than 3.6 m to the doors or 1.5 m from the sides of an above ground hydro vault (transformer).
- Trees may be planted at 0.5 m (measured horizontally) from buried streetlight cable, not closer than 0.9 m (measured horizontally) from other buried electric cables and not closer than 0.3 m (measured horizontally) from buried telephone and/or TV service cables where their location is known.
- No tree is to be closer than 2.0 m to a driveway or 0.5 m from a sidewalk going into a property
- No tree is to be closer than 6 m in line of sight to a stop sign or Railway Crossing Sign on a residential street only (i.e. not a collector or arterial road).
- No tree is to be closer than 15.0 m in line of sight to a stop sign or traffic signal light or Railway Crossing Sign on any collector or arterial road.
- No tree is to be closer than 3 m to the front and sides of a fire hydrant.
- No tree is to be closer than 0.3 m (measured horizontally) to a water main, or 0.7 m from a shutoff.
- No tree is to be closer than 0.2 m (measured horizontally) to a gas line.
- No tree may be closer than 2.0 m (measured horizontally) to a sanitary sewer.
- No tree may be closer than 3.0 m to another tree.
- No tree is to be closer than 4 m to a streetlight pole.

SaskPower Tree Planting Specifics

SaskPower provides pruning and planting guidelines for trees located near to equipment, poles, or power lines. This standard forms the minimum requirement for SaskPower Quality Assurance (QA) and Quality Control (QC) inspections over the course of operations on all distribution and sub-transmission vegetation maintenance contracts. The goal of these points is to make maintenance and servicing easier and retain trees far into the future. Mismanagement and improperly planning can result in preemptive removal to maintain service lines.

- All plantings should follow SaskPower guidelines using the four zone recommendations. These zones have height and growth standards as well as species recommendations.
    - Clear zone (0-3m from lines) = no trees permitted
    - Low zone (3-6m from lines) = small trees no taller than 6m permitted
    - Medium zone (6-15m from lines) = medium trees no taller than 12m permitted
    - Tall zone (15m or further from lines) = trees 12m and taller permitted

Species-specific Recommendations

Some species of trees are more prone to dropping branches and having branch failure. Identifying these trees and their maintenance needs can direct preventative planning to prevent their inference with power lines.

Top and overhang clearance

- American Elm overhang around power lines is only acceptable if it is 3.0m above primary conductors and the trees are mature with large stems. Overhang on Elms with smaller branches is to be removed and prevented. In no cases is overhang left on Siberian Elm.
- Poplar overhang is a pruning clearance priority.
- Large, mature and *healthy* Poplars with conductor overhang can be side-pruned where it is not cost-effective to remove overhang.

Side clearance

- Foliage side-clearance on Ash, American Elm, Manitoba Maple, Silver Maple, Burr Oak, Linden and similar trees should be **1.5m** or more.
- Vertical stem side-clearance to these trees shall be kept further away than **1.5m** to ensure that stems do not thicken to reduce this clearance or that they become large and heavy and lean into this clearance.
- Foliage side-clearance for fast-growing trees such as Poplar and Willow shall be a minimum of **5.0m** *or more* from conductors.
- Vertical stem side-clearance for Poplar and Willow shall be maintained at **5.0m** *or more*.
- Conifers at **2.0m** to the side or further are to be side trimmed to the main stem. A minimum side clearance of **2.0m** is to be attained.
- Conifers with a main stem within **2.0 metres** of an outside conductor will be top-directional pruned. This includes trees below, beside and higher than primary conductors.

V-Pruning Clearance

This type of pruning involves removing branches growing towards or touching a power line. It is typically involving deciduous trees planted under power lines and after pruning gives the distinct visual of a large V cut into the crown of the tree. This type of pruning significantly reduces the life expectancy of a tree but is better than removing it all together.

- Never on Poplars or Willows
- Only on town street-trees.

More detail can be found on the “SaskPower Best Management Practices: Vegetation Line Clearance Standard”.

