REGULAR MEETING
Board of Park Commissioners
February 12, 2025 - 6:30 PM

Community Room
933 Michigan Avenue, Stevens Point, WI

OR

Zoom Teleconferencing

Meeting ID: 863 3985 2367 | Passcode: 475482
By Computer: Join
By Phone: +1-312-626-6799 (US Chicago)

AGENDA

Discussion and Possible Action on:

1. Roll Call.
2. Approval of January 8, 2024 meeting minutes
3. Presentation of the Stevens Point Forestry Department Management Plan by Wachtel Tree Science, Inc.
4. Adoption of the Stevens Point Forestry Department Management Plan
5. Award of 2025 and 2026 Emerald Ash Borer Treatment contract.
6. Discussion on updated master plan concept drawings for Goerke and Zenoff Parks.
7. Director's Report
   - Update on press box capital project.
   - Seramur Park - 2025 Wisconsin Parks and Recreation Association Park Design Award Winner
8. Adjournment.

Meeting Rider
Any person who has special needs while attending this meeting or needing agenda materials for this meeting should contact the City Clerk as soon as possible to ensure a reasonable accommodation can be made. The City Clerk can be reached by telephone at (715) 346-1569, TDD # 346-1556 or by mail at 1515 Strongs Ave., Stevens Point, WI 54481.

Copies of ordinances, resolutions, reports and minutes of the committee meetings are on file at the office of the City Clerk for inspection during normal business hours from 7:30 a.m. to 4:00p.m.

SPECIAL NOTICE

Please take notice that a quorum of the Common Council, City Boards/Commissions may attend this meeting.

Agenda Notes

3. Presentation of the Stevens Point Forestry Department Management Plan by Wachtel Tree Science, Inc

Nathan from Wachtel Tree Science will present a summary of the recently completed Forestry Department management plan. A copy of the full plan is included in the packet.

4. Adoption of the Stevens Point Forestry Department Management Plan

Staff recommend approval of the plan as written; the plan is included within the meeting packet for your review.

5. Award of 2025 and 2026 Emerald Ash Borer Treatment contract.

Quotes for the Forestry Department's annual EAB treatments are due on Monday, February 10. Staff will open the quotes next week and provide a summary to park commission members before Wednesday's meeting.

6. Discussion on updated master plan concept drawings for Goerke and Zenoff Parks.

The updated concept drawings for Goerke and Zenoff Parks are included in the packet. These latest concepts include the feedback received from the park commission at our last review as well as a series of meetings with user groups since that time.

No action is recommended. Staff will ask for additional guidance and authorization to proceed with holding community-wide information meetings to gain the general publics feedback.

REGULAR MEETING MINUTES
Board of Park Commissioners
January 8, 2025 - 6:30 PM

Community Room
933 Michigan Avenue, Stevens Point, WI

OR

Zoom Teleconferencing

Meeting ID: 881 5477 2258 | Passcode: 917084
By Computer: Join
By Phone: +1-312-626-6799 (US Chicago)

Discussion and Possible Action on:

1. **Roll Call.**

Present: Alder Broderick, Alder Buse, Freckmann, Disher, Glodosky, Alder Keymer, McDonald, Okonek, Sorenson
Excused: Przybylski, Winn
Also Present: Todd Ernster

2. **Approval of November 6, 2024 meeting minutes**

Motion to approve by Disher, second by Glodosky, passed 9-0.

3. **Approval of awarding the 2025 Tree Care Operations quote for the Stevens Point Forestry Department to Zblewski Brothers.**

Motion to award as written by Sorensen, second By McDonald; passed 9-0.

4. **Forestry Division Report presented by Superintendent Todd Ernster**

No action.

5. **Director's Report**
   - **Winter sports area and ice rink updates**
   - **Master plans scheduled to return to Park Commission in February**
   - **February park commission meeting date (February 12)**

No action.

6. **Adjournment.**

Motion to adjourn by Glodosky, second by Sorenson; meeting adjourned at 6:59 pm.

