# **State of the Urban Forest 2022**

Forestry & Integrated Pest Management Operations Open Space Services Branch Parks, Recreation & Cultural Services Department City Planning & Community Development Division



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Do you look at the forest through the trees? Or do you look at the trees in the forest? Which view would you prefer?

For the reader, each measure within this document can stand on its own merit.

The measures can also be considered together to highlight a particular aspect of the urban forest or program component.

All measures can be considered together to evaluate the entire forestry program.



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Our community was recognized as one of the first 68 Tree Cities of the World with an inaugural announcement which occurred in February of 2020. The City of Regina received confirmation in February of 2022 of continuing status for the third year in a row. The program now recognizes 138 cities across the globe.

The Tree Cities of the World Program is a combined effort with the United Nations Food and Agriculture Organization and Arbor Day Foundation.

There are now 18 Canadian cities included in the designation.

Regina has applied again for continuing status with confirmation expected in early 2023.



- Total Carbon Sequestered Annually = 931 metric to
- Total Carbon Avoided Annually = 1,081 metric tons
- \*\*Carbon Equivalent Value = \$2.67 million



\* Spatially analysed GIS sample size of 135,746 trees was submitted using *iTree Eco*<sup>™</sup> for carbon analyis in August 2022 with results returned in November of the same year. *iTree ECO*<sup>™</sup> is a peer reviewed software package created by Davey Tree Inc. and U.S. Forest Service that is capable of analysing tree/urban forest benefits.

\*\* Carbon equivalent value is based on 2022 Federal Carbon Tax benchmark of \$50 per metric ton.

# **Community & Urban Forest Measures**

#### **Tree Species Diversity**

*Within the Regina Urban Forest Management Strategy - July 2000 (RUFMS)*, the City's sustainability goal is a maximum of 25% of any one genus within a neighbourhood. RUFMS further specifies that for a park space, no more than 20% of any one genus is permitted. Greater diversity minimizes risk of massive tree loss due to disease and insect damage. Prior to 1989, most plantings were predominately monocultures of elm (Ulmus) or ash (*Fraxinus*).

		ACUON.
25% Genus diversity Elm (UIn	nus) diversity reduced by 2.5% from	Introduce alternative genus & species.
2000 to 1	present (now 32.5%)	Example honey locust (Gleditsia)



\*Local common name followed by (Genus).

The pie chart shows the tree species diversity managed by Forestry Services and recorded within the ArcGIS<sup>™</sup> tree inventory database as of January 13, 2023.

- Inventory is primarily based on residential street trees, park spaces and some buffer areas around major arterials (ex. Arcola Avenue).
- Total trees recorded within GIS inventory is 142,661 trees. This amount is estimated to be 79% of total street and park tree inventory.
- Shrubs were added as a new inventory class during 2021. Since then, 4,640 shrubs have been added to inventory. Shrubs are not shown in this pie distribution.
- Some minor species not shown include cedar, hawthorn, hackberry, buckeye and pear, with a total combined number of 0.15%.

Regina remains predominately a monocultured urban forest, with just under two thirds of trees within the city being either elm or ash. Elms are our community's longest-lived trees with turnover of existing population expected to be multi-generational. Illustrative of urban forest diversity targets set by RUFMS, the City's elm tree inventory was measured at 36% (RUFMS-2000). It now measures 32.5%.

# How we are changing diversity to reflect targets

To minimize future risk from Emerald Ash Borer beetles, a decision to stop planting ash was made during 2018. As part of this decision, only trees that were previously approved and remained in the queue are permitted for planting so as to not adversely affect plans submitted by developers. This will, in the long term, reduce overall ash tree diversity.

#### 2022 Internal Planting Diversity

The Forestry Services is working to expand species diversity by trialing two new species of trees as experimental plantings. This will determine if survivability is possible with a changing climate. During 2021, there were 12 honey locust (*Gleditsia sp.*) planted in Ripplinger and Norseman Parks. The work unit also sourced four male clones of ginkgo trees (*Ginkgo biloba*). The ginkgo trees are located at Victoria, AE Wilson, Central and Arboretum Parks. Except for one tree damaged by vandalism, all trees were alive following the winter of 2021/22. Then during 2022, 8 additional honey locust trees were planted by the Cathy Lauritsen Memorial Dog Park and 5 additional gingko trees were planted in Ripplinger Park (east extension).



