

City of Sun Prairie

Urban Forestry

Management Plan



Prepared By

Stephen D. Lane: Urban Ecologist, Urban Forestry Consultant - ISA Certified Arborist #IL-4565A TRAQ

Prepared On

December 28th, 2023

This document was funded in part by and urban forestry grant from the State of Wisconsin Department of Natural Resources Forestry Program as authorized under s. 23.097, Wis. Stat.

Table of Contents

Foreword	1-2
Overview of Goals/Mission Statement	3-4
Sun Prairie's Urban Forest: At a Glance	5
Consultant's Overview	6
Direct Goals	6-21
Additional Goals	21-23
Strategic Partnerships	24-27
Personnel	28-29
State of the Urban Forest / iTree Results	29-47
Community Survey Results	48-51
Benchmarking Survey Results	52-55
The Future of the Urban Forest	56-62
Trees and Climate Change	63-69
Tree Removal Planning	69-74
Tree Planting Planning	75-79
Tree Pruning Planning	80-85
Other General Maintenance	86-88
Tree Preservation and Management During Construction	88-89
Tree Risk Assessment	89-93
Sample Budget Summaries	93-94
Key Performance Indicators	95
Glossary of Terms	96-101
Appendix A: Draft Storm Damage Response Plan	101-110
Appendix B: Acceptable / Unacceptable Species	111-112
Appendix C: Balled and Burlapped Planting Detail	113
Appendix D: Containerized Tree Planting Detail	114
Appendix E: Tree Pruning Detail	115
Appendix F: Tree Protection Detail	116
Appendix G: ISA Risk Assessment Form	117-118
Appendix H: Terrace Tree Planting Form	119-120

#	Exhibit	Pg.
1	"At A Glance" Statistics	5
2	Top 5 Tree Types	5
3	Existing Tree Condition	31
4	Existing Age Class Diversity	31
5	Planting Location Types	33
6	Existing Diversity	41
7	Existing Family Level Diversity	42
8	Level of Care Provided	50
9	Gain/Loss of Genera	57
10	DBH Comparison	60
11	Population growth	75
12	Sample Pruning Zones	84

#	Table	Pg.
1	Goals Gantt Chart	7
2	Basic Statistics	30
3	Planting Location Types	32
4	Existing Species Diversity	39
5	iTree Tables	44
6	Forestry Concerns	48
7	Additional Forestry Concerns	49
8	Level of Care Explanation	51
9	Additional Equipment Horizon	55
10	Change in Diversity	56
11	DBH Change Over Time	61
12	Sample Removal Budget	70
13	Sample Planting Budget	75
14	Sample Pruning Budget	80
15	Change in Pruning Budget	82
16	TRAQ Tables	84
17	Sample Budget	94

Foreword – Great Lakes Urban Forestry – How to Read This Plan

First off, our entire staff would like to thank the City of Sun Prairie (residents and staff), some of the surrounding communities, Dane County, the Wisconsin Department of Natural Resources, and other state level regulatory agencies for their combined commitment to the creation of this Urban Forestry Management Plan. All these groups responded to surveys and questionnaires which provided invaluable data for this project, the Wisconsin Department of Natural Resources provided oversight and editing for the project, and many other parties contributed along the way as well. Many meetings were held over the course of 2023 to make this happen, and we as consultants literally could not have done it without the input and hard work of all these people and organizations. This is truly a plan that the community at large had a great deal of input on, and as a result, we believe it will be very successful over the years as a management tool.

We also would like to take a moment to help familiarize the reader with how to approach this plan, and how we designed it to be read. As you can see, and possibly feel if you have a printed copy, this is a long, comprehensive document! It goes into many levels of detail that the casual reader may find complex in the later pages, but which are necessary from an internal policies and procedures, industry standards, and management standpoint. To that end, the first 26 pages of this document are meant to be a summary of the plan. If you wish, you may read up to the “State of the Urban Forest” section on page 29 and get a very good feel for what the forestry program in Sun Prairie has prioritized. In each of these goal summaries in those opening pages, we have provided references to page numbers and appendices where, if so motivated, a reader may turn to and get into a much higher level of detail on these topics. Our goal in mentioning this is to make you feel at ease that you do not need to read all 120 pages.

Another important point to note throughout the document is that Urban Forestry is caring for long-living organisms, and living things are complicated! Storms, newly introduced pests or diseases, new species available to plant, climate change, internal budgeting issues, staff changeover, and a wide array of other things may interfere in unpredictable ways with the ability of Sun Prairie to accomplish all these goals.

To that end, we ask the reader to bear in mind that nearly all the goals and milestones contained herein are meant by design to be adaptively managed. What this means is that this plan will be subject to a constantly evolving set of circumstances, environmental and social, and will need to be adapted to those new circumstances as they arise. The plan is therefore not meant to be monolithic, but rather designed to change over time, and almost nothing in this plan should be considered absolute. Nearly every aspect of this plan is designed to be changed when necessary, so please read these as guidelines or goalposts, and not things which require 100% adherence. There are a few exceptions to this, and we will point them out, but overall, this document is meant to be flexible and adaptively managed.

Another area we have attempted to make these sometimes-difficult concepts easier to understand is in how we call out some of the perspectives on these topics. This report is written from a team perspective and uses the word “we” fairly often to describe the City primarily, but really the whole project team speaking as one voice.

But there may be certain areas where we want to call something out specifically as a recommendation or instruction coming from us as the consultants, where the City really should do something or consider something which we are recommending. These will be called out in the blue callout boxes such as the one to the upper right, and are meant to differentiate the “we” in this plan from the “in our opinion” side of things as consultants.

Advice coming straight from our opinions as consultants will be shown in callouts such as this, with a blue border and italics.

We have also color coded the goals of this plan into 5 major subcategories. Those sections of the plan dealing with those subcategories will have their heading text color coded to match which goal section they come from. Those colors are defined below:

Organizational Goals	Internal definitions and goals for the organization and its staff
Document and Policy Goals	Specific Urban Forestry documents and policies to be created for future management
Operational / Production Goals	Specific goals for pruning, removal, planting, and other production tasks
Education and Outreach Goals	Goals aimed at engaging residents, business owners, and other stakeholders
Sustainability Goals	Goals tailored to sustainability, ecological pursuits, or other larger ecosystem goals

In addition, we have created a communication pipeline for feedback about this Urban Forestry Management Plan. In addition to being able to contact City staff listed below, we have also created an email address specific to this plan and the forestry program at large where residents and business owners can submit their ideas, feedback, complaints, or praise for the plan or forestry program overall. We very much want this plan to be community focused, and in order to do that we need to hear from you!

<u>Name</u>	<u>Title</u>	<u>Email</u> ____
Forestry Feedback	Email Feedback Address	forestry@cityofsunprairie.com
Cindy Burtley	Parks & Forestry Director	cburtley@cityofsunprairie.com
Brandon Hellenbrand	City Forester	bhellenbrand@cityofsunprairie.com

In closing this foreword, we just wish to reiterate once again that this plan is meant to be community focused and take into account a great diversity of viewpoints. Clearly, not all viewpoints will agree when it comes to trees and urban forestry, and this is part of living in a society where we must build consensus among differing opinions. This plan relies on fact and science-based evidence to draw its conclusions, and we will highlight those data sources for the reader to explore further should they wish.

Stephen D. Lane

Great Lakes Urban Forestry Management




OVERVIEW OF SUN PRAIRIE'S URBAN FORESTRY MANAGEMENT PLAN

Sun Prairie, Wisconsin currently manages approximately 10,702 trees (as of June 2023) throughout its City street terraces and rights of way, in the managed areas of 44 park properties, and on other City-owned parcels. Although open planting spaces have not been inventoried yet (planned for 2024), there is a significant potential for growth of the Urban Forest resource through planting. The City's trees were inventoried as part of an in-house project as a result of a Wisconsin Department of Natural Resources Urban Forestry Grant in 2022, and that data was used to construct this Urban Forestry Management Plan which will detail how these trees will be managed for the benefit of the City of Sun Prairie over the next 20 years, with a focus which begins in 2024, and projects out to 2044. This plan is designed to be executed with the City Forestry staff making decisions and performing necessary duties properly.

In terms of the condition of the Urban Forest in Sun Prairie, there are both strengths and opportunities for improvement. To start, some important strengths include the City's commitment to keeping an up-to-date GIS- based tree inventory, skilled staff to make data-driven decisions, and a community that supports sustainability and urban forest growth. Another strength is the fact that there are 92 species represented, which is impressive diversity for a municipal tree population of this size. The Maple genus, however, makes up almost 24% of the population which is quite high, and this leaves room for improvement.

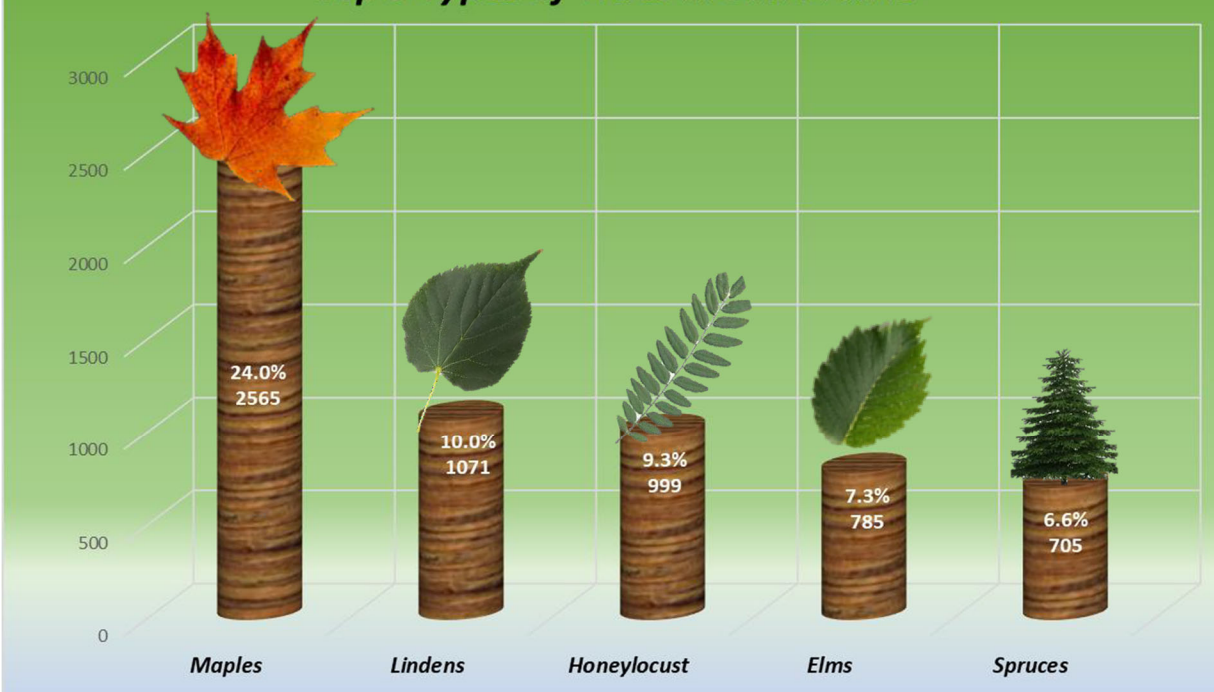
The overall condition of the population can be characterized as vigorous, with 9,274 of the City's 10,702 trees (87%) earning a condition rating of "Good". An opportunity for improvement would be to systematically add all available street tree planting sites to its existing GIS Tree Inventory, which is a planned project for 2024. With good data and trees in good condition, Sun Prairie will be able to focus on regular maintenance and enhancements rather than remedial action. Lastly, in order to create healthy, diverse, and sustainable urban forest the current budget being applied towards forestry management should likely be larger.

At approximately \$98,000 per year, not including grant funding, this is enough to fulfill basic needs, but even a modest increase to finance more equipment and staffing would allow Sun Prairie to accomplish much more. In order to enhance the Urban Forestry program so it will create long term benefits to the community while reducing costs, the following Urban Forestry Management Plan (UFMP) will address these strengths and challenges and create goals and milestones. Below is a broad view of the direct goals to come in the 2024-2044 period. Further detail is given in the body of the Plan, with separate sections detailing specific Urban Forestry activities, and how we propose they are achieved, along with standards and Best Management Practices.

An urban forestry program has been created in this Plan which attempts to achieve the greatest benefit for the community, based on the available data we have from the inventory, as well as input from stakeholders and residents of the City of Sun Prairie. However, all plans are subject to change based on new information, budgets, or other unforeseen circumstances. For this reason, it is asked that readers consider that this plan is to be an evolving document, and goals and strategies will be updated to fit new circumstances as needed. This Plan should be reviewed regularly and updated by City staff so that it is a living and useful document meant to help the City adaptively and strategically manage its urban forest. The community will have an opportunity to provide input and help improve the Plan during those periodic reviews. These strategies and goals are not absolute, but rather serve as guideposts to mark the road to success.

MISSION STATEMENT

It shall be the mission of this Urban Forest Management Plan to outline goals and Arboricultural Best Management Practices for the management of the Urban Forest in the City of Sun Prairie, Wisconsin to increase canopy cover, maximize the benefits as a City Service which trees provide, and to minimize cost, mitigate against climate change, and create a program to manage the Urban Forest Resource for the greatest public good in a manner that is both financially and programmatically sustainable, while maintaining flexibility for future adaptive management.

SUN PRAIRIE'S URBAN FOREST (June 2023): AT A GLANCE...***Total Number of Trees*****10,702*****Estimated Planting Sites*****3,500*****Total Number of Species*****92*****Annual Benefits Provided*****\$93,350/year*****Standing Value*****\$10,162,000***Exhibit 1 – “At A Glance” Statistics****Top 5 Types of Trees in Sun Prairie****Exhibit 2 – Top 5 Tree Types*

CONSULTANT'S OVERVIEW

At the very outset of this document, we as Great Lakes Urban Forestry would like to briefly summarize our thoughts on the state of the Sun Prairie Urban Forestry Program, using the text box callout style you will see throughout the rest of the document:

Sun Prairie's Urban Forestry program, based on our survey results, meetings with staff, and knowledge of Urban Forestry programs around the Midwest, is performing well. However, there are some critical issues we see which require improvement over the coming years. First, as the Forestry program is fairly new, it seems that Forestry staff are currently fairly dependent on other departments equipment and staff to complete tasks. We highly recommend that departmental responsibilities be streamlined so that Forestry staff are empowered and more self-sufficient. Second, the department requires more resources to accomplish the work it has been tasked with doing. This is not only more money, but more employees and equipment as well. We will discuss all of these increases in a data-driven fashion below. Finally, resident outreach and education must be prioritized so the residents of Sun Prairie understand why these Forestry tasks are being undertaken, and how residents can mimic these best management practices on their own land and trees. While there are many other goals presented throughout this document, the above 3 will have the greatest short-term impact. Though it must be clearly understood that all of these goals are interconnected, and do not operate in a vacuum.

DIRECT GOALS

Listed below are the direct goals of this Urban Forestry Management Plan (herein referred to as "UFMP", or "the Plan"), as well as a brief discussion of how they shall be met. Direct goals are those which this plan addresses very explicitly in describing pruning, removal, planting, and other activities. Every attempt was made to make these goals realistic and achievable, so they do not place an undue burden on the City of Sun Prairie, its residents, or its resources. Instead, the direct goals of this UFMP are to save money and provide greater benefits over time through proactive, as opposed to reactive, management. The Plan is also meant to be adaptive: New concepts, the introduction of new pests or pathogens, or changing climate (both social and meteorological) may all change the way the Urban Forest is viewed.

The Plan is intended to be reviewed and updated periodically by the Sun Prairie Forestry Staff, its Parks, Recreation and Forestry Commission (PRFC), and City Council. The review process should include evaluation of progress made towards these goals. Goals may be altered after the review, as conditions warrant. This UFMP is written with the understanding that organizations, stakeholders, and residents change over time, and therefore its goals require a degree of flexibility. Since trees represent a long term (50-80 year) commitment, this UFMP is intended to provide guidance and continuity through those changes, while also adapting to them as the need arises. Below is a Gantt Chart showing the rough outlines of when the goals below are anticipated to be completed. As noted many times throughout this document, most of these goals are guidelines and not absolutes, so we ask the reader to bear that in mind as you review the goals below.

GOALS	TASK / ITEM	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034 - 2044
Organizational Goals	Create a Needs Analysis											
	Establish Goals											
	Incorporate BMPs into Operations											
	Define Trees as Critical Infrastructure											
	Enhance Strengths/Realize Opportunities											
Document and Policy Goals	Update Tree Ordinance											
	Create Tree Preservation Plan											
	Create a Tree Risk Management Policy											
	Create Pest and Disease Policy											
	Create a Storm Damage Response Policy											
Operational / Production Goals	Mulch All New Plantings											
	Manage Tree Removals											
	Establish Cycle Pruning Program											
	Continue Resident Tree Planting Program											
	Maintain an Accurate Inventory of Trees											
	Create/Expand Gravel Bed Program											
	Increase Stocking Density on Terraces/Parks											
	Expand Tree Canopy From 22.8% to 25%											
	Cost Share Program for Tree Purchase											
	Increase Awareness of Urban Forestry											
Education and Outreach Goals	Citizen Education and Outreach											
	Private Property Planting Incentive Program											
	Create Public Tree Inventory Maps/Dashboards											
Sustainability Goals	Mitigate Climate Change effects											
	Create Urban Wood Utilization Program											
	Obtain Arboretum Status for Sun Prairie											
	Explore Phosphorus Remediation with Trees											

Table 1 – Goal Gantt Chart

Organizational Goals

Create a Needs Analysis for the Current Tree Population: Horizon = 1-3 Years

This is quite literally what is being done right now with the creation of this plan! Every tree population today is the result of decades of past management decisions. Over time, we increase our overall level of knowledge, skill, and efficiency in managing trees. Based on that new knowledge, we sometimes discover that decisions made decades ago may appear in retrospect to have been inappropriate, even though they were justified at the time. It is the goal of this Plan to assess the current state of the City of Sun Prairie's Urban Forest and examine its overall strengths and benefits, as well as look for opportunities for improvement to inform future decisions.



Each aspect of Sun Prairie's tree data has been analyzed: How many trees, what condition they are in, how old they are, what needs do they have, and more were all examined to create goals to improve the tree population for the benefit of the organization, its residents,

and other stakeholders. This forms the basis of more complex planning efforts later in the document. Specific goals in terms of planting, removals, pruning, budgets, personnel, and maintenance are all addressed. The strengths and opportunities stemming from these will be the guiding principles for the management strategies and specific goals outlined in each section below. To avoid repeating past mistakes, the Plan shall also attempt to leave room for adaptive management, so the plan may be changed when appropriate.

Establish Goals in Order to Enhance Strengths and Realize Opportunities: Horizon = 1-5 Years

In order to accomplish anything, goals are necessary to help guide organizations through the process. Enhancing a highly functional forestry program will require a series of attainable goals to be achieved. This UFMP seeks to accomplish those goals within a realistic budget and attainable timespan. As stated previously, goals are intended to change over time as the City's capacity to manage the Urban Forest resource may increase or be reduced.

In each section of the Plan related to direct goals, language has been included which incorporates both a budget and a time frame in which those goals can be accomplished. The overarching goal will be to have Sun Prairie use this UFMP to create a sustainable and adaptable forestry program within a 5-10 year period, and to have forestry staff empowered to make the decisions that enable this to happen. This program will include tree planting, tree maintenance, and tree removal for Sun Prairie's Urban Forest, so that the tree population will be healthy, and provide the greatest benefits and least risk to the community while maximizing benefits and minimizing risk. To learn more about the budgets, see the individual goals in each section below, or turn to the budget table on page 93.

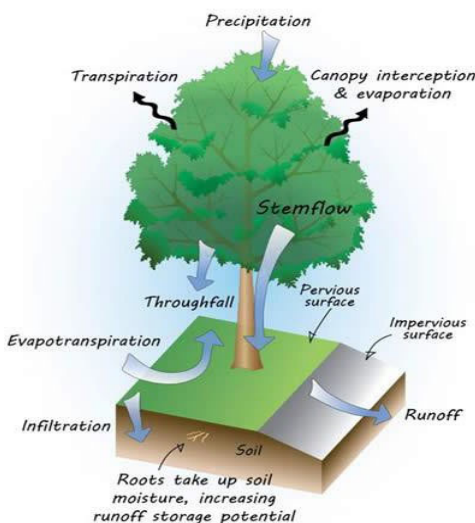
Incorporation of Best Management Practices in Tree Care Operations: Horizon = 1-3 Years

“Best Management Practices” is a term which means being on the cutting edge of your industry. All contractors working for the City should be compliant with the latest industry Best Management Practices based on the appendices in this report. We have also made a substantial push for the hiring of contractors who are also certified arborists and know these BMPs well and can perform quality work. The ANSI and ISA Best Management Practices (found in Appendices I - L of this document) shall be integral parts of any Request for Proposal (RFP) or bid documents when seeking qualified contractors. Full text of all referenced standards shall be made available to all City employees and contractors performing tree care operations. Public outreach and education shall be performed by the City of Sun Prairie Staff, ensuring that residents understand these practices as well. This UFMP will be placed in the public domain for all residents to use as a reference.

Define Trees as Critical Stormwater Infrastructure: Horizon = Immediate

Green infrastructure is rapidly becoming recognized as being just as important as grey infrastructure in many ways. Chief among these green infrastructure components are trees, and specifically the stormwater mitigation effects they provide. A 16" DBH Cottonwood tree can intercept or otherwise mitigate up to 5,000 gallons of avoided runoff every year (www.itreetools.org). Based on data found in

Sun Prairie's i-Tree Eco Analysis (found on pages 44-47), Sun Prairie's tree population of 10,702 trees is responsible for intercepting or avoiding over 730,000 gallons of stormwater runoff each year. The loss of this Urban Forest resource due to storm damage, insect or pathogen invasion, or other such damage would have a critical impact on the local stormwater infrastructure, and cost substantial capital to remediate. For this reason, a direct goal of this Management Plan is to define trees as critical stormwater infrastructure, and that these assets should be compensated for when lost to unforeseeable events. The City's forestry and stormwater staff should work together to protect and manage these vital resources.



Document and Policy Goals

Maintain an Acceptable / Unacceptable Species List: Horizon = Immediate

The urban environment is a difficult place for a tree to live. Between road salts, urban pollutants, limited soil, and other challenges, not all trees will thrive in the urban environment. Trees which have very weak wood, are known invasive species, produce messy or foul-smelling fruits, or create a public nuisance (among other characteristics) should also be avoided. Acceptable species are those which are adapted to our upper Midwest climate, are not invasive, and do not pose high risk to infrastructure or public safety.

An additional species list may also be developed that is specific for park land and natural areas where the focus will be on native plantings and species for wildlife habitat. City forestry staff and PRFC will review the lists periodically to ensure that it is being maintained in accordance with the latest information on specific trees. For more information on what species can and cannot be planted in Sun Prairie, see the Acceptable Species list in Appendix B.

Update City Ordinances for Enforcement of Tree Policies: Horizon = 1-3 Years

The full text of the city's tree related ordinances can be found here:

https://library.municode.com/wi/sun_prairie/codes/code_of_ordinances (Municipal code section 12.40). These ordinances are meant to reinforce proper practices while discouraging improper practices and care, and are not meant to be overly punitive, but rather to encourage the community to engage in proper tree care practices for the benefit of all parties.

Our ordinances are common industry regulations, such as enforcing rules about what trees cannot be planted because they are unsafe trees, or defining exactly what trees are the City's and the homeowner's responsibility, among other things. The goal of these ordinances is to create a tree population which is diverse, healthy, and improving, providing the greatest benefit to the City and its residents over the long term. To that end, we will periodically review our existing ordinances to dovetail with this plan, and if you have input on how these ordinances can be changed to make the lives of Sun Prairie residents better, we certainly would like to hear them.

Creation, Utilization, and Maintenance of a Storm Response Policy: Horizon = 1-3 Years

Since storms are inevitable, they must be a consideration in any municipal management regime and a decision-making variable in managing municipal tree populations. Urban Forest Management should always include strategies for building a resilient forest and a resilient community. United States Forest Service's *Community Forest Storm Mitigation – A Guide for Communities* which was published in the latter half of 2021 can be an excellent framework for the City. Included is a draft Storm Damage Response Plan (SDRP) in Appendix A which will be under development as a starting point for Sun Prairie's storm response activities in the future. It was

developed largely using the USFS document, as well as additional information from the Federal Emergency Management Agency, and Wisconsin Emergency Management as well. This policy defines who is responsible for which tasks, and how those tasks are prioritized to safely respond to a storm incident.



Creation, Utilization, and Maintenance of a Pest & Disease Response Policy: Horizon = 1-3 Years

With invasive pests such as Emerald Ash Borer, Spongy Moth, Japanese Beetle, and Spotted Lanternfly and diseases such as Oak Wilt either active or looming in Wisconsin, the development and implementation of a pest and disease response policy will enable the City to have a standard strategy for dealing with active or yet unknown infestations and infections of known pests and pathogens.

The City already has an EAB Management Plan in place, but a Pest & Disease Response Policy can be a more overarching plan that could encompass a variety of scenarios. It is not to be understated here how expensive introduced pests and pathogens can be. Treatment, removal, and replacement of trees can be tremendously costly, as well as stress equipment and staff resources to respond to these issues, so pest management is a very important concept in Urban Forestry.

Creation, Utilization, and Maintenance of a Tree Risk Assessment Policy

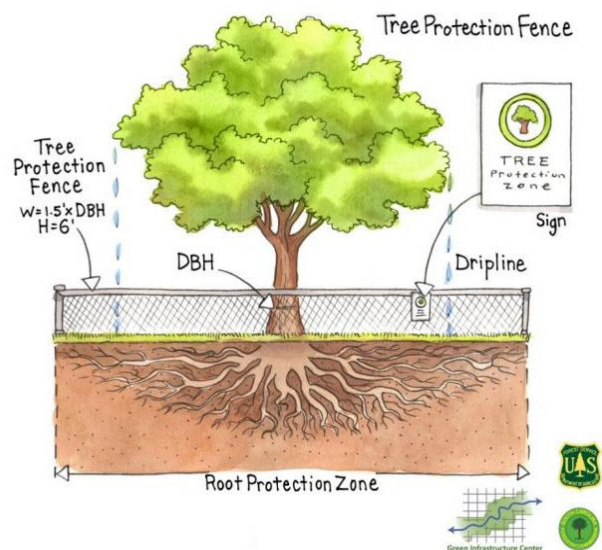
Trees create great benefits, but they may also pose various degrees of risk. Tree limb failure can have catastrophic effects on people or property, and trees need to be well-managed and healthy to avoid that risk. A risk assessment policy has been created for the City of Sun Prairie as part of this Plan.

This policy will aid in identifying, documenting, and designating for removal or mitigation, public trees which may pose a threat to public safety in a timely manner. This will reduce the overall level of risk posed by trees, as well as exposure to liability from tree-related incidents. Basic risk assessment language is included in this document, and a sample Tree Risk Assessment Policy has been created in page 92, and the ISA Basic Tree Risk Assessment Form can be found in Appendix G.

Tree Preservation

Sometimes City trees can become damaged by construction activities, costing the City money, and eliminating the benefit the tree had to the community. It is recommended that the municipal ordinance be revised to require a basic tree survey and assessment be conducted prior to the issuance of a permit for construction activities.

A tree protection zone should be established, fenced, and maintained during construction and the forestry staff, in conjunction with the engineering and building inspection departments, would monitor construction activities to ensure the tree protection zone remains intact and that local ordinances are adhered to. Removal of trees for construction purposes shall require prior approval by the City Forester during site planning and the developer shall be responsible for tree replacement or reimbursement based on a diameter ratio of the tree(s) being removed.



For example, if a 30" DBH tree is approved for removal, the developer would need to replace ten 3" DBH trees in other parts of the City, or reimburse the City for the cost of those 10 trees. The reimbursements costs can then be used for planting or other forestry endeavors in the City. A similar reimbursement system could be implemented if a proper tree protection zone is not established or maintained during construction, or if a tree is unnecessarily damaged by construction activities.

Please see Section 12.40 in the Village's Code for further information.

A video can be found here to better explain trees and construction issues:

https://www.youtube.com/watch?v=DR2KgK-_UqA

Invasive / Aggressive Species Management and Considerations

The removal of low quality aggressive or invasive species is also recommended. This not only increases the amount of planting space available for more desirable trees which are not invasive or aggressive, but also increases public safety. A direct goal of this Urban Forestry Management Plan is to preserve high quality trees, and reduce the amount of low quality, weak- wooded, and invasive species within the City of Sun Prairie. This plan seeks to accomplish this by using the tree inventory data to locate where these trees are, and plan for the removal and replacement with more desirable native and non-aggressive trees over the coming 20 years. For more information, see the WDNR website at [This Link](#) or turn to the Future of the Urban Forest section on page 56.

Operational / Production Goals

Increase Overall Diversity by 2044 Through Tree Planting: Horizon = 1-20 Years

Tree species diversity is one of the most important concepts in Urban Forestry today and was a clear leading topic of interest among community survey respondents. The reason pests and diseases like Emerald Ash Borer (EAB) and Dutch Elm Disease were so devastating is that there were too many Ash and Elm trees. When EAB arrived, many communities' Ash population was 20% or more, resulting in mass tree loss. This can be avoided by planting a greater diversity of tree species, so that when new pests or pathogens are introduced, we only lose small amounts of specific tree species.

Diversity leads to stability, and stability leads to reduced costs and increased benefits over time. Our primary goal is to comply with the "20-10-5 Rule", which is discussed in further detail on Pg. 34-35.

An achievable "Diversity Vision" has been created for 2044 which will see the tree population become far more diverse than it is at present. The current population includes a respectable 92 individual species and the diversity vision included in the Plan aims to reduce the number of trees that are over-represented and/or lower quality species while also seeking to increase the number of species that are under-represented or not present in the tree population.

Not only will trees be planted which are underrepresented or not present in the current population, they will also be planted in such a manner that selects the right tree for the right site. A direct goal will be to create a tree planting program where trees are matched to existing sites for the next 10+ years. Currently, Sun Prairie plants a widely varying number trees each year, and this plan seeks to stabilize that number at an average of 250 trees per year over the course of this plan, to both be able to replace older declining trees, as well as to grow the tree population by a net of more than 2,000 trees overall by 2044. Ideas such contract growing, is an additional option to implement a flexible and adaptable planting plan. To learn more about tree planting and reforestation, turn to page 75.

Manage Tree Removals: Horizon = 1-5 Years

This was also a topic of great interest to survey respondents. To prevent the spread of tree pests and pathogens, tree removal is sometimes unavoidable. Currently, city staff removes dead, dying, diseased, and trees which carry elevated risk beyond our tolerance, but our program is not as proactive as it could be. A tree removal program has been created in this Plan which budgets for the safe removal of trees requiring removal in order to maintain and enhance public safety. Cost projections for tree removals have been made based on the number, age, and condition of Sun Prairie's trees for the next 20 years, so long term budget projections can be made.

We have a recommended Key Performance Indicator for this goal, related to Stump Grinding:

Recommended KPI - REDUCE TIME TO GRIND STUMPS AFTER REMOVAL FROM 60 DAYS TO:

90% complete within 45 days by Dec 2024

70% completed within 30 days by Dec 2025

Also included are ANSI and ISA safety standards, as well as suggested bid specifications to ensure the City is hiring qualified contractors who will be held to the highest industry standards. For much more information on the details of Sun Prairie's proposed tree removal program, turn to page 61.

Creation and Implementation of a Cycle Pruning Program: Horizon = 1-5 Years

Properly pruned trees generally establish faster, grow quicker, suffer less storm damage, carry less risk, and live longer than trees which are not pruned, or improperly pruned. Since large trees provide the greatest benefits to the community, while city staff does prune some trees currently and acknowledges that it is important to the community to do so, creation of a cycle pruning program should be a critical part of the Urban Forestry program. Pruning should be done by trained city staff or Certified Arborist contractors. Over the next 2 years, trees identified as requiring pruning of dead, dying, and diseased limbs, or structural pruning should be prioritized so this vital risk mitigation work can be performed. Details will be discussed in the Tree Pruning section of this plan on page 80. The first goal will be to prune the trees which are in greatest need of it.

We have a recommended Key Performance Indicator for this Goal:

As Sun Prairie works to increase its ability and capacity for tree pruning as recommended in this Plan, we

Recommended KPI – START AND MAINTAIN A CYCLE PRUNING PROGRAM:

Complete 90% of all non-cyclical pruning in 2024 (appx 1,350 trees)

Complete 90% of listed cycle pruning in 2025 (appx 1,400 trees)

Complete 90% of listed cycle pruning in 2026 (appx 1,450 trees)

ONGOING: Complete 99% of listed cycle pruning each year

hope to establish this much needed cyclical pruning program. In previous years, staff from several different departments have worked together to prune up to 1,000 trees each year, primarily to provide vehicular clearance on the streets. A goal of this plan will be to gradually increase that number to an average of around 1,500 trees or 12,000 diameter inches of trees per year.

The cyclical pruning program proposed in this Plan will ensure that all trees on public property are pruned at a minimum every 7 years, increasing tree health and vigor while reducing costs associated with storm damage and tree failure. It should be noted here that the goal over time will be to reduce the number of years between cycle pruning to 6, and then to 5 years. The specifics of this reduction of time between pruning are beyond the scope of this plan currently, but are under consideration. For more information on tree pruning and maintenance, turn to page 80.

Maintain an Accurate Tree Inventory: Horizon = 1-20 Years

Managing an urban forest requires a clear understanding of the trees, their ages, conditions, and locations, so that City crews and contractors can perform work on these trees. A stem-by-stem tree inventory was completed in the summer of 2022. This inventory resulted in an unbiased assessment of all of the trees on public rights of way and on City-managed properties in Sun Prairie and will serve as the data which will guide the forestry program throughout the next 20 years.

All inventories are a snapshot in time. With approximately 10,702 trees on City terraces and ROWs, in City parks, and on other City-owned property, the tree inventory should be maintained with accuracy so that it doesn't become out of date. Sun Prairie's spatially explicit tree inventory is updated daily with work conducted in the field. The City's GIS team assists in creating mapping applications that the forestry staff needs to manage the tree inventory. It is also recommended that the comprehensive inventory be updated at a minimum of every 5 years in a cyclical fashion, ahead of the City's planned cycle pruning, to keep the information at its most current on a City-wide scale. Maintaining this tree data at a high level is vital in the execution of this Management Plan, as it forms the data-driven basis for making decisions on trees.

Proper Mulching of All New Plantings: Horizon = 1-3 Years

As noted above, the urban environment is a difficult place for a tree to become established and to live a long, healthy life. Proper mulching can significantly increase a tree's ability to do this. Mulch helps to conserve water during the summer by preventing it from evaporating from the soil. It also helps prevent weeds from growing around the tree and competing for water and nutrients and keeps lawn equipment such as weed whips away from the trunk where they can damage the tree.

We have a recommended Key Performance Indicator for this Goal:

Recommended KPI – MULCH ALL TREES 10" AND UNDER:

100% of all newly planted trees mulched by Dec 2024

90% of all existing trees 6" or less mulched by Dec 2025

80% of all existing trees 10" or less mulched by Dec 2026

These 6" and 10" breaking point here was chosen based on Sun Prairie's current age structure of its tree population, and the feasibility of performing this work. There is no national standard for this, we used local data and conditions to choose these thresholds.

Another intended outcome of this

initiative will be to educate residents about proper mulching care and notify them when poor mulching techniques are being used. Of particular concern is the practice known as "Volcano Mulching" which has the opposite effect of proper mulching and can severely damage a tree over time. For more information on proper mulching, turn to page 78.



Increase Urban Tree Canopy from 24.1% to 29%: Horizon = 1-20 Years

Tree canopy brings important benefits to the community, with more and larger trees providing greater benefits such as decreased heating and cooling costs, pollution reduction, increased storm water uptake, and decreased levels of the heat island effect. Tree lined streets are more attractive to homebuyers and potential new businesses, which increases home values, home ownership, and tax revenue. All of these factors benefit the community, so a direct goal will be to increase tree canopy in the City of Sun Prairie. See the following International Society of Arboriculture exhibit for more information:

www.treesaregood.org/Portals/0/TreesAreGood_Benefits%20of%20Trees_0321_1.pdf

As will be discussed in further detail on pages 46-47, Sun Prairie currently contains 24.1% tree canopy coverage, compared to other land cover types. Increases in tree canopy also come with increases in total benefits provided to the community, as will be demonstrated later in this plan.

We believe that an increase to 29% canopy cover is a realistic goal for Sun Prairie by 2044. This will be accomplished by increasing the number of trees on publicly owned property, as well as improving tree care allowing trees to live longer, become larger, and create more canopy cover. This increase in canopy cover will be a cooperative goal for all those living and working in Sun Prairie.

It should be noted here that the average lifespan of a street tree in urban area in the upper Midwest is around 40 years, or a tree that is approximately 16-18" in diameter. Most of these trees have the genetic potential to live much longer and provide much greater benefits! While caring for all trees, regardless of age, is important to the City, it is generally the trees under this size threshold of 16-18" that have the most potential for long term growth and survivability.

Encouraging or incentivizing tree planting on private property will also be considered through public-private partnerships with local organizations and businesses. As we will show in the detailed portions of this Plan, these are real benefits that will help Sun Prairie residents save money. For more information on Urban Tree Canopy, tree benefits, and other information, turn to Page 45.

Continue Resident Terrace Tree Planting Program: Horizon = 1-20 Years

The City currently has a program in place where residents can file an application to receive approval to install their own tree on the public right-of-way (terrace area¹) in front of their homes. The City has many open planting sites on its Terraces, but not sufficient funding on an annual basis to fill all those spots. For this reason and more, bolstering our existing program to get these trees planted through private investment is an important part of this plan, since more trees create more benefits to the community.

The terrace planting application requires the resident to provide information such as the proposed species of the tree, the proposed planting location, the caliper (size) of the tree, and the type of planting (B&B, container, or bare root). The application also requires answers to questions as to whether the tree will receive basic care such as watering, mulching, or staking. The application requires approval by the City Forester or other forestry staff and the tree remains the property of the City. This program aids in promoting canopy cover growth in the City, also increasing benefits.

Increase Stocking Density from 73% to 90%: Horizon = 1-20 Years

Currently, there are an estimated 3,500 open planting spaces on Sun Prairie's terraces, and the estimated stocking density is moderate at approximately 73%. It is worthy of note here that the total number of plantable spaces is currently unknown, and a planned 2024 initiative will locate those open sites. The 3,500 estimate was chosen based on our consultant's experience and data which shows that in the "average" tree population in the Midwest, there is generally 1 open planting space per every 3.5 trees, so with a tree population of 10,702 this figure is reasonable based on those ratios.

¹ Terraces are defined as the area between the street and the sidewalk

While 100% stocking density would be very difficult to achieve over the 20-year scope of this plan, and is not necessarily always desirable, we do believe that 90% stocking density is attainable and desirable. This will be done primarily by increasing tree plantings in the coming years, through the use of innovative strategies to fund increases in tree planting.

Enhancement of City of Sun Prairie Community Gravel Bed Program: Horizon = 1-5 Years

A gravel bed is an irrigated bed or pile of gravel where bare root or washed containerized stock is placed and safely held for up to 3-6 months. This system has been in use at commercial nurseries, municipalities, and universities for over 20 years. In a gravel bed, the above ground portion of the tree will not grow any faster than normal. The purpose of the gravel bed is to increase the fibrous root system, prepare for planting later and recover poor root systems. A gravel bed can provide many advantages over planting traditional bare root, balled and burlapped, and containerized stock. Such programs have been instituted in other communities and represent a quality investment resulting in several benefits.

Gravel beds can save the community money through the utilization of bare root stock, which is typically 1/2 the price of containerized trees and 1/4 the price of balled and burlap trees. Gravel beds can help increase species diversity because there are typically more species available as bare root stock than other production methods.

Greater species diversity can reduce our vulnerability to insects and disease. Gravel beds allow bare root stock obtained in the spring to be planted throughout the growing season and into the fall. Communities can plant less expensive trees when they have the time and resources. A gravel bed was constructed in 2023 and a goal of this Plan is to enhance this program to facilitate future growth of the Urban Forest.

Education and Outreach Goals

Cost-Sharing Program: Consideration for Tree Purchase or Resident Purchase: Horizon = 1-3 Years

Seeing as publicly owned trees belong to the City, and not the residents, the City should ultimately make the decisions on what trees will be planted at which specific sites using things like a data-driven tree planting plan which matches trees to where they will grow the best. However, if residents are interested in planting a specific species of tree on the publicly owned terrace in front of their homes instead of the species selected for them, a cost-share program may be considered, whereby the resident can pay for a portion of the cost of the installed tree which they have requested. Species must be approved by the City Forester or other forestry staff, to ensure compatibility with the site.

In addition, the City could investigate the possibility of allowing residents to purchase their own terrace tree as part of the City's planting cycle nursery stock order and have it installed on the terrace in front of their home at their own cost. However, we would advise the City and/or Parks, Recreation and Forestry Commission play an active role in determining what species are allowed to be planted so that diversity standards are met.

Educating residents at periodic meetings such as those suggested in the Key Performance Indicators on the different species of trees available in the nursery trade would be a good community outreach tool for broadening residents' horizons of what trees are available and will grow well on their terrace.