PUBLIC TREE INVENTORY REPORT AND MANAGEMENT PLAN

FOR THE

CITY OF STEVENS POINT, WI

PREPARED BY:

WACHTEL TREE SCIENCE, INC.
October 2024

Street Tree Inventory Report & Management Plan
For the City of Stevens Point, WI
By Wachtel Tree Science (262)538-1900
October 2024

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ACKNOWLEDGMENTS

Wachtel Tree Science would like to acknowledge the cooperation and efforts of the City of Stevens Point officials and their staff who have made this project possible. City officials provided Wachtel Tree Science with necessary information and assistance in a timely and professional manner.

City Mayor
Mike Wiza

City Alderpersons
Marc Christianson
Jacqui Guthrie
Ginger Keymer
Lara Broderick
Allison Birr
Dale Steinmetz
Mary Kneebone
Dean Shuda
Sam Lang
Dustin Buse
Shaun Morrow

Board of Park Commissioners
Carrie Winn
John Okonek
Michael Glodosky
Ald. Ginger Keymer
Ald. Dustin Buse
Robert Freckmann
Ald. Lara Broderick
Shaun Przybylski
Wayne Sorenson
Liz McDonald
Matt Disher

City Staff

Dan Kremer	Parks, Rec. & Forestry Director
Todd Ernster	City Forester

Wachtel Tree Science Staff

Nathan Schuettpelz	Consulting Department Manager

This project was funded with a grant from the Wisconsin
Department of Natural Resources as authorized under Wis. Stat. 23.097
and with matching funds from the City of Stevens Point

Public Tree Inventory Report & Management Plan
For the City of Stevens Point, WI
By Wachtel Tree Science (262)538-1900
October 2024

EXECUTIVE SUMMARY

The City of Stevens Point acknowledges that a well-maintained urban forest offers numerous benefits, enhancing the quality of life for its residents. These benefits include reducing air pollution, conserving energy, boosting property values, and improving the city's aesthetics. To maximize these advantages, the City partnered with Wachtel Tree Science to conduct a street tree inventory analysis and create an urban forest management plan aimed at further improving the community's green spaces. Wachtel has also reviewed the previous City Urban Forest Management Plan (2010). We would like to highlight the following accomplishments City Forestry Operations has made in the past 14 years:

- Increased tree planting to ~250 - 300 trees annually, up from ~150 trees planted annually in 2010.

- Reduced the maple (*Acer*) genus to ~22% of the street tree population, down from ~32% in 2010. Reduced the ash (*Fraxinus*) genus to ~7% of the street tree population, down from ~15% in 2010. These were the two most common genera of street trees in Stevens Point in 2010. Reducing these two genera has helped the City become more in line with the "20-10-5" rule for tree species diversity recommendations.

- Increased street tree diversity to 99 different tree species, approximately double the number of tree species in 2010.

- Implemented an annual training pruning program, maintaining ~2,000 young trees annually.

- Implemented a 5–8-year cyclical pruning program to address needs of larger sized trees.

- Implemented a successful hazard tree monitoring program to address high-risk trees, or trees requiring removal. This plan identifies only 81 trees that require removal in 2026 based on inventory data, roughly 1% of the total street tree population.

- Added a second full-time certified arborist to forestry staff, up from one full-time arborist.

This document reports the findings of the tree inventory that was provided by City staff in August 2024. Our findings and recommendations are limited to the data that was provided to us and do not include field assessments to verify data accuracy. The results include:

STREET TREES

- Total public tree value for the inventory of the City of Stevens Point is $7,670,600. This equates to an average value of ~$1,025 for each public tree or ~$138 per truck diameter inch in the City GIS database.

- 11,948 street tree records are made up of 7,757 trees and 4,191 vacant planting sites.

- The stocking level is 65%, 7,757 of the 11,948 street records are trees.