\*Local common name followed by (genus).

## 2022 Developer / Contractor Planting Diversity

The City also assumes trees as assets as public properties are developed. This can be through greenfield development or a redevelopment of an existing space. For this year, the Forestry Services assumed responsibility for 278 trees and shrubs from developers or non-Forestry Services managed contractors.



<sup>\*</sup>Local common name followed by (genus).

When the city assumes these trees, then Forestry Services ultimately becomes the "owners" of the asset. At that time all relevant maintenance activities to support the trees begins.

# **Other Urban Forest Measures**

Beyond diversity targets, Forestry Services looks at the urban forest as an asset to be managed. The following are additional measures intended to both understand quantity, overall change to asset, value and size of the urban forest.

# 1. Ratio of Public Trees to Official Community Plan (OCP)

In Regina's Official Community Plan (2013), Environment Goal 4.7.1 states: <u>Increase the urban forest to one tree per person in public spaces</u>. Currently the number of trees in the public inventory exceeds this minimum standard.

<b>Goal</b> : 1 public tree per resident	<b>Result</b> : Community exceeds target by 2.5%	<ul> <li>Action:</li> <li>Continue to fill tree vacancies through City capital tree planting program</li> <li>Support the Planning Department to develop tracking methods to ensure future development projects account for one tree per projected population target</li> </ul>
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#### City of Regina street & park tree inventory = <u>179,706</u> trees\*.

- Assumes 2001 MCSII inventory was correct = 161,836.
- 2002-2021 net tree change = +17,199.
- $\circ$  2022 net tree change = +672.
- \*In future years, the inventory processes will either verify or nullify this assumption.

#### "Woodlot" trees = 20,491 trees.

 These trees are located on properties owned by the City. These properties include the Dewdney West Tree Nursery, the Kings Park area (includes Tor Hill and Murray Golf courses). The tree counts were obtained through geospatial satellite analytics services provided by Western Heritage Inc. in 2020. The next analytics service of this type will be scheduled in 2030 or if a significant change happens to the properties.

#### • Provincial Capital Commission = 43,728 trees.

 Source = Tree inventory records as supported by City of Regina Geospatial Services. The City provided \$2.72 million in funding during 2022 in support of Wascana Park maintenance operations (2022 City of Regina Budget Book).

#### • RCMP Depot = 2,592 trees.

• This value is based on geospatial satellite analytics services provided by Western Heritage Inc. This was done along with the woodlot tree analysis.

#### • **Regina's population** = 239,930

 (City of Regina/MBN Dataset, January 2023). The City is both part of, and provides information to, the MBN Canada network.

#### 2. Net Tree Change to Urban Forest

Net Tree Change is a measure used to describe if the urban forest is growing or declining as an asset. If the urban forest is growing, this indicates that the asset is generally younger and is typically more sustainable barring a catastrophic event. If an urban forest is declining, resilience is lost and net tree change will be continuously in the negative.



In the above graphic, Net Tree Change is calculated from the total new trees planted (internal City and developer combined) minus total trees removed. When looking at the result the following is considered:

- For 2022 there was a net gain of 672 trees to the street and park inventory.
- The 5-Year Total Net Tree Change is 3,682 (green bar). This indicates the significance to inventory change over the past 5 years.
- The 5-Year Average # of Trees Pruned is 9,310 trees/year (yellow line). Pruning has exceeded the 5-year Net Tree Change. This is the third consecutive year that the pruning cycle has continued to exceed the Net Tree Change growth indicating pruning cycles are working towards improving service levels.
- In a typical year, most new tree plantings are trees that have been assumed from developers for greenfield spaces. These takeovers have slowed from a peak in 2017, and this trend is expected to continue for the foreseeable future. This means that a greater reliance will be on internally funded tree planting projects to maintain urban forest sustainability.

# 3. Valuation Estimates of Regina's Urban Forest



- \* Estimated replacement cost is \$800 per tree. Breakdown is as follows:
  - Average unit cost and installation of a 5-10 cm Diameter at Breast Height (DBH) tree = \$500
  - Estimated establishment costs for a minimum of three years following planting = \$300

\*\* Values are macro population estimates only as recorded inside of the current GIS inventory (January 2022). These values are determined by:

- Species ratings as determined by the Alberta Tree Ratings Guide (2003).
- This valuation en masse assumes 85% site condition rating.
- This valuation en masse assumes 85% overall health condition.
- Cost per cm<sup>2</sup> DBH = 12.26/cm<sup>2</sup>.