Continuing Citizen Education (Urban Tree Alliance/Local Organizations): Horizon = 1-20 Years

There is an organization called the Urban Tree Alliance active in the Madison area. This organization is a non-profit which assists in educating people about trees, how to prune, plant, and manage them, and their benefits to society. There are other local organizations with which the City could partner with as well, please see page 24 for more details. Upon acceptance of this Plan, Forestry staff should reach out to Urban Tree Alliance or a similar local organization in order to establish a relationship and assist in the creation of an educational program in order to engage the community.

We have a recommended Key Performance Indicator for this Goal:

Recommended KPI - INCREASE PUBLIC EDUCATION:

Hold 3 Educational / Public Outreach events (including Arbor Day) in 2024

Hold 4 Educational / Public Outreach events (including Arbor Day) in 2025

Hold 5 Educational / Public Outreach events (including Arbor Day) in 2026

Sun Prairie should avail the public of regular educational material and/or events to coincide with annual Spring and Fall planting cycles or other City events. These sessions may be taught by the City Forester, other forestry staff, or other such qualified parties, and cover tree watering, fertilization, pruning, and the basics of how to spot insects and diseases. In addition, basic tree care pamphlets could be made available at City Hall, Public Works, PRC, Engineering, and other City staff offices in addition to website-based forestry information. The City's Arbor Day annual celebration is an example of one such outreach events that could be enhanced to be more beneficial to the forestry department's programs and goals.

Private Property Tree Planting Programs: Horizon = 1-5 Years

Tree planting on private property is a direct goal of this Urban Forestry Management Plan, as noted above. Though the City has no formal jurisdiction to plant trees on private property, the benefits of tree planting on private property are substantial in terms of energy savings, storm water benefits, and other benefits as noted above.

The City could investigate incentivizing residents and business owners to plant trees on their property. Offering a slight reduction in water and sewer bills for each tree planted has been successfully utilized in other municipalities. Partnering with local nurseries to create a program where residents can purchase trees from that nursery at a reduced price may also be a way to encourage tree planting on private property.

Another idea which has been successfully implemented is having the City purchase trees from a wholesale nursery at wholesale prices, and then have an annual tree sale to residents. The City resells the trees at a slight markup from the wholesale cost, but still less than retail, and uses the proceeds to fund its forestry initiatives.

Private property tree planting could also be encouraged more effectively once a gravel bed program is operational. Bare root trees could be purchased by residents for a modest cost in comparison to the cost of balled & burlapped or containerized trees. Such programs would encourage tree planting on private property by reducing tree costs to the residents.

City Urban Wood Utilization Program: Horizon = 1-5 Years

As the UFMP recommendations take effect, a considerable amount of removed tree material will be generated that may be suitable for use as urban timber. Urban timber is defined as saw logs generated from urban tree removal operations. Larger and longer logs are suitable for dimensional lumber production, and smaller material may be used to produce many other products. Forming strategic partnerships with local sawmills, woodworkers, and carpenters would be an important early goal of this program, while creating a market for the finished goods will be an ongoing goal.

We have a recommended Key Performance Indicator for this Goal:

Recommended KPI – CREATE A REVENUE-GENERATING URBAN WOOD PILOT PROGRAM:

Design and document a pilot/proof of concept project for Urban Wood in 2024

Remove, dry, and mill 100 board feet of Urban Wood in 2025 (Apx 15 10' 2x4 boards)

Create any positive net revenue for Urban Wood Products in 2026

ONGOING: Produce 200 board feet of Urban Wood products sold at a net profit of any amount

Urban timber can be utilized to mill wood into a large variety of products including dimensional lumber, fine furniture, and artisan pieces. To successfully upcycle urban timber into usable lumber, steps must be followed to produce logs suitable for milling. Urban timber production will include specifications for tree removal operations that will produce saw logs of the proper dimension and quality, specifications for the construction of public buildings that require a specified amount of upcycled, local urban timber may qualify for LEED certification points, and raising awareness of the benefits of the urban forest, and creating a product that can serve as a revenue stream. For more information on urban wood utilization and a list of participating municipalities and companies please see [This Link](#).

Create Public Facing Maps and Dashboards for Urban Forestry Program

The City recently (2022) completed an in-house tree inventory. That tree data is currently being housed in an internal database which the Forestry department uses to plan its planting, maintenance, and removal work, among other things. However, the data is currently not available to the public for them to see and interact with, because the data is so new. Sun Prairie has very talented GIS staff in house and could actually make a publicly viewable version of the tree inventory, as well as several dashboards and interactive applications.

This would inform residents as to what trees are in their neighborhood, and enable them to see some information about the trees in front of their homes on the terrace. There are many additional GIS tasks that the GIS team at Sun Prairie can possibly look into in the future, such as creating online maps that residents can self-report tree issues with, or online dashboards showing when trees will be planted in which locations, or when tree pruning will be taking place in your neighborhood so you can plan ahead. But for the immediate future, a public access map and dashboard will be a strategic goal of this UFMP.

Sustainability Goals

It should be noted here that the City of Sun Prairie has a vibrant Sustainability program and staff in place already to focus on those tasks. For those reasons and more, this plan is meant to dovetail with the Sustainable Sun Prairie plan which can be found in [This Link](#).

Mitigate Climate Change Effects

As will be defined later in this plan, Climate Change is change in the climate, both human-induced as well as naturally occurring, that disrupts what we perceive to be the normal operation of climate. A proactive and effective strategy to mitigate a changing climate is to plant more trees. In fact, the US Environmental Protection Agency lists tree planting as one of the more effective solutions to mitigate climate change through absorption of carbon dioxide. See [This Link](#) for more info.

Increasing budgets and empowering staff, as spelled out in this Plan, will help get those trees planted and mitigate climate change on a local level. Outside of their aesthetic value, trees have a great variety of environmental benefits, specifically offsetting climate change by producing a cooling effect in urban heat islands, and flood abatement by absorbing stormwater. Trees also act as sinks for carbon dioxide, where carbon from the atmosphere becomes “sequestered” in the tree’s woody parts like the trunk and limbs because of photosynthesis.

Increasing tree canopy creates greater and more effective sinks for carbon dioxide, reduces the urban heat island effect, and reduces issues stemming from flooding. See [This Link](#) for more info. It also provides habitat for birds, pollinators, and other beneficial wildlife that can enhance the urban environment. Throughout this UFMP, in terms of examining the hard dollar benefits trees provide, looking at where trees can be planted to maximize their effect on heat islands and flooding, and looking at what species could be planted in the future as we are subject to higher average temperatures. For more information on using trees to mitigate climate change, turn to page 63.

Increase Awareness of the Urban Forest in the City of Sun Prairie, and Engage Stakeholders

The reason for the establishment and enhancement of an Urban Forestry program in Sun Prairie is to improve the lives of the residents, business owners, and other stakeholders who want to see the City be a healthier, happier community. In order to make this happen, Sun Prairie is looking for partners in the community to provide support for this program. Sun Prairie staff is reaching out to local garden clubs, philanthropic organization, residents, and business owners to make the forestry program innovative, and community based. In this manner, residents and business owners in Sun Prairie can take ownership of this important and beneficial resource, and allow it to work for them, their families, businesses, and the good of the whole City.

Make Sun Prairie an Official Arboretum

Through the ArbNet program (See [This Link](#)) the City of Sun Prairie could get its street and public tree population accredited as a Level 2 Arboretum. There are 4 total levels (1=lowest / 4=highest) of Arboretum that an entity can get certified as, and the Level 2 requirements (over 100 species) is what Sun Prairie qualifies for. This is a relatively simple matter of filing the appropriate paperwork, and creating a publicly viewable version of the tree inventory so residents and visitors can enjoy the community. This will help raise awareness of the importance of trees in the Urban Environment, show how seriously Sun Prairie takes its tree population, and provide some public recognition from its peers in the area that Sun Prairie is a leader in Urban Forestry.

Explore Phosphorus Remediation Using Trees

During meetings with the other City departments, the reduction of Phosphorus in our soils and waterways was discussed. Wisconsin actually has one of the more proactive approaches to controlling Phosphorus in their waterways, which causes algal blooms, fish and other aquatic life death, and other issues (See [This Link](#) for more info). Water conveyances like ditches and streams carry phosphorus quickly. One of the ways that Phosphorus can be controlled and mitigated is through what is called “phytoremediation”, or using plants to absorb certain nutrients we don’t want in that environment, like phosphorus, or certain heavy metals.

As Sun Prairie has Phosphorus concerns, as well as several ditches and waterways which are currently overgrown with nuisance vegetation, we discussed the concept of removing some of the nuisance vegetation from these areas, and then replanting them with certain tree species with higher Phosphorus requirements which can help absorb some of that excess Phosphorus. This is a relatively groundbreaking concept, and needs further study before implementation, but should definitely be considered as a potential innovative solution to a set of issues. Trees utilized for this effort should be native trees so that a project such as this might potentially reduce Phosphorus, make these conveyances able to carry water more efficiently by being mostly clear, and also making use of native plants as an ecosystem enhancement.

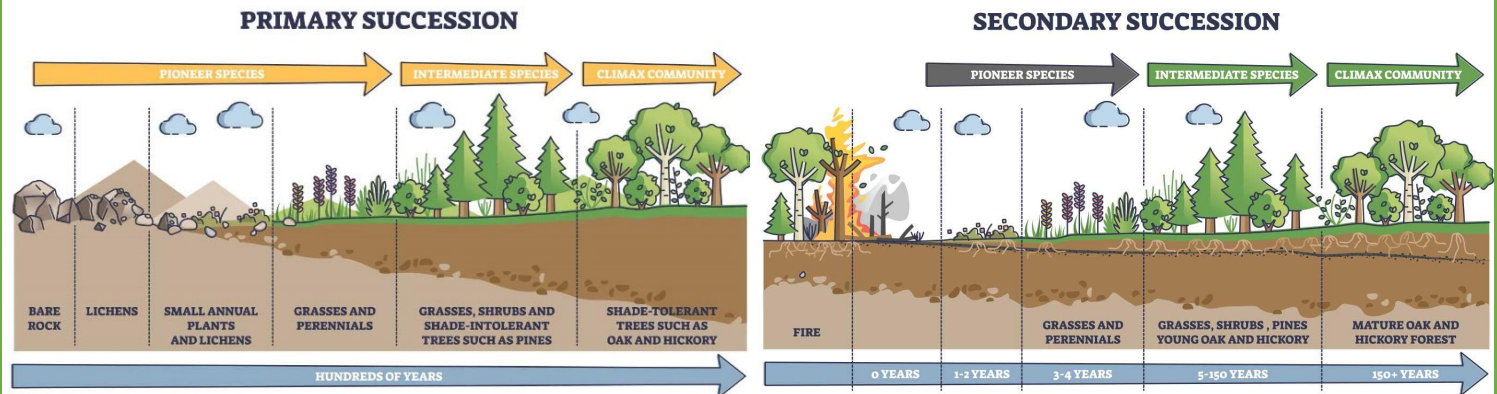
Additional Goals

There are no strategic timelines of projected budgets for these items, but due to public interest, they were included for consideration in the future as direct goals during a forthcoming update to this UFMP.

Miyawaki Forests

Miyawaki was a technique pioneered by Akira Miyawaki, a Japanese botanist and expert in plant ecology starting in the 1970’s. This method relies on dense plantings of native trees in smaller areas than traditional forests. This usually happens on degraded or disturbed land, where substantial organic amendments such as biomass have been added to the soil to ready it for planting. The basic theory is that if we can intensely manage a smaller forest resource, we can eventually build connectivity between those resources and use them as centers of diversity. In addition, because of their smaller size, ability to be managed easier, and focus on reduction of human impact, they can reach something approximating maturity in closer to 30 years vs 100 or more.

The other crux of this method is to encourage plants to communicate with each other by planting densely and allowing the roots to contact one another in order to share resources. This also creates root mats which discourage competition from aggressive or invasive species. Eventually, these desirable species begin to create their own seed banks. What the Miyawaki method is seeking is what we call in ecology a “Climax Community”. When a piece of land has been damaged or otherwise impacted, there is a usual progression of species which move in afterwards. We call this “Ecological Succession”, as detailed below. There are 2 types, Primary Succession, and Secondary Succession.



These 2 processes are essentially the same, but it all depends on the starting condition. If the area was bare rock before, and had soil created by organisms, it's Primary Succession. If the area had vegetation and soil to begin with, and that vegetation was disturbed (burnt, removed for agriculture, etc), and that process starts all over again, then it is Secondary Succession. The first species to colonize are the opportunistic species, which in the Upper Midwest tend to be many of the species on the “Undesirable” list such as poplars, cottonwoods, red elm, black locust, buckthorn, and other such species which reproduce readily and can grow in harsh environments. Eventually these species are outcompeted by the native species, and the climax community reestablishes itself.

In theory, this is what should happen in nature. However, with land disturbance from humans, climate change, and other processes, what often occurs is that natural forests do not regenerate as well as they have historically. Often, these primary colonizers persist for years. Miyawaki is a method to help speed this process up, by skipping the primary colonizer phase and moving directly into colonization with a high number of native trees and plants to create the climax community quickly.

While there is no strategic goal for establishing some Miyawaki Forests in Sun Prairie, their small size, use as a teaching tool, and popularity could make them something to consider for the future.

Restoration Projects Yielding Urban Wood

The project team was made aware, during a Public Information Meeting several months ago, of interest in performing some brush and nuisance tree removal in several of the larger parks in Sun Prairie. These areas have overgrown thickets of invasive or aggressive (undesirable) species which take up fairly significant portions of the land at these parks, which could otherwise be usable by patrons.

When the question came up about such clearing of these overgrown areas during the PIM, it also led to a discussion about Urban Wood Utilization, which is in fact a direct goal of this UFMP, with a suggested KPI. There are in fact some larger trees in these wooded areas, none of particularly high quality ecological or from an urban forestry perspective. But certainly some with Urban Wood value.

Black Locust, for instance, is actually highly prized as a wood for knife and tool handles due to its hardness and interesting orange color and unique grain. This is a lesson that urban wood products don't have to be big things like tables, or flooring for a home. They can be simple items like knife handles or toys even. Since the wood must be cleared from these areas anyways, it seems to make sense to attempt to use that wood for a higher purpose than just woodchips.



Once these areas have been cleared of nuisance vegetation, some of which may have made into their secondary market, the land itself can be used for ecological restoration and enhancement, creation of hiking trails, use of interpretive signage. Native Wisconsin wildflowers, grasses, shrubs, and trees can be planted to create a more natural environment, and this land can be used as teaching tool for residents, students, and others to learn about native plant communities and their importance to Sun Prairie at large

Or alternatively the land could be developed into a play area, nature play area, green building, the possibilities are nearly endless. Sun Prairie has a history of considering things like LEED standards and Conservation Design when constructing new facilities, so even a more traditional hard infrastructure development here would very likely include significant green features.

Once again there is no dedicated budget or strategic timeline set forth for this goal. Though as noted above for the Miyawaki forests, this concept ties in with many other concepts already in this plan, such as Urban Wood, and Natural Areas management. In fact, one could make the argument that these newly restored areas might be perfect for Miyawaki Forests, to tie both concepts together.

We hope the City of Sun Prairie, and its residents and staff strongly consider incorporating some of the above ideas into the future of their Urban Forest



Strategic Partnerships

Strategic partnerships are a very effective means of getting forestry projects funded when tax funding may present a shortfall. These typically involve either public-private partnerships or partnering with other public entities. Typically, the organizations seen participating in these programs include local garden clubs, scout groups, rotary clubs, businesses, state departments of natural resources, and other such groups. Below is a sample list of groups we either plan on contacting or have had contact with already. This will be an ongoing goal, and continuing partnerships with new organizations shall always be sought.

Dane County Land & Water Resources Department

The Land & Water Resources Department strives to protect and enhance the natural, cultural, and historic resources of Dane County; provide the county's residents with a broad array of accessible, high-quality resource-based recreational services and facilities; and support residents, communities, local governments and other agencies and organizations in their resource management and protection activities. One of the Department's goals is to implement stormwater management projects and as one of the primary goals of this UFMP is to define trees as critical stormwater infrastructure, Land & Water Resources Department is a logical partner. Additionally, the Parks & Forestry Division could be a partner for educational opportunities.



UW-Madison

The Department of Forest and Wildlife Ecology at the University of Wisconsin – Madison is a national leader in forest science and wildlife ecology research, teaching, and training. Their programs combine relevant course work with hands-on experience for an educational experience that not only educates students, but trains future leaders. The Department employs faculty, staff, and graduate students who maintain excellence in applied forest and wildlife ecology research. Partnering with UW-Madison could enable students to participate in educational opportunities and gain practical experience in urban forestry.



Madison Area Technical College

The Tree Care Technician program at Madison Area Technical College prepares students for exciting careers in areas related to urban forestry. By partnering with MATC, the City could benefit from the opportunity to work with students who are interested in gaining hands-on knowledge regarding urban forestry in Sun Prairie.



Tree Canopy Collaborative

The aim of the Tree Canopy Collaborative is to collectively maintain, protect, and expand public and private tree canopy across Dane County where ecologically appropriate. Within this aim, a particular focus is on ensuring equitable access to trees and their associated benefits for all residents. Partnership is fundamental to achieving success. The Collaborative is working collectively in Dane County to co-develop goals with local experts in order to recognize neighborhood opportunities, needs, and constraints.



Wisconsin Arborist Association

The mission of the Wisconsin Arborist Association is to "To improve the practice of arboriculture and increase public appreciation of trees and urban forests." WAA is a professional organization made up of certified arborists from throughout the state of Wisconsin. The association strives to further the education of certified arborists and can serve as a valuable resource to reach the goals of this plan.



Urban Wood Network- Wisconsin Chapter

The Urban Wood Network was developed in 2017 to formally unite unique urban wood industry groups and efforts under the common mission of growing professional and consumer confidence in the urban wood industry through information, collaboration, and connection. Since the early 2000's, the founding groups behind the Urban Wood Network program have worked diligently to unite, promote, and demonstrate urban wood utilization. Now the ever-growing network of urban wood industry professionals and state-specific chapters are provided access to consistent messaging/marketing tools and a useful platform for collective experience, support, and connectivity to help the industry thrive.



Urban Tree Alliance

The Urban Tree Alliance is a Madison-based urban forestry not-for-profit focused on growing and diversifying the local canopy through tree planting, resource management, and research. Their mission is to preserve and grow the urban forest canopy in a sustainable and innovative manner in partnership with the public. The Urban Tree Alliance is committed to providing Madison-area residents with the knowledge, skills and resources they need to grow and maintain a healthy, resilient urban forest. They support homeowners in caring for trees on their property and empower groups to tackle community forestry projects. The Urban Tree Alliance could be a valuable partner for Sun Prairie.



Wisconsin Department of Natural Resources

The WDNR's mission is to protect, perpetuate, restore, conserve, and manage the forest and related resources of Wisconsin, both public and private. To that end, they have an abundance of resources, staff, and a network of partners which can help Moline accomplish the goals laid out in this plan, including funding for such things as tree planting or local education and outreach.



Master Gardeners

Master Gardeners are trained volunteers who dedicate their time and skills to making their community a more beautiful place. They are horticultural experts who serve their communities through service projects and delivery of educational programs and could assist Sun Prairie in coordinating educational events.



Sun Prairie Garden Club

The Sun Prairie Garden Club promotes an interest in gardening and the beautification of the landscape in the community. Sun Prairie Garden Club is active in the community and in partnership with local organizations it contributes to the beauty of Lombard through donations and volunteer service. Trees are an essential part of gardening, and spreading the word about the importance of trees can be accomplished through local volunteers like those at the Garden Club and may serve as a resource for education and other environmental initiatives.



Sun Prairie Public Library

The Library is a place where people congregate and learn. As such this would be a first rate location to advertise opportunities for public outreach education about urban forestry, as well as stocking and showcasing books related to urban forestry and its related disciplines.



Local school districts

Urban Forestry is by and large an unknown profession, but there are many aspects of STEM concepts that go into it: GIS Mapping, chemistry, physics, biology, and math are all essential facets of Arboriculture. A relationship with local school districts would be a reciprocal relationship, where students could engage in study projects based around trees, and citizen science. This type of program may develop interest in or even promote careers in the green industry.



Local Boy and Girl Scout Troops

The mission of the Boy Scouts of America is to prepare young people to make ethical and moral choices over their lifetimes by instilling in them the values of the Scout Oath and Law and the mission of the Girl Scouts of the USA is to build girls of courage, confidence, and character, who make the world a better place. Both organizations foster a dedication to education, community service, and volunteerism and a partnership with the City could be a beneficial relationship for all entities involved.



Happy Hikers 4-H Club

4-H is delivered by Cooperative Extension – a community of more than 100 public universities across the nation that provides experiences where young people learn by doing. For more than 100 years, 4-H has welcomed young people of all beliefs and backgrounds, giving kids a voice to express who they are and how they make their lives and communities better. 4-H would be a valuable partner, particularly for community service projects involving the City's urban forest.



Rotary Club of Sun Prairie

Rotary is a global network of 1.2 million neighbors, friends, leaders, and problem-solvers who come together to make positive, lasting change in communities at home and abroad while developing personal relationships and having fun. The members of the Rotary Club of Sun Prairie are an active, diverse group of individuals with a common interest in making the community and the world a better place for everyone. The City could partner with the Rotary Club in organizing educational events.



Personnel

The City's forestry program has evolved over the years and currently the forestry program is a Division in the Parks, Recreation, and Forestry Department.

Currently, the forestry division is made up of approximately 2 FTE staff members and 1 LTE staff member. A goal of this plan is to add additional LTE and FTE positions in the forestry division to make the department even more robust and add the staff capacity necessary to complete as many of the goals in this plan as possible on a reasonable timeline for the betterment of the community. The Forestry Division reports to the Director of Parks, Recreation, and Forestry and the Parks, Recreation, and Forestry Commission.

Parks, Recreation and Forestry Commission (PRFC)

The Parks, Recreation and Forestry Commission, as established by Ordinance, act as the representatives of the residents of Sun Prairie in parks, recreation, and forestry related matters. It is tasked with ensuring the proper oversight of the Urban Forest so that all residents can realize its benefits. The Commission provides informed recommendations to the City Council as it pertains to decisions affecting the Urban Forest. To streamline Urban Forestry Operations, tasks are assigned to various staff and contractors or consultants. Below is an overview of current positions that comprise the forestry division at the City:

Parks and Forestry Director (50/50 Parks and Forestry FTE)

This position is responsible for developing and implementing goals, objectives, and policies to sustainably manage the city's forestry program. It is responsible and accountable for all park and forestry operations in the city. This position (formerly titled Parks and Forestry Division Manager) has the authority of the City Forester, in their absence, as mentioned in city ordinances. It prepares, reviews, and edits plans, budgets, and projects that affect publicly managed trees and/or city parkland. It represents and is accountable for the forestry division at PRFC and City Council meetings. It works cooperatively with the City Forester to address and resolve tree concerns identified by the public.

City Forester (FTE)

The City Forester has the authorities and responsibilities as identified in city ordinances. It leads the coordination of all forestry field operations in the city conducted by internal staff and hired contractors/consultants. It is responsible for the management of the City's urban forest by implementing forest management and maintenance activities and provides guidance, direction, and recommendations for the care of the City's Urban Forest and its tree inventory. It works cooperatively with the Parks and Forestry Director to address and resolve tree concerns identified by the public. It is the direct supervisor of the temporary staff in the forestry division.

Maintenance Specialist (50/50 Parks and Forestry FTE)

This position assists and conducts forestry field operations as directed by the City Forester. The position also reports the Parks Maintenance Supervisor conducting parks maintenance activities.

Urban Forestry Technician (LTE)

This is a temporary position (1,040 hours) that assists the City Forester with all arboricultural and urban forestry projects including, but not limited to, tree care procedures such as removals, pruning, watering, planting, chemical applications for EAB, stump grinding, invasive species management and GIS data entry and management.



The task of establishing and enhancing a robust, effective, and sustainable Urban Forestry program can be difficult. There are many challenges and learning curves, contracts to renegotiate, bid documents to create, resident concerns to manage, and other responsibilities which may require the assistance of different types of external tree care professionals to assist with capacity challenges many municipalities face.

Tree Care Contractors

Tree Care Contractors are responsible for performing work identified by the Parks and Forestry Director and/or the City Forester in a timely, safe, and expeditious manner. Tree Care Contractors may or may not have International Society of Arboriculture (ISA) Certified Arborists either on staff and/or on site when work is being performed, depending on the scope of work. They are often hired to prune, remove, plant, and water trees, grind stumps, and conduct chemical applications for pests and/or diseases. It is recommended that the city work with tree care contractors that have at least one ISA Certified Arborist on staff and preferentially a certified arborist onsite assisting and/or directing field operations.

Forestry Consultants

Forestry Consultants are often hired to write forest management plans, conduct and/or maintain city-wide tree inventories, provide technical recommendations, sourcing and interviewing contractors and vendors for tree pruning, removal, and planting operations, train City staff on tree health and risk assessments, assist in explaining policies to homeowners, preparing contract and bid specifications, and teaching residents how to help the City in caring for their trees.

State of the Urban Forest

Using the tree inventory data collected for the City of Sun Prairie, it was determined that there are a total of 10,702 trees on City -managed rights of way (June 2023). The charts and statistics in this portion of the Management Plan illustrate that the tree population in Sun Prairie can be characterized as being in overall good condition and the stocking density is estimated to be at a moderate level, at approximately 73%, though we must reiterate that the exact number of open planting sites is not currently known, so these are just estimates. The species diversity in Sun Prairie is quite good with 92 individual species represented, and even more cultivars, hybrids, and subspecies, as detailed below. Based on the following data in the Management Plan, the City of Sun Prairie will be equipped to use this valuable information to address short-term concerns, long term management considerations, and overall planning objectives.

Basic Statistics – Managed Trees

Number of Trees Inventoried	10,702
Total Number of Species	92
Total Diameter Inches	93,040"
Average Tree Diameter	8.69"

Table 2 – Basic Statistics

Condition Statistics

During the tree inventory, the condition of each tree was rated using a Good, Fair, Poor, and Dead/Dying rating system. The rating criteria is based entirely on canopy cover as follows:

TREE CONDITION

GOOD: >75% canopy cover

FAIR: 50 – 75% canopy cover

POOR: 25 – 50% canopy cover

DEAD/DYING: <25% canopy cover



The chart below represents the distribution of trees in each of the 4 categories. This data illustrates a positive trend with nearly 87% of the tree population earning a condition rating of “Good” indicating that each tree in this category had canopies with greater than 75% vigorous canopy foliage.

Approximately 9% of the tree population was rated as “Fair” indicating 50 – 75% canopy cover. Just over 3% of the population was rated as “Poor” with 25 – 50% canopy cover and only 1% of the population received a condition rating of “Dead/Dying”. Overall. These statistics are an indication of a generally healthy urban forest.

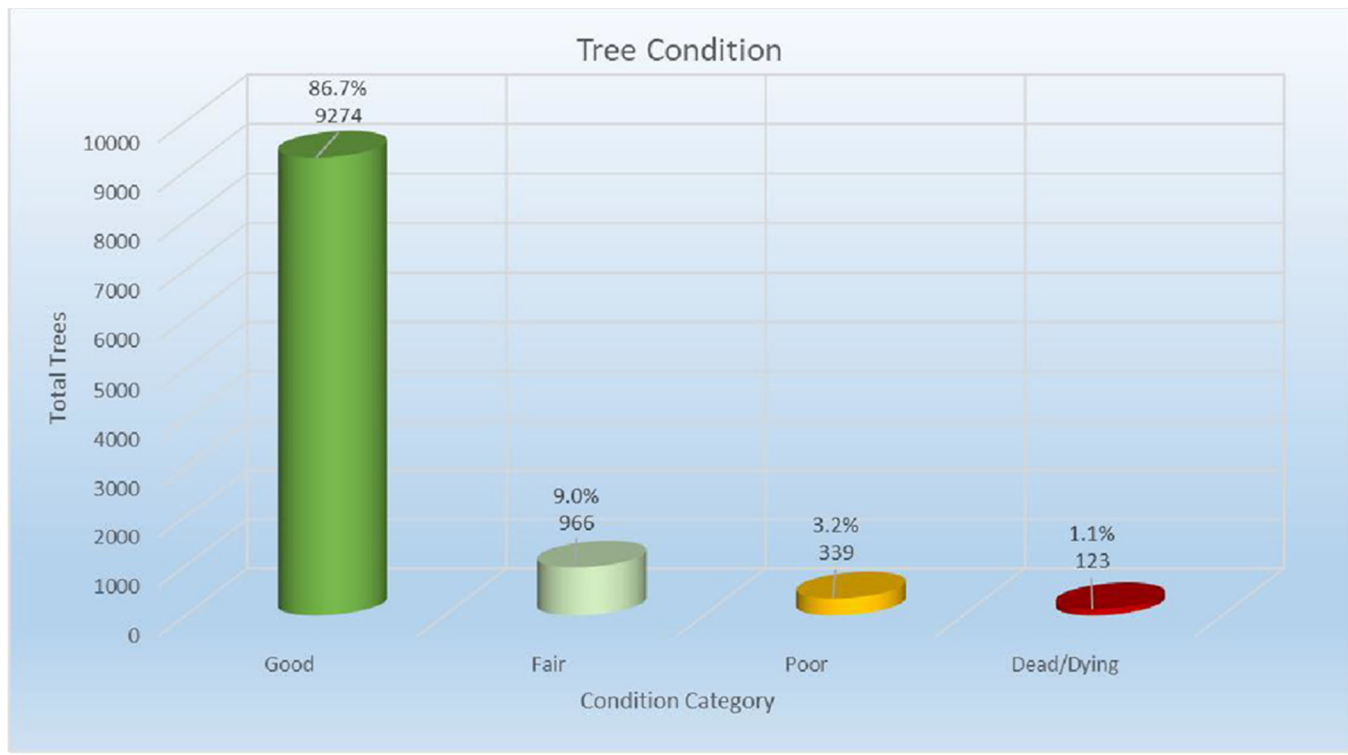


Exhibit 3 – Existing Tree Condition

Age Class Diversity

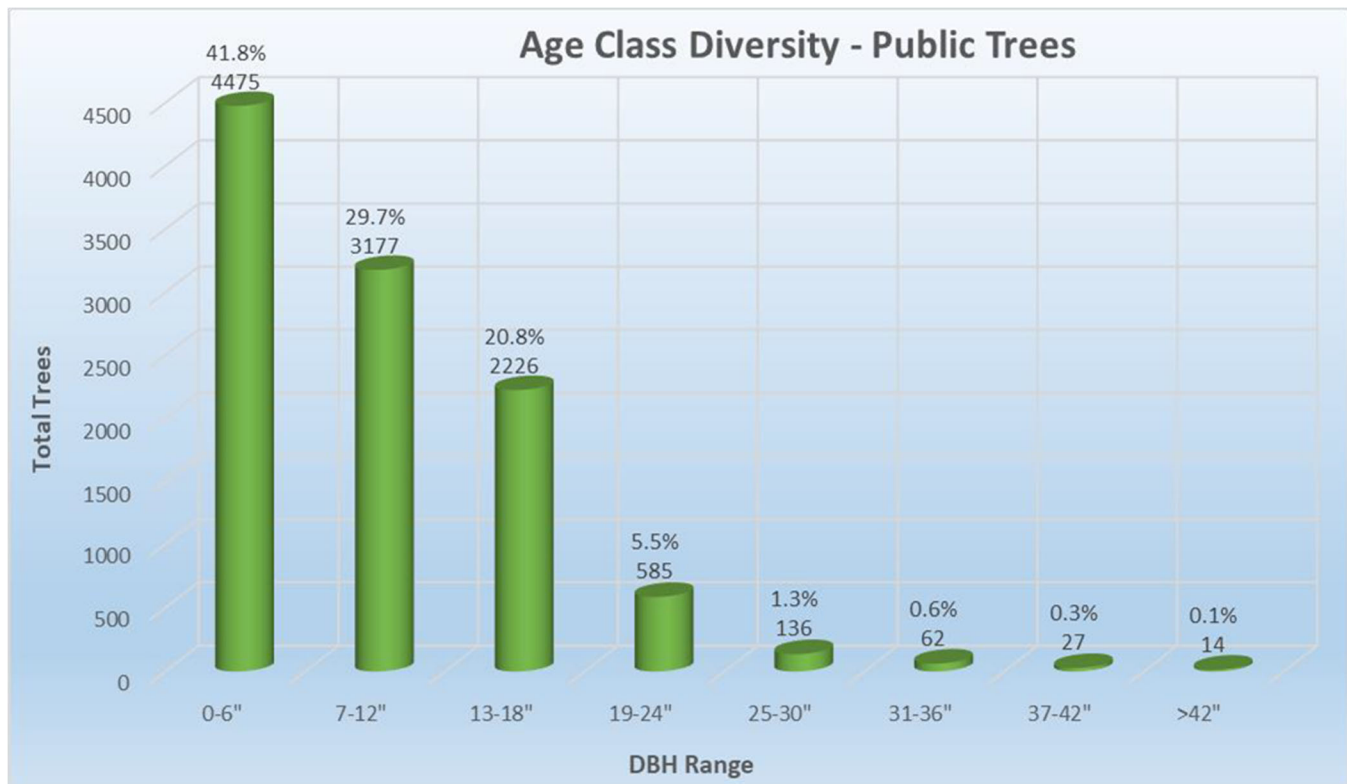


Exhibit 4 – Existing age class diversity

In terms of the ages of trees in Sun Prairie, we have split the tree population into 8 “classes” of 6” diameter increments. This tells us how many trees are in each “age class”. Because trees are measured by Diameter at Breast Height (DBH) as a standard measure, this breakdown can help show where trees are in their life cycles. Some trees like Cottonwood and Silver Maple grow in diameter very quickly, up to 1” per year or possibly more. Other slower growing trees such as Oak and Hickory may only add ¼” or less every year. As a broad generalization, it can be said that most trees on average grow at around ½” per year. [This Link](#) from the Missouri Department of Conservation shows some examples of this.

The age class analysis chart above illustrates a typical trend in the overall age spread of a tree population seen in a municipal setting. We often see many trees in younger to middle aged categories, and a relatively lower number of trees in the older age categories. The Sun Prairie tree population is largely younger with 71% of the tree population measuring between 12” DBH or less.

Why is this important? Let’s synthesize some of the information we have provided to date. Bigger trees provide more benefits to the community, so we generally want trees to live longer so they can really provide those maximum benefits. It has been discovered that the average lifespan of a tree in an urban environment has traditionally only been only 20-30 years or so, see [This Link](#) for more info.

By 20-30 years old, based on our calculations above, a tree may only be 15” or so, and not providing those maximum benefits. What we want to encourage throughout this plan is a holistic program which focuses on using all of these tools, budgets, staff, education, etc. drive the lifespan of trees in our terraces much higher, where they provide much greater benefits.

A fairly equal number of trees in each age classification is desirable and indicative of a consistent focus on tree planting and tree maintenance, and that is the goal we strive to attain. Also, the estimated 3,500 open planting spaces gives Sun Prairie an enormous opportunity to focus on tree planting going forward. As the younger trees continue to grow, Sun Prairie will have an opportunity over time to bring the age classes to a more balanced level.

Tree Locations

The chart and table below show the locations of the trees in Sun Prairie in terms of if they were street trees (trees between the curb and sidewalk), park trees (trees in a public park or greenspace), or Municipal Campus trees (trees in places such as City Hall, Fire and Police Stations, etc.)

Street Trees	7973
Park trees	2062
Municipal Campus Trees	667

Table 3 – Planting location types

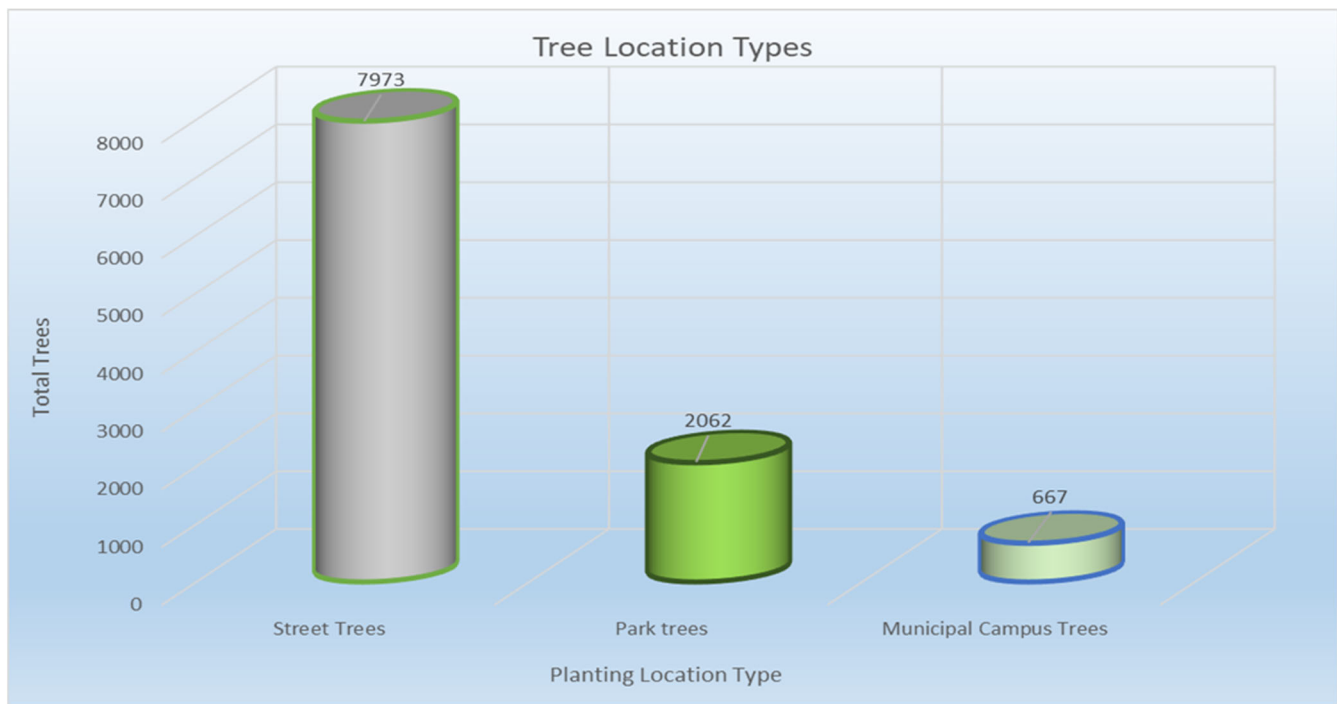


Exhibit 5 – Planting Location Types

As can be seen from the above, Sun Prairie’s publicly owned trees are largely on the street side terraces in the Right of Way (ROW). Approximately 2,062 are in Sun Prairie’s 44 parks, and yet another 667 are located on municipal campuses such as City Hall, Fire Station, and other such properties.

It should be noted here that planting location makes a large difference in what trees may or may not be successful. Some species such as Cottonwoods or Silver Maple² are not desirable for City terraces since they are weak-wooded and can be prone to limb failure, while in a park or natural area, they can uptake a lot of stormwater, making them valuable. Or evergreens, which are welcome screening or landscape trees in parks and other city campuses, but can create visibility issues with cars backing out of driveways in a terrace planting.

Diversity Analysis

Taxonomy is the method by which scientists classify plants, animals, and other life forms into distinct categories. A species is unique. There is only one type in that category, such as Bur Oak (*Quercus macrocarpa*), which refers to only one specific type of tree. A genus, however, is a group that may contain multiple species. All Oak trees, for instance, are in the genus *Quercus*. The further down the taxonomic ladder you go, the more similar things become.

² Please note, other trees with Silver Maple genetics such as Autumn Baze and Armstrong Maple have similar issues

It should also be noted here that there are several even finer grained looks at taxonomy than species, such as subspecies, cultivars, hybrids, and varieties. These are naturally or human bred plants of the same species, but that have different appearances, so for instance there is “straight species” Eastern Redbud with green leaves and purple flowers. However, there is also a cultivar called ‘Forest Pansy’ that has a purple leaf, and one called ‘alba’ that has white flowers. These definitions are listed below:

Cultivar is cultivated, selected by humans. Rarely ever “True to Seed”, and typically vegetatively grown through cuttings. Can be a hybrid OR just a unique individual mutation. Notated using single quotes and non-italicized trade name: *Gleditsia triacanthos* ‘Shademaster’.