- This population contains 52 genera and 99 different species of trees, up from the 47 different tree species identified in the 2010 management plan. The city has doubled their tree species diversity in the past 14 years. ***Special note – the current tree population contains a mix of 234 different tree species, varieties, and cultivars.*** * This inventory dataset contains by far the most detailed and organized categorization of different tree varieties and cultivars that we have had the pleasure to work with. City staff should be commended on both promoting tree diversity throughout the city and taking notes in detail to catalog the diversity of trees being utilized in the urban forest.

- Stevens Point's urban forest management is actively trying to follow ambitious goals for species diversity but there is always opportunity for improvement. Over the past 14 years, the city has actively addressed the previous plan concerns by reducing the Ash tree population by half and reducing the maple tree component of the urban forest by 10%. Today, the maple genus (*Acer,* 1,729 trees, 22.3%) exposes the City's urban forest to the greatest risk in the event a pest is introduced that impacts maples.

- The City of Stevens Point's public tree inventory shows a population curve that is heavily weighted towards young trees (=<6" DBH). This is a direct result of aggressively planting with diverse, vigorously growing trees. Most trees (58%) are in the tree diameter classes of 1"-6" DBH, which was roughly the same as the 2010 urban forest assessment. Trees 6"-12" DBH make up ~17% of the total population. These trees are considered established in the landscape and will grow exponentially, adding value to the landscape. The size class distribution significantly tapers off in the larger size classes. ~25% of the total population are trees >12" DBH. The City will need to prepare for **exponentially increasing management budgets** that will be required as the young trees grow into large trees. Investing budgets now in simple training pruning techniques will avoid costly management responding to large tree failures in the future.

- A majority of the trees (90%) are in good condition class or greater, which is ideal and a testament to planting high quality trees with good structure, as well as maintaining better structure of trees as they become established. This population component increased by roughly 3% from the 2010 urban forest assessment. (10%) of all trees are within the fair condition class or lower. Resources will need to continue to be allocated to managing trees in fair condition. These trees would benefit from routine and safety pruning to increase their condition and overall value. Maintain resources to managing trees in good condition or better to keep trees in these valuable condition classes will add exponentially greater benefits to the community as these trees grow.

- Training pruning is noted as the primary maintenance need in approximately 69% (5,380) of all trees. This is directly linked to the high number of newly planted trees in the City. Structural pruning should be utilized to improve young tree structure which can reduce future maintenance costs and improve overall tree health. Trees that are 12 inches trunk diameter and larger are beyond the point of corrective pruning. These trees are more susceptible to failure in storm events and have a greater risk of being prematurely removed. Future maintenance should focus on structural pruning in the years following new tree planting. A great manual available for field instruction on pruning practices is "The International Society of Arboriculture Best Management Practices, Pruning. *Third Edition.*"

- With a tree population facing immediate needs (structural pruning of many young trees), the City should plan to continue supporting forestry with sufficient staff time and budgets. The City could look to increase staff hours dedicated to forestry or contract budget to stay on top of these tree care needs to avoid costly large tree failures in the future, and establish a healthy, diverse tree population for years to come.

GENERAL OBSERVATIONS

- **The City is doing an exceptional job increasing species diversity** following removals of many public Ash trees and planting in expanding development. In future planting, the City should prohibit the planting of the genus *Fraxinus* (ash). The City should continue limiting planting *Acer* (maple).

- The City is aggressively managing newly planted trees, pruning ~2,000 every year. We recommend the City continue this focus on young trees (<6" DBH, ~58% of total public tree population). Trees should not be planted with a mind set of "set it and forget it". Young trees require regular maintenance every 2-3 years following planting to promote good structure. Investing budgets in simple forestry tasks early on will reduce unforeseen budgets down the road to complete technical storm response work.

- This plan included an assessment of both the urban forest as it is today, as well as a look back to the city's urban forest in 2010. Tree species diversity has doubled, the young tree population has increased slightly, and the population of trees in Good condition has also increased. These metrics confirm the City has taken an active role improving their urban forest the past 14 years. These efforts, and those individuals that had an integral role in this initiative, should be applauded for years of exceptional work!