Other qualitative note(s):

- 1. At the time of an assessment of an individual tree, a formal condition and site assessment are also made.
- 2. The *Regina Forestry Bylaw (2008-48)* states that for any tree removed for development purposes, the requestor is charged 20% of the assessed value or \$500, whichever is greater. This funding is then used to plant a minimum of two replacement trees (*Regina Urban Forest Management Strategy, July 2000*).

## 4. Size Distribution of Regina's Urban Forest (GIS)

Big trees are considered the most valuable from both an environmental and monetary point of view. The larger the tree the greater the value. The following is an overall size distribution of trees for the urban forest.



This data is stored within GIS records as queried on January 13, 2023. As trees are added to inventory, DBH is recorded at the same time. These values change as more trees are added to the inventory each year or at the time of pruning when the DBH is adjusted for growth.

The smallest trees with a DBH of 9 cm or less comprise 17.57% of current inventory. The smallest trees are considered the most juvenile trees in the inventory.

Currently there are only 176 trees measuring over 100 cm in diameter as recorded in the ArcGIS database. Of these, the three most common trees in inventory are:

- 63 poplar (*Populus*)
- 53 elm (Ulmus)
- 46 willow (Salix)

When considering a tree removal application, our policy does not support the removal of trees with a DBH of 60 cm or greater. These are the biggest trees in the community and comprise 5.6% of total inventory. Trees of 60 cm and greater are classified as *Significant Trees*.

# **Urban Forest Maintenance**

When the original *State of the Urban Forest* document was written in 2016, the intent of the document was to measure overall tree pruning, tree removals and tree planting numbers to provide some form of program evaluation. As the document has evolved, these core measures remain to monitor daily operations relative to intent of the urban forest program.

The *Regina Urban Forest Management Strategy - July 2000* (RUFMS) identifies that regular pruning operations can achieve the following outcomes:

- Cost savings if trees are pruned in a systematic fashion.
- Reduced costs for service.
- o Improved safety and decreased liability.
- Reduced insect and disease problems.
- o Improved tree condition and tree value.
- Increased property value. This is further supported by the *Tree Cities of the World Program*, as it estimates that property values increase by as much as 7-20%. (See page 3)

To achieve the goals outlined, RUFMS then sets a high-level goal of pruning street trees as one full pruning cycle every 7 years.

Goal:	Result:	Action:
Prune street trees once every seven years	Current Pruning Cycle is at 10 years	Efficiencies gained to date have reduced timeline from 14 years to 10.



# 1. Tree Pruning

Tree pruning includes the following work codes:

- o Internal Scheduled Pruning (aerial & ground),
- Service Requested Pruning (aerial & ground),
- Broken Branch Pruning,
- Public Works Pruning
- Contracted Services Scheduled Pruning.

A total of 11,524 trees were pruned during 2022. Storm related work values are not included and will be addressed later in the analysis. (See page 15).

## 2. Contracted Versus Internal Pruning

Contracted services are engaged to enhance overall pruning and aid internal crews towards yearly targets. Typically contracted services provide an approximate 30% percent enhancement to tree pruning totals in any given year. Most contracted services are targeted at improving the overall condition of the elm inventory.



Forestry Service continued to focus on improving efficiency throughout 2022. This included providing 7-day service initiative from April 23<sup>rd</sup> to August 23<sup>rd</sup>.

During the first quarter of 2022, a stretch goal was set to prune 10,000 trees in a single calendar year. Even with including contracted pruning numbers, pruning 10,000 trees in a single calendar year has never previously been met.



Combining internal pruning along with contracted pruning, this target of 10,000 trees was met by October 31. By the end of year, the target of 10,000 trees was exceeded by 1,524 trees setting a single year record. (+23.7% as compared to average)

# 3. Analysis of Scheduled Pruning Locations within Regina

The *Regina Urban Forest Management Strategy* (RUFMS) sets a high-level goal of "street tree" pruning to one full pruning cycle every seven years for trees located along streets and boulevards. This strategy achieves this target by utilizing scheduled pruning goals.