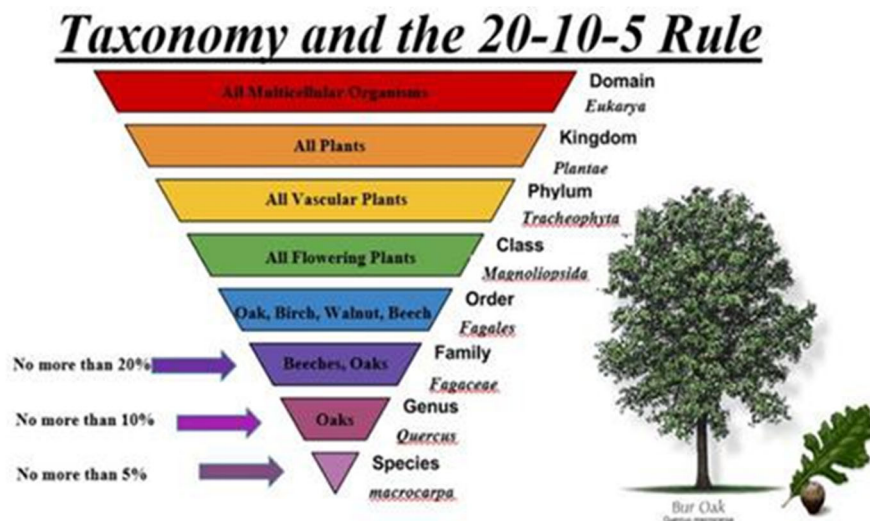
Varieties are naturally occurring mutations that DO produce true to seed, but are not necessarily hybrids, but just routine mutations in the gene pool. These are named using the term var. which is always italicized: *Cercis canadensis* var. *alba*

Hybrids are the offspring of 2 members of the same genus who can interbreed with characteristics of both. They can be EITHER man made, in which case they are cultivars, or naturally occurring, in which case it is just a hybrid, and not necessarily a variety. These are typically notated using an ‘x’, and everything is italicized: *Acer x freemanii*

Subspecies is a level below species and is meant to indicate 2 genetically different groups of the same species. Notated using “subsp.” without italics, but the subspecies name in italics: *Acer saccharum* subsp. *Nigrum*

It should be noted that when it comes to taxonomic diversity, we only evaluate it from the species level and higher, so subspecies, cultivars, and varieties of a species do not count as any additional diversity. An exception is made for Hybrids here, where hybrids are considered different species.

The more similar tree species are to each other, the higher the likelihood that an insect or pathogen can exploit every species of that genus. Emerald Ash Borer is a classic example of this, as it affected every tree species in the ash genus (*Fraxinus*). The most effective prevention of tree loss we have is to limit the number of trees planted that a new pest or pathogen can affect. While diversity at the species level is important, it is also important to achieve diversity on the genus and family levels, so that a large selection of trees is planted.



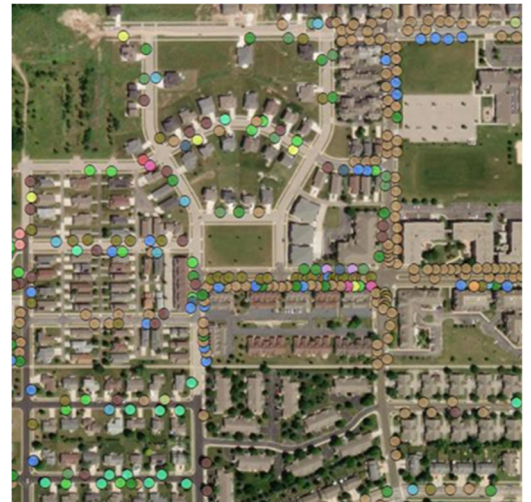
The “20-10-5” rule for Sun Prairie’s future tree plantings is recommended, which states that no more than 20% of any one family, 10% of any one genus, and 5% of any one species shall be planted during any one year. It will also be a long-term direct goal of the forestry program to have the tree population in compliance with the 20-10-5 Rule, although it may not be possible by the 2044 date used in this document, as it is a difficult standard to attain even given the best possible funding and manpower circumstances, which Sun Prairie does not currently have. This level of taxonomic diversity is consistent with today’s arboricultural industry standards (see above graphic).

The old paradigm of urban forestry was to create tree lined streets and parks in which every tree was the same type, shape, age, and height. This was thought to produce a uniform appearance. Urban foresters have now learned that once a pest or pathogen is introduced into a monoculture planting such as this, an epicenter of infestation is created that may cause serious damage, both ecologically and financially. Diversity in the urban forest helps to prevent and reduce the impacts of pests and pathogens. There are three aspects of diversity (spatial, age-class, and taxonomic) in the urban forest. We will examine these in detail.

Spatial Diversity

Spatial diversity is the concept of mixing tree species over the whole geographic area. The easiest way to slow the spread of any new pest or pathogen is to increase the distance between potential host trees. Every pest or disease, such as EAB or Dutch Elm Disease (DED), has a limited area to which it can spread in a given time frame. The more difficult it is to get to the next host tree, the less of a problem the pest or pathogen becomes, and the easier quarantine becomes.

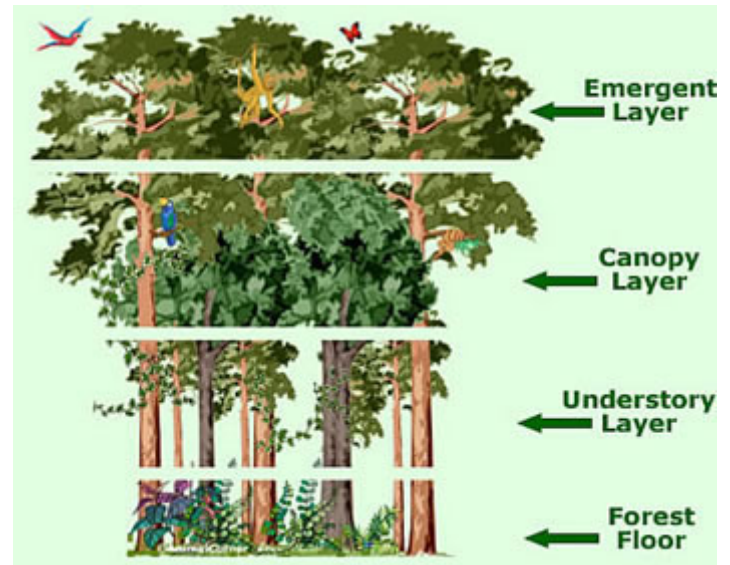
In addition to the functional benefits provided by increasing spatial diversity, organizations which have implemented diverse planting over the past several decades have demonstrated that such diversity yields an arboretum-like landscape that is both functional and aesthetically pleasing. At present, the Spatial Diversity in Sun Prairie is moderate due to the presence of a large percentage of Maples in the tree population. During the tree planting planning phase, care should be taken to ensure that new plantings are done in a manner that yields a highly spatially diverse tree population, and creation of areas of low spatial diversity (monocultures) should be avoided.



Age-Class Diversity

Age-class diversity is also an important consideration. A healthy natural forest has trees of many ages. Young, intermediate and mature trees allow for regeneration, replacement and vigor in the overall forest community. A mixture of tree species, locations, and ages will lead to great diversity, which insulates a natural forest against pest and pathogen outbreaks. The Urban Forest is no different. The outdated urban forestry paradigm promoted even-aged tree plantings, so that all trees were approximately the same size and age.

However, once these trees begin to decline, most will require removal and replanting simultaneously. This can leave an entire street segment or neighborhood without shade and aesthetics for a long time. The current approach of the urban forestry community is to strategically plant trees on streets or in neighborhoods over a longer timeframe to encourage mixed age stands. Though there is no industry standard about the length of this time frame, the City is considering undertaking a long-term tree planting plan, which will help guide the planting timelines needed to meet this goal of having a good age class distribution. With this strategy, trees will grow to maturity in different stages, and decline at different times. When declining trees are eventually removed, there will always be a variety of age classes and tree sizes on a block or in a neighborhood. This reduces the pressure to plant trees in an area immediately after tree removal, helping to manage costs. A mixed age-class planting ensures that mature trees are always present in a neighborhood. It also will allow for planting of smaller trees.



An additional benefit of mixed-age plantings is the ability to plant shade-loving trees as well as sun-loving trees. When a street or neighborhood is newly planted with trees of the same age, all the trees are essentially in full sun. This reduces the ability to plant shade-loving trees, as they tend to dry out in the summer sun. With mixed-age stands, shade-tolerant trees may be planted underneath the canopy of larger, mature trees. This approach will be used for future tree removal and replacement and help to create an Urban Forest that has mature trees, middle aged trees, and young trees in similar quantities.

Taxonomic (Species) Diversity

Why is it important to plant a diverse set of trees at the species, Genus, and Family levels? Simply put, it is to ensure that we will not fall victim to mass tree loss from pests and pathogens in the future. The reason Emerald Ash Borer (EAB) was such a devastating expense for many organizations was because their tree populations were composed of over 20% Ash trees. When these trees died and had to be removed, those organizations lost 20% of their trees..

This comes with the obvious expense of having to remove these trees and replace them. But it also comes with hidden expenses as well, namely the loss of the ecological services that those trees provided: Homes cost more to heat and cool, storm water infrastructure falls under heavier pressure, and increases in pollutants and greenhouse gases may be observed. For all these reasons, a more diverse group of trees needs to be planted, such that we are never at risk of losing more than 5-10% of our trees at any given time due to a pest or pathogen. We also would like to explore several key definitions when it comes to native species and other similarly confused terms:

Native – Plants which have been in our upper Midwest geographic region since the last glaciation (approx 11,000 years ago). Hereafter, the word “region” shall apply to the upper Midwest region in which Sun prairie is located, and no other region around the country or the world, and the word “native” shall be taken to mean “native to the geographic region in which the City of Sun Prairie is located”. It should be noted here that the further you go back in time, the more “native” things become due to continental drift and long geological time periods. Ginkgo, for instance, which is native to China, was in fact somewhat native to the United States when Pangea (the supercontinent) existed 200 million years ago. But when we speak of “native” in this document, we are specifically referring to the time period since the last glaciation from 11,000 years ago to present.

It should also be noted here that the term “native” alone does not always imply “good” or “desirable”. Some trees such as Cottonwoods (which we will discuss in some considerable detail) can be both desirable and undesirable depending on where they are growing. We will attempt to clear up as much of this nuance as possible. Examples of native trees include Oaks, Hickories, Basswoods, Walnuts, and many others.

Non-Native – Plants which are not native to the region, but do not necessarily pose a risk of being invasive that we are currently aware of. This is an extremely important differentiation to make between non-native and invasive. While we did focus on native trees for our diversity vision for this UFMP, there are a fair number of species of trees in the proposed diversity vision here which are non-native. This helps to increase the diversity of trees on our terraces and in our parks and creates a more resilient urban forest. The trees are being planted in the built environment, which differs substantially from the native environment. When we plant non-natives, we always monitor them for signs of invasiveness, and will stop planting any tree showing invasive tendencies.

Invasive – Plants which are not native to the region³ and compete directly with our native species in nature. Examples include European Buckthorn, Asian Honeysuckle, Black Alder, Siberian Elm, etc. To fall into this category, species must have invasive tendencies, escape cultivation, or outcompete more desirable native species. If they do not, they are simply “non-native” as described above.

Aggressive – Plants which are native to the region, but if left unchecked may outcompete more desirable native species. Examples include Box Elder, Black Cherry, Cottonwood, etc. It should be strongly noted here that we have included this category to separate out some of these less desired native species due to their aggressive nature.

The Missouri Invasive Plant Council has a website with similar definitions at [This Link](#).

³ See <https://dnr.wisconsin.gov/topic/Invasives/terminology> for a full discussion of WI state rule for invasives

Species Diversity of Sun Prairie's Current Tree Population

<u>SPECIES</u>	<u>COUNT</u>	<u>% OF TOTAL</u>	<u>AVG DBH</u>
MAPLE-NORWAY	1151	10.75%	11.04
MAPLE-SILVER	1013	9.47%	11.50
HONEYLOCUST	999	9.33%	10.09
LINDEN-AMERICAN	969	9.05%	9.60
ELM-HYBRID	757	7.07%	7.15
APPLE-CRAB SPP	462	4.32%	4.51
SPRUCE-BLUE	413	3.86%	10.56
ASH-WHITE	375	3.50%	15.76
HACKBERRY	331	3.09%	4.76
MAPLE-RED	258	2.41%	8.55
ASH-GREEN	249	2.33%	14.93
OAK-SWAMP WHITE	249	2.33%	5.17
SPRUCE-WHITE	232	2.17%	11.67
KENTUCKY COFFEETREE	225	2.10%	3.15
GINKGO	223	2.08%	2.23
LILAC-JAPANESE	197	1.84%	2.84
OAK-RED	193	1.80%	7.90
PEAR-CALLERY	189	1.77%	6.14
AMERICAN HORNBEAM	148	1.38%	3.68
YELLOWWOOD	140	1.31%	2.12
WALNUT-BLACK	122	1.14%	12.72
SERVICEBERRY-SPP	118	1.10%	2.27
MAPLE-SUGAR	100	0.93%	4.13
PINE-WHITE	99	0.93%	14.27
SYCAMORE	94	0.88%	2.41
IRONWOOD	92	0.86%	1.82
LINDEN-SPP	86	0.80%	9.70
BUCKEYE-OHIO	78	0.73%	1.52
PINE-SPP	72	0.67%	12.85
ARBOR VITAE	65	0.61%	4.92
SWEETGUM	65	0.61%	2.70

COTTONWOOD*	62	0.58%	16.43
HAZELNUT-TREE	61	0.57%	2.02
BOXELDER*	56	0.52%	16.90
TULIPTREE	51	0.48%	3.25
OAK-WHITE	45	0.42%	23.09
SPRUCE-NORWAY	40	0.37%	18.92
UNKNOWN ²	40	0.37%	2.43
MAPLE-SPP	39	0.36%	5.41
OAK-BURR	37	0.35%	10.94
DAWN REDWOOD	32	0.30%	8.22
BIRCH-WHITE	31	0.29%	7.62
EASTERN REDCEDAR	30	0.28%	7.08
HICKORY-SHAGBARK	30	0.28%	10.34

HAZELNUT-TURKISH	29	0.27%	2.34
ELM-AMERICAN	28	0.26%	5.15
CHERRY-BLACK*	24	0.22%	9.73
LILAC-JAPANESE TREE	24	0.22%	2.90
BIRCH-RIVER	23	0.21%	6.92
HAWTHORN-SPP	20	0.19%	2.36
BLACK LOCUST	19	0.18%	13.84
HORNBEAM-AMERICAN	18	0.17%	2.35
PINE-RED	17	0.16%	12.37
LINDEN-LITTLELEAF	16	0.15%	10.18
MULBERRY-SPP*	12	0.11%	8.78
AMUR CORKTREE	11	0.10%	1.57
ASH-SPP	11	0.10%	11.03
SPRUCE-BLACK	10	0.09%	1.00
SPRUCE-SPP	10	0.09%	12.65
OAK-CHINQUAPIN	9	0.08%	2.67
OAK-SPP	9	0.08%	3.09
MOUNTAIN ASH-SPP	7	0.07%	3.40
OAK-PIN	7	0.07%	11.53

WILLOW-SPP*	7	0.07%	28.51
DOGWOOD-SPP	5	0.05%	2.48
OAK-HILLS	5	0.05%	11.06
ARBORVITAE	4	0.04%	6.50
ASPEN-SPP	4	0.04%	3.98
BIRCH-PAPER	4	0.04%	10.40
BIRCH-YELLOW	4	0.04%	6.53
BLACKGUM	4	0.04%	4.05
MAPLE-AMUR	4	0.04%	7.45
POPLAR-WHITE*	4	0.04%	1.38
WILLOW-WEeping*	4	0.04%	17.00
AMERICAN REDBUD	3	0.03%	3.47
BEECH-SPP	3	0.03%	1.83
LARCH	3	0.03%	3.03
BALDCYPRESS	2	0.02%	12.10
CATALPA	2	0.02%	8.20
LILAC-SPP	2	0.02%	1.05
MOUNTAIN ASH-EUROPEAN	2	0.02%	1.80
OAK-PIN NORTHERN	2	0.02%	1.25
OAK-REGAL PRINCE	2	0.02%	1.60
YEW-SPP	2	0.02%	4.25
ALDER-SPP	1	0.01%	10.60
APPLE-EDIBLE	1	0.01%	6.10
ASPEN-QUAKING	1	0.01%	4.50
DOUGLAS FIR	1	0.01%	15.50
HORSECHESTNUT	1	0.01%	1.70
MAGNOLIA-CUCUMBR	1	0.01%	2.70
PLUM-AMERICAN	1	0.01%	2.00
VIBURNUM-SPP	1	0.01%	2.60

* - Asterisk denotes “undesirable” for the purposes of this plan

Table 4 – Existing Species Diversity

As shown in the table above, the City of Sun Prairie Tree population consists of 92 distinct tree species, accounting for 10,702 total trees as of June 2023. The above table shows the percent of the total population each species makes up, as well as the average Trunk Diameter (DBH). This population is shown graphically below

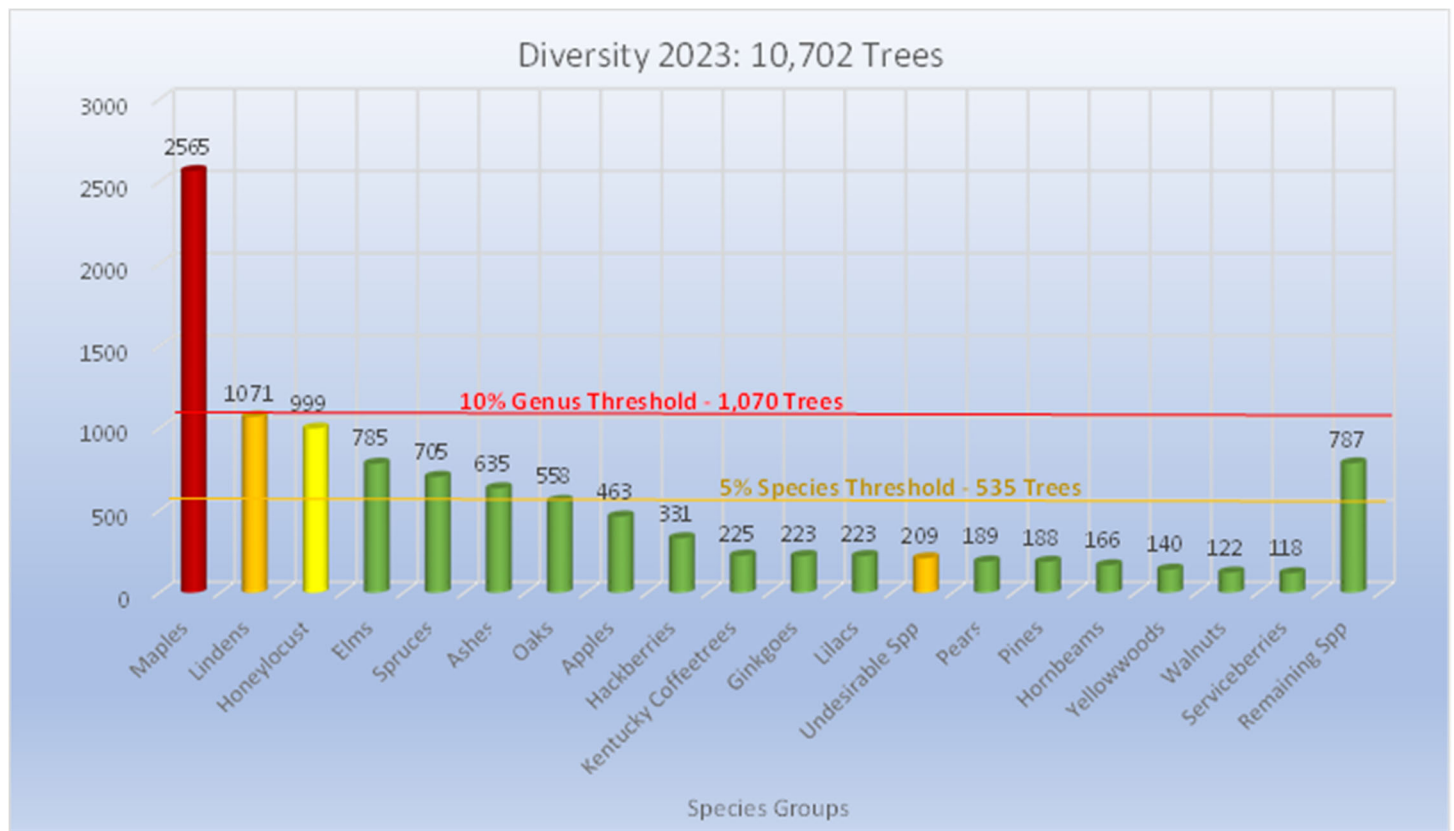


Exhibit 6 – Existing Diversity

In general, the Sun Prairie tree population has overall notable diversity with 92 different species represented. However, one genus, which includes all Maple species, accounts for 24% of Sun Prairie's tree population. It is quite common for Maple species to be the highest represented species in municipalities and in other urban settings because they are typically adaptable and hardy shade trees. However, if a pest or pathogen that attacks only the Maple genus were introduced into our region, Sun Prairie could potentially lose nearly a quarter of its tree population. This could amount to approximately \$25,000 a year in benefit losses, and nearly \$2.5 Million in standing value.

The Norway Maple species alone makes up nearly 11% of Sun Prairie's entire publicly managed tree population and is followed by Silver Maple, Honey locust, and American Linden each at over 9% making nearly 40% of the entire population represented by 4 singular species.

Spruce trees also make up a significant portion of the population and are particularly susceptible to several pathogens and should be monitored for the presence or progression of these diseases. The 209 trees that were classified in the "Undesirables" tree category consist of species that are invasive and/or have fast-growing or weak-wooded characteristics that make them unwanted in the urban landscape, particularly on street terraces. These include species such as Willow, Poplar, Mulberry, Siberian Elm, Black Cherry, and Boxelder. It's important to note that these species are often found in urban park settings and on private property and are usually less problematic.

It should generally be said that reducing the number of Maples overall while increasing lesser represented species should be a strategic goal, and a Diversity Vision guided by the 20-10-5 Rule will help to accomplish this. Actual diversity projections and genus/species recommendations will be discussed in more detail in the “Future of the Urban Forest” section below.

Please note, the “remaining species” bar at the far right is a combination of all the species which did NOT exceed 1% of the total population. Therefore, while that bar appears to be “violating” the 5% species threshold, it is not. Please note, the bigger that “Remaining Species” bar is, the greater overall diversity Sun Prairie has. For a full accounting of all species, see the above table.

With an estimated 3,500 available planting spaces, a long term tree planting plan would be an invaluable tool for Sun Prairie to pursue. Such a plan would not only further improve overall diversity, but also maximize the lifespan of trees on the terraces by carefully matching tree species requirements and tolerances with each individual planting site. Trees that are well adapted to their growing conditions will establish more quickly, require less maintenance, be healthier overall, and more resistant to disease and insect problems. By matching the right trees with the right planting spaces using a tree planting plan, the City of Sun Prairie can protect its investment in each new tree.

Although Sun Prairie’s diversity is good overall (with the exception of those overplanted or undesirable species discussed above), the City has many species to choose from which are commercially available and underrepresented in their population. As mentioned above, this plan will lay out strategies to further improve diversity, and we will examine the specific species recommended in the “Future of the Urban Forest” Section below. We have also supplied the below chart, which shows Sun Prairie’s diversity at the Family level⁴:

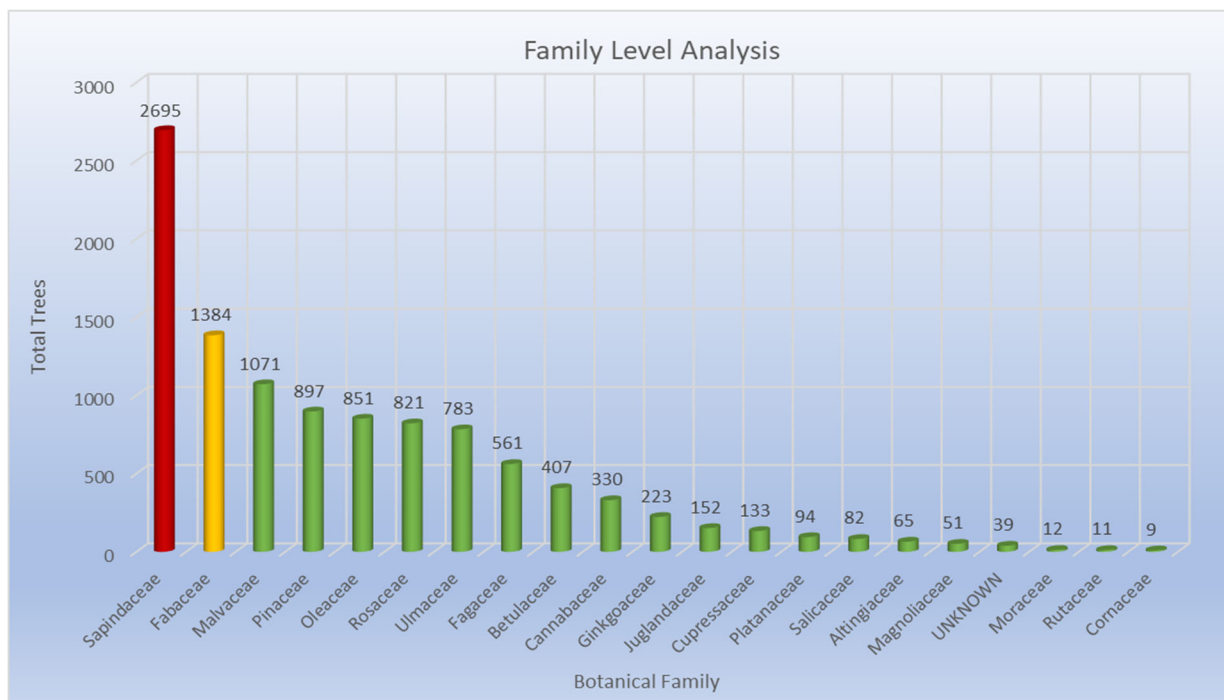


Exhibit 7 – Existing Family-level diversity

⁴ The ‘Aceraceae’ is the Maple Family, and the Fabaceae is the Pea family (Honeylocust, Coffeetree, etc.)

i-Tree Report/ Urban Tree Canopy Assessment

i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides Urban Forestry analysis and benefits assessment tools. The i-Tree tools help communities of all sizes to strengthen their forest management and advocacy efforts by quantifying the structure of trees and forests, and the environmental services that trees provide. Please note, the math involved with these calculations is far from basic, and to that end, we are not going to expand on it here. Those interested in a deeper look into the iTree calculations can find that at the iTree website through [This Link](#).

The i-Tree suite calculates hard dollar values that trees provide to communities. Trees provide “ecological services” that save residents money, such as in heating and cooling costs, where large trees help shade houses in the summer, saving on air conditioning and electricity bills, and provide windbreaks during the winter, saving on heating and natural gas costs. They also provide CO₂ uptake, reducing the effects of climate change, as well as air quality improvements by the absorption of urban pollutants. Trees also absorb stormwater, which reduces strain on stormwater infrastructure, and saves money in replacement costs. Finally, trees contribute up to 15% of the total value of a property, so they have monetary aesthetic benefits as well.

Using the data from the tree inventory, an i-Tree report has been prepared for the City of Sun Prairie. Below you will find reports on the annual benefits of the tree population, replacement values, and breakdown of benefits per species. The results of these analyses are below, and full tables and the i- Tree Report are available.

i-Tree Eco Analysis Results

A summary of the iTree Eco report for the Sun Prairie tree population (June 2023) is provided below in several formats, as a summary table, and with a bullet point list.

- **Number of trees: 10,702**
- **Tree Cover: 67.29 acres**
- **Most common species of trees: Norway maple, Silver maple, Honeylocust**
- **Percentage of trees less than 6" (15.2 cm) diameter: 43.9%**
- **Pollution Removal: 1.596 tons/year (\$10.1 thousand/year)**
- **Carbon Storage: 2.242 thousand tons (\$382 thousand)**
- **Carbon Sequestration: 88.72 tons (\$15.1 thousand/year)**
- **Oxygen Production: 236.6 tons/year**
- **Avoided Runoff: 732.8 thousand gallon/year (\$6.55 thousand/year)**
- **Building energy savings: \$23,500/year**
- **Carbon Avoided: 59.73 tons/year (\$10200/year)**
- **Replacement values: \$9.78 million**

Pollution Removal	\$10,100
Carbon Sequestration	\$15,100
Avoided Runoff	\$6,550
Building Energy Savings	\$23,500
Carbon Avoided	\$10,200
Oxygen Production	\$27,900
TOTAL ANNUAL BENEFITS	\$93,350

Carbon Storage	\$382,000
Replacement Value	\$9,780,000
TOTAL STANDING BENEFITS	\$10,162,000

Table 5 – iTree Tables

As can be seen from the above tables, the tree population in the City of Sun Prairie currently provides approximately \$93,350 in benefits every year, directly related to trees and their effect on homes, businesses, and the environment. It should be noted that the annual budget for all forestry activities recommended in this plan, projected for the calendar year 2024, will total approximately \$130,000 per year (see sample budget on page 93), so the annual benefits alone from the tree population are worth almost 75% what the cost put into them will be. In addition, the total standing value as a commodity and an ecological resource of the whole tree population is \$10,162,000.

These benefits can be viewed as “income” to Sun Prairie’s residents, and so long as the trees are well maintained, they will continue to provide these benefits, and more. As trees grow, they also increase their benefits! For example, a 3” diameter tree provides less than \$50/year in benefits, whereas a 20” tree can provide up to \$500 per year. The goal is to increase benefits even more, where the tree population pays for itself and even yields “profits”!

The replacement value of trees was also calculated. Currently, the standing value of all trees in the City of Sun Prairie population is \$10,162,000. This value is calculated using the industry standard reference, the *9th Edition Guide to Tree and Landscape Appraisal*, which is published by the Council of Tree and Landscape Appraisers. The i-Tree Eco data looks at the value of the trees in the absence of the effect of homes or businesses, and looks at trees more from an ecological perspective, mostly what the tree’s value is in sequestering and storing Carbon. These numbers are based on peer reviewed science in both Arboriculture as well as Climatology and other disciplines.

The iTree algorithm recently changed, and because of the new calculations, trees have a much lower (30- 40% lower) annual ecosystem services value than they used to using the older iTree Streets algorithm.

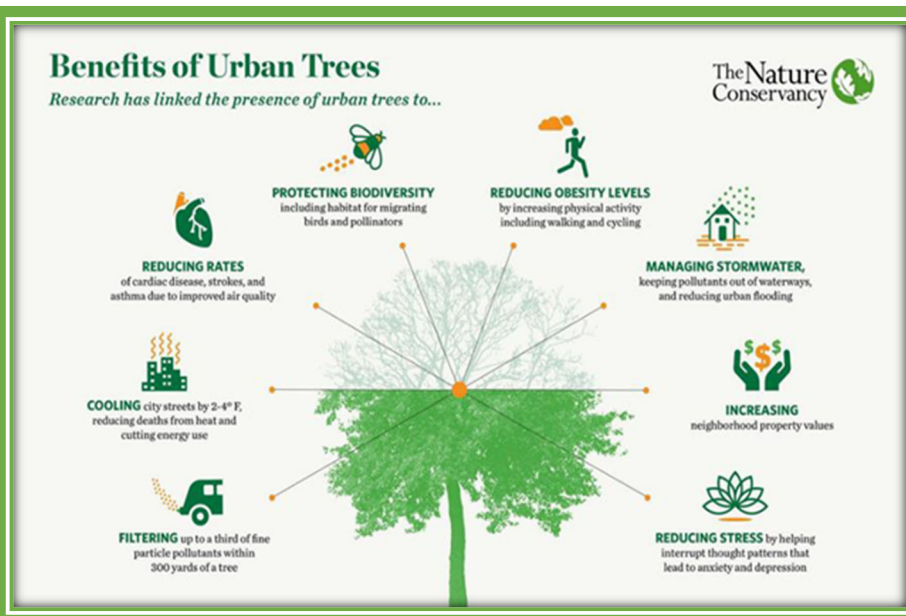
From an Urban Forestry perspective, this was disappointing, but the algorithm may change again later to yield higher results in the future. We will continue to run these analyses using the latest methodologies.

The goal of this Urban Forestry Management Plan is to create a tree population which maximizes these ecological services to Sun Prairie residents by increasing the number of trees in City, and how long they live, while minimizing costs in order to create a healthy, well maintained, and vibrant tree population. Below are several examples of Ecological Services provided by trees:

Energy Savings: During the summer when temperatures are warm, trees create shade, and temperatures are cooler in the shade. Cooler temperatures cause air conditioners to have to work less, which reduces the amount of energy a household uses. During the winter when temperatures are cold, winter winds cool your home quickly. Trees act as windbreaks, causing heating systems to use less natural gas, saving energy and money.

Carbon Dioxide (CO₂): The amount of CO₂ which is put into the atmosphere each year has a direct correlation with global climate change. That change causes more severe storms, greater drought conditions, and many other costly outcomes. Reducing CO₂ from our atmosphere lessens these effects. Trees uptake CO₂ and act as a carbon sink, putting carbon into long term storage in its woody tissues, removing it from our atmosphere, creating a net benefit to society, and saving money.

Air Quality: Industrial processes and vehicle emissions put pollutants into our air. These pollutants



can cause or worsen health conditions such as heart disease, asthma, and lung disease. In addition, these pollutants can mix with water in the atmosphere and create nitric and sulfuric acid, causing acid rain, which can destroy fisheries and contaminate water supplies. Trees absorb these compounds with their leaves and other tissues and prevent them from remaining in the atmosphere.

Reductions in these pollutants results in overall better health, reducing the cost of healthcare to society, and saving communities money.

Storm water: The cost of delivering fresh water to homes, as well as removing and treating wastewater and storm water is considerable. One of the greatest costs comes when these systems are overwhelmed, such as during flooding, which can cause millions of dollars of damage to homes and vehicles, or when these systems need to be replaced. Fortunately, trees take water from the soil and put it back into the atmosphere through the process of transpiration. Therefore, the more trees an organization has, the less flooding is an issue, and the less strain is put on storm water infrastructure, resulting in fewer repairs and replacements. In addition, tree canopy slows rainfall's effects on flooding by "intercepting" it with leaves and branches, delaying how quickly rainfall can become floodwater. All of this adds up to savings for an organization.

Aesthetic/Economic: Up to 15% of the value of a property can be attributed to its trees and other landscaping. Tree lined streets are much more appealing to homebuyers than streets devoid of trees, resulting in increased home sales, and therefore increased tax revenue, or increased tax revenue with which to fund initiatives relating to trees, attract new businesses, etc.

Urban Tree Canopy Assessment

Based on data available from the US Forest Service and Wisconsin Department of Natural Resources (<https://data-wi-dnr.opendata.arcgis.com/>), the total Urban Tree Canopy percentage of Sun Prairie can be determined. This is expressed as the percent of the City covered by tree canopy from an aerial view. This assessment included 5 total land cover types, including trees, grass and shrub, bare soil, water, buildings, roads/railroads, and other paved surfaces. The result of this assessment was that Sun Prairie as a whole, on both public and private land combined, contains 24.1% total tree canopy.

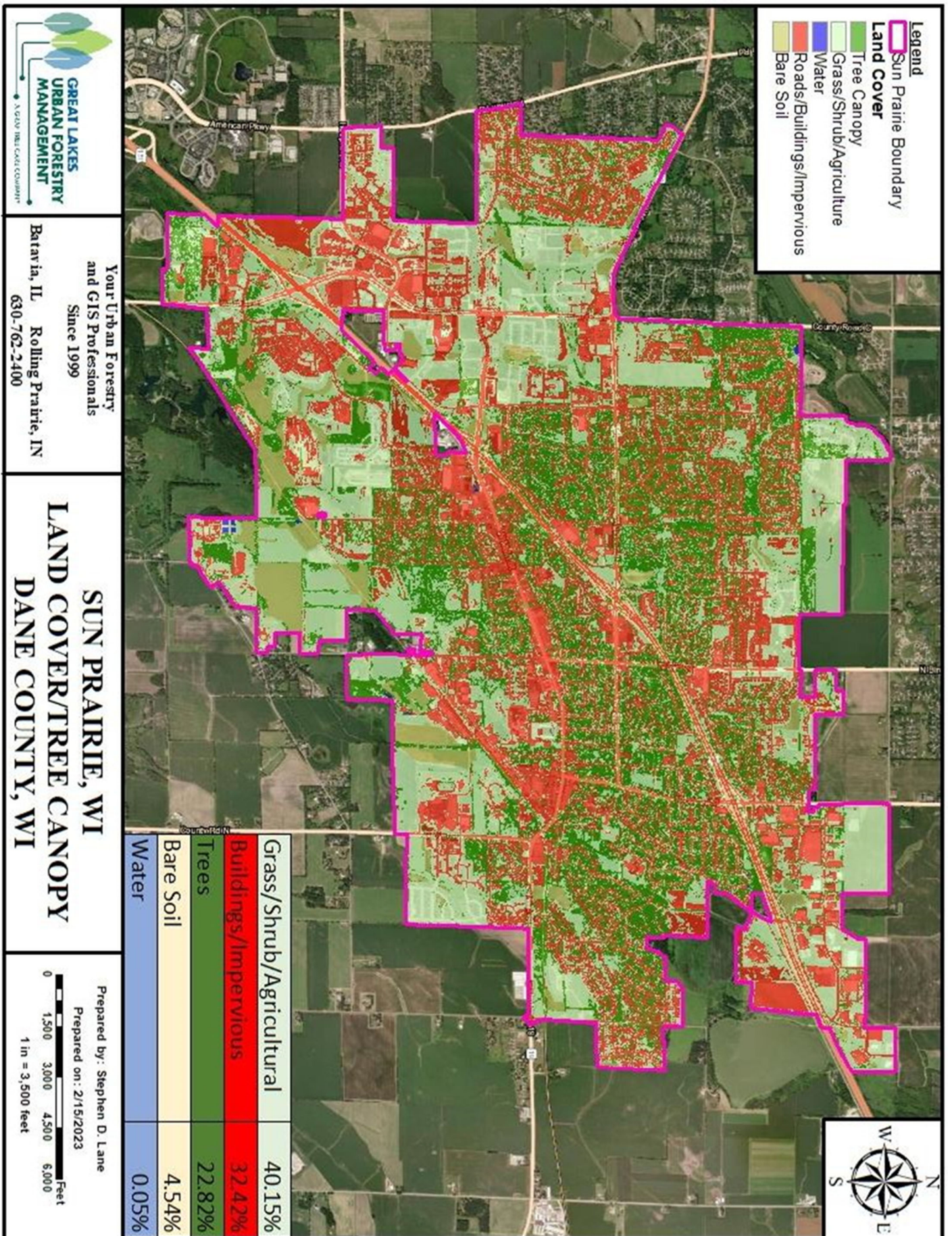
The city's tree inventory itself was only conducted on publicly owned land such as terraces, boulevards, parks etc. Detailed information on each tree is not included in the Urban Tree Canopy Assessment tables and maps in this sections, only total coverage. Aerial images were used to estimate how many tree and other land cover types were in the City using a software which is similar to Google Earth or Bing Maps, and no incursion onto private property was done to gather this data.

The goal is to increase the total tree canopy in Sun Prairie to 29% by 2044. We believe this is an attainable goal over this time. Canopy cover goal increases are a very complex topic, and highly dependent on a great number of variables such as age of source images or datasets, analysis methods, 2D or 3D data, sampling procedures, proprietary algorithms, and others. WDNR addresses this topic in [This Link](#). This goal can be monitored using aerial imagery analysis like the analysis presented by GLUFM using WDNR's data and 2D aerial analysis using image classification below. Every 10 years, the imagery would be assessed, and a new canopy cover percentage can be calculated for Sun Prairie.

Sun Prairie as a whole has an overall moderate amount of tree canopy, and it is fairly average compared to other similar suburban communities in Wisconsin. The goal set is a modest, but reasonable, increase, which will still yield beneficial results. If Sun Prairie attains this first goal easily, then more ambitious goals can be set based on past performance. The progress towards these goals can be measured directly by continuing to monitor the canopy cover. Wisconsin DNR says new analyses should be available every 3-7 years in the future, and the City staff have access to GIS tools and consultants who can also generate these benchmarks for them.

This will be accomplished through increasing the number of trees on the City's terraces as well as other City-managed properties. It should also be accomplished by maintaining the existing tree population in a proactive fashion, by enhancing the Urban Forestry program in Sun Prairie. This will ensure that existing trees will live longer as they are given appropriate care.

Tree planting and maintenance will also be encouraged on private property, by encouraging residents and business owners to plant trees through public-private partnerships. It is very important to note here that the most potential for new tree planting is in fact on private property, where Sun Prairie has no jurisdiction. But we are actively trying to encourage and incentivize tree planting on private property to make this increase in canopy cover in the coming years, as well as continuing to plant in our public terraces and open spaces. The City's forestry program should conduct education and outreach events such as Arbor Day and Earth Day celebrations.



Community Survey Results

Before we move on to exploring the future of the urban forest, and largely where the rest of this plan will guide Sun Prairie into the future, we wanted to take a moment to discuss the results of the community survey we released to the public in September of 2023. This is to ensure that we are considering the voices who took the time to respond to this survey. Just as with trees, diversity in human populations is something that is objectively good, and we want to create an inclusive plan where all voices can be heard. If you want to provide your opinions on the forestry program or our staff, please feel free to reach out to us at forestry@cityofsunprairie.com.