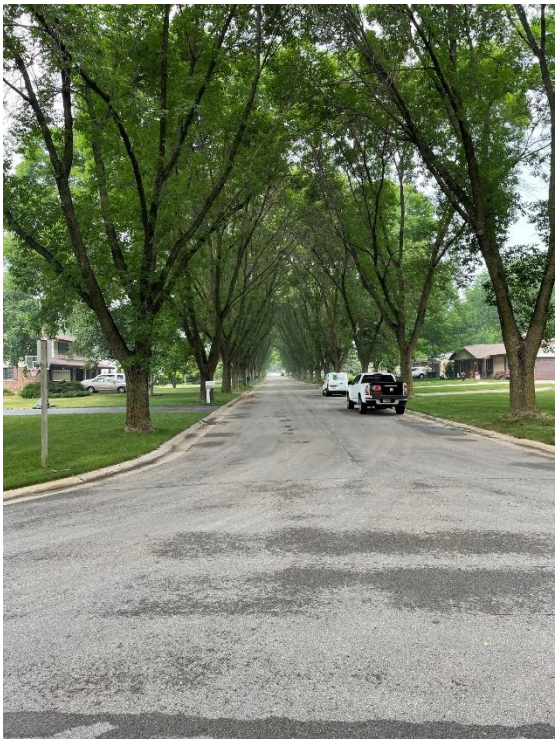
Policy recommendations, maintenance schedules and budget requirements are outlined in the included management plan to assist the City of Stevens Point in both short- and long-term municipal tree maintenance planning.

Photo Credit: City Website. April 27, 2021. Stevens Point celebrates 40 years as a Tree City USA recipient.

INVENTORY REPORT

I. INTRODUCTION

Trees are an essential part of the City of Stevens Point, making a strong first impression on visitors and enhancing the daily lives of residents. They add beauty by softening the appearance of buildings and creating a more inviting atmosphere. When well-managed, trees can continue to improve the quality of life for future generations.



The energy savings from trees are significant. Strategically planted trees can reduce cooling costs by up to 30%, saving homeowners as much as $250 per year. Trees also act as windbreaks, lowering heating bills in winter. Properly placed trees can reduce solar radiation (providing shade), improve air circulation, and cool the air, thus countering the "heat island" effect in urban areas.

Trees play a crucial role in improving air quality. One acre of mature trees can absorb up to 2.6 tons of carbon dioxide annually while producing enough oxygen for 18 people. They also trap dust particles and absorb various harmful gases. Additionally, trees can help reduce noise and lower pollution levels, making the environment more livable.

In terms of stormwater management, trees help reduce soil erosion, decrease runoff, and improve water quality. By intercepting raindrops and encouraging soil infiltration, trees lower the volume of stormwater runoff. Their roots absorb water and take up nutrients that could otherwise harm water quality.

Trees positively affect health and well-being in multiple ways. They help lower air pollution and mitigate urban heat, which reduces related health risks. Neighborhoods with more trees also tend to have lower crime rates. Interestingly, some areas have reported an increase in crime following the loss of ash trees due to the emerald ash borer. Forested areas promote mental health, providing calming environments that help reduce stress, depression, and anxiety.

Community trees enhance recreational opportunities by creating inviting parks for various activities. They also support wildlife diversity in Stevens Point by offering habitats for birds and small animals.

The presence of trees contributes to economic stability by attracting and retaining businesses. The National Arbor Day Foundation notes that people spend more time in shaded shopping areas. Properties surrounded by trees rent more quickly, experience less turnover, and can see a 10% or greater increase in value, according to studies by the U.S. Department of Agriculture's Forest Service. People are indeed willing to pay a premium for tree-covered properties.

However, while the urban forest adds significant value, it can also pose risks if not properly maintained. Unmanaged trees can break during storms, causing property damage and disrupting utilities. In some cases, they may even endanger people. It is crucial for the City of Stevens Point to select and plant appropriate tree species to minimize these risks. The cost of neglecting tree management is invariably higher in the long term.