Locations shown are recorded by field staff within the ArcGIS Collector<sup>™</sup> app while crews were responding to Service Requests for general pruning during 2022. The map then shows areas (green) where scheduled pruning occurred in the 2021 calendar year.

Relative to the RUFMS 7-year pruning cycle goal. The Whitmore and Hillsdale areas were fully pruned ten years previously. Although the target of seven years was not met, this is an improvement as the work unit acknowledges scheduled pruning was previously once every fourteen years. There is still work to do to improve levels of service.

An analysis of service requests shows that in areas where scheduled pruning occurred, tree pruning service requests were lowered by 88.6%. This indicates that scheduled service work is more effective over the long term rather than responding to ad hoc service requests. Ad hoc service requests increase overall drive time of equipment in a typical shift (see telematics analysis page 37 - i.e. drive time is not pruning time).

NOTE: Sector 20 (part of Normanview) scheduled pruning occurred towards the end of 2021 and was completed early 2022.

# 4. Current and Future Scheduled Pruning Locations within Regina

The City of Regina is one of 18 cities across North and South America that has partnered with Bloomberg Philanthropies and John Hopkins University focusing on the improving the use of data to deliver better service to residents. The Parks Recreation and Cultural Services Department has been focusing on utilizing Service Request (SR) data to explore how to enhance service delivery. The Forestry Services is using SR data to aid in identifying areas of Regina where pruning is most needed next.



Areas highlighted in orange identifies areas where scheduled pruning for 2023 and early 2024 will occur. Most of these areas were targeted due to the highest volume of calls from residents during 2022. Both Glencairn and Uplands areas had the highest number of service requests for pruning throughout 2022. Additionally, most areas identified are approximately 10 years out from previously scheduled pruning. Glencairn is targeted to begin scheduled pruning in the second of 2023.

#### 5. Storm Response

Summer storms on the prairies are a normal function of the local environment. Though not clearly defined, it is assumed that climate change will increase the frequency and intensity of storms. This then means that storm response becomes more problematic as it is both unpredictable and can delay long term pruning objectives.



During 2022, a total of 393 trees were serviced for storm related weather events. Damage directly related to storms was slightly below average for the first time since 2019.

During all events, the following was completed as part of the Forestry Services' storm response:

- 13 trees were removed for safety reasons.
- 380 trees were repaired to a safe status.

Storm response work is not counted as part of regular internal pruning numbers. As previously mentioned, it is anticipated that larger storm events will negatively impact pruning numbers over time.

#### 6. Tree Removals

Tree removals typically occur when a tree naturally reaches the end of its life. Tree removals located on streets are considered the highest priority due to public safety. Declining trees in parks are ranked next highest in terms of safety. Lowest rated are trees in buffers whereby risk caused by failure will not pose an immediate threat to the public and property. Although not necessarily defined, sometimes there is an opportunity to leave some trees up beyond initial mortality to allow for harborage to small wildlife. Ultimately decisions are made based on level of risk to the public and property.





Tree removals (447 trees) were below the 5-year average (first chart). Most of the 283 trees that were rated as "poor condition" are a result of the continuing drought experienced since 2017 (second chart). During 2022, precipitation continued to be below average with Regina receiving a total of 267.9 mm precipitation (average 389.7 mm/year, Environment Canada).

## **Tree Planting**

Tree planting is intended to increase the overall number of trees in the community. This is to ensure that net tree change is positive over time, as it is an indicator that the urban forest is growing. Typically, internally planted trees are in park spaces to either enhance a park space or simply replace dead trees along parks and streets. Developer planted trees are usually planted to meet a minimum requirement of a development project relative to community guidelines, such as the zoning bylaw.



#### **Internal New Trees**

The Capital Funded, Street and Park Tree Replacement Program planted 841 trees with a total spend of \$179,341 for the 2022 budget year.



#### **Developer New Trees**

There were 278 trees recorded within GIS as Developer Takeover during 2022. These are non-Forestry Services managed planting programs. Any trees under developer or direct contractor control are not reported until the City has issued "CCC2" takeover.



New Tree Locations – Internal & Developer Combined

The above map highlights locations of where new trees were planted. Red identifies where the Forestry Services assumed responsibility for 278 trees from development projects 2022. Green identifies where the Forestry Services teams planted 841 trees across the city.