Design and Species Considerations

Species Selection

- Use of species with high adaptability to climate change is desirable.
- Use of native species over non-native and invasive species is desirable. Native means naturally occurring (indigenous) to Saskatchewan and the region.
- No more than five of any one species or variety is to be planted on one side of the street in a row. Trees should be matched one side of the street to the other (maximum of 10 matched trees) to provide a 'closed canopy' effect at maturity.
- The planting should reflect the landscape character of plantings in adjacent neighbourhoods. It is not necessary and may not be desirable to match species in adjacent neighbourhoods, but consideration should be given to a neighbourhood identity with similar tree shape and size at maturity.
- In order to integrate species diversity into each neighbourhood, the species mix shall provide no more than 10% of any one species town wide.
- Trees with similar shape (eg. vase, oval, upright) are to be selected to provide a neighborhood landscape character.
- Trees with large or messy fruit may be planted only in limited situations.
- Trees with large thorns are not permitted and species such as poplar and willow are discouraged for street tree planting.
- Coniferous needle-bearing trees will not be in boulevards, as they can cause sight line obstructions but may be planted rear of the sidewalk.

Planting Stock

- Ball and burlap trees are preferred. Bare root trees are not acceptable. All synthetic twine should be removed, and burlap should be pulled back. Trees must not show visible signs of damage.
- Minimum size: 5 cm caliper (measured 15 cm above ground level) for deciduous trees and 150 cm tall for conifers.

Watering and Maintenance:

- Water 2-4 gallons/week, applied weekly for first year
- A 5 to 7.5 cm layer of natural mulch may be applied to the planting area but must be kept 15 cm away from the tree trunk.
- A tree should only be staked if it is unable to stand on its own, or when planted on boulevard. When staking, the stake should be placed on the windward side of the tree avoiding damage to the trunk and root ball. The tree should be tied to the stake, allowing for natural movement of the trunk. The stake should be fastened to the tree with a figure-eight loop tie of a soft elasticized material. The stake should be removed after one year or when the tree is established.

Compatible Species – Planting List

The following is a list of tree species that are compatible within Hardiness Zone 3b and are recommended for planting in White City:

Scientific Name	Common Name
Alnus incana	Alder, Grey
Malus spp	Apple
Fraxinus pennsylvanica	Ash, Green
Fraxinus nigra	Ash, Black
Fraxinus americana	Ash, White
Populus tremula 'erecta'	Aspen, Swedish Columnar
Populus tremuloides	Aspen, Trembling
Betula lenta	Birch, Cherry
Betula papyrifera	Birch, Paper
Thuja spp	Cedar
Prunus maackii	Cherry, Amur
Prunus virginiana	Cherry, Choke
Prunus serrulata	Cherry, Flowering
Prunus spp	Cherry/Plum
Cupressus spp	Cypress
Cornus alternifolia	Dogwood, Alternate-leaved
Ulmus americana	Elm, White
Ulmus pumila	Elm, Siberian
Crataegus spp	Hawthorn
Syringa reticulata	Lilac, Japanese Tree
Tilia americana	Linden, Basswood
Tilia cordata	Linden, Littleleaf
Gleditsia triacanthos	Locust, Honey
Acer spp	Maple
Acer ginnala	Maple, Amur
Acer x freemanii	Maple, Freeman
Acer negundo	Maple, Manitoba
Acer platanoides	Maple, Norway
Acer tartaricum	Maple, Tartarian
Sorbus americana	Mountain-Ash, American
Quercus rubra	Oak, Red
Elaeagnus angustifolia	Olive, Russian
Pyrus spp	Pear
Pinus mugo	Pine, Mugo
Pinus sylvestris	Pine, Scotch
Populus balsamifera	Poplar, Balsam
Populus x canescens	Poplar, Tower
Picea pungens	Spruce, Colorado
Picea abies	Spruce, Norway
Picea glauca	Spruce, White
Salix spp	Willow