Questions

The following questions were asked during the survey:

Name/Address/Phone/Email	Are you aware Sun Prairie has a Forestry Department?
What are your 3 biggest concerns about trees in Sun Prairie?	What can we include in the UFMP to alleviate <u>your</u> concerns?
Do you support investing in trees and green infrastructure?	Would you be willing to attend meetings about our trees?
What day of the week could you meet?	What time of day works better (afternoons, evenings, etc.)?
<u>Would</u> you participate in local volunteer tree care groups?	Would you consider being on a Tree Advisory Committee?
What is level of care being provided for Trees (1-10)?	Explain answer to 1-10 rating?
What else can we be doing differently for our trees?	Additional Comments

Awareness of Forestry Program

Of those who responded, 93.8% were aware that there was a forestry department in Sun Prairie. Believe it or not, and while this may seem like a very simple question, in our opinion as consultants, this is actually a pretty high rate compared to what the response to this question is like in other communities. Awareness is a very important starting point, and the importance of this percentage can't be overstated.

Concerns	%
Tree Pest and Disease Issues	9.8%
Proper Care Being Provided	7.8%
Dead Trees Not Being Taken Down-Public	5.9%
Need More Trees	5.9%
Tree Diversity	5.9%
Proper Pruning	5.9%
Public Safety	5.9%
Too many trees being taken down	3.9%
Residents Removing Trees That Aren't Theirs	3.9%
Equitable distribution of canopy	3.9%
Climate Change	3.9%
Tree Preservation During Construction	3.9%
Using Native Trees	3.9%

3 Biggest Concerns

As can be seen from the table to the left, these are all the concerns that residents made us aware of during this process which had multiple responses. The table below represents all of the single comments. To respond briefly to these comments and concerns, we are glad that pest and disease issues are still top of mind for many folks. As Emerald Ash Borer is currently being managed in Sun Prairie, we understand that there is likely a lot of press around this issue right now, and so this largely makes sense.

Table 6 – Forestry Concerns

We have included a pest and disease management strategy in this plan to assist with managing potential future pest and disease outbreaks, and hopefully will have addressed this concern for the residents of Sun Prairie.

To lump a few responses together, the concerns about proper tree care, proper pruning, trees both being taken down and not taken down, we would direct you to the production goals below, where these topics are covered in extensive detail, and we believe we will have addressed this concern. That said for both of the above and future responses, if you feel your concerns were not captured in this UFMP, please contact us so we can speak with you and include your comments in the next edition when we do our first update.

Once again to lump a few responses together, the concerns about needing more trees, needing more diversity, equitable distribution of canopy cover, and using native trees, we discuss these topics extensively in the sections on tree planting, as well as the future of the urban forest below.

We also have a section devoted to nothing but addressing trees and construction, and a risk management section which addresses public safety, and truly this whole document exists in large part because of trying to maintain public safety. The remaining concerns are listed below, and were all single respondents:

Residents being under informed on forestry	Need Bigger Trees
Lack of funding in Forestry	Hiring Unqualified Firms for Tree Work
Trees Being Removed to Install Sidewalks	Not Treating <u>Saveable</u> Trees
Habitat Trees	Dead Trees not Being Taken <u>Down-Private</u>
Proper Disposal of Diseased Trees	Utility Clearance
Invasive Species	New Plantings Not Watered Enough
Wrong Species for Urban Location	Some Areas With No Trees
	Proper Planning

Table 7 – Additional Forestry Concerns

Without going into extensive narrative on each, we can assure you these concerns are addressed in this plan in some fashion or another, and cannot reiterate enough that if you do not feel your issue was given enough consideration in this document, we do want to hear from you and discuss how we can address your concerns in future drafts of this document, which is meant to be revisited and edited periodically.

There are many issues mentioned here which are in our top line concerns for Sun Prairie, notably increasing budgets, better informing residents and creating outreach and education, getting necessary pruning and removal work done, and making sure work is being done by qualified staff and personnel.

A hidden issue with coming out of the EAB “wave” is that residents and internal staff may consider expenditures on forestry activities as no longer necessary. Nothing could be further from the truth. Many times, during EAB, so many resources are directed at managing EAB, that many other tasks fall by the wayside, such as tree planting and maintenance of non-Ash trees. Making sure you maintain and grow your forestry budget after EAB is essential for the community to realize that forestry is an ongoing expense, not just an occasional natural disaster to fund.

What to Include in UFMP to Address Those Concerns

See Included In Plan?	%	See Included In Plan?	%
Increase Tree Diversity	10.3%	Don't Overbuild	2.6%
Public Education	7.7%	Clear Brush From Parks/Woods	2.6%
No Response	7.7%	Maintenance of Existing Trees	2.6%
More Native Trees and Shrubs	7.7%	Plant Trees Where There are None	2.6%
Plant More Trees	7.7%	Define Tree Owner Responsibilities	2.6%
Tree Inventory Maintenance	5.1%	Where Future Trees Will be Planted	2.6%
More Public Greenspace	5.1%	Trees as Carbon Offset	2.6%
Pest and Disease Issues	5.1%	Notify Residents of Tree Trimming	2.6%
Better Greenspace Reg'lts-Development	5.1%	Hire Permanent Arborist + Staff	2.6%
Expand Forestry Program	2.6%	Volunteer Program for Tree Care	2.6%
Science Based Planning	2.6%	Tree Removal Planning	2.6%
Remove Fewer Trees	2.6%	Tree Planting Plan	2.6%

Once again, we are impressed by the respondents here! The top line concerns from the public on what we should include in the plan are all addressed, and the items at the top of the list, as you will see in the next section, are focused on planting more trees, increasing diversity, planting native trees, and many of the other issues listed here.

Level of Care Provided by Sun Prairie to Its Trees

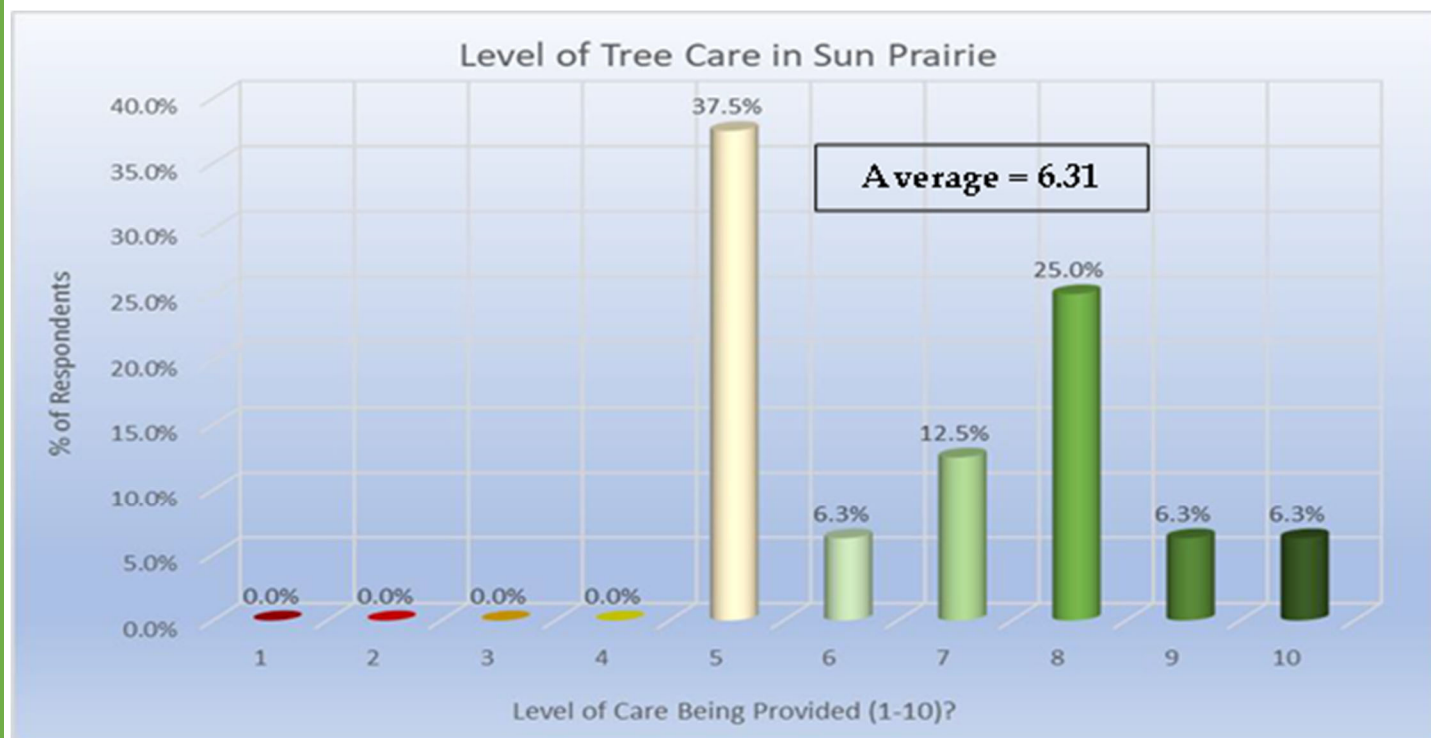


Exhibit 8 – Level of Care Provided

We should note here from having performed many surveys that the 1-10 rating system is sometimes confused with an academic grading system. "5" here is not the same as "50%" or "Failing Grade". A 5 here is "average", and therefore more like a "C" in academic terms, so these ratings are actually very good.

It is very important to note from the above chart that Sun Prairie gets fairly high marks when it comes to their forestry program. We would ideally like to convert those “5” responses to something higher as a result of this plan and may even consider adding a Key Performance Indicator to that effect in later versions of this document. But what is most important here is what is absent: There were no respondents, zero, who thought that the forestry program was below average. This is exceedingly rare and should not be overlooked. What is somewhat curious though is when we asked respondents to explain their rating. Here is what the responses were:

<u>Level of Care Explanation</u>	<u>%</u>
Seems Like Things Are Good	29.4%
No Response	23.5%
Good, but Needs More Funding/Resources	17.6%
Don't Like Tree Removals for Sidewalk Building	5.9%
Want Diseased Tree Removal on Private Property	5.9%
Increase Diversity of Trees	5.9%
Better Evaluation of Trees That Need Work	5.9%
Some Neighborhoods With No Trees	5.9%

Table 8 – Level of Care Explanation

So, it would appear that though there were a combined 52.9% of the respondents who did not care to support their rating or made some form of comment that it “seems like things are good”. Additionally, another 18% responded that issues with forestry were external, and that more resources were needed to improve service.

An additional 12% were focused on the need for more and more diverse trees, which is not necessarily indicative of a lack of performance per se. The only responses which were seemingly valid reasons for marking down the staff’s current rating were related to removal of trees to build sidewalks (a policy issue), needing better evaluation of trees before performing work (a resource issue), and wanting to include diseased tree removal on private property.

This UFMP, and many other documents like it, specifically stays away from any sort of regulation of private property trees, and the City involving itself with private trees. We as Great Lakes Urban Forestry will say this in no uncertain terms: The City of Sun Prairie does not have sufficient funding for its Forestry program to handle its currently publicly owned tree population. Attempting to extend their responsibilities to include private property trees is strongly not recommended in our opinion. Trees are considered an appurtenance to a property, and thus privately owned.

Investment in Green Infrastructure?

Overwhelmingly, the respondents were in favor (87.5%) of investment in Green Infrastructure. It should be noted here that there were no respondents who answered “no”, there were just 2 responses left blank.

The remainder of this plan is essentially in pursuit of meeting the community’s needs.

Benchmarking Survey Results

In addition to the Community and Staff surveys, a benchmarking survey was also prepared which will allow Sun Prairie to measure its success against other similar, and in some cases not so similar communities. These results are below.

Tree Inventory Analysis

Municipality	Inventory?	Type	Managed By	Notes	Terrace Trees	Planting Sites	Park Trees	Natural Areas	Other Trees
Sun Prairie	Yes	In House GIS System	In House Staff	ArcGIS Online Web Apps and Dashboards	8000	3500 (Est)	2058	N/A	650
Stevens Point	Yes	Non-Spatial/Spreadsheet	In House Staff	Moving from Access DB to Online GIS	10700	4000	3000	5000	2000
Franklin	Yes	In House GIS System	In House Staff	Inventory used for all maintenance tasks	10000	750	600	1000	0
McFarland	Yes	In House GIS System	Staff/Contractors	ESRI (ArcGIS) In House program	3500	600	300	5000	200

In terms of overall tree count, Sun Prairie has among the highest number of trees among the benchmarking communities, with only Stevens Point having a higher tree count. And in fact, Stevens Point lines up as a very good Benchmarking Community as a proxy for Sun Prairie. It also seems as though all of these communities are managing their tree data in approximately the same way, using an online GIS program.

The tree inventory is the data platform for the entire forestry program, and the importance of maintaining it at the highest level of accuracy practical is of utmost importance in the management of the Urban Forest and execution on this plan. To that end, we would suggest that Sun Prairie consider budgeting for annual inventory updates performed by a consultant. This will keep the data clean and accurate, and let the Forestry staff handle the day-to-day changes. Inventory updates are typically performed in the upcoming pruning zone in advance of its pruning. This can help to generate accurate diameter data on which Requests For Proposals can be built so that bid responses are being compared "apples to apples" and all vendors are bidding on the same set of tree diameters instead of relying on self-reporting.

Staff Assessment for Sun Prairie

	Has City Forester?	Forester % Time Forestry	Full Time Staff	LTE/Seasonal Staff	All Staff % Time Forestry	Onboarding Program?	Describe Onboarding	Time For Networking?
Sun Prairie	Yes	75-100%	1*	1	75-100%	No	None	Yes
Stevens Point	Yes	75-100%	3	6	50-75%	Yes	Packet and Training Videos	1-4 Hours/Month
Franklin	Yes	50-75%	2	0	25-50%	No	General Public Works Training	1-4 Hours/Month
McFarland	Yes	25-50%	2	1	25-50%	No	None	Nothing Consistent, by request

*Sun Prairie has access to additional FTEs; however, the capacity of other departments to assist with forestry tasks is very limited so it is most accurate to say Sun Prairie has one dedicated forestry FTE.

There has been a consistent theme throughout many of our meetings with the various departments and the surveys we have distributed, and those results show that Sun Prairie needs more devoted forestry staff. Stevens Point, probably the closest analogue to Sun Prairie in terms of tree count, has 3 full time staff and 6 Limited Time staff for approximately the same number of trees that Sun Prairie has.

With one of the country's most prestigious Urban Forestry academic institutions in town, we understand that maybe this is more than what is necessary to perform minimum tasks. However, even in much smaller communities there are 2 full time staff and at least 1 seasonal. Objectively speaking, with the number of trees Sun Prairie has, compared to other surrounding communities, the forestry program is understaffed at the moment, and this should be a top priority going forward.

Use of Volunteers

Community	Do You or Would Use Volunteers?	Describe
Sun Prairie	We have not in the past but are interested going forward	
Stevens Point	Yes, and we will continue to do so	Volunteers come and go, need consistency
Franklin	We have not in the past but are interested going forward	Had some in past, but needs better coordination
McFarland	We have not in the past but are interested going forward	Volunteers are hard to depend on

The region shows a strong will to have a volunteer program, but many communities in the Benchmarking survey have not initiated these programs yet, or if they did, they found them to be too much work to maintain. The use of volunteers for basic urban forestry work, and to build a sense of community, is becoming a very important concept in urban forestry today.

Volunteer labor can be a tricky proposition. On one hand, we have set goals in this plan which may require more manpower to accomplish than current staff salaries and time allow for, and therefore we need the community to pitch in as well. It is also looked on favorably by granting agencies to use some volunteer labor, which will help procure future grants. This also builds buy-in among the community and builds positive connections with staff and may even turn into a pipeline for LTE of FTE employees. On the other hand, staff can perceive volunteers as competition, and managers who do not understand the significant difference in skill levels between professionals and volunteers may incorrectly assume that volunteers can do the same things staff can and cut back on budgetary allocations to forestry. The crucial element in using volunteers is clearly defining what they are capable of and expected to do, and what they are not capable of and should not do, and building systems that assist them in completing tasks with minimal supervision.

Production Numbers for Urban Forestry Program

Community	Trees Pruned/Year	Trees Removed/Year	Trees Planted/Year	Inventory Updates/Year	Trees Watered/Year	PHC Applications/Year
Sun Prairie	600	100	400	New Inventory, N/A	N/A	250
Stevens Point	1500	100	325	325	700	300
Franklin	1700	100	175	1500	175	N/A
McFarland	500	30	70	Semiannual Updates	N/A	N/A

The above shows the reported production numbers from the benchmarking communities. There are areas where Sun Prairie excels, such as in tree planted per year in response to EAB and new construction. There are areas where Sun Prairie is keeping up with surrounding communities, such as the number of trees removed every year and PHC applications. However, when it comes to the notion of cycle pruning, Sun Prairie is well behind other communities, and this has everything to do with the available manpower and equipment being lower than surrounding communities, and again, this is just an objective statement of fact. And Sun Prairie has not even begun to update its inventory yet, this is yet another expense and time commitment which Sun Prairie does not have enough support for at this time.

Risk Management Planning

<u>Community</u>	<u>Risk Management Policy?</u>	<u>Risk Management Process?</u>
Sun Prairie	In Progress	Not finalized
Stevens Point	Yes	Simple inspections by staff
Franklin	In Progress	Certified Arborist inspects
McFarland	In Progress	Not finalized

Since there are currently few Risk Management plans active in the selected benchmarking communities, we see a potential opportunity here to create a regional toolkit for Dane County's communities to develop Risk Management plans around. Every community's plan will necessarily need to be different, but a set of common terms and language that all plans can reference as a local standard would be helpful in establishing a regional understanding of Tree Risk and resources and conditions unique to Dane County.

Do You Currently or Would You Potentially Participate in an Urban Wood Utilization Program?

<u>Community</u>	<u>Do You Participate in Urban Wood Utilization?</u>
Sun Prairie	Not yet, but we are making it a goal to do so
Stevens Point	Nothing formal, but always trying. No tree waste goes to landfill.
Franklin	Use for firewood, have tried upcycling before, tough to get started.
McFarland	Donate saw logs to local High School, they mill for program.

These results show much potential in the area, with several trial programs having been performed, and several ongoing but fairly loose programs with getting wood to high school or performing ad hoc projects. But this is actually much more than many communities are doing! We would suggest that Sun Prairie step into a role as a leader in the region by formalizing an Urban Wood program. This is exactly what we have done in the context of the UFMP by creating a KPI showing the Sun Prairie will begin to generate and sell some urban wood products. If successful, meetings with these other communities could happen so that a regional Urban Wood network could begin to take hold. Southern Wisconsin has many more resources available to it in terms of portable and brick and mortar sawmills, and this seems to be the bottleneck in most urban wood operations.

Equipment Matrix

	<u>Sun Prairie</u>	<u>Shared?</u>	<u>Stevens Point</u>	<u>Shared?</u>	<u>Franklin</u>	<u>Shared?</u>	<u>McFarland</u>	<u>Shared?</u>
Climbing Saws	2	Y	3	Y	3	Y	2	N
Large Saws	6	Y	6	Y	5	Y	6	N
Pole Pruners/Power Poles	4	N/A	5	Y	3	Y	2	N
Small Chippers (12" or Less)	0	N/A	0	N/A	0	N/A	0	N/A
Large Chippers (Over 12")	2	Y	1	Y	3	Y	1	N
Stump Grinders	1	Y	0	N/A	1	N/A	1	N
Small Bucket Trucks (<25')	0	N/A	0	N/A	2	Y	0	N/A
Large Bucket Trucks (>25')	1	Y	1	Y	1	N/A	1	N
Other Trucks	2	Y	5		N/A		0	
Chip Box Trucks	2	Y	1	Y	1	N/A	1	N
Skid Steers/Bobcats	1	Y	1	Y	3	N/A	1	N
Water Tanks	2	Y	3	Y	2	N/A	1	N
Loaders	4	Y	0	N/A	2	N/A	1	N
Air Spades	0	N/A	1	N	0	N/A	0	N/A
Tub Grinders	0	N/A	1	Y	Rented	Y	0	N/A

What the above chart shows, at least from a basic analysis, is that Sun Prairie is mostly keeping pace in terms of equipment with its surrounding communities. There are a few things worthy of note here though. First, while most communities do in fact share their equipment (not uncommon in municipal government), there is 1 community which does not, and that is McFarland. McFarland's Urban Forestry operation, according to their City Forester, has their own unique set of issues they need to resolve, but equipment is not one of those.

We have explored fairly extensively that Sun Prairie has the need for additional equipment in the form of a chipper, an additional bucket truck, and a multitool skid steer to be more efficient and get more work done to service residents more effectively. While it would appear from the above that Stevens Point handles their workload with approximately the same equipment that Sun Prairie has, we do need to recall from the staff chart that Stevens Point has 3 FTEs and 6 LTEs vs Sun Prairie's 1 FTE and 2 LTEs. On paper, that puts their manpower at 3x Sun Prairie's.

We do need to remember at the end of the day that tools are just that: a tool. They still need to be operated by a human being, and the issue in Sun Prairie is that there are not enough humans capable of handling those tools appropriately.

What we might suggest here is that Sun Prairie start by hiring 1 more FTE for the Forestry department, get some dedicated equipment or streamline the equipment sharing process, and see if some of the pinch points in the process are alleviated. Below is a rough guide for when some of these investments in equipment and manpower can be scheduled for.

<u>Year</u>	<u>Investment</u>	<u>Cost</u>
2024	Additional Forestry FTE (Certified Arborist)*	\$80,000/yr. (includes benefits)
2025	2 LTE's	\$40,000
2026	Larger Bucket Truck	\$75,000
2027	Additional Forestry FTE	\$100,000/yr. (includes benefits)
2028	Additional Chipper Truck	\$50,000

Table 9 – Additional Equipment Horizon

The Future of the Urban Forest

In this section, a vision of what the tree population of Sun Prairie could become by 2044 was created and compared with the current population. Using the existing data, and the diversity vision, we will then define exactly how Sun Prairie can move from where it is now to where it could be.

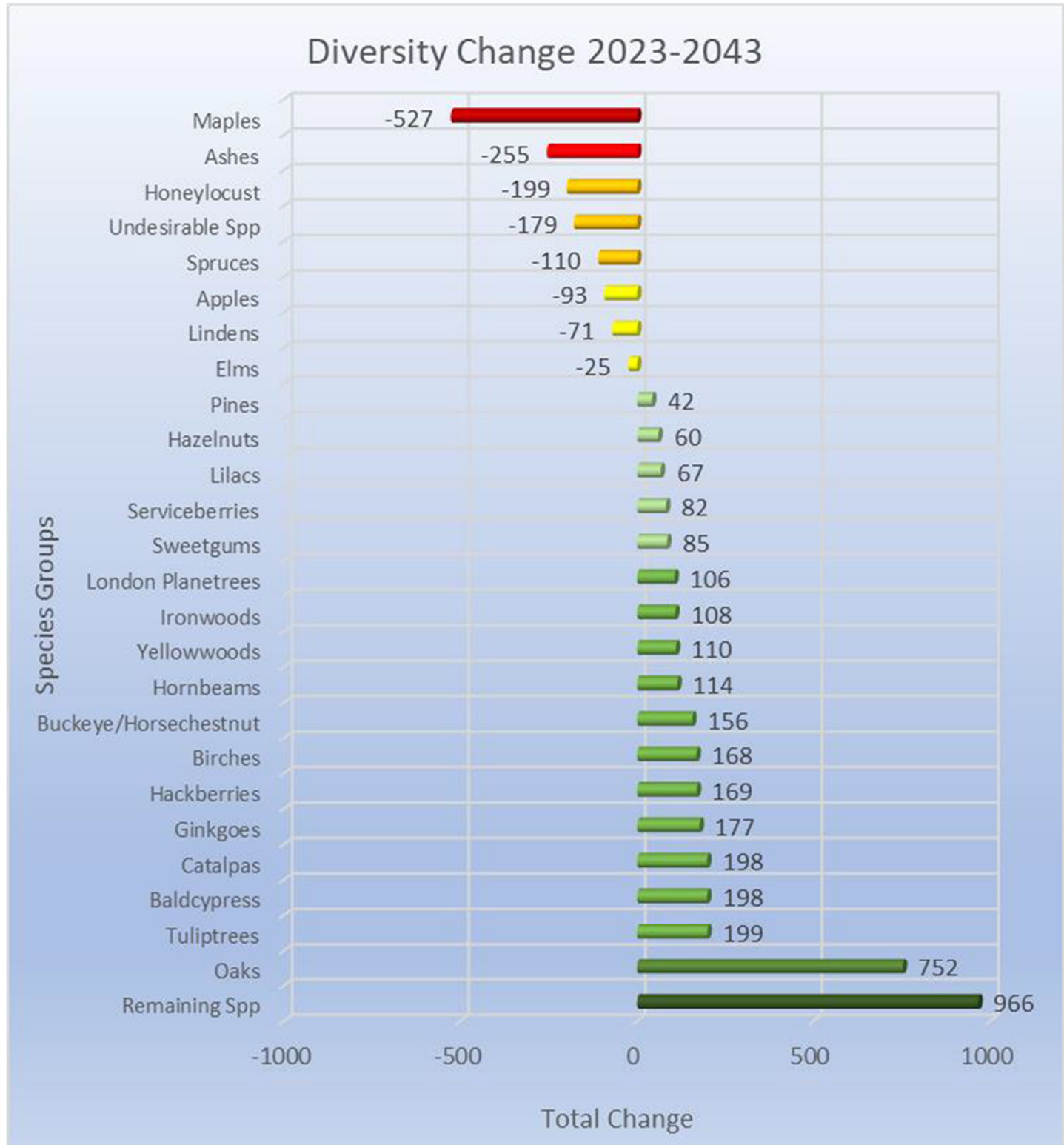
Change in Species Composition: Terrace and City Park Tree Population

The full calculations for this change in diversity were performed by hand, not using automated software. Local knowledge of the trees, their conditions, what is growing well and what isn't were all used and yielded this very customized urban forest species composition change list unique to the City of Sun Prairie. These species count goals are meant as general recommendations and guideposts, and not absolutes. Be aware that this Plan, and the species composition goals, are meant to be adaptively managed over time as new information becomes available.

SPECIES	COUNT 2023	COUNT 2043	SPECIES	COUNT 2023	COUNT 2043	SPECIES	COUNT 2023	COUNT 2043
MAPLE-NORWAY	1151	850	UNKNOWN	40	0	LARCH	3	40
MAPLE-SILVER	1013	600	MAPLE-SPP	39	80	BALDYPRESS	2	200
HONEYLOCUST	999	800	OAK-BURR	37	150	CATALPA	2	200
LINDEN-AMERICAN	969	750	DAWN REDWOOD	32	50	LILAC-SPP	2	0
ELM-HYBRID	757	750	BIRCH-WHITE	31	50	MOUNTAIN ASH-EUROPEAN	2	20
APPLE-CRAB SPP	462	350	EASTERN REDCEDAR	30	75	OAK-PIN NORTHERN	2	20
SPRUCE-BLUE	413	300	HICKORY-SHAGBARK	30	75	OAK-REGAL PRINCE	2	40
ASH-WHITE	375	225	MAPLE-MIYABEI	30	50	YEW-SPP	2	0
HACKBERRY	331	500	HAZELNUT-TURKISH	29	50	ALDER-SPP	1	100
MAPLE-RED	258	300	ELM-AMERICAN	28	10	APPLE-EDIBLE	1	20
ASH-GREEN	249	150	CHERRY-BLACK	24	5	ASPEN-QUAKING	1	30
OAK-SWAMP WHITE	249	350	BIRCH-RIVER	23	100	DOUGLAS FIR	1	40
SPRUCE-WHITE	232	175	HAWTHORN-SPP	20	60	HORSECHESTNUT	1	50
KENTUCKY COFFEETREE	225	400	BLACK LOCUST	19	60	MAGNOLIA-CUCUMBER	1	10
GINKGO	223	400	HORNBEAM-AMERICAN	18	100	PLUM-AMERICAN	1	10
LILAC-JAPANESE	221	250	PINE-RED	17	30	VIBURNUM-SPP	1	0
OAK-RED	193	300	MULBERRY-SPP	12	0	AMUR MAACKIA	0	20
PEAR-CALLERY	189	25	AMUR CORKTREE	11	10	BEECH-AMERICAN	0	20
AMERICAN HORNBEAM	148	200	ASH-SPP	11	5	BEECH-EUROPEAN	0	30
YELLOWWOOD	140	250	SPRUCE-BLACK	10	30	BUCKEYE-RED	0	30
WALNUT-BLACK	122	75	SPRUCE-SPP	10	30	BUCKEYE-YELLOW	0	30
SERVICEBERRY-SPP	118	200	OAK-CHINQUAPIN	9	100	DOGWOOD-CORNELIAN	0	30
LINDEN-LITTLELEAF	102	200	OAK-SPP	9	50	DOGWOOD-KOUSA	0	20
PINE-WHITE	99	100	MOUNTAIN ASH-SPP	7	20	DOGWOOD-PAGODA	0	10
LONDON PLANETREE	94	200	OAK-PIN	7	50	FIR-CONCOLOR	0	30
IRONWOOD	92	200	WILLOW-SPP	7	0	JAPANESE SCHOLARTREE	0	20
BUCKEYE-OHIO	78	125	DOGWOOD-SPP	5	15	KATSURA TREE	0	30
PINE-SPP	72	100	OAK-HILLS	5	50	LILAC-PEKING	0	40
MAPLE-SUGAR	70	110	ASPEN-SPP	4	15	LINDEN-SILVER	0	50
ARBOR VITAE	69	100	BIRCH-PAPER	4	40	MAGNOLIA-SAUCER	0	20
SWEETGUM	65	150	BIRCH-YELLOW	4	40	MAGNOLIA-STAR	0	20
COTTONWOOD	62	20	BLACKGUM	4	100	MAPLE-PAPERBARK	0	30
HAZELNUT-TREE	61	100	MAPLE-AMUR	4	15	OAK-SHINGLE	0	50
BOXELDER	56	5	POPLAR-WHITE	4	0	PERSIMMON	0	30
TULIPTREE	51	250	WILLOW-WEeping	4	0	SMOKETREE	0	20
OAK-WHITE	45	150	AMERICAN REDBUD	3	50	WITCH HAZEL-COMMON	0	40
SPRUCE-NORWAY	40	60	BEECH-SPP	3	5	ZELKOVA	0	30

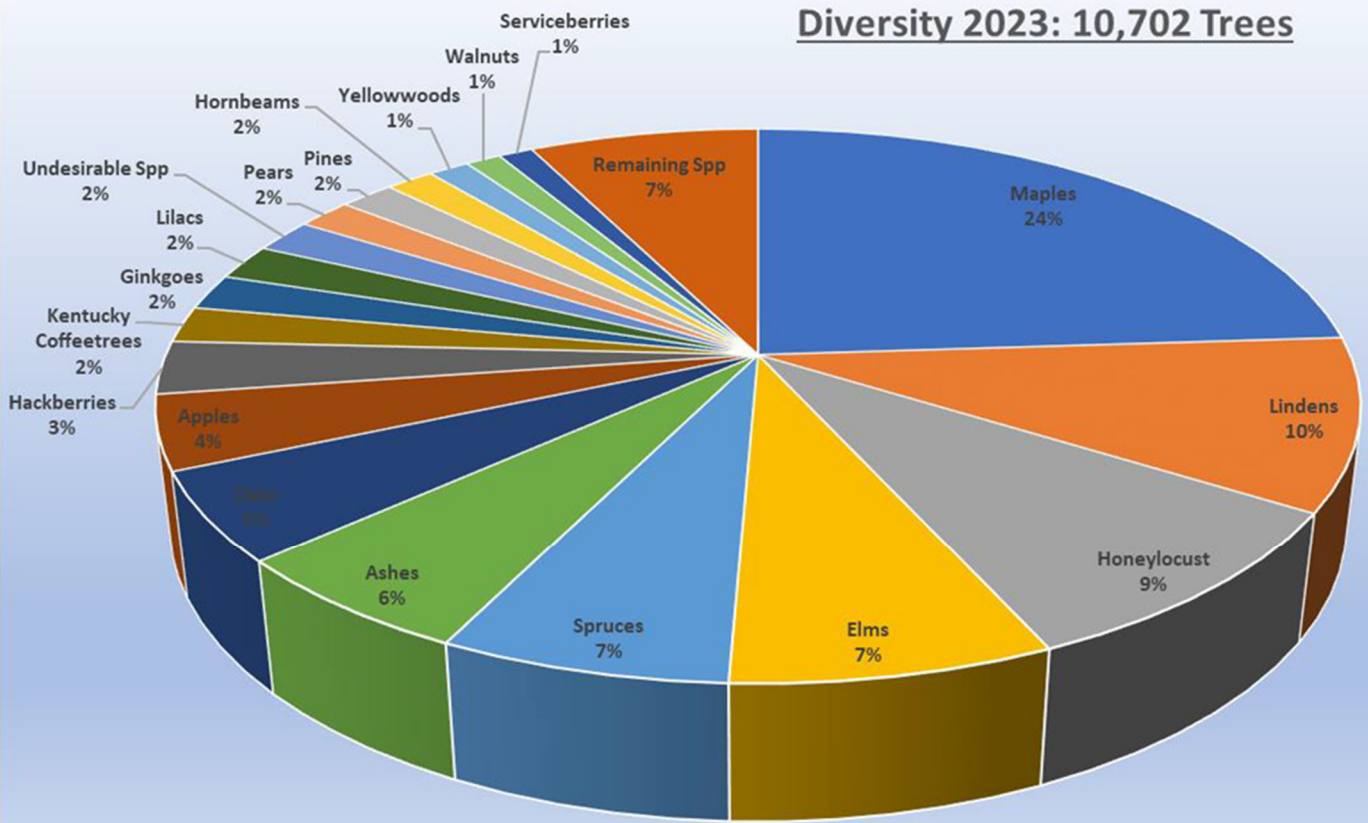
Table 10 – Change in Diversity Table

	Plant in Abundance
	Plant in Limited Quantities
	Maintain Existing Population
	Reduce Population Size

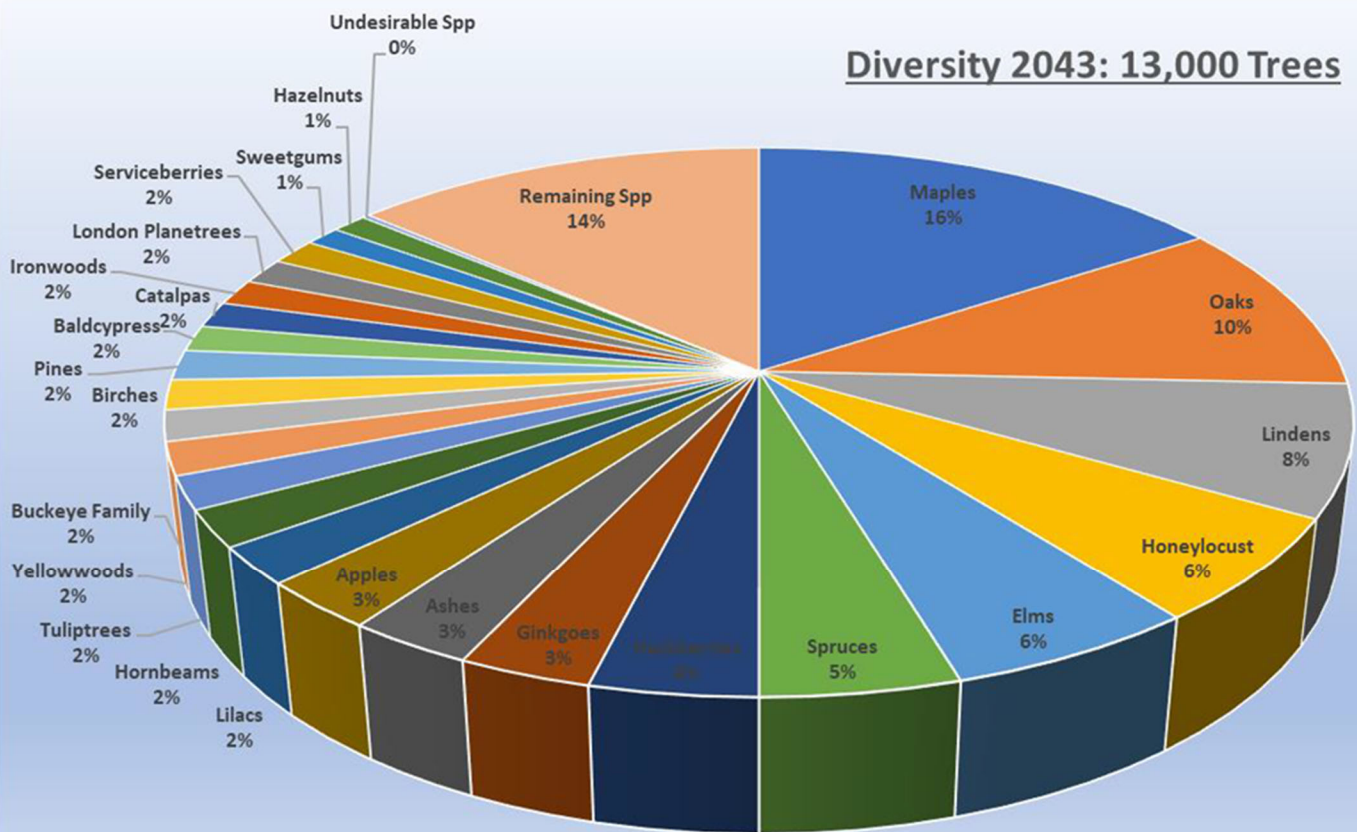
Change in Species Composition*Exhibit 9 – Gain / Loss of Genera*

This chart shows either the reduction (red, orange and yellow) or increase (green shades, darker = more) in genera of trees. So for instance, between 2023 and 2043, Maples will decrease by 527 trees, while Oaks will increase by 752 trees.

Diversity 2023: 10,702 Trees



Diversity 2043: 13,000 Trees



As can be seen from the above several pages of charts showing the change in species composition over the next 20 years, the City should move away from planting the overrepresented or undesirable species discussed above, and a variety of different species, those which are underrepresented or not present in the tree population, should be planted instead. This will lead to an overall increase from 10,702 to 13,000⁵ trees total on the City's terraces and other public spaces as well as a change from the current total of 92 species to a total of 103 species. This will result in a more robust and resilient Urban Forest which is more resistant to pest and pathogen outbreaks.

After the city is able to conduct a full accounting of all available planting sites on its terraces (planned 2024) and continues to grow in size and gain more ROW and park land in the coming years, the number of open sites will change with time, and that 13,000 number can and very likely will change as growth continues. Once again, adaptive management is the important concept here, not the exact figure of 13,000 trees. This is just a projection for now based on current conditions and understanding.

The Benefits of Larger, Healthier Trees

Larger trees provide greater benefits to the community: They create more shade to offset cooling costs, absorb more storm water, create greater buffers against cool winter winds for heating costs, and absorb and sequester more carbon than smaller trees do.

For the 2044 vision of the tree population, a variety of methods were used to arrive at a reasonable age-class distribution. We used the current population structure, and anticipated high rates of survival based on planting practices which would involve qualified forestry staff guiding a city-wide "right tree/right site" approach. The intention of this approach is to evaluate each planting site for above ground growing space, available growing space for roots, amount of sunlight or shade, soil moisture, nutrient and/or salt loading, and recommended tree form and then match the tolerances and requirements of the species to be planted to the site.

This approach can help the City protect its investment in each planted tree. This plan also aims to increase survivorship of existing trees due to better management and care practices. Predicted growth, survivorship, and eventual tree losses are based on current species composition and future plantings and removals. This allowed the creation of a vision of what the tree population, including species and size, will look like 20 years from now.

As mentioned several times previously, the City is currently considering a long term planting plan which will create a "right tree for the right site" approach to tree planting, and plan specific location where specific tree species will be planted at specific times in order to boost all 3 levels of the triple bottom line diversity: Taxonomic, Spatial, and Age Class.