In total there are 1,119 new trees in our community.

# **Risk Mitigation**

Integrated Pest Management Services (IPM) is primarily tasked with ensuring that insects and disease affecting the urban forest are monitored for, and then controlled only when required. As the forest is becoming more diverse, so too are the issues encountered by IPM. By using monitoring techniques and comparing to threshold levels, an environmentally sustainable management strategy can be implemented to manage the overall risk.

# 1. Dutch Elm Disease (DED) Program



There were 18 trees were lost to Dutch Elm Disease (DED) during 2022. Of these, 15 trees were located on City property and 3 trees were located on private property. The total number of trees lost to DED from 1981 to 2022 inclusive (41 years) is <u>168</u>.

A best practice goal is to limit annual losses of elm trees from DED at 1% or less. With elms being 32.5% of 179,706 trees, a one percent annual loss would be equivalent to 584 elms per year. For 2022, only 15 city owned trees were lost to DED, which is a 0.025% loss.

Regardless of the success, the increasing trend for DED in Regina is still a longerterm concern. Current thinking is that the increase of DED incidences is still correlated to the recent multi-year drought conditions. If the drought continues, this may cause the higher numbers of DED incidences to become a new normal.

#### Location of Trees lost to DED



Elm Tree Samples – Laboratory Results



The Provincial Crop Protection Laboratory provides diagnostic services for tree disease identification. A total of 47 field samples were submitted to the lab for formal confirmation of presence of DED. Only in a lab setting can the DED fungus (*Ophiostoma ulmi.*) be separated out from a similar fungal disease known as Dothiorella Wilt (aka Doth) (*Dothiorella ulmi*). Doth is considered much less aggressive than DED and is managed through a pruning and fungicide program.

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#### **Tree Injections for DED Management**



IPM provides an injection program for trees that are thought to be close enough to a previously DED infected elm tree. The product can also be used to inhibit the spread of Doth because the injections are intended to stop the spread of fungal infections in a tree. In the case of DED this is typically through underground root grafting.

At year end, IPM injected 32 trees using this product.

For the record, there were no injections carried out during 2020 due to staffing limitations caused by the response to the pandemic.

#### 2. Cankerworm Program

After DED, cankerworms are the next issue regarding the elm tree health. This insect is historically known to cause major defoliation events in our community. IPM places significant effort into monitoring for, then treating, when action thresholds are met indicating damage to the trees will occur.



The graph shows that 13,000 trees were treated for cankerworm during 2022. Trees were treated with a biological product typically known to residents as BTK. Spraying activities are only based on populations in an area exceeding an established threshold.



Areas of Regina where treatments for cankerworms occurred during 2022. In total, seventeen sector areas were treated either in part or whole.

#### 2022 Fall Cankerworm Survey



The action threshold established (yellow line) was from threshold identification work done in 2008 by the City's then Pest Control group. This threshold was peer reviewed and published in the *ISA's Arboriculture and Urban Forestry Journal (2008).* The threshold value represents an estimated 25% defoliation event. If a count exceeds the threshold line, then treatment is warranted.

Of the 66 sector areas surveyed during the fall of 2022, only one area (sector 91, part of Albert Park) is currently identified as exceeding threshold (grey bar) currently. This is for the fall cankerworm only as spring cankerworm counts are not undertaken until April 2023.

For context, the previous season's adult cankerworm survey (blue bar) is shown for 2022. These are same sector areas, as a comparison to illustrate difference, in population between survey cycles.

It is possible that control activities may not be required in 2023 if the spring cankerworm population count also remains low in 2023.

# 3. Tent Caterpillar Program

Tent caterpillars (*Malacosoma sp.*) are a defoliating insect and typically affect ash trees. Timing for a defoliation event is June while the insect is in its juvenile form. As the timing of the cankerworm and tent caterpillar emergence nearly lines up, many residents often confuse the two insects.



Fall monitoring during 2018 indicated tent caterpillar would be below threshold. This trend has continued into 2022 with no trees requiring treatment and no calls received from residents regarding this insect.

Branch sampling was not undertaken in the fall of 2022 to predict the 2023 population.

The community is likely nearing the end of a natural low cycle on this insect as population spikes occur every 7-10 years. Monitoring should resume in either 2023 or 2024.