⁵ Sun Prairie's estimated tree goal is dependent on identifying the number of open planting sites throughout the City. A goal of 13,000 total public trees by 2044 is based on an estimated 3,500 planting sites. New growth in the City may also provide new planting sites

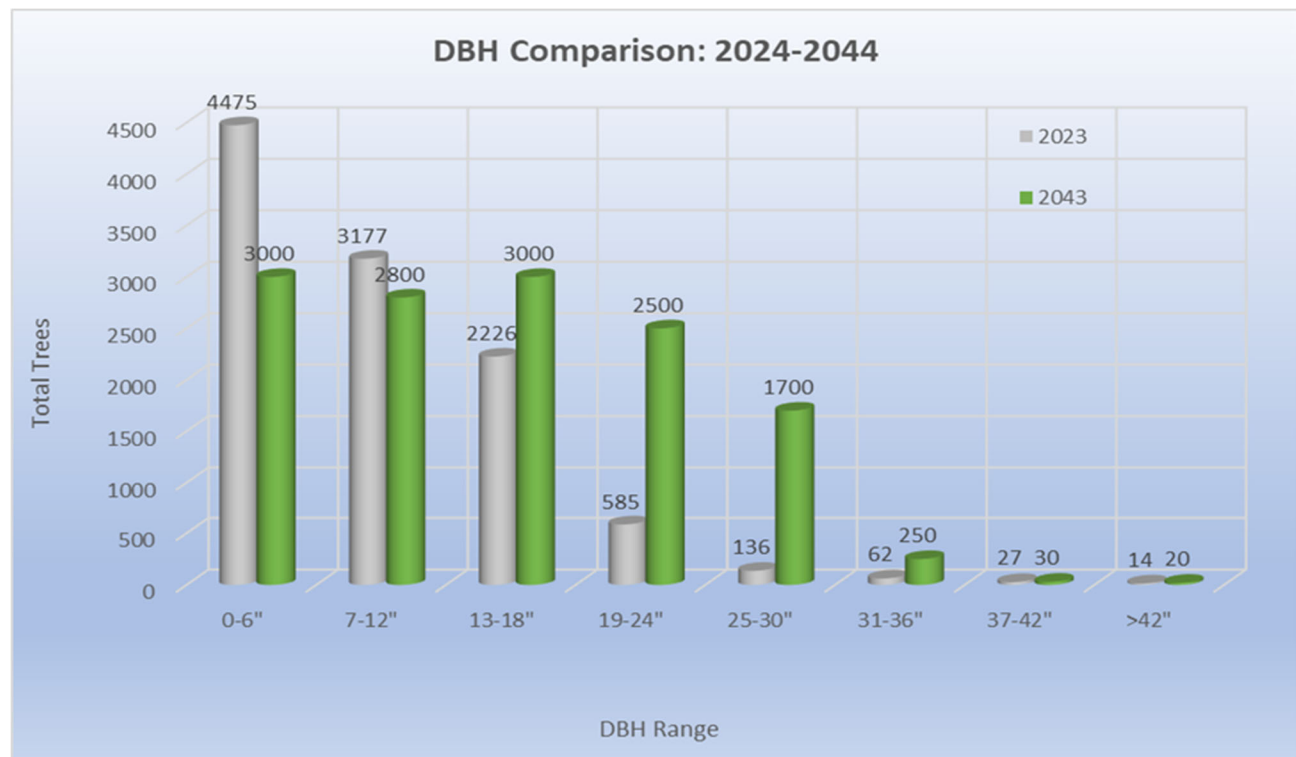


Exhibit 10 – Current and Future DBH Comparison

It can be seen from the above chart that the existing tree population (grey bars) shows a predominantly younger tree population with gradual decreases in numbers of trees through the 13- 18" category and a steep drop in numbers in the larger age class categories. The projected age class chart shows a steady increase in the larger age class categories over the course of this Plan, and also projects more trees surviving into the older age classes, where they will provide greater benefits in terms of ecological services to the community. The table on the following page also shows this data.

This was based on the fact that maintaining and even enhancing the levels of care for existing and newly planted trees would enable them to survive longer. One main enhancement would be the establishment of a cycle pruning program which will be discussed in more detail in the Tree Pruning section of this plan. The graph and table show a general expectation of how the changes in tree diameters might change over the next 20 years based on the recommendations discussed throughout this Urban Forestry Management Plan, such as proper planting practices, cycle & structural pruning, prioritized removals, and other maintenance.

For projections of future age classes of trees on the following page, a ½" per year growth rate was roughly estimated by assuming that it would take an average tree 10 years to go from one age class to the next (6" = appx 10 years growth). Also used were the number of trees to be planted and removed annually, as calculated below in the Tree Planting and Tree Removal sections. These numbers were arrived at based on all the above, as well as the best professional opinion of Great Lakes Urban Forestry Management. As time goes by, these projections could change. These are rough estimates for the purposes of this Plan.

Table 11 – DBH Change Over Time

	2023	2033	2043
0-6"	4475 (41.8%)	3000 (25.5%)	3000 (22.6%)
7-12"	3177 (29.7%)	3600 (30.6%)	2800 (21.6%)
13-18"	2226 (20.8%)	2750 (23.4%)	3000 (22.6%)
19-24"	585 (5.5%)	1900 (16.1%)	2500 (18.8%)
25-30"	136 (1.3%)	425 (3.6%)	1700 (12.8%)
31-36"	62 (0.6%)	50 (0.4%)	250 (1.9%)
37-42"	27 (0.3%)	40 (0.3%)	30 (0.2%)
>42"	14 (0.1%)	10 (0.1%)	20 (0.2%)

Please note in the table below, each color allows you to track a “cohort” of trees. So starting in 2024, the trees in the light blue 7-12” class go to the 13-18” class by 2034, and the 19-24” class by 2044. The numbers themselves were projected by hand, based on our prior experience, and the methods detailed below. If these projections are held, Sun Prairie could see a \$23,337 or 25% increase in annual benefits up from their current level of \$93,350/year to \$116,687/year. Standing

values of the tree population could increase \$3,048,600 or 30% from their current level of \$10,162,000 to approximately \$13,210,600.

The overall increase in size of the tree population and diameters of the individual trees will yield a much greater dollar figure when it comes to the ecological services provided and provide residents with a greater sense of being in an arboretum-like setting when they are enjoying the urban forest.

Return on Investment

Return On Investment (ROI) for an individual tree is strongly favorable over the life of a tree in terms of investment in planting, care, and removal versus the ecological benefits the tree provides. As we strive to justify the expenditure on trees and tree care, it is important that organizations and their staff are aware of this.

On the following page, we have provided an ROI calculation sheet. This sheet breaks the tree’s lifetime down into three phases, based on the anticipated costs of pruning in the budgets sections below. These phases are the young (3-12” DBH), mature (13-24” DBH), and full grown (25-36”) ranges shown below.

Data was taken from the i-Tree algorithm and applied towards the average benefits provided by a tree at each of these life stages, and multiplies it out over the 20 year period each phase accounts for. We also looked at costs for planting, watering, routine maintenance, emergency maintenance/storm damage, and eventual removal of that tree over 60 years. The results are pictured below.

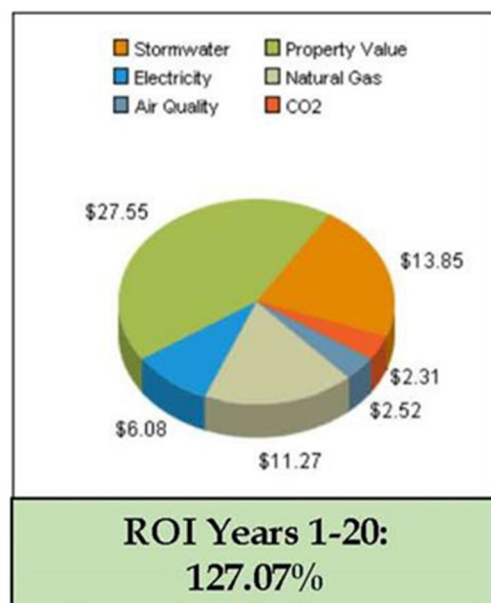
Please note that years 1-20 are also listed as 3-12” in diameter, because on average a tree grows around a half inch every year, as noted previously. Since trees do not broadcast their age accurately all the time (cottonwoods (e.g.) can be large and young while oaks can be smaller and much older), we have supplied the age of the tree as both formats. Diameter, and translation to predicted age.

Also please note, these are calculations for a generic and random tree, and are not tied back to a specific species or genera, these are meant to be average figured for a tree selected at random from a population.

Return on Investment: Years 1-20 (3-12" Diameter)**Costs**

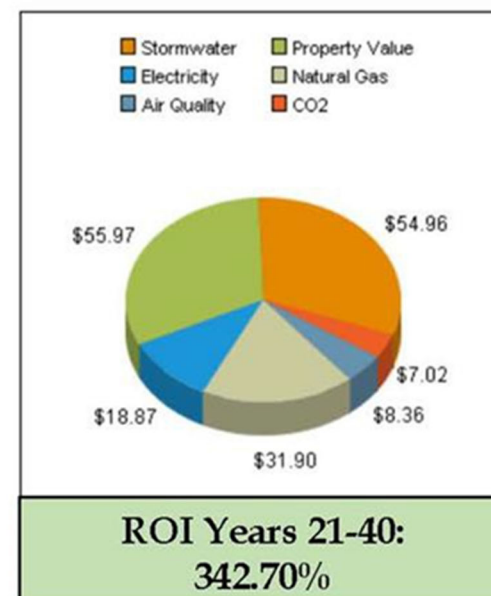
Initial Purchase and Installation	\$300.00
Watering for 2 Years	\$100.00
Pruning - 4x @ \$40/prune	\$160.00
TOTAL INVESTMENT	\$560.00

Benefits	Avg/Year	Over 20 Years
Electricity	\$6.08	\$121.60
Natural Gas	\$11.27	\$225.40
Property Value	\$27.55	\$551.00
Stormwater	\$13.85	\$277.00
Air Quality	\$2.52	\$50.40
CO2 Reduction	\$2.31	\$46.20
TOTAL RETURN		\$1,271.60

**Return on Investment: Years 21-40 (13-24" Diameter)****Costs**

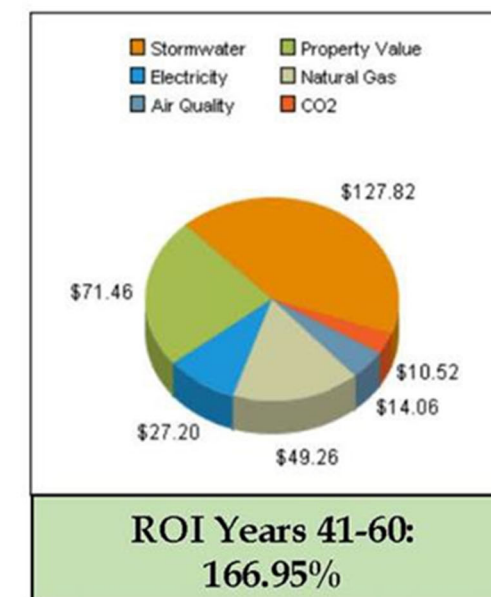
Pruning - 4x @ \$75/prune	\$300.00
Emergency Maintenance (2x)	\$500.00
TOTAL INVESTMENT	\$800.00

Benefits	Avg/Year	Over 20 Years
Electricity	\$18.87	\$377.40
Natural Gas	\$31.90	\$638.00
Property Value	\$55.97	\$1,119.40
Stormwater	\$54.96	\$1,099.20
Air Quality	\$8.36	\$167.20
CO2 Reduction	\$7.02	\$140.40
TOTAL RETURN		\$3,541.60

**Return on Investment: Years 41-60 (25-36" Diameter)****Costs**

Pruning - 4x @ \$150/prune	\$600.00
Emergency Maintenance (2x)	\$650.00
Eventual Cost of Removal	\$1,000.00
TOTAL INVESTMENT	\$2,250.00

Benefits	Avg/Year	Over 20 Years
Electricity	\$27.20	\$544.00
Natural Gas	\$49.26	\$985.20
Property Value	\$71.46	\$1,429.20
Stormwater	\$127.82	\$2,556.40
Air Quality	\$14.06	\$281.20
CO2 Reduction	\$10.52	\$210.40
TOTAL RETURN		\$6,006.40



Trees and Climate Change

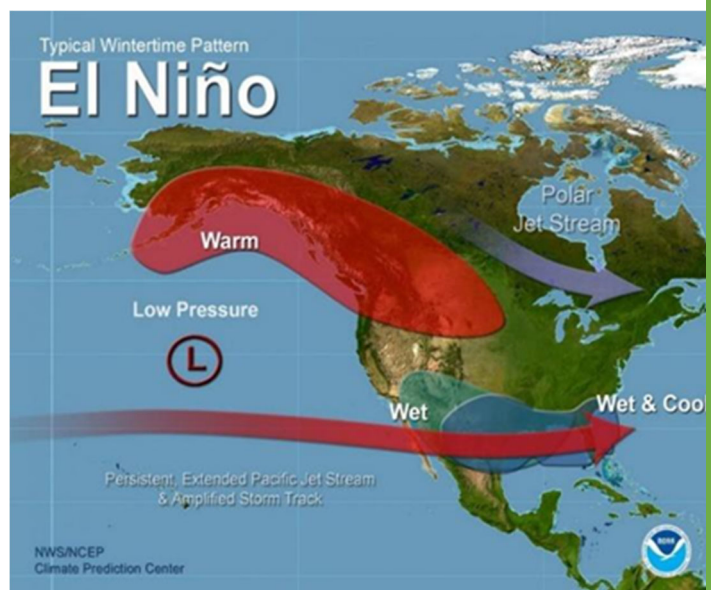
According to the United States Environmental Protection Agency, National Oceanic and Atmospheric Administration, Wisconsin Department of Natural Resources, and a variety of other national and international reputable scientific and humanities-oriented sources, climate change will cause significant suffering over the coming hundreds to thousands of years. Increases in carbon dioxide, methane, and other greenhouse gases in the atmosphere trap heat from the sun and will create a generally warming climate. Though it should be said that “climate change” means more than just warming trends, and solving climate change will take much more than the efforts considered here.

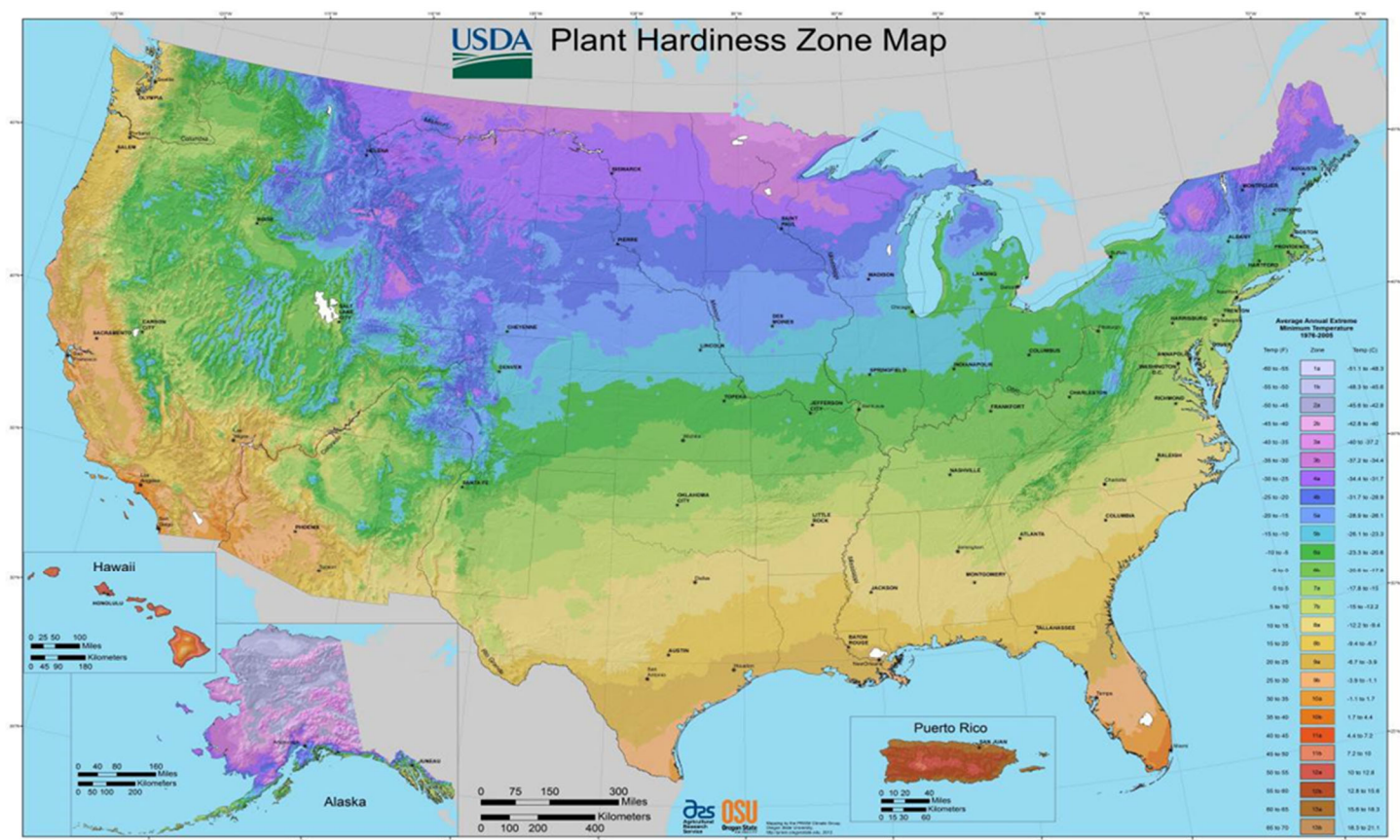
First, let's define a few terms: **Climate Change** is change in the climate, both human-induced as well as naturally occurring, that disrupts what we perceive to be the normal operation of climate. It should be noted here that “climate” is different from “weather”. Weather is the day-to-day meteorology such as rain on Tuesday and sunny on Wednesday. Climate is what the long-term averages are for an area, such as average June temperatures in the mid 70's with 2-3 inches of rain.

The term **Global Warming** has been misapplied many times when speaking about climate change. Yes, increases in carbon dioxide emissions lead in general to a warmer climate, which comes with very specific problems. But the climate change we are seeing currently is one of extremes: higher highs, lower lows, more severe storms, etc. The important part is that during this process of change, year to year weather becomes more unpredictable as the climate changes to generally a warmer one.

All of the organizations involved with changing climate and the carbon dioxide inputs that drive it have the same message: planting more trees, particularly in areas predisposed to changes in climate, will aid in pulling CO2 from the atmosphere and reducing the impact of climate change. So the number of trees we are planting is important, both on public as well as private land. But the types of trees we are planting matters as well. The US Forest Service is already starting programs of planting climate sensitive tree species outside of their historic natural ranges in anticipation of an overall warmer climate

(<https://www.fs.usda.gov/ccrc/story/helping-forests-keep-pace-climate-change>).





When it comes to tree planting in anticipation of climate change for urban environments in our area, we need to be careful, however. While the general trend is towards warming, the “extremes” side of this makes for a difficult decision.

While summers may be warmer and support trees which are adapted to warmer conditions overall, our winters will still reach down into the -30° F and even colder range for extended periods. And cold weather is the limiting factor for what can be planted in an area. See the USDA Hardiness Zone map above for a more detailed explanation. It shows the **coldest** temperatures which can be expected in an area, not the **warmest** ones. So, before we start planting trees in south central Wisconsin that are more native to more southern states, we must understand that we need to plan for the coldest temperature, not the warmest.

Please note, as temperatures warm, some tree species in Wisconsin will retreat north over the years as they seek a cooler climate. This precession of species to track their ideal climate over long time periods of climate change is well documented. Some more northern tree species, like Sugar Maple (the state tree of Wisconsin which many in the state rely on economically for maple syrup production), will have an especially difficult time keeping up with the pace of climate change vs natural cycles which plants normally respond to over long time periods. Therefore, it is possible that tree species that are currently considered common throughout southern Wisconsin may not be as common in the not-so-distant future. The Wisconsin DNR has more information on how climate change could affect urban trees in Wisconsin ([this link](#)).

All of that said, we should start planting trees now, at least on a somewhat experimental basis that will be more tolerant of a warmer climate. Below are some suggestions of trees which the City could plant which are just outside of our climate region, and may be successful over the coming 30 years or so, depending how effective we are at combatting climate change using other methods:

Southern Catalpa (<i>Catalpa bignonioides</i>)	Southern Hackberry (<i>Celtis laevigata</i>)	Swamp Chestnut Oak (<i>Quercus michauxii</i>)	Cherrybark Oak (<i>Quercus pagoda</i>)
Water Hickory (<i>Carya aquatica</i>)	Pecan Hickory (<i>Carya illinoensis</i>)	Sourwood (<i>Oxydendrum arborea</i>)	Mimosa Tree (<i>Albizia julibrissin</i>)
Carolina Silverbell (<i>Halesia Carolina</i>)	Crape Myrtle spp (<i>Lagerstroemia spp</i>)	Flowering Dogwood (<i>Cornus florida</i>)	Sweetbay Magnolia (<i>Magnolia virginiana</i>)
Southern Magnolia (<i>Magnolia grandiflora</i>)	American Holly (<i>Ilex opaca</i>)	Oklahoma Redbud (<i>Cercis reniformis</i>)	Ornamental Cherries (<i>Prunus spp</i>)

Table 12 – Potential Species for Climate Change

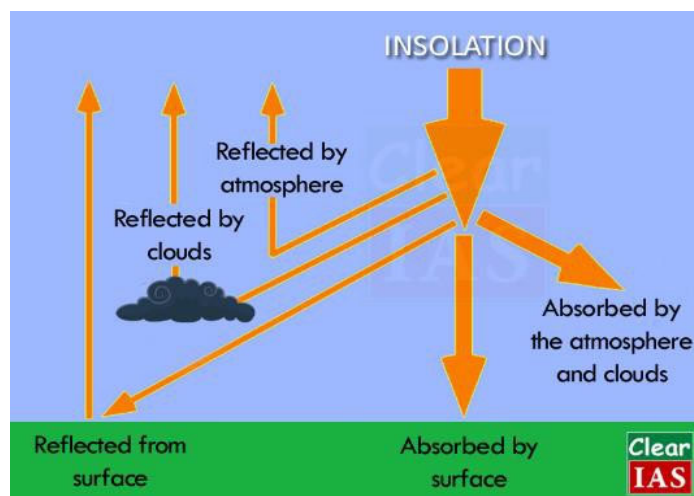
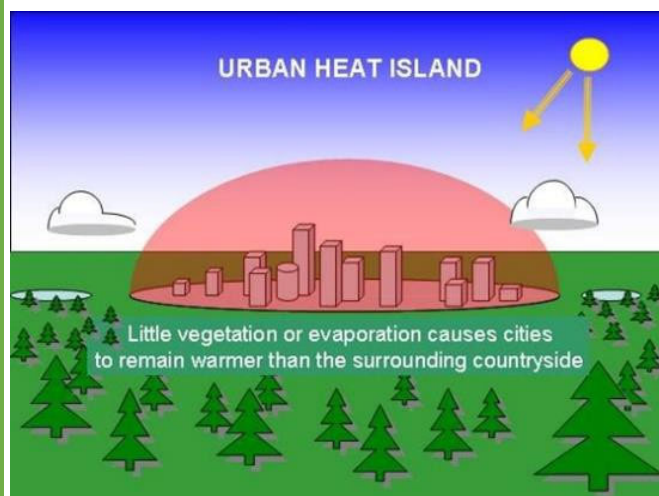
All of these species grow in more southern climates, and some are certainly more risky than others. Crape Myrtle for instance is barely tolerant of the climate in southern Illinois, while Southern Hackberry can already be planted in more northern climates with reliable success. But nonetheless they are good species to keep on the radar for experimental plantings.

Positive Tree Benefits for the Environment

When it comes to trees and climate change, let's move on to some of the immensely positive benefits that trees provide. Here, we are focusing on several topics, those being climate change and the urban heat island effect, as well as flooding prevention and stormwater benefits.

Urban Heat Island Mitigation

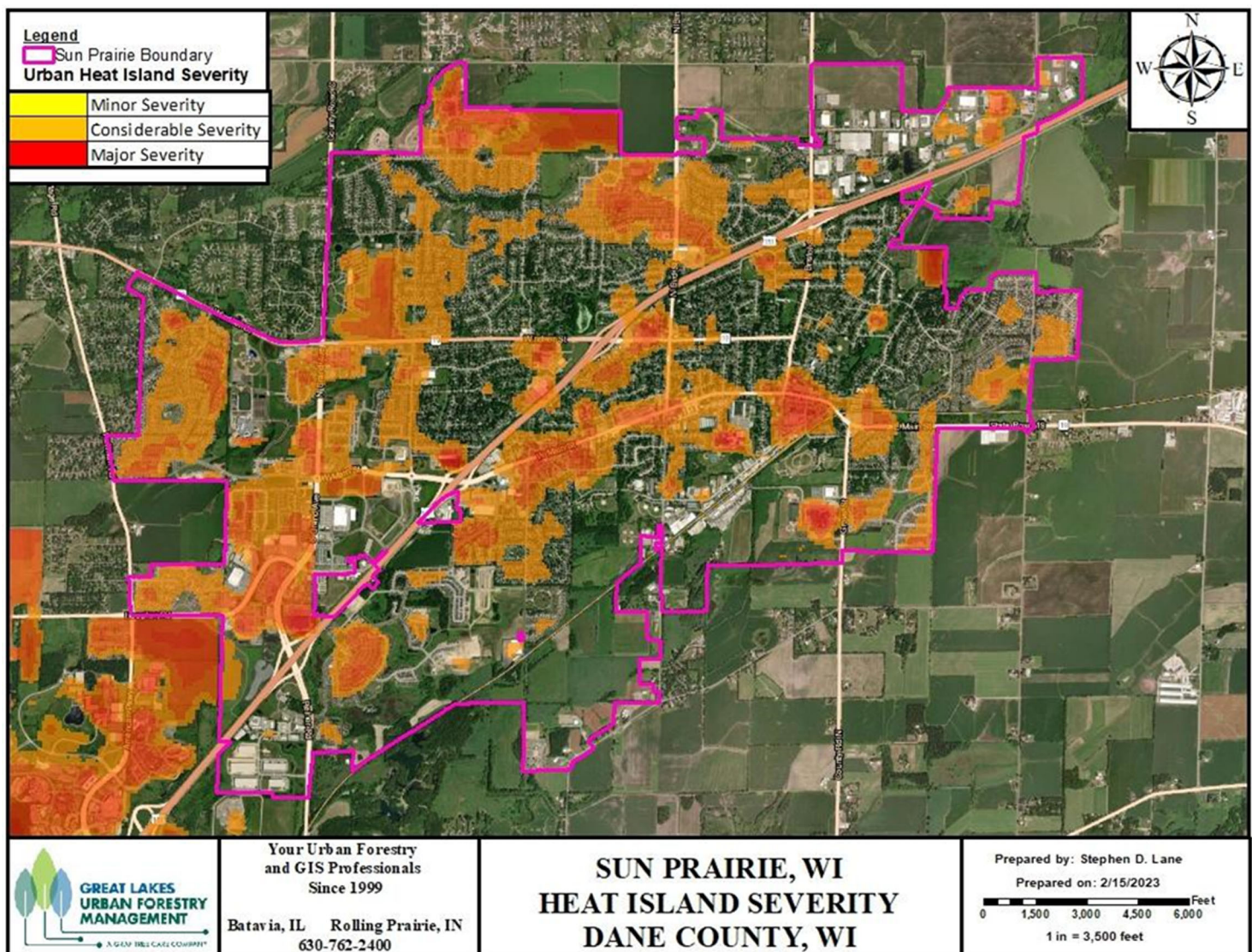
The **Urban Heat Island Effect** is a separate but related issue. Trees and plants contain chlorophyll, a naturally occurring compound which is custom built by nature for converting the sun's energy into sugars by photosynthesis. And what an immense energy the sun has! The amount of energy from the sun hitting the Earth at any given time is approximately 1,350 Watts per square meter, which is a LOT of energy to absorb. When an area has fewer plants, and a lot of asphalt and other dark surfaces, this produces a lot of heat. This is why increased canopy coverage aids in reducing the heat island effect (<https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands>)



Think about it, if you wear a dark shirt when the sun is shining, you feel hotter than if you were wearing a white shirt. That is because different colors absorb light energy differently, and lighter colors reflect light while darker colors absorb it and absorbing more light leads to absorbing more heat. So asphalt and other urban surfaces create local heating above normal atmospheric heating.

All of this is of course just scratching the surface of a set of very complex issues. But essentially, when we have a generally warming climate, combined with this urban heat island effect, it can dramatically raise temperatures in urban areas, leading to a variety of issues. This is where trees become a major factor in making things better. Not only do they absorb carbon dioxide from the atmosphere, which helps to reduce the effects of climate change, but especially in urban areas, if we can plant trees over areas of asphalt and dark surfaces, this will keep the sun from hitting those surfaces, and instead direct the sun's energy to photosynthesis in the tree's leaves. The combined effects of these things will lead to reductions in warming.

For the City of Sun Prairie, below is a map of the urban heat island areas. The darker red or orange areas represent greater heat island effects, but do not represent specific "degree based" deviations, and areas of no shading mean no deviation from long term averages:

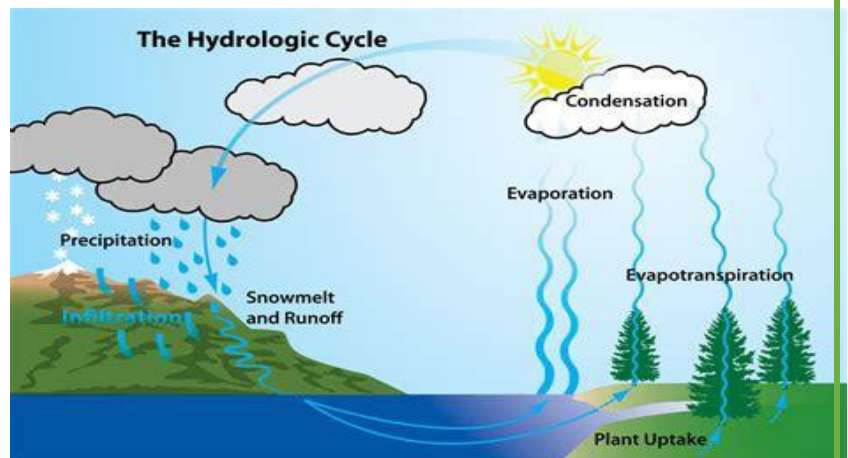


As can be seen from this map, the greatest heat island effects are along the transportation corridors, as well as the industrial areas where greenspace is lower overall. These are the areas where tree planting will create the greatest cooling effects.

Planting trees not just on City owned property, but also encouraging residents and business owners to plant trees on their own property is a long-term goal of this management plan, and one of the big reasons is to offset the effects of climate change and the urban heat island effect. It should also be remembered that the climate is global, and there are no walls that separate cities, states, countries, etc. So, when one area warms, it has effects on the whole climate system. Conversely, when an area has more trees and vegetation planted, those benefits do not just stay confined to that area but benefit the whole planet. Trees are truly an example of acting locally and impacting globally. Sun Prairie can use its inventory data to identify neighborhoods with lower stocking densities to focus new plantings, therefore benefiting the City as a whole.

Reduction in Flooding/ Storm Effects

Once again, let's define a few terms here. First, the Earth has what is called a **Hydrologic Cycle**, which is pictured in a simple form to the right. All of the water that has ever existed on Earth was effectively here when the Earth first formed around 5 billion years ago and has simply been recycled ever since then. Water stored in the oceans and lakes evaporates into the atmosphere where it forms clouds, and then rains down, either into the ocean to start again, or over land, where things get more complicated. When rain falls over land, several different things can happen to it that determine what happens next in the cycle.

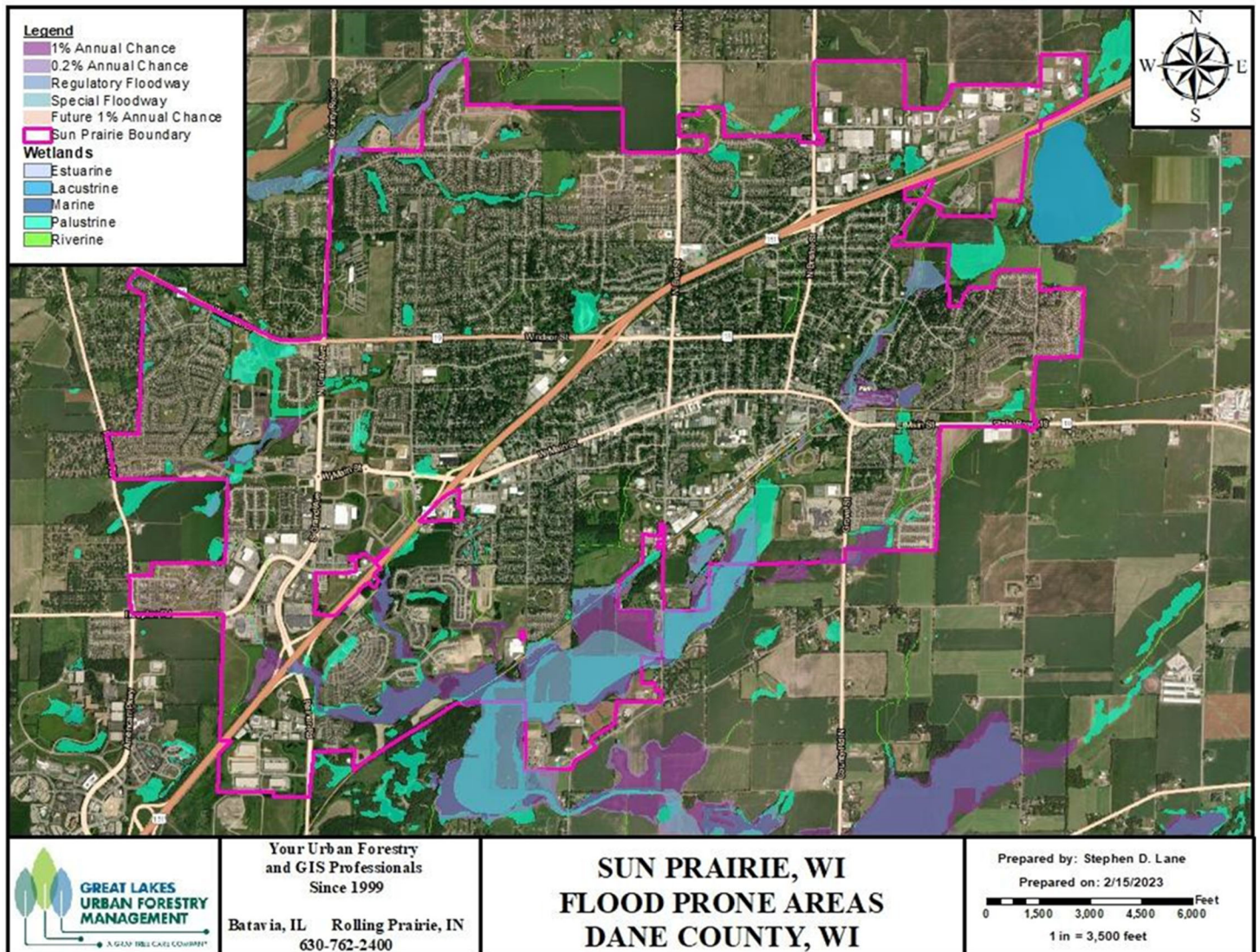


If the rain falls onto the soil surface, some of that water **percolates** into the soil where it moves as groundwater (water under the soil surface). However, when there is so much rain that the soil becomes saturated like a wet sponge that cannot hold any more water, then any additional rainfall becomes **runoff**, which “runs off” over the top of the land surface. This is what we traditionally call **floodwater**.

When an area floods, the consequences can be enormous in terms of economic impact and the impact to humans and wildlife. And there is another side of this story as well. Most communities have what is called **stormwater infrastructure** to handle this water. Storm drains are things we all see regularly which are meant to handle this water. But those systems are expensive to maintain, and the more water they handle, the more often they need repair or replacing. So, what can we do to reduce this floodwater? Plant more trees.

It is worthy of note here that some trees, such as Cottonwood, are listed as “undesirable” in several places throughout this plan, do also happen to be top performers at reducing flooding. We ask the reader to not think about tree species in absolute terms, but more conceptually.

Trees do something called **transpiration**, which effectively means that their roots soak up excess water in the soil, and they release it through their leaves back to the atmosphere. So the more trees we plant, the greater the reduction in flooding, and the less our stormwater infrastructure is taxed, and the less economic and social suffering there has to be as a result of flooding. Below is a map showing flood prone areas in Sun Prairie:



The map above shows that there are not significantly flood prone areas in the City's boundaries. What is important to note from the above map is not what the exact colors mean, just know that these colors all show either known wetlands, water bodies, or flood prone areas near Sun Prairie. Tree planting in proximity to any of these locations will help to transpire extra water out of the soil and prevent occasional excess stormwater runoff from occurring. The city could work with stormwater staff to implement this strategy in and near stormwater areas to increase infiltration.

In particular, there are trees which are naturally adapted to growing in wetter soils, and these trees can really move a lot of water out of the ground, especially as they age. A mature tree can move as much as 6,500 gallons of water per year out of the system. Multiply that by thousands of trees, and you can see how quickly this adds up to a big difference:

<https://www.epa.gov/sites/default/files/2015-11/documents/stormwater2streettrees.pdf>

Some examples of species tolerant to hydric soils include Sweetgum, Swamp White Oak, Bald cypress, Dawn Redwood, Larch, London Planetree, and River Birch. As mentioned above, some species which are generally considered undesirable for cohabitation with humans (“undesirable”, in the context of this plan) are very good at absorbing stormwater. So we once again ask the reader to be very careful not to conflate the term “undesirable” with the term “bad”. Some of these trees have a place in our ecosystems, but not always a place next to our homes and public spaces.

The important thing to note is that tree planting efforts should take the proximity to more flood prone areas into account, as well as the areas which appear to be drier and more drought prone where there is no shading on the map. And just like climate change is not confined to a single area, neither is stormwater and flooding. Whatever floodwater is not absorbed in one area moves downstream to another area. So by reducing runoff in Sun Prairie, it will help all downstream communities. The more communities take action on this, the more stormwater issues will be reduced.

Tree Removals

One of the first steps towards attaining Sun Prairie’s forestry goals will be to remove trees which are diseased, dying, or present a hazard. The preservation and enhancement of public safety is, unequivocally, the most important task we are presented with in Urban Forestry, and trees sometimes need to be removed in furtherance of those goals. These decisions are based on the condition of the tree, site, and the professional experience of staff acting in the public’s best interests.

As previously mentioned in this UFMP, the current inventory data for the City does not include a maintenance recommendation for every single tree, only the ones which are actively being worked on, so we do not have a full accounting for every tree which may require removal⁶. Typically, municipal inventories reveal between 3-5% of the tree population requiring some form of removal at any given time, so based on the current population of 10,702 trees and the projected 2044 population of 13,000, the City should expect to plan for 300-500 trees will require removal annually. This number will become more stable and likely decrease as time goes on and we have more data to rely on. Based on the Diversity Vision, we anticipate the long-term rate of tree removal will be approximately 150 trees per year. Though it is important to note this is just a projection, and the actual number of removals can and will vary. Also important to note is that the removals here are of all types, removals due to age and senescence, failed new plantings, and middle aged trees lost to disease are all generally accounted for here, but we did not split out the analysis by age or cause of need to remove.

⁶ Forestry staff are currently developing a tree inspection program to monitor and identify recommended maintenance activities for all trees identified in poor or dead/dying conditions.

As time goes on, reevaluation of the tree population on a periodic basis by the City Forester or other forestry staff will specify which specific trees require removal, and the following budget tables can be refined with this new data. These numbers, detailed below, are meant to be a projection based on the existing inventory data and estimated 5-15% mortality of new plantings each year. Please note, a task under consideration right now is a large-scale mortality study for new plantings, so we can more accurately determine which species are more, or possibly less, hardy specifically to the Sun Prairie area.

For purposes of projection, costs have been estimated using past pricing data for tree removal and stump grinding, which is a conservative estimate based on current market pricing. Rates could certainly be found lower than this in a competitive bid process or using in-house labor. As is the case with all cost projections for this Plan, no cost increase is assumed for the first 5 years, and a 3% annual cost increase is assumed thereafter. This is also a conservative estimate based on the Consumer Price Index, and actual costs are likely to be lower than projected. In addition, for trees in year 6 and beyond, these are anticipated averages of trees to be removed. The exact numbers of trees to be removed may be more or less, and these numbers are under no circumstances to be used as hard actual budget allocations.

Milestones	2024	2025	2026	2027	2028	2029-2044
Trees Removed	100	110	120	130	140	150
Diameter Inches	1,500"	3,000"	3,000"	3,000"	3,000"	3,000"
<i>Table 12 – Sample Removal Budget</i>	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates
Notes						
Removal Cost (2023)	\$15,000	\$16,000	\$17,500	\$19,000	\$20,500	\$21,750
Removal Cost (CPI)	\$15,000	\$16,000	\$17,500	\$19,000	\$20,500	\$25,013

It's important to note here that these cost estimates are simply projections, and should not under any circumstances be interpreted as absolute values or budget requests, but rather examples of what a budget might look like given the current data available. As this program is adaptively managed, these budgets should be revisited periodically to reflect actual costs being paid.

Reasons for Tree Removal

Removal of trees on public spaces is an unavoidable reality of managing large tree populations. When the trunk, branches or roots fail, a standing tree can cause personal injury or property damage. The City determines its decisions on removal based on if the tree meets any of the following criteria: dead, diseased, dying, public nuisance, or an otherwise hazard. Old trees can hold great sentimental value, and many people become attached to them. However, there are times when their presence creates a hazard, and at those times that action must be taken to ensure public safety. It's also important to remember that a tree removal today is the promise of a new tree for the future!

Removal of trees on City of Sun Prairie public property should always be at the discretion of the City Forester or other forestry staff. Trees will never be removed without a sound reason from the City Forester or other forestry staff. Removal requests that don't fit the above criteria will be considered on a case-by-case basis by the City Forester. The city is not responsible for trees on private property unless they are considered a public nuisance as stated in Sun Prairie municipal ordinance 12.40.050.

Dead or Dying

If a tree is biologically dead or nearly dead, it may require removal. In Right of Way situations on terraces, or other areas near humans and property, these trees will almost always be removed.

However, in natural areas situations where these trees may provide valuable wildlife habitat, and do not pose any sort of elevated risk to passersby or property, they may be allowed to remain. However, for those trees in the Right of Way or other public areas in the built environment which are standing dead, have approximately 50% dead crown or greater, or have less than approximately 40% structurally sound wood in the cross-section of the trunk should be removed as expediently as practical. These determinations shall be at the discretion of the City Forester or forestry consultants.

Diseased or Infested

Diseases are caused by viral, fungal, or bacterial pathogens. Infestations are caused by insects or other small animals. Dutch Elm Disease and Oak Wilt, for example, are fungal diseases that kill Elm and Oak trees when they are infected. Emerald Ash Borer is an insect which kills Ash trees by infesting them. The prompt removal of diseased or infested trees limits the exposure of other nearby trees. The removal of 1 tree may save dozens of others.

Trees in the public Right of Way or on public property deemed to be diseased or infested by the City Forester or other forestry staff should be removed as expediently as possible in order to slow the spread of insects and diseases. It should be noted here that Sun Prairie currently has an ordinance (12.40.050) which provides the City the right to require removal of trees on private property. We should make very clear here that this ordinance was drafted a long time ago in the face of Dutch Elm Disease, which has largely left the area. And the City has not used this ordinance to remove any trees on private property in many years. We are currently reviewing all tree and landscaping ordinances and will be updating ordinances as necessary.

High or Extreme Risk

“Tree Risk” is the potential of a tree or tree part to impact a nearby person or piece of property and

cause property damage or personal injury. This topic is of great interest in Arboriculture today, and insurance companies are becoming increasingly involved in the process of assessing and managing the risk posed by trees. Litigation involving trees is a perennial concern for public entities. Sometimes risk can only be safely mitigated by tree removal, as opposed to pruning or other measures. In these cases, their timely removal is critical because of potential exposure of the public or property to potential harm.



When necessary, the City Forester, forestry staff, or a City-approved TRAQ Qualified Risk Assessor should assess the tree and prepare a Tree Risk Assessment Report which will document the details of the situation, prior to removal.

Often, risk can be mitigated by removing a portion of the tree, or other mitigation actions. If the entire tree is deemed to be at high or extreme risk of failure, however, the entire tree should be removed as a means of reducing its residual risk to zero. It is recommended that at least one current City forestry staff be TRAQ qualified. Sun Prairie anticipates that at least one staff member will be TRAQ qualified by the end of 2024. The ISA Basic Tree Risk Assessment form can be found in Appendix G, and tree risk will be discussed in more detail in the Tree Risk Assessment Policy section below.

Emergency / Storm Damage Removals

A tree should be removed if it has been severely damaged and/or compromised by lightning, wind, or other such weather event. "Storm-damaged" shall be generally defined as a tree that has lost a significant portion of its crown, has a large crack or other wound in the trunk, has a lean of greater than ten degrees from vertical, has sustained a lightning strike, or other such issues directly related to storm events. The City Forester or their designee can determine the need for removal of a tree in these cases, although in an emergency situation such as a tree impacting a person, vehicle, home, power lines, or other such emergency, the City may perform any actions necessary to abate public hazards so long as they are in compliance with all relevant Arboricultural standards and practices. It should be mentioned that any tree that requires maintenance or removal which could affect a utility asset (like power line/gas line. etc.) is the responsibility of the utility. In Sun Prairie that would likely be Sun Prairie Utilities (SPU) and We Energies.

Damage from Construction or Vehicle Strike

The City Forester or other forestry staff shall assess trees that have been impacted by a vehicle strike or piece of construction equipment. If the tree has suffered physical damage or extreme root compaction and is likely to decline and become high risk, it should be scheduled for removal in order to maintain public safety. That decision will be based on the City's tree damage ordinance -12.40.120 and the best professional judgement of the City Forester or other forestry staff.



Interference with Utility or Signage

A tree shall be removed if it is interfering with the function or visibility of official traffic control devices or has impacted above or belowground utilities in a manner that cannot be mitigated by pruning or other measures. In these cases, it is likely that no new tree will be planted in these sites.

Overplanted and Underperforming

No healthy tree shall be removed for the sole reason of having been overplanted. As a result of this UFMP, Sun Prairie will be enhancing their use of industry best management practices for diversity in the urban forest, with the goal of building a diverse urban forest. Overplanted species listed as being in poor condition will be reviewed to assess further decline or recovery. Those trees in noticeable decline shall be removed at the discretion of the City Forester or other forestry staff. This will be used as a preventative measure so that these trees do not continue to decline to a point where they become hazardous, and not used as a reason to remove an otherwise healthy tree.

Tree Removal Activities

Safe Removal of a Tree to an Appropriate Flush Cut

Tree removal can be dangerous, but when performed by professionals is very safe. Therefore, all tree removal activities on Sun Prairie's public property should be performed under the guidance of a Certified Arborist or Arborist Trainee. This may be the supervision of the City Forester, or a staff Certified Arborist alongside a contractor. It is not necessary that a Certified Arborist from the City staff monitor every removal, just that a Certified Arborist from either the City or the Contractor's team be available when needed. The safe removal of a tree involves the safe removal and lowering of all portions of the tree according to all relevant ANSI standards and Best Management Practices. The stump must be flush cut such that the highest portion of the cut is no greater than two inches from the highest part of the ground surface to prevent a tripping hazard on public property.

Stump Grinding

Within a reasonable amount of time following the removal, stumps and surface roots should be removed using an approved stump grinding machine, such that the stump is ground to a minimum depth of 6 inches, and no surface roots are visible. Generally, this time frame will coincide with the City's Public Works monthly Brush Week, so no stump shall remain on the parkway longer than 60 days, though exceptions may be made at the discretion of the City Forester or their designee. If the site is to be planted with a new tree, that depth should be increased to 12 inches below the soil surface. This will ensure that a new tree may be successfully planted, and that no re-



sprouting will occur from the old stump. The depths to which the stump must be ground may be altered by the City of Sun Prairie depending on needs for specific circumstances or contracts. Deeper stump grinding may require additional cost and specific equipment. A safety cone or other high visibility marking shall be placed in the stump hole until such time that the site is fully restored as discussed below.

Planting Site Restoration

Once the tree has been safely removed and the stump has been ground out, the open planting space must be fully restored if a tree is not scheduled to be planted in or adjacent to the old hole. Site restoration consists of removing the stump chips from the hole, filling it with a quality mineral topsoil, tamping down to match the surrounding grade, spreading grass seed over the top of the topsoil, and spreading Seed Aide over the topsoil. This will ensure that grass grows back to restore the aesthetics and function of the terrace and prevent tripping hazards from the removal scar.

Basic City Tree Removal Requirements and Standards

All of the following requirements and standards should be met during tree removal activities as matter of local policy.

City of Sun Prairie

1. The City of Sun Prairie will remove trees meeting the following criteria: dead, diseased, dying, public nuisance, or hazard.
2. All personnel directly involved with process of chainsaw operation, climbing, bucket truck operation, and rigging limbs shall be provided with sufficient training and experience to perform such duties while employed by the City of Sun Prairie or performing work as a contractor employed by the City.
3. Only qualified utility arborists may perform tree removal operations within ten feet of an electric utility line. City of Sun Prairie employees or contractors may complete the process of trunk removal and stump grinding only if the remaining portion of the tree is greater than ten feet from a transmission line. Questions regarding trees in overhead wire ROWs should be directed to Sun Prairie Utilities at (608) 837-5500.
4. The City will not remove healthy trees in order to meet diversity goals, unless the tree meets the removal criteria described above.
5. The City of Sun Prairie shall not perform or assist, programmatically or financially, with the removal of trees on private property unless deemed necessary by the City Forester or their designee

Tree Planting

Whereas tree removal is necessary to promote public safety, planting of new trees must happen to increase Sun Prairie's diversity and canopy cover. At present, the City of Sun Prairie has an estimated 3,500 open planting spaces on its terraces. As a means of attaining the goals of increasing canopy cover to 29% and increasing overall diversity, this plan calls for the planting of about 5,000⁷ trees over the coming 20 years. These trees will be planted by City staff or planting contractors. This plan has a direct goal of planting trees where they have the best chances to establish and thrive based on their specific sites and species requirements.

For the goals and milestones shown below, the program began with being able to replace trees called out for removal above and also to begin planting in open spaces on the City's terraces. A goal of this plan is to set a plateau of approximately 250 new plantings per year.

Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
Trees Planted	150	170	190	210	230	250/year avg
Planting Cost (2023)	\$45,000	\$51,000	\$57,000	\$63,000	\$69,000	\$140,000
Planting Cost (CPI)	\$45,000	\$51,000	\$57,000	\$63,000	\$69,000	\$161,000

Table 13 – Sample Planting Budget

For the costs of planting, \$300 per tree (installed) has been used, and this data comes directly from Sun Prairie's historic data in terms of their costs, and the City may be able to perform planting at a more favorable rate. These costs could be reduced through planting smaller trees such as bare root and gravel bed options discussed throughout the plan, as these plants cost less to purchase and are easier to install. Also, if in-house labor is used to install trees, cost could be further reduced.

*You will notice in our tree planting calculations that we present a total number of trees planted each year. We also present a number for the size of the tree population each year. You may notice that these numbers are different. So if we plant 250 trees, why doesn't the population grow by 250? This is because some trees will have to be removed each year. So we have to calculate **Net Growth** in the tree population, not just Gross Growth. So the calculation for growth of the tree population is:*

**TOTAL TREES
PLANTED**

-

**TOTAL TREES
REMOVED**

=

**NET POPULATION
GROWTH**

Exhibit 12 – Population growth explanation

⁷ Tree population growth assumes a variable rate of mortality between 5-15% depending on the species in question

The Importance of Planning Your Tree Planting

Right Tree in the Right Site

Urban Forestry has an unfortunate history of not planning carefully for tree planting. Whatever was readily available, inexpensive, urban tolerant, and grew fast was seen as desirable, and often planning of tree plantings was left to developers, nurseries, and planting contractors. With our history of invasive insects and diseases in the Midwest region and knowing these will only get worse in the future, it is more crucial than ever that we have a process to plan our tree plantings.

This process should involve assessing each site to be planted in much the same way we would assess a tree, except that in this case, we look for factors such as available above and below ground growing space, how much light the tree receives, amount of soil moisture present, and possibly other factors such as soil pH and texture. Once this information is collected, planting sites can be matched with trees which are well suited to those sites. Matching the right tree to the right site like this will result in trees which establish faster, grow more vigorously, live longer, and provide far greater benefits.

Even a simpler version of this process is better than nothing. When you have your species list for each open planting site assembled, it makes bidding nurseries and installers easier since you have a plan in hand.

A comprehensive tree planting plan such as that proposed here should be a primary goal for Sun Prairie to increase its diversity.

Playing an active role in your tree planting planning also allows for meeting diversity standards such as the taxonomic, spatial, and age class diversity principles outlined above and attempts to get the tree population into compliance with the “20-10-5 Rule”. With approximately 3,500 planting sites to be assessed, tree planting planning can be conducted in phases each year as the planting budget takes shape and diversity is evaluated. Being targeted about species selection also allows the use of species which are slightly more difficult to find appropriate sites for. These species that are considered “less urban tolerant” can still be planted when the appropriate site is found! We anticipate that over the 20 year timeline of this plan, nearly all of these spaces will be planted, resulting in 90% stocking density.

The success of a tree depends on where and how it is planted. The City Forester or other forestry staff should assess planting sites before trees are purchased and installed each year, to ensure the correct tree is being planted for the correct site. Each tree planted represents a 25-75+ year commitment, and this planning helps to increase the benefits the community can reap from this commitment.

Nursery Stock Procurement

Nursery stock quality is yet another aspect of planning which can help a tree establish, survive, and thrive to provide great benefits to the community. The City Forester or other forestry staff should inspect and select every tree which is to be planted on City property to minimize the possibility of installing lower quality nursery stock. Specifications for terrace plantings should be for material approximately 1.5’ caliper, with good form for the species, planted as either balled and burlapped, gravel bed bare root stock, or minimum 5-gallon containerized stock. In order to secure quality nursery stock, the importance of having explicit nursery stock specifications cannot be understated.

As are many things in the fair market, the lowest price often does not mean the best quality product. This can be challenging with common municipal purchasing policies. Currently, the industry is recovering from a nursery stock shortage due to high demand to replace Ash trees lost to Emerald Ash Borer, which impacted the availability of some species. We strongly recommend not to accept substitutions in the requested species lists, as many nurseries are still attempting to substitute overplanted trees for some of the higher diversity species which may still difficult to obtain. It is recommended to have an approved substitution prepared for each requested tree species. A list of species and acceptable substitutes has been included in Appendices A-C.

Tree Transport and Planting

Proper transport and planting procedures determine a tree's success after planting. Even healthy trees from the field, if improperly transported, may dry out during transport, or have structural damage to root balls incurred. When it comes time to plant, trees planted too deeply will suffer from root compaction and trunk decay. Please see Appendices D and E for a detail of proper tree planting.

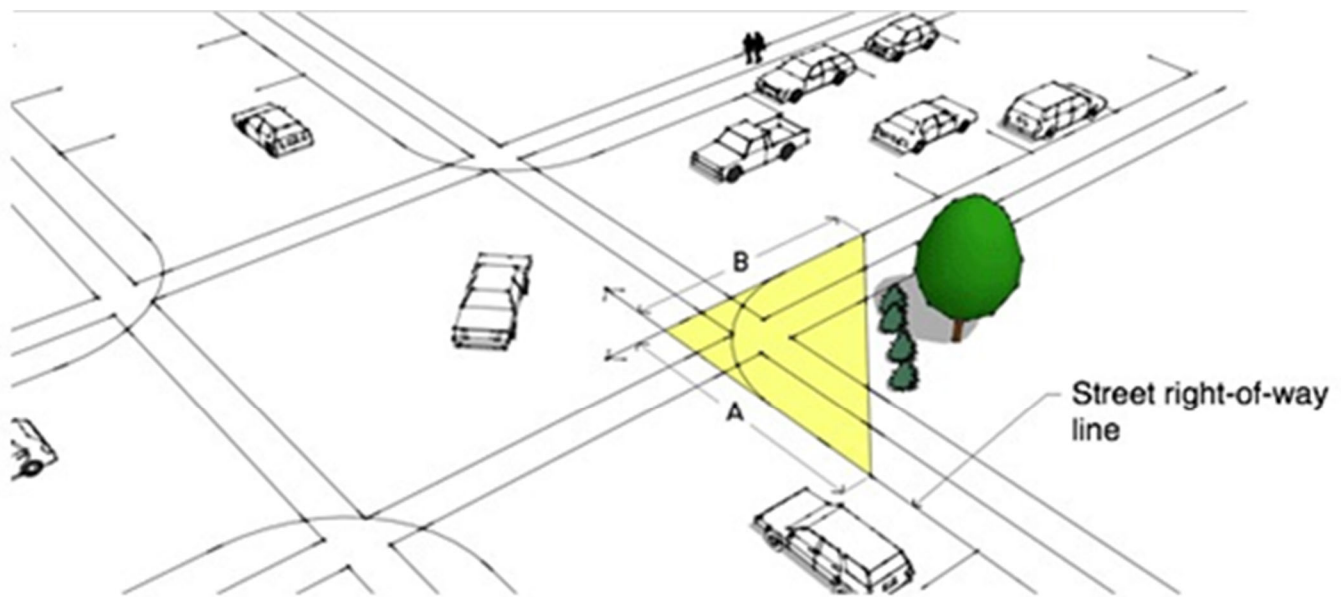


Trees planted without properly dug holes may suffer from stunting. Trees planted without proper removal of packaging materials may develop girdling roots. Trees planted too high may have surface root desiccation. Trees improperly staked or with improper trunk protection may suffer from trunk wounds or girdling of the entire trunk. The ANSI standards and Best Management Practices for tree transport and planting are detailed later in this section.

Tree Spacing and Visibility Requirements

Minimum tree spacing between large, medium, or small sized deciduous shade trees should be appropriate for the species and conform to City of Sun Prairie standards. As stated in municipal ordinance 12.40.080, there shall be a minimum distance of twenty (20) feet and a recommended distance of twenty-five (25) to fifty (50) feet between terrace area trees depending upon the size of tree and other factors. Where possible, terrace trees shall be planted equal distance between the sidewalk or proposed sidewalk and back of the curb or proposed back of curb.

In terrace areas less than three feet wide, planting will not be permitted. Terrace area *trees* shall be a minimum of twenty-five (25) feet from an intersection, five (5) feet from driveway and alleys and ten (10) feet from hydrants and utility poles. This will allow trees to grow to their full potential without heavy competition for water and nutrients with neighboring trees, and without limited space for crown or root growth. Trees may be planted under aboveground powerlines, but must be from the "Small" selections listed in the Approved Species list in Appendix B. No evergreen species shall be considered acceptable for street trees, as they can obscure views of the road and may lead to accidents. Evergreens are acceptable for parks and other City-owned properties.



Watering

Watering of newly planted trees is essential to their establishment, growth, and survival, particularly during the first 2 years of their lives. Since regular watering is not possible in our current budget, this responsibility falls on the property owners. As is already the practice in Sun Prairie, when a tree site is selected for planting, a basic letter is provided to residents describing how much water to give a tree, and when it should be given. Such simple information can make the difference between a tree dying from drought stress, a tree dying from overwatering, and a happy, healthy tree. Additionally, the City uses seasonal staff for watering when they are able, which will be discussed in more detail in the “Other General Maintenance” section below. It should be mentioned here that watering is a very low-cost barrier to entry for LTE jobs such as seasonal employment or internships. We actually see working as part of a watering team as a potential avenue for residents or others to become an LTE and possibly even a Full-Time Employee.

Challenges of Urban Plantings

Urban planting sites are a difficult environment for a tree to thrive in, and based on long term data, it is expected that 5-15% of new plantings fail each year in the upper Midwest region, which is actually below the 19% predicted by the literature⁸. The City might consider the feasibility and cost effectiveness of requiring contracts for tree planting to include a one to two-year replacement warranty for any new trees that fail to thrive in their new environment. Urban tree plantings can pose an uphill battle in many ways, due to limited soil volume, salt runoff, airborne pollutants, and other factors. New planting mortality is to be expected despite best efforts, but the planning measures outlined above will help to mitigate annual new planting mortality.

⁸ <https://www.fs.usda.gov/research/treesearch/18718>

Tree Planting Requirements and Standards

City of Sun Prairie

1. Appropriate Planting sites shall be determined and monitored using the City's tree inventory, in conjunction with forestry staff input.
2. New planting sites should be 50 feet away from intersections and 15 feet away from driveways, signage, crosswalk cutouts, and utility structures. If this distance cannot be maintained, the site should not be planted, even if a tree was removed from the same site.
3. Choice of species for planting should be done so according to the City's taxonomic, spatial, and age-class diversity goals. A diverse and resilient urban forest minimizes exposure to financial, environmental, and health risks while maximizing aesthetics, environmental benefits, and ecosystem services to its residents. Selection of species is determined by City Forester.
4. All planting stock should be grown within 150 miles of the City/ planting site, or at least consistent with a similar ecoregion with similar climate and soils. Exceptions to this may be made at the discretion of the City Forester or their Designee.
5. Acceptable nursery stock shall conform to the following standards:
 - A. 1.25-inch caliper minimum, measured at six inches from the trunk flare, and as appropriate for the species and/or approved by the City Forester.
 - B. Root ball conforms to ANSI Z60.1 Standards for Nursery Stock
 - C. Less than 10% deadwood in the crown
 - D. Architecture consistent for the species, cultivar, or variety in question
 - E. No included bark or other such narrow branch attachments, unless consistent with species or variety
 - F. Free of pests or pathogens
 - G. Approved species list for the City of Sun Prairie
6. Planting and digging of certain species shall only occur at certain times of year, in accordance with nursery industry best management practices and professional judgement. These times are subject to the professional opinions of both the City Forester and its approved contractors.
7. Residents shall be permitted to plant trees on the City-owned right-of-way, if purchased independently and conform to all species, spacing, and proper planting requirements as specified by the City Forester. A planting application form should be submitted by the resident and must be approved by the City Forester. Sample form can be found in Appendix
8. Diggers Hotline (811), or another similar utility locating service shall be contacted, and all utilities located a minimum of three days before planting is scheduled to begin.

Tree Pruning

When maintaining a tree population for its greatest benefits and lowest risk, tree pruning is one of the most cost-effective maintenance activities which can be performed. Pruning provides several important services for a tree: It reduces the risk of failure, provides clearance for structures, streets, or sidewalks, reduces wind resistance and wind damage, maintains overall tree health, and improves overall aesthetics.

Currently in Sun Prairie there is no proactive cycle pruning schedule in place, and most pruning is done in a reactive way. Street clearance pruning to allow vehicular access generally occurs in winter and pruning is completed as requested by residents, but these are not full structural pruning activities. Since the inventory data does not include full maintenance recommendations for each tree, the projections below are broad estimates⁹

For the next 5 years, it is recommended that Sun Prairie slowly increase the number of trees pruned each year through 2028 until they are at full capacity to handle the 7-year pruning cycle which has been proposed for the City. Once in the full 7-year pruning cycle for the estimated tree population of 12,500 total trees by 2033, it is anticipated that approximately 1,800 trees per year will require pruning to maintain this cycle. A map of the proposed pruning cycle has been provided on page 83. This is a 6-year street tree pruning cycle, with an extra “Zone” for parks and Municipal Campus trees.

You will notice below that we are starting with all non-cycle pruning work that needs to get accomplished. This should ensure that all higher priority work that still needs to be done in all geographic regions of the City is accomplished before moving on to more zone-based pruning. As with all budget tables in this report, these are just projections, and are under no circumstances intended to be used as hard budget figures. Forestry staff shall determine annual budgets on an annual basis.

Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
Trees Pruned	1500	1550	1600	1650	1700	1,850/year avg
Notes	All Non-Cyclical Pruning	1,550 Cycle Prunes	1,600 Cycle Prunes	1,650 Cycle Prunes	1,700 Cycle Prunes	Approximately 1,850 Cycle Prunes / year in perpetuity
Cost (2024)	\$72,500	\$75,000	\$77,000	\$79,000	\$92,500	\$125,000
Cost (CPI)	\$72,500	\$75,000	\$77,000	\$79,000	\$92,500	\$134,375

Table 13 – Sample Pruning Budget

⁹ This is something that could be addressed during the next update of the City’s Tree Inventory, targeted in 2027

Reasons for Pruning Establishment/Structural Pruning

Establishment or structural pruning of newly planted trees is the single most cost-saving measure in tree care, as it establishes good form and branch structure for the life of the tree. Establishment pruning should be performed a minimum of one time prior to the tree reaching six inches in diameter. Once established, the tree will only require periodic cycle pruning to maintain an appropriate form for the urban forest and to maintain health and keep the tree free of dead limbs.

Cycle Pruning

A Best Management Practice in Urban Forestry is that trees should be pruned on a cyclical basis as preventative maintenance. No tree should go more than seven years without proper pruning, as longer than that becomes more reactive than proactive. Cycle pruning ensures that dead branches, storm damaged limbs, or unsightly growth are removed before becoming hazardous or bad for the health of the tree. Cyclical pruning also ensures the proper leaf to stem ratio, which provides structural support for the tree. It also ensures that pruning stays relatively inexpensive, as severe issues do not have time to develop. Cycle pruning is a maintenance activity which if performed regularly, actually needs to be performed less often!



Emergency / Storm Damage Pruning

Emergency pruning is necessary to mitigate severe risk after storm events, such as limbs which have fallen and are blocking traffic, have impacted a structure, are interfering with a utility, or are hanging and in imminent danger of doing any of the above. Emergency and Storm Damage Pruning should be conducted at the discretion of the City, with the best interests of the public in mind.

When life or property are in imminent danger due to conditions associated with a downed tree or tree part, the City may take whatever remedial action is practical and reasonable to mitigate such imminent risk. These tasks will be examined in the section on Storm Damage Assessment below.

Sanitation Pruning

As part of the City's proposed Pest & Disease Response Policy, when a tree has been diagnosed as having been diseased or infested with a pest or disease, sanitation pruning may be employed to maintain the tree while removing the diseased or infested portions. This technique is only effective when the host tree is infected/infested with certain pests and pathogens, and only in a localized area of the tree. Examples for when to use sanitation pruning might include removing limbs with fire blight, black knot, or cankers. With more widespread cases of disease or insect infestation, removal will be the most cost-effective and safest option to avoid endangering other nearby trees, as these pests and diseases tend to spread, particularly when there is more of the same species nearby.

Removal of High-Risk Limbs

At times, a tree as a whole may not pose a high risk, but a single limb may have defects that make it hazardous. At these times, the removal of such limbs or parts may render the tree to be low risk again, without causing permanent damage to the tree.

Provided below is a series of estimates based on the change in composition of the Urban Forest over time. As larger underperforming trees are removed and smaller trees planted in their place, the size breakdown of the Urban Forest will change. Given this expected change in the average size of trees, we have included several breakdowns below estimating costs as the composition of the Urban Forest changes. Please note these are estimates and should be reviewed regularly to ensure accuracy.

2024 Cost Breakdown – Pruning 1,500 Trees/Year by 2024

	<u>Total Trees</u>	<u>Avg %</u>	<u>Cost/Tree</u>	<u>Pruned/year</u>	<u>Cost/year</u>
Evergreen	929	8.68%	\$20	130	\$2,604.67
Large (>24")	220	2.06%	\$150	31	\$4,626.17
Medium (13-24")	2417	22.59%	\$75	339	\$25,412.38
Small (1-12")	7136	66.69%	\$40	1,000	\$40,014.95
					\$72,658.18

2034 Cost Breakdown – Pruning 1,700 Trees/Year by 2034

	<u>Total Trees</u>	<u>Avg %</u>	<u>Cost/Tree</u>	<u>Pruned/year</u>	<u>Cost/year</u>
Evergreen	900	7.64%	\$20	130	\$ 2,598.73
Large (>24")	375	3.18%	\$150	54	\$ 8,121.02
Medium (13-24")	4200	35.67%	\$75	606	\$ 45,477.71
Small (1-12")	6300	53.50%	\$40	910	\$ 36,382.17
					\$ 92,579.62

2044 Cost Breakdown – Pruning 1,850 Trees/Year by 2044

	<u>Total Trees</u>	<u>Avg %</u>	<u>Cost/Tree</u>	<u>Pruned/year</u>	<u>Cost/year</u>
Evergreen	900	6.92%	\$20	128	\$ 2,561.54
Large (>24")	1700	13.08%	\$150	242	\$ 36,288.46
Medium (13-24")	5200	40.00%	\$75	740	\$ 55,500.00
Small (1-12")	5500	42.31%	\$40	783	\$ 31,307.69
					\$ 125,657.69

Table 15 – Change in Pruning Costs Over Time

Pruning Activities

Creation of a Pruning Cycle

Initially, the City should prioritize the trees that may have been identified as requiring priority pruning, regardless of where they are located to prioritize public safety before routine maintenance. After these trees are pruned, Sun Prairie should aim to implement a 7-year pruning cycle based on the size of its tree population both now and in 2044.

With approximately 13,000 City trees total by 2044, this would mean that over a 7-year period, approximately 1,850 trees would require pruning each year. As noted above, the number of trees as well as their overall sizes will be changing over that time period, hence the tables above show adaptive management of the tree pruning program. It's important to mention that if trees go for more than 7 years without pruning maintenance, pruning becomes more reactive than proactive, hence the need for a commitment to a dedicated program.

Though tree pruning may seem expensive, the cost of maintaining trees is significantly less than the costs associated with trees causing damage or injury due to storm damage. The benefits trees provide when healthy and well maintained can be prolonged and significantly increased, as shown in the projections above. A cycle pruning program is the hallmark of an effective forestry program, and it is highly recommended that Sun Prairie begin to budget for this essential expense.

Pruning of Young Trees

For the purposes of this Plan, a young tree is considered to be under 12" DBH. Young trees are still trying to acclimate to their sites. The pruning of young trees has different goals and outcomes than the pruning of larger, mature trees. Standard nursery stock has been meticulously pruned for four to ten years to have a single trunk, and the specific branching patterns which are considered common to the various tree species.

Without proper establishment pruning, these trees might have multiple trunks, poor branch structure, and overall poor form and architecture. Pruning of young trees to establish proper form is one of the most cost-effective maintenance activities which can be performed. It is an inexpensive task that does not require a great time commitment and saves thousands of dollars in pruning and maintenance costs later in the tree's life.

Pruning of Mature Trees

A mature tree, for the purposes of this Plan, is considered to be greater than 12" in diameter. Mature trees are established in and acclimated to their sites. The pressure these trees face from their environment generally comes from above-ground factors such as pests, pathogens, man-made structures, other trees, windstorms, or lightning strikes, as well as some below ground factors like girdling roots, limited soil volume, or poor soil quality. Pruning is performed to mitigate the above-ground issues, as well as balance out any below ground issues when possible. Natural aging and limb dieback are additional reasons these trees are pruned.

Pruning of mature trees may mitigate a short-term risk, such as after a storm, or pruning may be done to maintain a tree's long-term health and structure. In the wild, trees lose limbs frequently. This is called self-pruning. Allowing trees to self-prune over time is not advisable in an urban setting. Safety factors may arise, and the process of self-pruning may bring up aesthetic issues in an urban environment. Mature public trees should only be pruned by professional Certified Arborists and done in accordance with industry Best Management Practices and accepted ISA and ANSI standards.

Proposed Pruning Zone Map

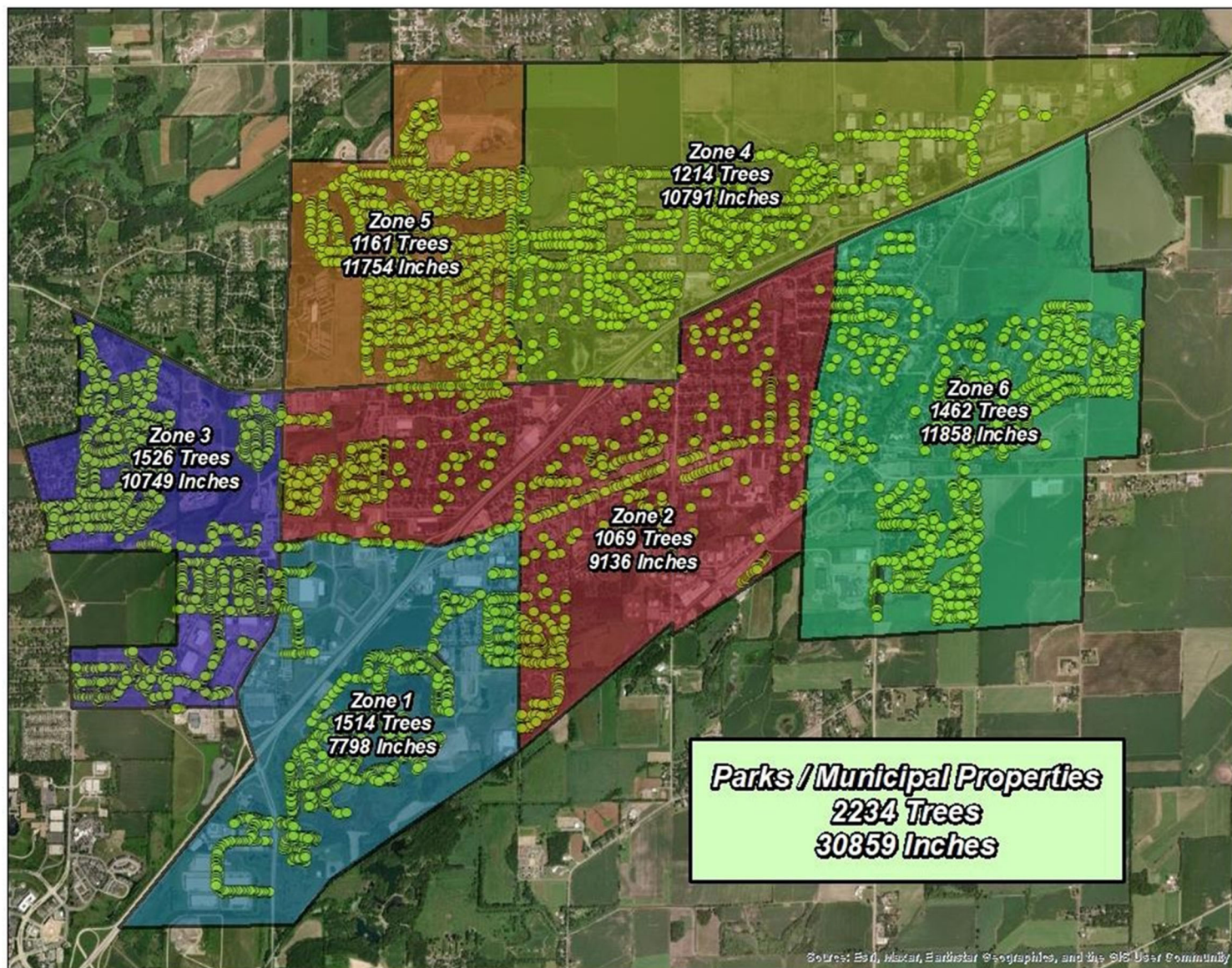


Exhibit 12 – Sample Pruning Zones

Private Property Trees

The City of Sun Prairie shall not be responsible for the pruning of trees located on private property, unless under extreme circumstances. The City has the right to prune portions of trees overhanging public property, but is under no legal obligation to do so, and will perform such pruning at the discretion of the City Forester or other forestry staff. Likewise, it is worthy of mention that the City is under no legal obligation to prune limbs from public trees overhanging onto private property, though the resident is allowed to prune our trees back to the public ROW line.

Tree Pruning Requirements and Standards

Please see Appendix K for ANSI pruning standards and ISA Best Management Practices.

City of Sun Prairie

1. All activities directly related to the operation of a chainsaw, bucket truck, limb rigging, or tree climbing should be performed by a qualified employee, contractor, or under the supervision of a certified arborist or arborist trainee.
2. No pruning or maintenance activity that takes place within ten feet of a power transmission line shall be accomplished by a City of Sun Prairie employee unless certified as a qualified Utility Arborist.
3. No heading, pollarding or espalier pruning shall be conducted on City-owned trees, and no wound dressings shall be used under any circumstances, without a permit and prior written approval of the City Forester.
4. The need for pruning and maintenance of individual trees shall be at the discretion of the City Forester or other forestry staff.
5. No more than 25-33% (depending on the species) of a tree's crown shall be removed during pruning operations to preserve the health of the tree. Any more than 25% of the crown being removed puts the tree in danger of severe dieback.

Other General Maintenance

Chemical Applications

Trees, like people, sometimes contract pests and pathogens. Often these pests and pathogens can be controlled with a simple chemical application just as illnesses in humans can be controlled with medication. This practice is called Plant Health Care (PHC). When financially practical, chemical control for common pests or pathogens may be utilized as a preventative or curative method and increase the aesthetics and benefits of the tree population.

Currently, only city staff are allowed to chemically treat publicly managed trees. At present, Sun Prairie is only treating trees to control EAB infestation, however in the future if additional resources are available, other treatment options might be explored, for example Japanese beetle treatments.

The City could consider developing an application that residents can submit to get approval from the City Forester to chemically treat their terrace trees. Once approval is granted, residents of Sun Prairie may perform chemical applications on the terrace trees, such as treatment for Emerald Ash Borer, Dutch Elm Disease, Apple Scab, or other common disorders. The City will not bear any financial responsibility associated with the costs of such treatments, and treatments must be performed by a Certified Arborist who holds a valid Pesticide Applicators license.

Such an allowance would be strictly informational, to allow the City to be aware of chemical treatments occurring on trees that it owns. Such work may be denied or revoked for utilizing unqualified contractors, potentially hazardous chemicals, or any other reason at the discretion of the City. Additionally, trees being treated by residents may still be removed at the discretion of the City for any of the reasons listed above.



Water Management

The importance of water in the establishment, growth, and survivorship of trees cannot be overstated. Most trees adapted to our climate zone (USDA Zone 5a) are also adapted to the amount of moisture we have in an average year. However, younger trees with less expansive root systems are susceptible to prolonged drought. Young trees need supplemental watering, which is an essential maintenance activity and can prevent newly planted tree mortality.

As we anticipate approximately 5,000 additional trees being planted over the course of the next 20 years, this concept becomes very important. A general rule would be to expect to pay approximately \$50/tree for staff and equipment for the first 2 years of its life to water it weekly throughout the first 2 growing seasons. So, with planting 250 trees per year, there would be 500 trees requiring water at any given time, for a total cost of around \$25,000 each year. Once again however, these numbers can be highly variable. The use of LTE labor budgets would help enable the City to provide this service.

Additionally, there is the option to rely on well-informed residents to water trees. Upon receiving a newly planted tree on the terrace in front of their homes, residents are supplied with an informational letter which explains how often to water their new tree during the first 2-3 years. It is also suggested that the City Forester or other forestry staff hold basic tree maintenance classes open to all residents.

Mulch

Proper application of mulch is a necessary and cost-effective maintenance activity. Mulch has many benefits, including reducing weed growth in the root zone, protecting the tree trunk and root flare from lawn maintenance equipment, allowing water to move into the soil, reducing evaporation and drought stress, and creating a naturally fertile soil environment. Turf grass typical of terraces competes for water and nutrients, and mulch reduces this competition.



But not all mulching is beneficial. The practice known as “Volcano Mulching” is the practice of piling mulch against the trunk in excess of 3” deep. This causes moisture build up against the trunk, and can cause decay of the trunk tissue, and possibly death. Material such as crushed limestone, red volcanic rock, or rubber pellets can alter the soil chemistry in an undesirable way, and cause dieback or tree death.

Fortunately, mulch is a commodity many communities can get for free so long as they are pruning and removing trees each year. A marshalling yard for wood chips is established in City limits. These chips can be made available for free to residents as well as planting contractors. This arrangement works well for everyone: Contractors do not have to pay to dispose of chips or for transportation, residents get free woodchips, and planting contractors don’t have to charge the City for mulch when new trees are planted. All newly planted trees should have mulch applied appropriately. A goal for Sun Prairie should be to mulch all trees 12” DBH and smaller, but for now, mulch for all newly planted trees, and preventing volcano mulching should be a primary concern.

A recommended Key Performance Indicator is to have 90% of all trees under 10” DBH mulched. While we have not budgeted for it in the budget due to the significant variation in pricing, we anticipate that to accomplish this goal will take approximately 700 cubic yards of mulch and 1500 man-hours to accomplish. Use of wood chips from local removals, and volunteer effort will reduce costs.

Retaining a Consultant

The task of establishing or enhancing a robust Urban Forestry program can be difficult. There may be many new challenges and learning curves, contracts to renegotiate, bid documents to create, resident concerns to manage, and other responsibilities which may require the assistance of a professional. Retaining a consultant may be necessary to increase the capacity of internal forestry staffing.

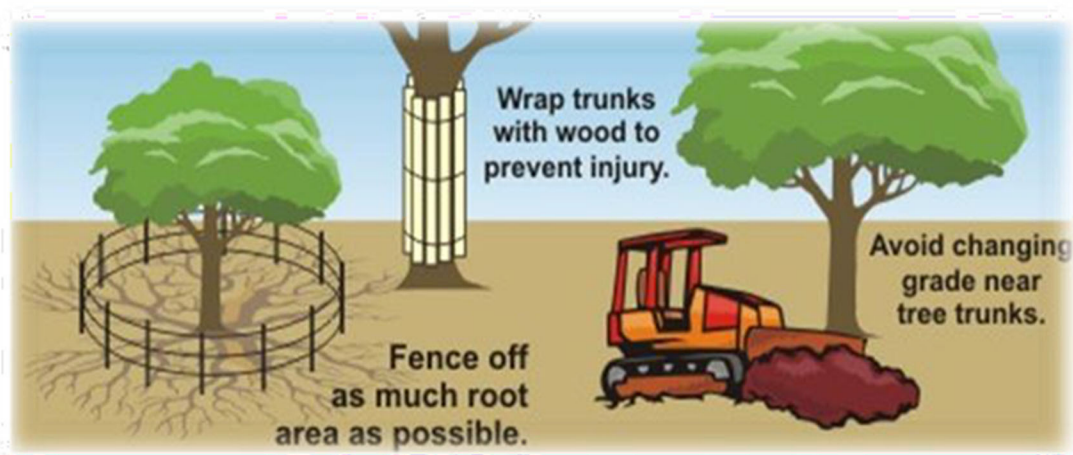
The Forestry Consultant may be involved in sourcing and interviewing contractors and vendors for tree pruning, removal, and planting operations, assisting in maintaining the tree inventory, training City staff on tree health and risk assessments, assisting in explaining policies to homeowners, preparing contracts and bid specifications, and teaching residents how to help the City in caring for their trees. The importance of this early relationship cannot be overstated, no matter how large or small the organization. More information on what the role of a Forestry Consultant might be are found in the Personnel section on page 28 above.



Tree Preservation and Management During Construction

In many municipalities, ordinances exist to protect trees and shrubs from construction activities. The intent of these ordinances is to protect the benefits those trees and shrubs provide to the community. See Sun Prairie's municipal ordinance 12.40.120.B for more information on the City's policies for terrace trees.

Trees and shrubs may be privately owned but are also community resources that provide benefits such as aesthetics, storm water benefits, energy savings, carbon sequestration and increased property values. Therefore, tree and shrub protection and preservation during construction represents an investment in the community! Ensuring the protection and preservation of these trees while minimizing burdens to businesses, developers, and residents is essential to a healthy urban forest.