# 4. Fall Webworm Program



During 2022 a small effort was made to control fall webworm (*Hyphantria sp.*) A total of 58 trees were treated. This was in response to service requests received where residents recognized an issue. Populations are expected to increase into 2023.



# 5. Aphid Program

No trees treated for aphids (*Eriosoma spp.*) during 2022. Typically, this program is determined by volume of service requests received. When a call is received indicating a problem, the entire block is inspected and treated if required.

#### 5. Cottony Psyllid affecting Ash trees

Cottony psyllid insect (*Psyllopsis discrepans*) primarily affects black ash trees (*Fraxinus nigra*). When psyllid appears, black ash tree mortality dramatically increases. Researchers from the University of Saskatchewan and Agriculture and Agri-Food Canada have recently published a study where a bacterium *"Candidatus liberibacter solanacearum"* seems to be associated with black ash mortality and cottony psyllid infestation (Wamonje et al, 2022).



The insect made its first appearance in Regina during 2007. It then remained at an undetectable level until spring 2018. Following detection, Pest Control began treatments for the insect using a pyrethrin based spray. During 2019, psyllid was almost undetectable, and no treatments were required. It is thought that the population had crashed due to below normal winter temperatures experienced in February 2019. During that month, eleven nights were well below -30°C with the coldest reaching -42°C.

Psyllid continued to remain undetectable during 2022. Population spikes may continue to be sporadic.

# 7. Emerald Ash Borer Program

Emerald Ash Borer (*Agrilus planipennis*) is an invasive insect originating from northwestern Asia. In 2002, it was first identified in the great lakes region nearest to Detroit Michigan and Windsor Ontario. The southern Ontario experience is showing ash inventory can be nearly wiped out in a decade once the insect is found in a community. If the insect successfully establishes itself in our community, major losses to the ash inventory would be problematic. One factor in Regina's favor, is that our community is further north and colder, which may slow the insects spread over time.



IPM operates 25 Emerald Ash Borer (EAB) traps within City limits for monitoring purposes. Trapping locations for early detection of Emerald Ash Borer during 2022 are highlighted. Trap locations have not been altered for the previous four years.

Monitoring results to date:

- No EAB was detected during 2022.
- Closest known location for EAB: Winnipeg MB first detected in 2017.

# 7. Clearwing Borer Moth affecting Ash Trees

Clearwing borers (*Podosesia sp.*) are moths with clear wings that have been known to damage ash trees within Regina. The larva of this insect mines the sapwood of ash trees which moves sugars and water in the tree.



The three-year trendline indicates population continues to remain at a low level.

The current strategy for control is intensive pheromone trapping. There were 330 trapping locations operated inside city limits during 2022.

Outliers in data set include:

- 2011 No trapping occurred
- 2016 Incomplete dataset

# **Vibrant Community**

#### a. We make Regina a great place to work, live and visit.



Following a three-year hiatus due to the pandemic, the Ladybug Day event returned on July 13, 2022. More than 600 children along with their parents took part in the event. The event was structured to be a teachable moment for residents to learn about using insects like lady bugs and lacewings to protect Regina's elm trees from aphids.

We had fun and thanks to City of Regina and sponsors for the ladybugs for my

Nyrsa Habeebkutty

Like Reply 27w Edited

gardenu .

#### b. We create a healthier environment and more inclusive community.

City of Regina | Municipal Government o September 27, 2022 · @

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Today, the City of Regina received a TD Green Space Grant from TD Bank Group and the Arbor Day Foundation! This grant supports innovative urban greening and tree planting projects.  $\gamma^{*}$ 

This morning, our Open Space Services branch hosted an educational tree planting with grades 3 and 4 from Prairie Sky School along the Devonian Pathway. The grant will support planting 110 trees at this location. We are honored to be one of 20 U.S. and Canadian cities selected to receive a grant.



The City of Regina received a 50-50 cost share grant valued at a maximum of \$25,000 from TD Greenspace and the Arbor Day Foundation. The grant allowed for the planting of more than 100 caliper-sized trees plus edible-tree seedlings. Prairie Sky School participated in the seedling planting event on September 27, 2022.

Most communities cut down forests as they build their cities.

Our community plants a forest as we build our city.

\*END\*