Tree protection and preservation during periods of construction involves protecting trees from damage caused by construction activities. This damage includes physical and chemical damage to the trunk, branches, and roots. Damage may be caused by equipment such as backhoes, skid steers, or other appendage-type equipment. The effects of damage to the visible above ground portions of the tree can be obvious, as when branches are broken. But hidden effects such as root compaction or improper grading may not become evident for years until the tree begins to die back. The standards set forth below and in the appendices are industry standards with a proven record of success.

Tree Preservation Requirements and Standards

City of Sun Prairie

1. A tree survey should be performed by a qualified individual prior to the beginning of any development activities. The survey shall detail the size, species, and condition of each tree 3 (three) inches DBH and greater OR managed landscape tree (intentionally planted, non-volunteer tree) of any size.
2. The Tree Survey and a Tree Protection Plan should be submitted to the City of Sun Prairie and all relevant architects, engineers, and workers, detailing the following:
 - A. Trees to be removed
 - B. Trees to be preserved
 - C. Location and size of the Tree Protection Zone (TPZ) for each tree
3. The Tree Protection Zones for each tree shall be visibly delineated by the site engineer, using orange snow fencing or other high visibility exclusion material. When such a delineation is not possible, all workers on site shall be made aware of the TPZ verbally.

Tree Risk Management

Trees provide ecosystem and aesthetic benefits, but all trees also pose some degree of risk. Determining the acceptable level of risk, along with effectively managing that risk, is a key priority for urban forestry operations. As a tree manager, the City of Sun Prairie always assumes some degree of risk. It is up to the City to track that risk to ultimately decide how to take steps to mitigate trees which pose such risk in a manner which is responsible both economically as well as in the interest of public safety. See Sun Prairie ordinance 12.40.050 - Abatement of tree nuisances, for more information on Sun Prairie's policies for publicly managed trees.

Levels of Risk Assessment – An Overview

These Risk Assessment Levels are based on the International Society of Arboriculture's (ISA) Tree Risk Assessment Qualification (TRAQ) protocols, as well as the ANSI A300 Part 9 (Tree Risk Assessment) Standards. The TRAQ forms can be found in Appendix G at the end of this report.

Tree failures resulting in personal injury or fatality are exceedingly rare. So low in fact that data from the National Institute of Health show it as being on par with a lightning strike or winning the lottery: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9303233/> . That said, the general populace has an irrational fear of trees and tree parts failing. It is important to recognize just how rare these occurrences are, and to not over-manage for them. The activities outlined in this plan should help to minimize those figures already, and attempting to eliminate all risk entirely is not feasible.

Level 1 Assessment

Also called a “limited visual assessment”, whereby a tree has a basic analysis of obvious physical defects and condition. The assessor walks or drives by the tree, assesses it quickly for defects, evaluates the risk posed by the subject tree, and reports the results of the assessment to the tree owner. Often, prior to a recommendation, a more detailed (Level 2 or Level 3) assessment will be required to gather additional data.

Level 2 Assessment

A Level 2 Assessment, also called a “basic assessment”, is a report detailing the information collected during a detailed visual inspection of the tree and the surrounding site. Such an inspection requires a 360 degree walk around, and may include the use of simple tools, such as binoculars, magnifying lenses, mallets, probes, and trowels or shovels. The goal is to get a more complete picture of the tree in its environment, as well as previous histories of failures, and a root to branch evaluation of not only the tree but also potential “targets” which falling tree limbs may impact. Targets are things such as structures, people, vehicles, or other things which may be damaged or injured by trees.

Level 3 Assessment

A Level 3 Assessment, also called an “advanced assessment”, provides detailed information about specific tree parts, targets, and risk associated with each potential interaction. By definition, it requires specialized equipment known as “advanced tools”, such as bucket trucks, resistance drills, sonic tomographs, and other such equipment. This is the most detailed and time-intensive type of assessment and is typically only performed when a decision to retain or remove a tree is very difficult, as would be the case for a high quality tree near a potential target that has significant defects, the extent of which are not known, but must become known before making a decision.

Considerations in Assessing Risk

The following are meant for the reader to gain additional insight into the TRAQ process. Once again, TRAQ inspections were not performed on City trees during the inventory data collection, but this information will help the reader understand the terminology better and help inform staff and residents as to how and why these inspections are performed.

Likelihood of Tree Part Failure

As it sounds, this is a process of determining how likely a tree part is to fail, and then how likely that failure is to impact a target. The Likelihood of Failure is an assessment of the tree's defects, and the load on those defects, like weight, gravity, ice, or wind. The parts impacted are generally the roots, root plate, trunk, branches, or potentially whole tree failure at multiple points.

Likelihood of Tree Failure Impacting a Target

Determining the likelihood of impacting a target is figuring out the occupancy rate, or the amount of time that targets (particularly people or high value property) are within the fall zone. A large tree in the middle of a field could fail with little impact, but that same tree in a playground might have serious consequences. In many roadways, motor traffic is present day and night. All the City's inventoried 10,702 trees are in rights-of-way adjacent to roads and next to parks and municipal campuses where failure of a tree not only impacts motorists, but it also has a potential effect on pedestrian traffic, park patrons, visitors to municipal campuses, and utilities within right-of-way also.

Consequences of a Tree Failure Impacting a Target

The potential consequences of the tree failure impacting a target are a cumulative function of both the "value" of the target (person vs car) and the consequences to that target if the tree fails. Whereas the previous step was concerned with occupancy rates, this step looks at the consequences of the impact, and assumes that the target is always present. To follow with the above example, it is assumed that if a terrace tree were to fail, that a car, utility line, and person are all underneath it at the time of failure, and the consequences to those targets is evaluated. Consequences are generally considered to be "minor" for targets that can be easily replaced or repaired and step up through 4 levels with the highest level being "severe", which would constitute severe injury to a person, or even a fatality (see the table below).

Weather

Every tree, no matter how healthy, can fail from wind, lightning strikes, ice loading or soil saturation. "Normal" weather can cause tree or tree part failures for trees which have existing defects, like deadwood, cavities, or poor architecture. Extreme weather events, by contrast, can cause the failure of perfectly healthy trees. For all Tree Risk Assessments, Risk should be assessed assuming "normal" weather conditions. Though it should be noted that "normal" weather conditions for central Wisconsin do include gusty winds, thunderstorms, snow, and even an occasional ice storm. It is the extremes of these events that should be considered abnormal.

SAMPLE City of Sun Prairie Tree Risk Assessment Policy

The City of Sun Prairie has created this policy to maintain an acceptable level of risk from its tree population(s). In order to maintain a high level of public safety, while mitigating undue burden, the City shall adopt the following risk assessment protocols:

1. The City of Sun Prairie maintains a tree inventory detailing the species, size, and condition of all trees on City Terraces, as well as a basic level of risk posed by each tree. This UFMP recommends that the trees listed as being in elevated risk categories during the initial inventory be audited on an ad hoc basis. During these audits, the City Forester or other forestry staff should inspect these trees and identify trees potentially posing an unacceptable level of risk. Such trees identified shall either be scheduled for a more detailed risk assessment (Level 2 or 3), or shall be mitigated, either by pruning, bracing, or removal, as soon as practical following the assessment.
2. During subsequent years, staff shall perform limited visual assessments on an ad hoc basis by driving by trees during the normal course of daily operations. Trees which may appear to present an elevated risk level shall be scheduled for a more detailed risk assessment (Level 2 or 3), or shall be mitigated, either by pruning, bracing, or removal, as soon as practical following the assessment.
3. Upon notification from a resident of a concern about a potentially high-risk tree, the City Forester or other forestry staff perform a Level 1 limited visual inspection within (14) business days of the notification by the resident. If a Level 2 or Level 3 Risk Assessment is required based on that inspection, it shall be performed within an additional (14) business days. A decision shall be made by the City Forester or other forestry staff as to what the appropriate mitigation measures are, if any.
4. All trees determined to be in need of mitigating actions (removal, pruning, etc.) should be documented in writing by the City Forester or other forestry staff. The documentation shall include the date the assessment was performed, the species, size, and condition of the tree, and a brief narrative detailing which parts of the tree are likely to fail, the likelihood of failure, the likelihood of impacting a target, the consequences of tree or tree part failure, and the overall tree risk rating, per the ISA's TRAQ system of risk assessment.
5. A minimum branch diameter of three (3) inches, by ocular estimate, shall be the standard to which this risk assessment policy applies. Assessing all branches smaller than three inches represents an undue burden to the City.

TRAQ Forms can be found in Appendix G at the end of this report

TRAQ Tree Risk Assessment Matrices**Likelihood of Tree Failure Impacting Target**

<u>Likelihood of Tree Failure</u>	<u>Likelihood of Impacting Target</u>			
	Very Low	Low	Medium	High
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Risk Rating Matrix

<u>Likelihood of Failure and Impact</u>	<u>Consequences</u>			
	Negligible	Minor	Significant	Severe
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Table 16 – TRAQ Matrices

Example Budget

The budget numbers below, as mentioned in previous sections of this Urban Forestry Management Plan, are estimated figures if these services were entirely contracted out and are based on current industry rates. These tables provide example budget figures for contracted services throughout the next 20 years based on expected mortality, removals, and plantings. Based on input from City staff, the budget begins this year with a dollar amount that is within their current annual budget for tree related expenses. From there, generally the budget increases slightly each year, and projects through 2044.

Currently, the forestry division's 2024 annual operating budget includes a total \$18,000 for contracted services that could include removals, pruning, stump grinding, consulting, and planting services. Currently, tree purchases and planting services are funded entirely through permit fees and only allocated for new development areas. In the 2024 – 2033 Capital Improvement Plan, there is an additional \$30,000 for tree planting associated with street reconstruction projects. Currently, forestry activities are done by 1.5 FTE and 1 LTE field staff members and all of the vehicles and equipment that forestry staff currently use are shared with other departments (40ft bucket truck, pickup trucks, chippers, chipper trucks, tool cats etc.).

CITY OF SUN PRAIRIE URBAN FORESTRY MANAGEMENT PLAN

REMOVALS	Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
	Trees Removed	100	110	120	130	140	150
	Diameter Inches	1,500"	3,000"	3,000"	3,000"	3,000"	3,000"
	Notes	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates	Removals Found in Inventory Updates
	Removal Cost (2024)	\$15,000	\$16,000	\$17,500	\$19,000	\$20,500	\$21,750
	Removal Cost (CPI)	\$15,000	\$16,000	\$17,500	\$19,000	\$20,500	\$25,013
PLANTINGS	Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
	Trees Planted	150	170	190	210	230	250/year avg
	Planting Cost (2024)	\$45,000	\$51,000	\$57,000	\$63,000	\$69,000	\$140,000
	Planting Cost (CPI)	\$45,000	\$51,000	\$57,000	\$63,000	\$69,000	\$161,000
PRUNING	Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
	Trees Pruned	1500	1550	1600	1650	1700	1,850/year avg
	Notes	All Non-Cyclical Pruning	1,550 Cycle Prunes	1,600 Cycle Prunes	1,650 Cycle Prunes	1,700 Cycle Prunes	Approximately 1,850 Cycle Prunes / year in perpetuity
	Cost (2024)	\$72,500	\$75,000	\$77,000	\$79,000	\$92,500	\$125,000
	Cost (CPI)	\$72,500	\$75,000	\$77,000	\$79,000	\$92,500	\$134,375
FORESTRY CONSULTANT	Milestones	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029-2044</u>
	Notes	Basic Assistance with contract prep, etc	Appraisals and Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management
	Cost (2024)	\$2,500	\$2,500	\$5,000	\$5,000	\$5,000	\$5,000
	Cost (CPI)	\$2,500	\$2,500	\$5,000	\$5,000	\$5,000	\$5,750
TOTALS - PROJECTION ONLY	TOTALS - 2024 \$	\$135,000	\$144,500	\$156,500	\$166,000	\$187,000	\$291,750
	TOTALS - CPI 3%	\$135,000	\$144,500	\$156,500	\$166,000	\$187,000	\$326,138

Table 13 – Overall Sample Budget

Sample Key Performance Indicators

As noted in their individual sections where they occur, these example Key Performance Indicators have been created to gauge the efficacy of this document and the forestry program overall:

KPI #1- GOAL - MULCH ALL TREES 10" AND UNDER:

100% of all newly planted trees mulched by Dec 2024 90% of all existing trees 6" or less mulched by Dec 2025 80% of all existing trees 10" or less mulched by Dec 2026

KPI #2 - GOAL - REDUCE TIME TO GRIND STUMPS AFTER REMOVAL FROM 60 DAYS TO:

90% complete within 45 days by Dec 2024

70% completed within 30 days by Dec 2025

90% completed within 30 days by Dec 2026

KPI #3 - GOAL - INCREASE PUBLIC EDUCATION:

Hold 3 Educational / Public Outreach events (including Arbor Day) in 2024 Hold 4 Educational / Public Outreach events (including Arbor Day) in 2025 Hold 5 Educational / Public Outreach events (including Arbor Day) in 2026

KPI #4 -GOAL - CREATE A REVENUE-GENERATING URBAN WOOD PILOT PROGRAM:

Design and document a pilot/proof of concept project for Urban Wood in 2024 Remove, dry, and mill 100 board feet of Urban Wood in 2025 (Apx 15 10' 2x4 boards) Create any positive net revenue for Urban Wood Products in 2026

KPI #5 - GOAL - START A CYCLE PRUNING PROGRAM:

Complete 90% of all non-cyclical pruning in 2024 (appx 1,350 trees) Complete 90% of listed cycle pruning in 2025 (appx 1,400 trees) Complete 90% of listed cycle pruning in 2026 (appx 1,450 trees)

Glossary of Terms

Aerial Device: Any piece of equipment expressly intended to elevate a human worker above the level at which they typically stand with their feet on the ground surface. Can include but is not limited to bucket trucks, scissor lifts, etc.

Aggressive: A floral or faunal organism which is native (endemic) to the United States or southern Wisconsin, but which is known to outcompete other more desirable organisms

Arborist: An individual engaged in the profession of arboriculture who is educated, trained and licensed to provide for or supervise the management of trees and other woody plants

Arborist Trainee: Any person working under the direct supervision of an Arborist or Certified Arborist

Balled and Burlapped: A tree, shrub, or other plant prepared for transplanting by allowing the roots to remain covered by a ball of soil around which canvas or burlap is tied and secured with a basket.

Bare Root: Harvested plants from which the soil or growing medium has been removed

Best Management Practices (BMP): Methods or techniques found to be the most effective and practical means in achieving an objective while making the optimum use of resources.

Caliper: Standard nurseryman's measure of tree diameter (size). Caliper measurement of the trunk shall be taken six inches above the ground up to and including four-inch caliper size. If the caliper at six inches above the ground exceeds four inches, the caliper should be measured at 12 inches above the ground.

Certified Arborist: An individual who has sufficient experience in the field of Arboriculture, and has been certified by the International Society of Arboriculture as being a Certified Arborist

Border Trees: Trees whose trunks, when measured at DBH, are situated on both Public and private property

Branch Collar: The branch collar is the point where a branch joins the trunk or another branch. This is the area the arborist chooses to make a proper cut.

City Park Property: Park land which, by deed or title, belongs to the City of Sun Prairie

Climbing Line: Any rope or other such material explicitly intended for bearing the weight of a human being

Collected Plants: Trees or shrubs which have been sourced from private property for the intent of transplanting elsewhere

Compacted Soil: A high-density soil lacking structure and porosity, characterized by restricted water infiltration and percolation (drainage), and limited root penetration

Consumer Price Index: an index of the variation in prices paid by typical consumers for retail goods and other items

Containerized: A tree, shrub, or other plant prepared for transplanting, or grown in, a solid-walled container such as a plastic pots or wooden boxes

Contracted Staff: People working for the City as part of an independently owned and operated private company which performs work for the City, but who are not directly employed by the City

Controlling Authority: An agency, organization, or corporate entity with the legal authority and/or obligation to manage individual trees or tree populations

Crew Leader: Any person who has by direction or implication been chosen to lead a team of In- House or Contracted Staff

Crown: The upper part of a tree, measured from the lowest branch, including all branches and foliage

Critical Root Zone (CRZ): The minimum volume of roots necessary for a tree to have health and stability

Cycle Pruning: The process of routine maintenance pruning of trees, not related to storm damage or other hazard or emergency related-pruning, that occurs on a set and predictable time scale set forth by the City

Deadwood: Wood on a tree or shrub which is no longer biologically living and becomes brittle or prone to failure

Decline/Declining: Trees or shrubs which are experiencing symptoms of a general decline on health due to age, pest, or pathogen related issues

Desirable: A Tree or other plant whose characteristics are sought after due to ecology, aesthetics, or public safety

Diameter or DBH: Diameter at Breast Height. A standard forestry measure of tree diameter (size), measured at 4.5' above ground level on the uphill side of a tree using a Diameter Tape

Diggers Hotline (811): The Wisconsin underground utility locating service

Digging Machine(s): Any piece of mechanical equipment whose express purpose is to remove soil and plants from their current locations

Diseased: The status of a tree which has been negatively impacted by a pathogen, bacterial, fungal, viral, or similar lower life forms

Drip Line: The soil surface delineated by the branch spread of a single plant or group of plants

Drought: A period of two weeks or greater, during which there is less than one inch of rainfall, when the average daytime temperature during that same period exceeds 75 degrees Fahrenheit.

Dutch Elm Disease: A fungal pathogen which causes decline and death of specific species of Elms

Dying: A tree which is in the process of biological death due to senescence, disease, infestation, or other such malady from which there is very little to no hope of long-term survival

EAB: Emerald Ash Borer. An invasive beetle pest which affects all Ash trees

Establishment Pruning: The pruning of a young tree in order to establish proper form and branching

Established Trees: Those trees which have been permanently planted for a period of no less than 6 months, and which have permanent roots established in the soil

Failure (tree failure): Breakage of stem or branches, or loss of mechanical support in the root system

Feeder Root: Any portion of the below ground portions of the tree whose purpose is to absorb water and nutrients

Floodplain: Land which has been determined to be periodically inundated with water from a nearby moving or static water body, such as a lake or river. Determined by the Federal Emergency Management Agency

Flush Cut: Either a pruning cut or final cut to remove a stump, for which the maximum acceptable distance from the ground or the branch bark ridge shall be no greater than 2 inches

Full-Time: An employee who has regular employment through the City and whose work hours exceed 36 hours in a week, and who is employed year-round.

Fungal: Any of a group of spore-producing organisms feeding on organic matter, including molds, yeast, mushrooms, and toadstools

Grade: The level or pitch of a certain piece of land, as defined by the trees or shrubs which inhabit it

Hardscape: The nonliving or man-made fixtures of a planned outdoor area, such as sidewalks, retaining walls, street lamps, etc

Hazard: A known and documented state of imperiling public safety

Healthy Tree: Any tree which is successfully adapting to its environment, and shows no signs of disease, pests, pathogens, or other such maladies, as determined by the City Forester

Host: An organism which is susceptible to a known pest or pathogen

Infested: The status of a tree which has been negatively impacted by pests

In-House Staff: Staff directly employed by the City of Sun Prairie, either full-time or Part-Time

Invasive: A floral organism which is not native (endemic) to the United States or southern Wisconsin

Job Site: Any geographic location where a person or persons will be performing activities related to the care and maintenance of City of Sun Prairie property

Liner Nursery: A privately owned plant propagation facility which specializes in the growth of small trees which are intended to be planted for growth into a full form

Managed: A tree or shrub which is in an area of the City which is routinely mowed and managed. Not a wild forest grown tree or shrub, or area containing such trees and shrubs

Manufacturer's Recommendations: Any expressly written instruction manual for a given piece of equipment that details how said equipment is supposed to be managed or maintained

Mineral Soil: Any substrate which is composed of a variety of rocks and minerals in various states of decomposition, leading to the development of a substance on which living plants may live

Mitigation: The process of diminishing risk

Monoculture: A population of trees in close proximity to one another which is comprised of 3 species or less of trees and shrubs which is prone to pest or pathogen outbreak

Natural Resources: Flora, fauna, and other such living and non-living parts of the environment which the City of Sun Prairie maintains

Nursery Stock: Woody Perennials which are of a “Tree Form” growth habit and are supplied by a nursery contractor for planting. Not established trees.

Parkway Tree: Any woody plant within a Publicly-Owned right-of-way, or any other property owned or managed by the City of Sun Prairie

Part-Time: An employee who has regular employment through the City and whose work hours are less than 36 hours in a week, and who is employed year-round

Pathogen: A fungus, virus, or other such microscopic organism which causes decline or death of trees

Pest: An insect or other macrofaunal organism which causes decline or death of trees

Private Property: Land which, by deed or title, does not belong to the City of Sun Prairie

Public Safety: The welfare and protection of the general public

Reforestation: The process by which trees are planted to replace trees which have been removed

Rigging Line: Any rope or other such material explicitly intended for bearing the weight of a tree limb. Not to be used for supporting a human being

Right-of-Way (ROW): The publicly-owned land on which a road, drainage ditch, trail, or other public access is built

Risk: A situation involving potential exposure to danger or endangering public safety

Root Protection Zone (RPZ): The area on the ground surrounding a tree in which excavation, compaction, and other construction-related activities should be avoided or mitigated

Saddle: A piece of equipment expressly intended to hold a human being above ground level with the assistance of a rope or other such device

Sanitation Pruning: The removal of tree limbs that have become diseased or infested, in order to prevent the spread of disease or infestation from spreading throughout the rest of the tree e.g., Dutch Elm Disease, Black Knot Fungus, etc.

Seasonal Employees: Those employees retained by the City for less than 6 months out of the calendar or budget year

Shrub: Any woody perennial which has a multi-stemmed growth habit not consistent with being considered a tree. Can be subject to interpretation by Sun Prairie Staff.

Sound Wood: Structurally sound, non-decayed, non-compromised wood in the trunk or Scaffold Branches

Staff: Those employees retained by the City on a full-time basis with benefits provided

Structural Root: Any portion of the below ground portions of the tree whose purpose is to stabilize the plant against the forces of wind and gravity

TRAQ: Tree Risk Assessment Qualification. The International Society of Arboriculture's formal status of an individual who is qualified to assess the risk that trees may bring to the general public

Tree Protection Zone (TPZ): The area surrounding a tree in which excavation and other construction-related activities should be avoided. Generally 1 inch in radius for each diameter inch of the tree.

Tree Risk: The likelihood and consequences of failure of a tree or tree parts

Tree Risk Assessment: A systematic process used to identify, analyze, and evaluate tree risk

Underperforming: Trees which have systematic health and vigor issues resulting in poor health, architecture, or other such maladies as determined by City staff

Undesirable: A tree which is not desired in the landscape due to ecological, aesthetic, or public safety reasons, as determined by Sun Prairie Staff

Unmanaged: A tree or shrub which is in an area of the City of Sun Prairie which is not routinely mowed and managed. A wild forest grown tree or shrub, or area containing such trees and shrubs

Urban Wood: Any tree or other woody perennial material which has been harvested for the sole purpose of long term storage in the form of furniture, recreational material, etc. Differentiated from "Reclaimed Wood"

Utility Arborist: A person explicitly trained in the management of trees and other plants in relation to energized power lines. Someone who is licensed to work with conflicts between trees and such energized power lines.

Appendix A: Draft Storm Damage Response Plan

Living in a seasonal climate like we do here in the Upper Midwest, the City of Sun Prairie is subject to a wide array of weather over the course of an average year. As we discuss in the Risk Management section of this UFMP, “normal weather” in south central Wisconsin can include thunderstorms, snow, gusty winds, ice storms, flooding, drought, and other similar events. These are the weather events we expect to deal with every year. And we are always under potential threat of severe weather, which includes non-normal events such as straight-line winds (Derechos), tornados, and extreme temperatures. These events are considered “abnormal” but do occur with some frequency in our region.

Despite our best planning efforts, severe weather events can take a devastating toll on our trees in the urban forest. And while we welcome trees in our community because of the vast benefits they provide, trees or tree parts failing during extreme weather events can be a potential hazard in an emergency. We as an agency need to be prepared for these events and have a plan to respond to them. What follows is a plan for Sun Prairie to prepare for, respond to, and effectively manage the aftermath of storm events which have impacted trees. It should be noted that this plan is intended for response at the local and immediate regional level only. If an event has been so severe that a state or federal disaster declaration has occurred, there are other higher-level resources which Sun Prairie can take advantage of. Some of these are listed below:

Wisconsin Emergency Response Plan:

[https://wem.wi.gov/wp-content/library/preparedness/2021-2023_State_of_Wisconsin_Emergency_Response_Plan_\(WERP\).pdf](https://wem.wi.gov/wp-content/library/preparedness/2021-2023_State_of_Wisconsin_Emergency_Response_Plan_(WERP).pdf)

Wisconsin Emergency Alert System (EAS) Plan:

<http://www.sbe24.org/EAS/MAIN0223.pdf>

Wisconsin Recovery Plan:

https://wem.wi.gov/wpcontent/library/recovery/Master_Recovery_Plan2.25.2022.pdf

Federal Emergency Management Agency (FEMA) Response Planning Guide:

<https://www.fema.gov/emergency-managers/national-preparedness/plan>

FEMA Emergency Operations Guide:

https://www.fema.gov/sites/default/files/documents/fema_cpg-101-v3-developing-maintaining-eops.pdf



FEMA

Local Non-Emergency Contacts

While this plan is intended to be utilized in the case of a widespread storm which has affected a large geographic area, smaller or isolated events such as a single tree or tree part impacting property do occur more frequently. If you have an issue which does not involve widespread damage from a storm event:

Name	Title	Department	Phone #	Physical Address	Call For
Cindy Burtley	PRF Division Manager	Parks	608-825-0723	2598 W Main St, Sun Prairie WI	General forestry inquiries, minor issues
Brandon Hellenbrand	City Forester	Parks	608-772-0275	2598 W Main St, Sun Prairie WI	Forestry specific issues, downed trees
Benjamin John	PW Operations Manager	Public Works	608-825-0713	300 E Main St, Sun Prairie WI	Clearing of trees from streets / sidewalks
Mike Steffes	Chief of Police	Police	608-825-1153	300 E Main St, Sun Prairie WI	Non-life threatening emergency

Training

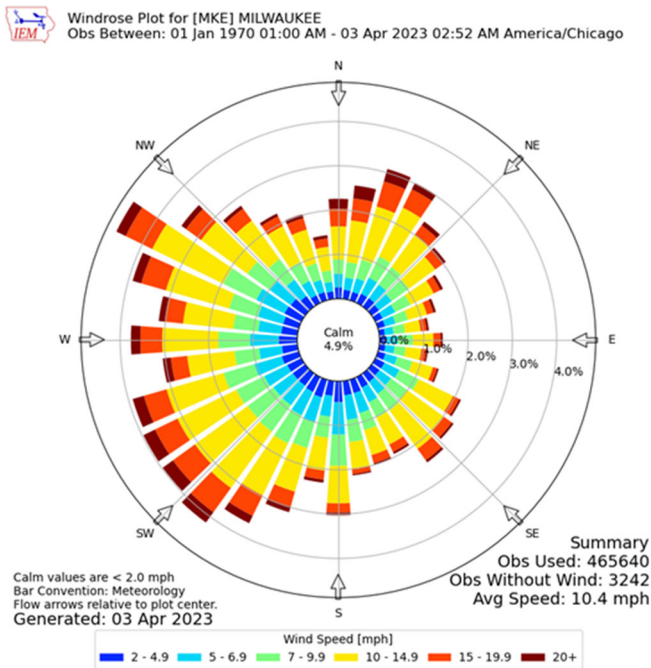
All staff involved with emergency operations shall have taken the following courses online through the FEMA Emergency Management Institute (<https://training.fema.gov/nims/>) in order to better understand how Incident Command and the National Incident Management System (NIMS) works:

ICS-100	Introduction to the Incident Command System
ICS-200	ICS For Single Resources and Initial Action Incidents
IS-700	National Incident Management System, an Introduction
IS-706	NIMS Intrastate Mutual Aid

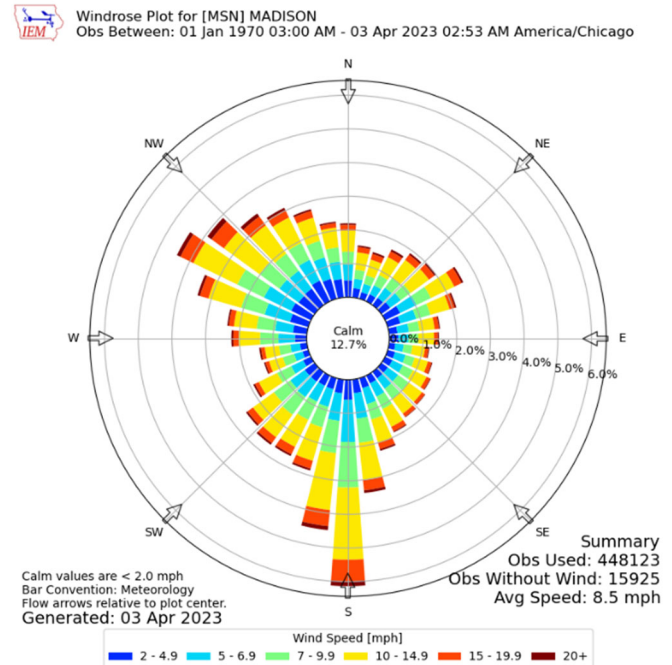
These online courses represent approximately 10 hours' worth of online video and study, and staff should be given sufficient time over the course of the first 8 weeks following this plan's adoption to watch these videos and obtain the certificates of completion, which should be kept on file with the appropriate internal staff.

Weather Monitoring

Weather conditions shall be monitored by staff. The NOAA (National Oceanic and Atmospheric Administration) local forecast office is actually out of Milwaukee, so some NOAA forecasts may need to be crosschecked against weather data available from more local sources such as that available from the Truax Field Regional stations. Below are 2 examples of wind roses, showing the average wind speed and direction of the Milwaukee area (left) and the Madison area (right). As you can see, these are very different. Dane county has some interesting weather patterns vs the rest of the state.



Milwaukee Wind Rose, showing prevailing winds from the W and SW, with occasional gusts



Madison Wind Rose, showing prevailing winds from the S and NW, with occasional gusts from

Even though weather notifications are generally the responsibility of staff, all employees and front line staff should be monitoring the weather via phone apps or radio during the day. Staff should familiarize themselves with basic weather patterns in the area and changes in climate factors. Threats of potential severe weather should be communicated quickly and efficiently from any staff member who has a reliable source of weather information. Which shows severe weather is incoming. A basic tutorial on how to effectively read and interpret doppler radar can be found here:

<https://meteor.geol.iastate.edu/~jdduda/portfolio/How%20to%20read%20and%20interpret%20weather%20radar.pdf>

What is Extreme Weather?

The International Panel on Climate Change (IPCC) defines Extreme Weather as the following:

"An event that is rare at a particular place and time of year. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations."

Therefore, we must know the climate and expected weather patterns well before we can define what is abnormal for a region. There is a wide array of weather data available for the region through the following websites:

NOAA National Weather Service: www.weather.gov

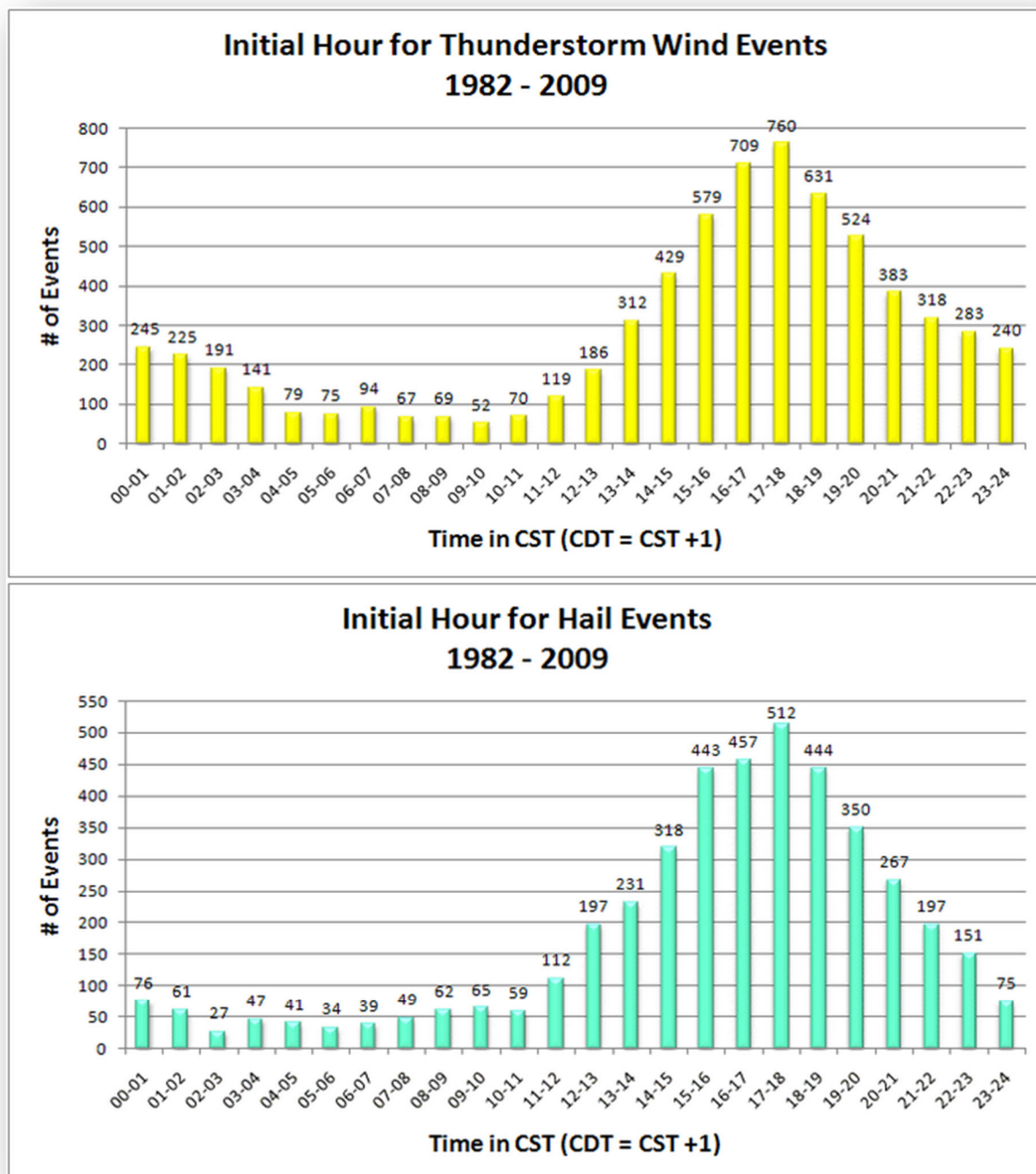
Old Farmer's Almanac: www.almanac.com

Weather Underground: www.wunderground.com

Weather Channel: www.weather.com



As an example, below is an output from the National Weather Service showing the initial hours of certain weather events and when they are more likely to occur (https://www.weather.gov/grb/storm_init). While it is beyond the scope of this storm response plan to provide detailed analyses of exactly where and when certain weather events are likely or unlikely to occur, it is important to note that training on weather events is likely something that should be prioritized for safety meetings, in house trainings, etc.



Extreme Weather Event Types

Listed below are several types of extreme weather events, how they are defined, as well as the tree related damage which can typically be expected of them.

Severe Thunderstorms

Defined as *“Storms capable of producing hail that is 1” or larger, and wind gusts in excess of 58 mph”*. These storms may produce heavy rain, hail, flash flooding, lightning strikes, and strong winds, and may possibly spawn tornadoes. There are some additional subcategories, such as Considerable Damage Threat, which implies that there could be 1.75” hail and winds up to 70 mph, or Destructive Damage Threat, which implies 2.75” hail and winds up to 80 mph.

Wisconsin averages approximately 29 Severe Thunderstorm Watches each year.

Damage Expected

Broken Limbs	Due to strong winds
Damage to Tree Parts	Due to lightning strikes
Uprooting of Trees	Due to strong winds combined with loose soil from excess soil moisture
Mechanical Injury	Due to hail strikes

Tornadoes

Defined as *“a violently rotating column of air extending from the base of a thunderstorm down to the ground”*, these storms are capable of completely destroying structures, uprooting trees, and hurling items through the air.

Wisconsin averages 23 tornadoes each year.

Damage Expected

Broken Limbs	Due to severe winds
Uprooting of Trees	Due to severe winds
Damage to Property	Due to tree parts becoming aerial and striking objects

Ice Storms

An ice storm is used to describe *“occasions when damaging accumulations of ice are expected during freezing rain situations”*. Significant accumulations of ice pull down tree parts and can occasionally cause whole tree failure. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of ¼" or greater. Wisconsin Averages around 1 ice storm every 4 or 5 years.

Damage Expected

Broken Limbs	Due to weight of ice
Worsening of Defects	Due to frost wedging
Whole Tree Failure	Due to weight of ice

Winter Storms

Winter Storms are those which *“can include heavy snowstorms, blizzards, snow squalls, freezing rain, and blowing and drifting snow conditions. Winter storms can also bring extreme cold temperatures”*. These storms can create significant weight loading on tree parts, and during periods of extreme cold may cause some tree species to actually die due to exceeding their cold hardiness.

Wisconsin averages 3 to 5 Winter Storms each year.

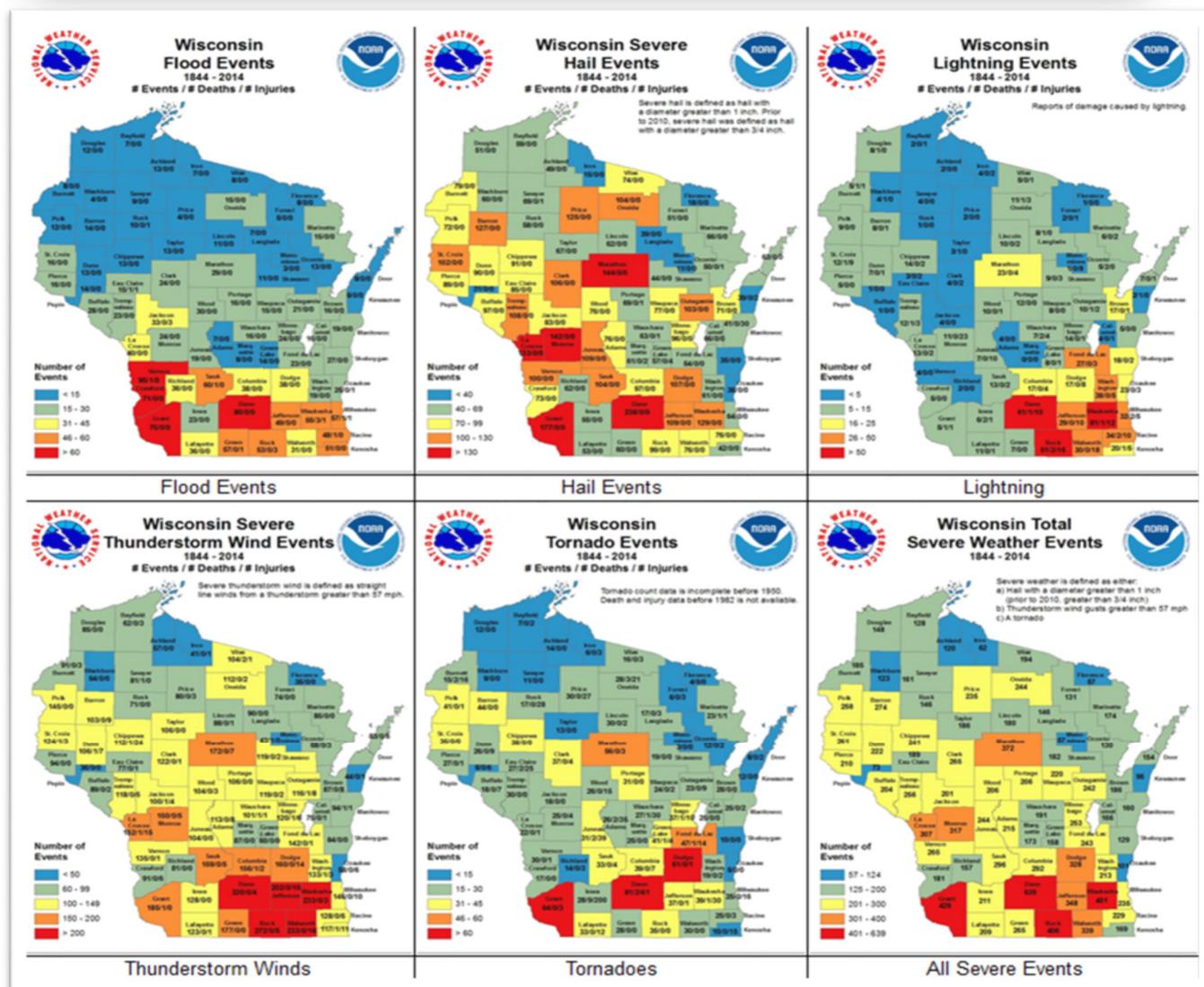
Damage Expected

Broken Limbs	Due to weight of snow combined with wind
Whole Tree Failure	Due to weight of snow combined with wind

Any of the above can be subject to watches, advisories, or warnings. A Watch indicates that the conditions are correct for formation of any of the above types of extreme weather and an event may occur, while a warning indicates that the storm has already begun. The table below displays this information (courtesy of NOAA):

Something worth of note here is how much more severe weather the southern part of the state is subject to, including Dane county. This is largely a result of the gulf stream of warm, moist air still being present in the southern portions of the state. This warm air mixing with cooler polar air from the north can cause severe and extreme weather outbreaks when it does. Therefore, of all the weather events extolled above, a greater proportion of them happen in Dane county and the surrounding areas.

WARNING	A warning is issued when a hazardous weather or hydrologic event is occurring, imminent or likely. A warning means weather conditions pose a threat to life or property. People in the path of the storm need to take protective action.
ADVISORY	An advisory is issued when a hazardous weather or hydrologic event is occurring, imminent or likely. Advisories are for less serious conditions than warnings, that cause significant inconvenience and if caution is not exercised, could lead to situations that may threaten life or property.
WATCH	A watch is used when the risk of a hazardous weather or hydrologic event has increased significantly, but its occurrence, location or timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so. A watch means that hazardous weather is possible. People should have a plan of action in case a storm threatens and they should listen for later information and possible warnings especially when planning travel or outdoor activities.



Storm Pre-Planning

In the event of a storm warning which staff has determined to be of sufficient potential for harm, dysfunction, or damage, staff shall perform the following actions:

1. Notify all relevant staff to return to the Public Works facility to prepare for the incoming event, and cancel all leave time for staff which falls within the anticipated event window.
2. Contact partners in mutual aid networks and private contractors on retainer and ensure that they have the ability to provide assistance, and are willing to provide it.
3. Ensure that all equipment such as trucks, chainsaws, buckets, etc. are fueled / charged, and in working order.
4. Assemble and prepare backup parts and fuel for trucks and equipment, not limited to spare chains, files, gasoline and diesel, portable charging units, Personal Protective Equipment (PPE), and warm weather clothing, and stage this equipment in a specific location either at the Public Works or in the hands of the individual employees.
5. Ensure additional food and water resources are available for staff, contractors, and mutual aid partners
6. Create a list of all personnel who will be present for the event, and detail their contact information and duties, generally following the FEMA ICS 100 protocol (see graphic below).
7. Create a prioritized list of critical facilities to monitor during the event. Not all roads will be passable, so staff should be stationed near critical facilities either during or after the event.
8. Create a prioritized list of critical roads and transmission lines which should be monitored
9. Create a prioritized list of critical trees which should be monitored. This can be ascertained by using the tree inventory to find trees which are larger, have structural defects, or have a higher likelihood of failure and impact.
10. Monitor weather for changes in conditions or timing of potential event and maintain communication with command structure.
11. Create a go/no go list for monitoring or patrolling by staff, contractors, or mutual aid partners specific to the anticipated event. So (e.g.) in the event of extreme thunderstorms, all team members know when they should and should not be on patrol in response to lightning or high winds (e.g.).

In House Staff	Provide Incident Command structure. Monitor and patrol critical facilities and utility / transportation corridors, communicate needs to contractors and mutual aid partners. Assist in removal of smaller trees and debris, coordinate debris hauling and staging.
Contractors	Provide operational support in removal of large trees and tree parts from Public Right of Way and other Public property. Assist in updating of tree inventory or other systems of record. Provide Risk Assessment data. Provide hauling services or dispose of debris.
Mutual Aid Partners	Provide operational support as well as equipment support for tree removal and debris management operations. May also play a part on command structure at discretion of Incident Commander. Provides support operation such as distribution of food, water, and equipment resources to other response team members.

During the Event

1. Depending on the severity of the event and at the discretion of the Incident Commander, staff, contractors, or mutual aid partners may patrol the critical facilities, roads and utility corridors, and trees to monitor for any signs of tree failure, and to respond to events quickly.
2. If not in the Public Works Facility, the physical location and contact information of each response team member should be known, as well as how to contact those people in the event of an emergency.
3. If the event is severe enough, no one from the response team should be out in the elements and should remain safe and shelter in place until the event has ended or lessened in severity. A simple Red, Yellow, Green color system can be prepared to help make this decision based on the risk tolerance of the organization. This decision shall be made by the incident commander.
4. Communication from the public shall be monitored by staff when possible, and response to communication shall be at the discretion of the incident commander. If it is unsafe for staff, contractors, or mutual aid partners to be out in the current conditions, staff shall prioritize responses for when it is safe to respond.
5. Any response activities conducted during the event shall be done so only on an as-needed basis, and need shall be determined by the incident commander operating with information being provided from front line response team members.
6. Responses during the event generally include only the most critical tasks, such as clearing of trees and tree parts from roads and/or critical facilities which are blocked or inoperable or removing fallen trees or tree parts from vehicles or other structures where there maybe be people trapped inside.
7. Response team members should be in constant contact throughout the event if deployed. Specific communication methods and mean are currently TBD.
8. Rally points near critical facilities and transportation/utility corridors should be visited on a routine basis during the event to provide rapid response in the event of a tree failure.
9. It is important to remember that dangerous conditions make response efforts much more hazardous, and only the most critical needs should be met during the event. All mobilization and response efforts shall be done in compliance with Occupational Safety and Health Administration (OSHA) rules and regulations.



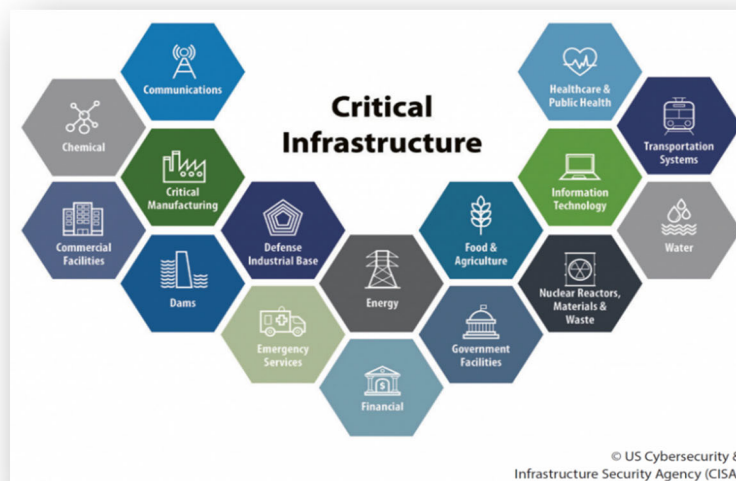
Immediate Response

1. The Incident Commander shall decide, based on data available from the National Weather Service and response team input, when the conditions are safe for response to begin, and will activate each individual member or agency as needed.
2. Response shall be organized into a series of Strike Teams to be deployed throughout the City. The general priority orders are shown to the right. Please note that any of this prioritization can be overridden at any time by the Incident Commander.
3. Response shall take place in teams of a minimum of 2 members. No single resource shall be deployed alone without a partner for safety reasons. Response teams shall be equipped with the equipment noted below at a minimum:

1	Human Life at Stake-Any Circumstance
2	Clear Critical Transportation Routes
3	Restore Critical Facilities if Damaged
4	Restore Utility Services
5	Clear Secondary Transportation Routes
6	Restore Noncritical Facilities
7	Patrol for Severely Damaged Standing Trees
8	Patrol for Additional Downed Tree Debris

Cell Phone/Tablet/Radio	Vehicle	Tree Inventory Access	Paper/Pencil/Clipboard
Diameter Tape	Charging Cables	Flashlights	First Aid Kits
Chainsaws/Fuel/Oil/etc.	Camera	PPE/Hardhats	High Visibility Outerwear
Drinking Water	Food/Snacks	Identification Badge	Barricade Tape

4. Response teams shall initially be entirely operational, focusing on the priority items above in terms of physical debris removal for known issues. Only once the most critical items (1-4) on the list above are completed will the response transition into a patrolling one where team members are actively seeking out issues which have not been recorded yet.
5. Response teams shall communicate with all other response team members
6. Debris shall be cleared as expediently as possible from the Critical Facilities and Transportation/Utility Corridors in order to reopen or reactivate them. Debris may be temporarily staged near where it is being removed, and the staging areas must be marked appropriately with Barricade Tape which clearly states "DO NOT ENTER". No tape shall be utilized which has words such as "CAUTION" which could be misinterpreted by passersby.
7. Response teams shall obey all OSHA Rules and Regulations and ANSI Standards while conducting response operations. Particularly when dealing with tree and utility conflicts, response teams shall ensure conductors are no longer energized before beginning any sort of clearing of debris begins.
8. For tree issues not dealing with energized conductors, response team member shall conduct a basic Level 1 Assessment of the tree or tree part, to ensure that operations may be conducted safely before any clearing of debris begins.
9. If, during immediate response operations, the response team happens to notice additional tree related issues which must be dealt with, these trees should be noted in the tree inventory or other system of record for the event. They may be added to the immediate response list at the discretion of the incident commander.



Recovery

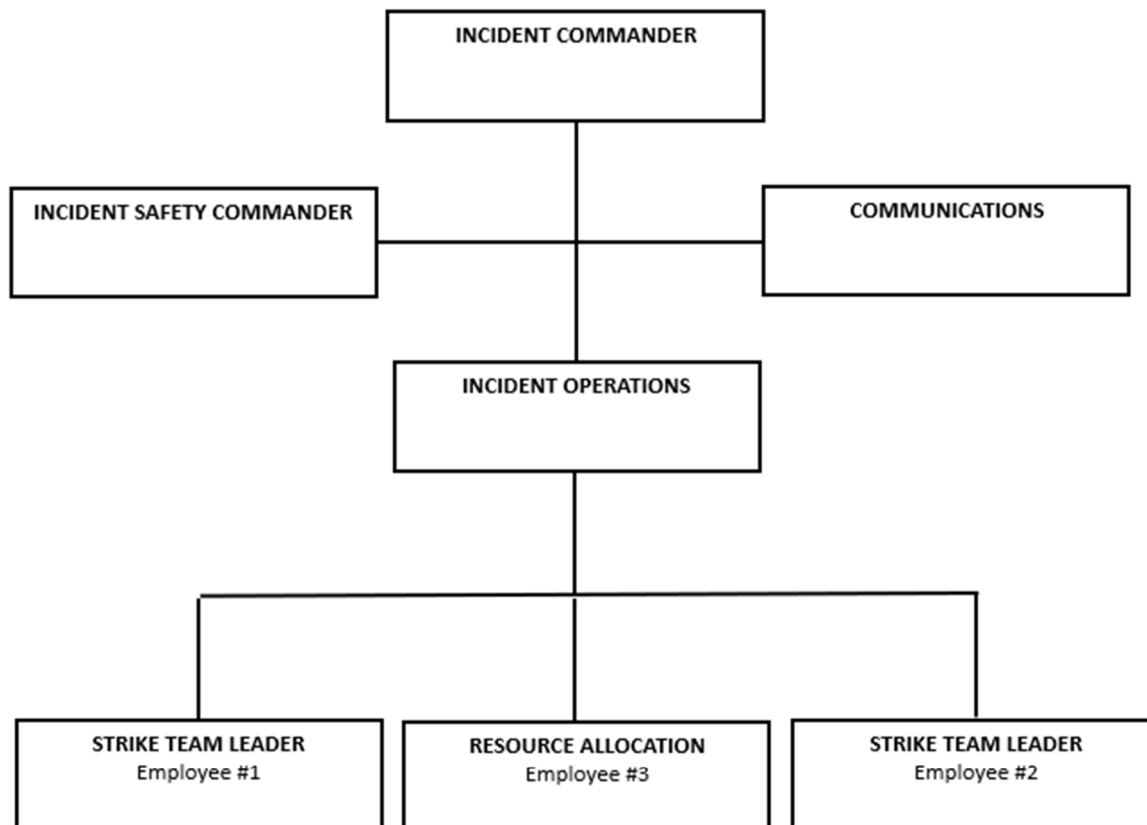
1. The Incident Commander will notify the response team (staff, contractors, and mutual aid partners) when the incident has transitioned from immediate response to recovery.
2. The focus of the Strike Teams shall transition away from restoring immediate needs, and switch to evaluating the remaining damage. Operationally, this means making a switch from handling known issues to actively searching for less obvious issues, as well as debris management, according to the rough prioritization table to the right. These priorities may be overridden at any time at the discretion of the Incident Commander.
3. The Incident Commander may choose to hold a press briefing or other Public Information meeting at this stage once response efforts have reached this phase.
4. Trees which are standing, but were severely damaged and are at a high or extreme risk of failure in the near future should take clear precedence, followed by trees which will likely remain standing, but which have parts which must be mitigated or removed before their risk levels drop to tolerable levels. Sun Prairie will need to determine what the standard is for allowing a tree to remain vs needing to be removed.
5. All patrol work should be documented digitally in the City's tree inventory, or kept as separate paper records, depending on that nature and severity of the event. As the patrols report field data back about various tree issues, the Incident Commander will prioritize these issues and communicate operational support to the remaining response team members.
6. Patrol work shall generally follow the model set forth in the US Forest Service's Strike Team protocols, which can be found here (<https://communityforestry.academy/>), with assessment of individual trees being based on a "Rapid Assessment" of their condition, roughly following the International Society of Arboriculture's TRAQ
7. Marshaling yards for debris management shall be established throughout the City where tree debris can be staged before it is prepared for disposal. Landfill Diversion is the preferred method of debris management. As much material as can be chipped and used for woodchips at a later date, or logs that can be diverted into the Urban Wood Upcycling stream are preferred. Procuring a tub grinder from a response team partner is also recommended as these machines can handle more and larger debris on a larger scale.
8. Communication with residents shall continue as well, in order to inform the Incident Commander when patrols may have missed a tree related issue.
9. At some point to be determined by the Incident Commander, the Recovery process shall be considered to have concluded, and any remaining work to be done shall be done as part of normal ongoing Forestry operations.

1	Trees at High Risk of Failure
2	Large Hanging Branches
3	Large Trunk Wounds
4	Trees Being Braced by Other Trees
5	Smaller Hanging Branches
6	Smaller Trunk Wounds
7	Larger Debris on Ground
8	Smaller Debris on Ground

List of Critical Facilities - To be completed prior to event

List of Critical Trees - To be completed prior to event

Incident Command Team - To be completed prior to event



INCIDENT COMMAND STAFF LIST

Appendix B: Acceptable and Unacceptable Species

This list will be updated regularly by forestry staff and subsequently reviewed and approved by PRFC. Below is the current 2022 Approved Street Tree List.

Type	Common Name(s)	Genera	Scientific name(s)	Preferred Cultivar(s)	Notes
Street	Freeman maple	Acer	<i>Acer x freemanii</i>	Celzam; Armstrong	
Street	Maple	Acer	<i>Acer sp.</i>		
Street	Red maple	Acer	<i>Acer rubrum</i>		
Street	State Street Maple	Acer	<i>Acer miyabei</i>	Morton	
Street	Serviceberry	Amelanchier	<i>Amelanchier canadensis, Amelanchier x grandiflora</i>	Rainbow Pillar; Robin Hill	tree form only; shrub form not acceptable
Street	European hornbeam	Carpinus	<i>Carpinus betulus</i>	Frans Fontaine	
Street	Muscledwood; American hornbeam; blue beech	Carpinus	<i>Carpinus caroliniana</i>		
Street	Common hackberry	Celtis	<i>Celtis occidentalis</i>	Chicagoland; Prairie Pride; Prairie Sentinel	
Street	Yellowwood	Cladrastis	<i>Cladrastis kentukea</i>		
Street	Turkish filbert	Corylus	<i>Corylus colurna</i>		
Street	Ginkgo	Ginkgo	<i>Ginkgo biloba</i>	Autumn Gold; Princeton Sentry; Magyar	male only
Street	Honey locust	Gleditsia	<i>Gleditsia triacanthos var. inermis</i>	Harve; Skyline; Suncole; Shademaster; Street Keeper	thornless and fruitless varieties only
Street	Kentucky coffeetree	Gymnocladus	<i>Gymnocladus dioica</i>	Espresso; Prairie Titan	
Street	Tuliptree	Liriodendron	<i>Liriodendron tulipifera</i>		
Street	flowering crabapple	Malus	<i>Malus sp.</i>	Starlite; Royal Raindrops	disease resistant varieties
Street	Ironwood; American Hophornbeam	Ostrya	<i>Ostrya virginiana</i>		
Street	Planetree; Sycamore	Platanus	<i>Platanus x acerifolia</i>	Bloodgood; Morton Circle	
Street	Bur oak	Quercus	<i>Quercus macrocarpa</i>		
Street	Chinkapin oak	Quercus	<i>Quercus muhlenbergi</i>		
Street	English oak	Quercus	<i>Quercus robur</i>		
Street	Heritage oak	Quercus	<i>Quercus x macdanielii 'Clemons'</i>		
Street	Northern red oak	Quercus	<i>Quercus rubra</i>		
Street	Pin oak; swamp spanish oak	Quercus	<i>Quercus palustris</i>		

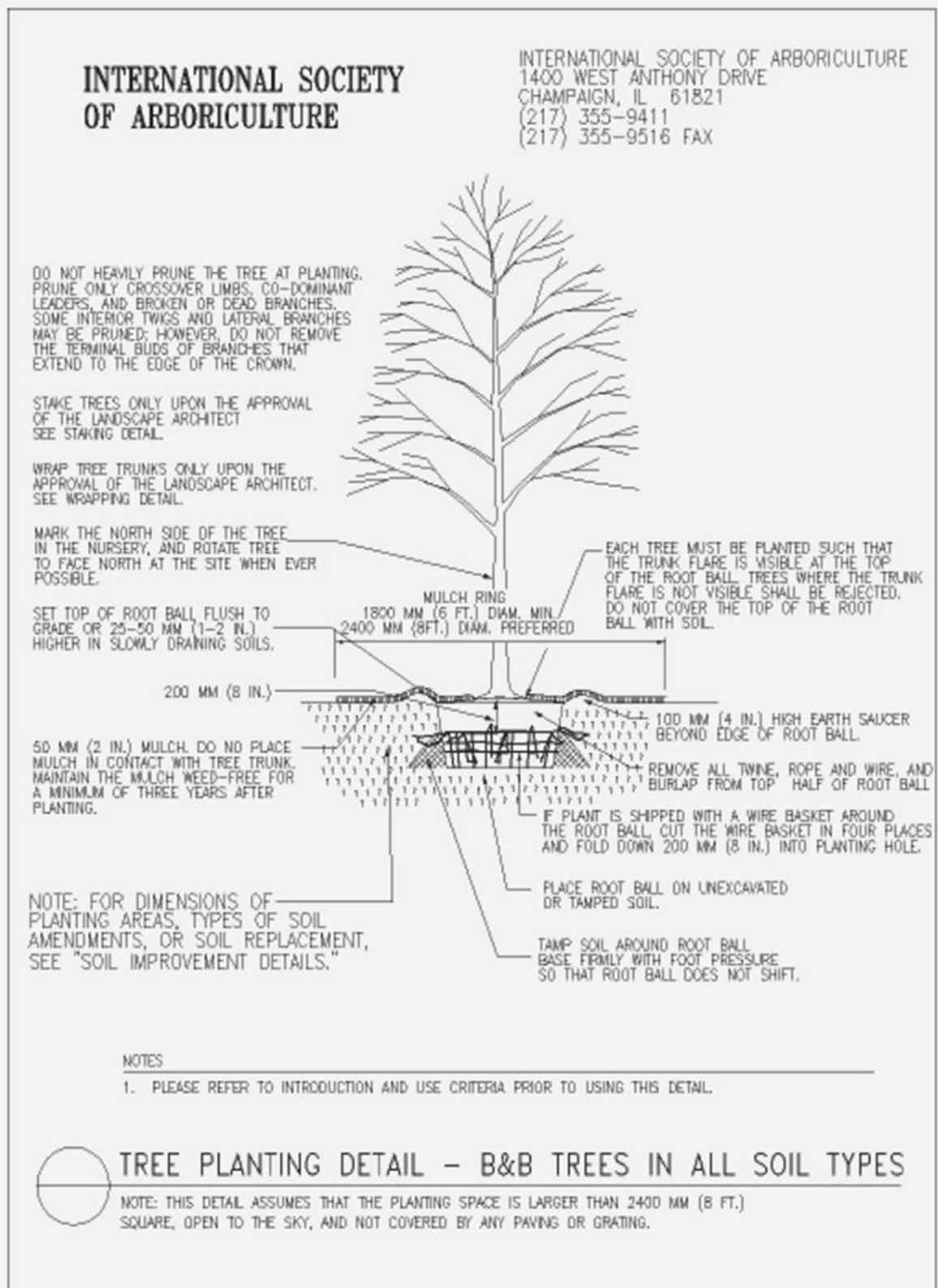
Approved Street Tree List 2022

Type	Common Name(s)	Genera	Scientific name(s)	Preferred Cultivar(s)	Notes
Street	Regal Prince Oak	Quercus	<i>Q. robur</i> x <i>Q. bicolor</i>		
Street	Swamp white oak	Quercus	<i>Quercus bicolor</i>		
Street	Japanese tree lilac	Syringa	<i>Syringa reticulata</i>	Elliott; Ivory Silk; Willamette	
Street	American Basswood;	Tilia	<i>Tilia americana</i>		
Street	American Linden				
Street	Littleleaf linden	Tilia	<i>Tilia cordata</i>	Glenleven; Greenspire; Halka	
Street	American elm	Ulmus	<i>Ulmus americana</i>	New Harmony; Valley Forge; Jefferson	disease resistant varieties only
Street	Elm	Ulmus	<i>Ulmus</i> x <i>hybrids</i>	Cathedral; Morton Glossy	disease resistant varieties
RESTRICTED*	Amur maple	Acer	<i>Acer tataricum</i> subsp. <i>ginnala</i>		invasive spp.
RESTRICTED*	Tree-of-heaven	Ailanthus	<i>Ailanthus altissima</i>		invasive spp.
RESTRICTED*	European alder	Alnus	<i>Alnus glutinosa</i>		invasive spp.
RESTRICTED*	Japanese barberry	Berberis	<i>Berberis thunbergii</i>		invasive spp.
RESTRICTED*	Autumn olive	Elaeagnus	<i>Elaeagnus umbellata</i> ; <i>Elaeagnus angustifolia</i>		invasive spp.
RESTRICTED*	Winged euonymus	Euonymus	<i>Euonymus alatus</i>		invasive spp.
RESTRICTED*	Ash	Fraxinus	<i>Fraxinus</i> sp.		EAB susceptible
RESTRICTED*	Honeysuckle	Lonicera	<i>Lonicera x bella</i> ; <i>Lonicera mackii</i> ; <i>Lonicera morrowii</i> ; <i>Lonicera tatarica</i>		invasive spp.
RESTRICTED*	White mulberry	Morus	<i>Morus alba</i>		invasive spp.
RESTRICTED*	Princess tree	Paulownia	<i>Paulownia tomentosa</i>		invasive spp.
RESTRICTED*	Amur cork tree	Phellodendron	<i>Phellodendron amurense</i>		invasive spp.
RESTRICTED*	White Poplar	Populus			invasive spp.
RESTRICTED*	Sawtooth oak	Quercus sp.	<i>Quercus acutissima</i>		invasive spp.
RESTRICTED*	Buckhorn	Rhamnus	<i>Rhamnus cathartica</i> ; <i>Frangula alnus</i>		invasive spp.
RESTRICTED*	Black Locust	Robinia	<i>Robinia pseudacacia</i>		invasive spp.
RESTRICTED*	Siberian Elm	Ulmus	<i>Ulmus pumila</i>		invasive spp.

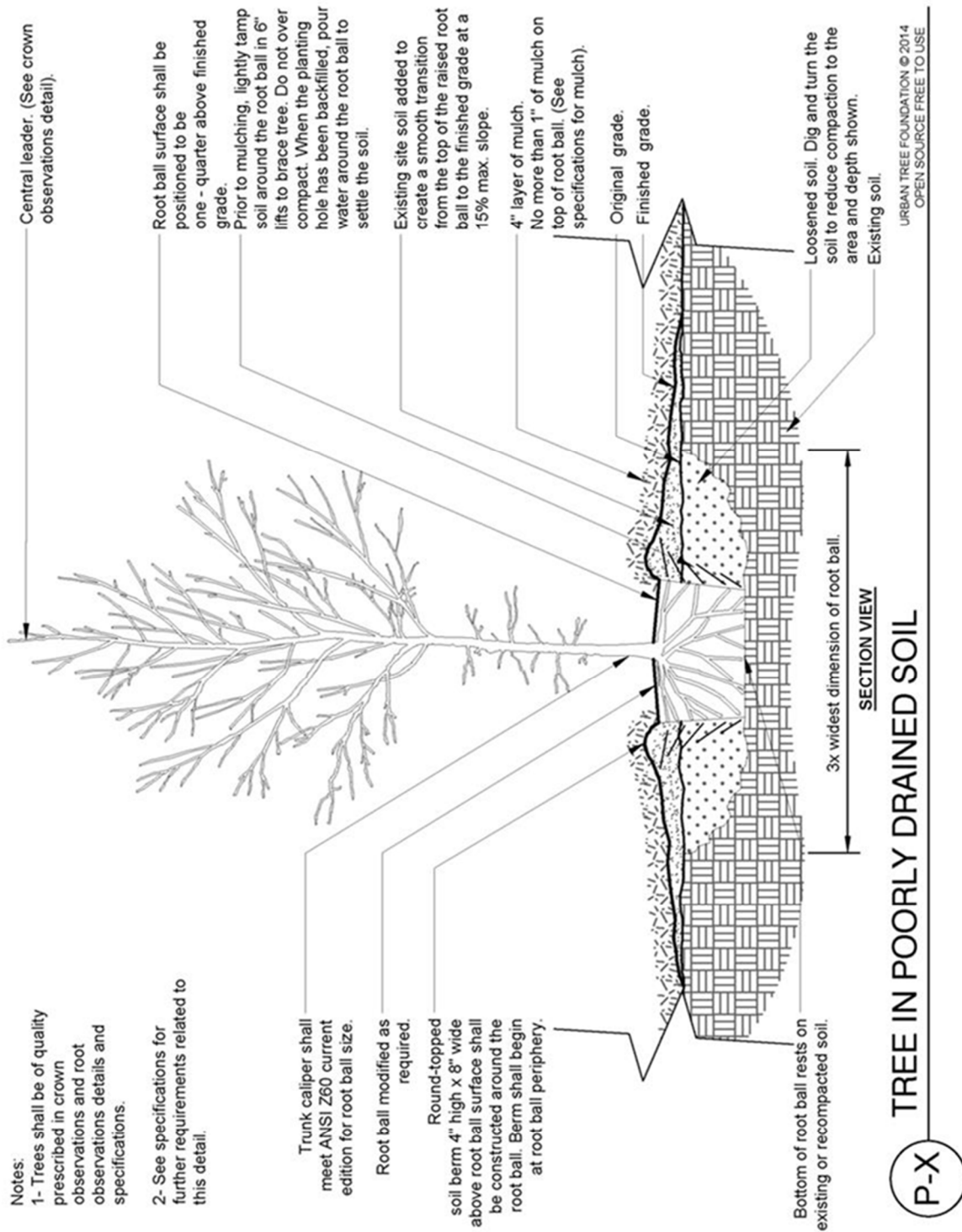
*Species identified as "Restricted" shall not be planted.

To plant a species not identified on this list, written approval must be given by the Parks and Forestry Division Manager.

Appendix C: Balled and Burlapped Planting Detail

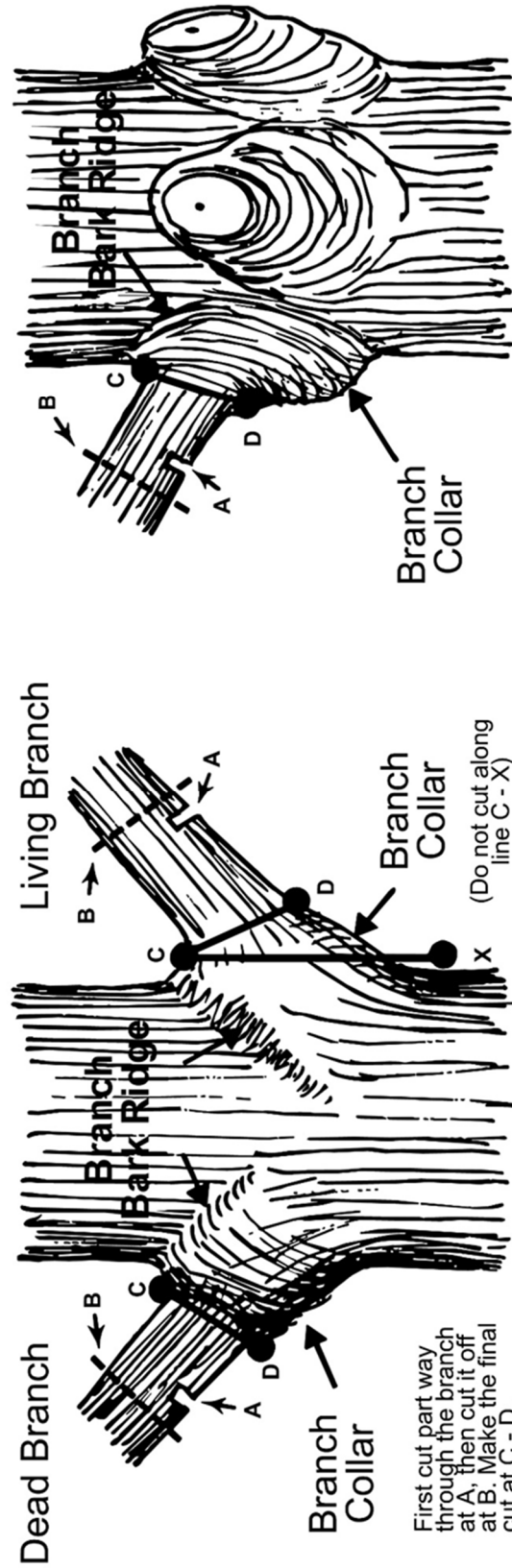


Appendix D: Containerized Planting Detail



Appendix E: Tree Pruning Detail

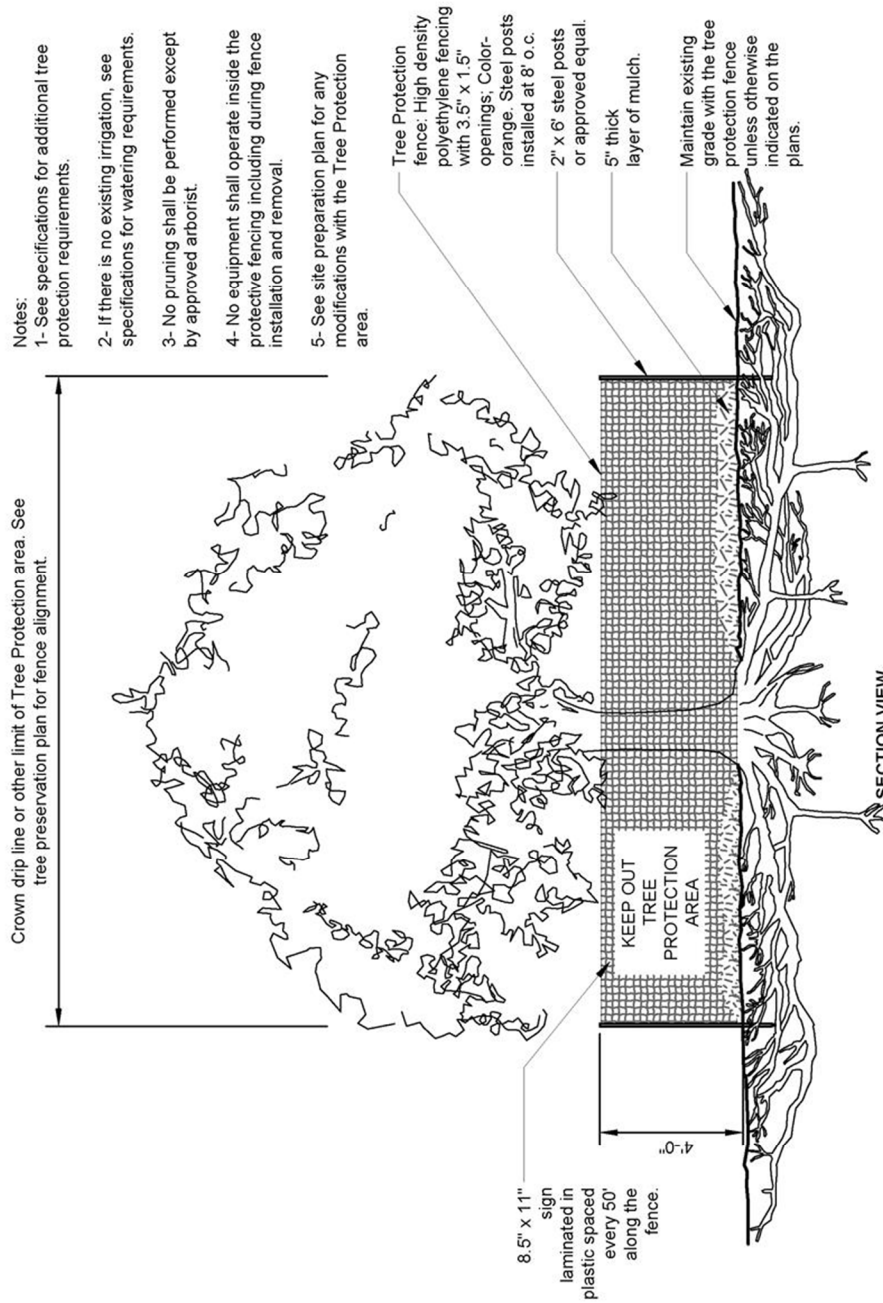
Proper Pruning Principles



Conifers

Hardwoods

Appendix F: Tree Protection Detail



URBAN TREE FOUNDATION © 2014
OPEN SOURCE FREE TO USE

TREE PROTECTION

S-X

Appendix G: ISA Tree Risk Assessment Form (TRAQ Level 2-Basic)

ISA Basic Tree Risk Assessment Form

Client _____ Date _____ Time _____
 Address/Tree location _____ Tree no. _____ Sheet _____ of _____
 Tree species _____ dbh _____ Height _____ Crown spread dia. _____
 Assessor(s) _____ Time frame _____ Tools used _____

Target Assessment

Target number	Target description	Target zone			Occupancy rate 1 – rare 2 – occasional 3 – frequent 4 – constant	Practical to move target?	Restriction practical?
		Target within drip line	Target within 1 x Ht.	Target within 1.5 x Ht.			
1							
2							
3							
4							

Site Factors

History of failures _____ Topography Flat ☐ Slope ☐ _____ % Aspect _____

Site changes None ☐ Grade change ☐ Site clearing ☐ Changed soil hydrology ☐ Root cuts ☐ Describe _____

Soil conditions Limited volume ☐ Saturated ☐ Shallow ☐ Compacted ☐ Pavement over roots ☐ _____ % Describe _____

Prevailing wind direction _____ Common weather Strong winds ☐ Ice ☐ Snow ☐ Heavy rain ☐ Describe _____

Tree Health and Species Profile

Vigor Low ☐ Normal ☐ High ☐ Foliage None (seasonal) ☐ None (dead) ☐ Normal _____ % Chlorotic _____ % Necrotic _____ %

Pests _____ Abiotic _____

Species failure profile Branches ☐ Trunk ☐ Roots ☐ Describe _____

Load Factors

Wind exposure Protected ☐ Partial ☐ Full ☐ Wind funneling ☐ Relative crown size Small ☐ Medium ☐ Large ☐

Crown density Sparse ☐ Normal ☐ Dense ☐ Interior branches Few ☐ Normal ☐ Dense ☐ Vines/Mistletoe/Moss ☐ _____

Recent or planned change in load factors _____

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR _____ % Cracks ☐ _____ Lightning damage ☐
 Dead twigs/branches ☐ _____ % overall Max. dia. _____ Codominant ☐ _____ Included bark ☐
 Broken/Hangers Number _____ Max. dia. _____ Weak attachments ☐ _____ Cavity/Nest hole _____ % circ.
 Over-extended branches ☐ Previous branch failures ☐ _____ Similar branches present ☐
Pruning history
 Crown cleaned ☐ Thinned ☐ Raised ☐ Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐
 Reduced ☐ Topped ☐ Lion-tailed ☐ Conks ☐ Heartwood decay ☐ _____
 Flush cuts ☐ Other _____ Response growth _____

Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐ _____

Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐ _____

— Trunk —

Dead/Missing bark ☐ Abnormal bark texture/color ☐
 Codominant stems ☐ Included bark ☐ Cracks ☐
 Sapwood damage/decay ☐ Cankers/Galls/Burls ☐ Sap ooze ☐
 Lightning damage ☐ Heartwood decay ☐ Conks/Mushrooms ☐
 Cavity/Nest hole _____ % circ. Depth _____ Poor taper ☐
 Lean _____ ° Corrected? _____

Response growth _____

Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐

Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

— Roots and Root Collar —

Collar buried/Not visible ☐ Depth _____ Stem girdling ☐
 Dead ☐ Decay ☐ Conks/Mushrooms ☐
 Ooze ☐ Cavity ☐ _____ % circ.
 Cracks ☐ Cut/Damaged roots ☐ Distance from trunk _____
 Root plate lifting ☐ Soil weakness ☐

Response growth _____

Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐

Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

Risk Categorization

Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood												Consequences				Risk rating of part (from Matrix 2)
							Failure				Impact				Failure & Impact (from Matrix 1)				Negligible	Minor	Significant	Severe	
							Improbable	Possible	Probable	Imminent	Very low	Low	Medium	High	Unlikely	Somewhat	Likely	Very likely					
1																							
2																							
3																							
4																							

Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impacting Target			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Notes, explanations, descriptions _____

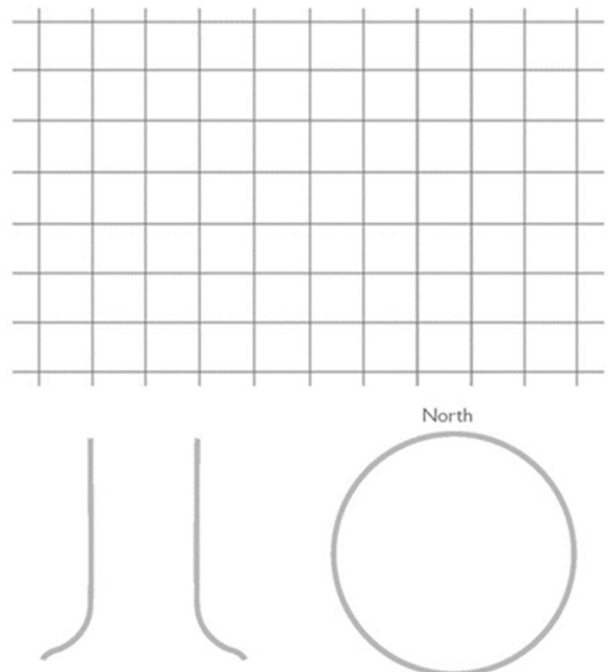
Mitigation options _____

Overall tree risk rating Low ☐ Moderate ☐ High ☐ Extreme ☐

Overall residual risk Low ☐ Moderate ☐ High ☐ Extreme ☐

Data ☐ Final ☐ Preliminary Advanced assessment needed ☐ No ☐ Yes-Type/Reason _____

Inspection limitations ☐ None ☐ Visibility ☐ Access ☐ Vines ☐ Root collar buried Describe _____



Residual risk _____

Residual risk _____

Residual risk _____

Residual risk _____

Work priority 1 ☐ 2 ☐ 3 ☐ 4 ☐

Recommended inspection interval _____

Appendix H – Terrace Tree Planting Form

REQUEST FOR TREE PLANTING ON CITY MANAGED PROPERTY

Name: _____ Date: _____

Address: _____

Email: _____ Phone: _____ / _____
(home) (cell)

This application shall serve as a written request to plant a tree onto the City right-of-way or property in accordance with City Ordinance 12.40.070.

1. Please explain where you would like to plant a tree:

2. What species of tree are you requesting to plant?

3. What is the size of the tree you are requesting to plant? (No trees less than 1" diameter will be allowed to be planted.)

4. Will it be a ball and burlapped (B&B), bare root or container planting?

5. Please provide a sketch or map showing the requested planting location and attach to this application.

6. Will you be staking the tree after planting? _____

7. Do you plan to water the tree upon planting? _____

8. Will the tree be mulched? _____

I submit this permit application for planting and I acknowledge that once the tree is planted in the city right-of-way, easement, park, storm water area or city-owned property the tree belongs to the City and all rights to prune, remove, replace or otherwise manage the tree will be at the full discretion of the City. I further acknowledge that I have contacted Diggers Hotline to mark the planting location. (Diggers Hotline marks in three days. 1-800-242-8511)

Signed: _____

Print Name: _____

Date: _____

All permits expire after six month from issuance.

Please return to:

City Forester

City of Sun Prairie

Parks, Recreation, and Forestry Department

2598 W Main Street

Sun Prairie WI 5350

Official use only (below line)

City Forester or Designee:

I authorize the planting of this tree as requested provided the following conditions are met:

☐ This request is approved

☐ This request is being denied because _____