Public trees in Stevens Point belong to all citizens. Unlike most public infrastructure, which depreciates over time, trees increase in value as they grow. Investing in the urban forest benefits both current and future generations, making it a wise and lasting contribution to the community.

II. INVENTORY METHODOLOGY

A. Inventory System

A public tree inventory update was completed by City staff in the summer of 2024. GIS data has been maintained by City staff until the present day. This inventory meets the minimum tree inventory requirements as set by the WIDNR for urban forestry grant recipients.

Field data was collected and maintained on tablet computers using the City's existing web-based GIS (geographic information systems) tree inventory application. All trees and potential planting sites in the public ROW of the City were inventoried per community mapping supplied by the City.

B. Public Tree Record Information

- Primary ID - tree or vacant growth space unique identification number
- Date Assessed - date the site record was collected or updated
- Species or Site Status - tree species, vacant planting site or stump
- Address Number- the house number
- Address Street - the street that corresponds to the address
- Space Type - the general site type or characteristic (street, park, natural area, etc.)

- Space Size - a detailed description of the growth space
- Diameter at Breast Height (DBH) - tree diameter measured at 4.5 feet above ground, rounded to nearest inch, for multi-stemmed trees the largest stem was used as the basis for measurement and additional stem diameters were recorded in the inventory notes section
- Condition Class - an overall assessment of the health of the tree
- Maintenance Need - the highest priority maintenance need, usually removals or safety pruning
- Special needs – secondary needs of young trees, such as watering and staking
- Wires - a record within a close proximity to overhead or underground utilities
- Notes - a general section to capture other useful information about the site or tree

III. INVENTORY RESULTS AND DISCUSSION

For analysis, the City of Stevens Point provided inventory data on their public tree population. This plan focuses on managing street trees, it does not address or provide recommendations of the City's Park tree population. We recommend the City add park trees to their existing tree inventory within the next 5 years. One benefit to this initiative would be tracking success of newly introduced tree species that are being planted in places such as Iverson Park and along the Green Circle trail.

A. Street Tree Inventory

The City of Stevens Point's Street tree population consists of 7,757 tree records and 4,191 vacant planting sites.

i. Planting Site Summary

There are 4,191 potential planting sites identified within the street tree inventory that was delivered by the city. The number of planting sites has increased by ~50% since the 2010 inventory assessment. We reviewed aerial maps that show the distribution of existing tree records throughout the City's streets and can confirm the inventory is complete along all City streets. Tree records and vacant sites are only located on sites where the ROW will support the future below ground and above ground growth of street trees. There are streets within the city that are not suitable for new tree planting due to limited growing space and should not be considered for new vacant plantings.

The current tree inventory identifies a significant number of vacant planting sites. Filling all vacant sites to 100% capacity may benefit the city by introducing many new trees, but we recommend planting be approached thoughtfully and sustainably. This plan will look at existing forestry budgets and what is an appropriate number of trees that can be managed by current City staff. It is important the city does not plant so many trees that operations fall behind in routine maintenance tasks.

ii. Species Frequency

Providing species and age diversity in the urban forest are the two most significant ways to reduce the impact of a destructive pest or disease. Dutch Elm Disease (DED) should have taught us this lesson, but we weren't listening. In the years following DED, communities replanted one tree species, American Elm, with three species, Green Ash/Honeylocust/Norway Maple. As the emerald ash borer became an emerging threat in Wisconsin in the early 2010's, communities were faced with yet-again losing 25%-50% of their public tree populations.

Leaders within the urban forestry community advocate for more stringent species diversity guidelines. Communities should not have to accept losing 20% or more of their urban forest as new pests and/or diseases emerge. The current industry recommendations for tree species diversity are, "no more than 20% in one family, no more than 10% in one genus and no more than 5% of any single species, including cultivars and varieties."

Shown below is an example of how this works:

Plant no more than 20% of a family: i.e. *Fagaceae* (Beech Family)
Plant no more than 10% of a genus: i.e. *Quercus* (Oak trees)
Plant no more than 5% of a species: i.e. *Quercus bicolor* (Swamp White Oak). *Other spp:*

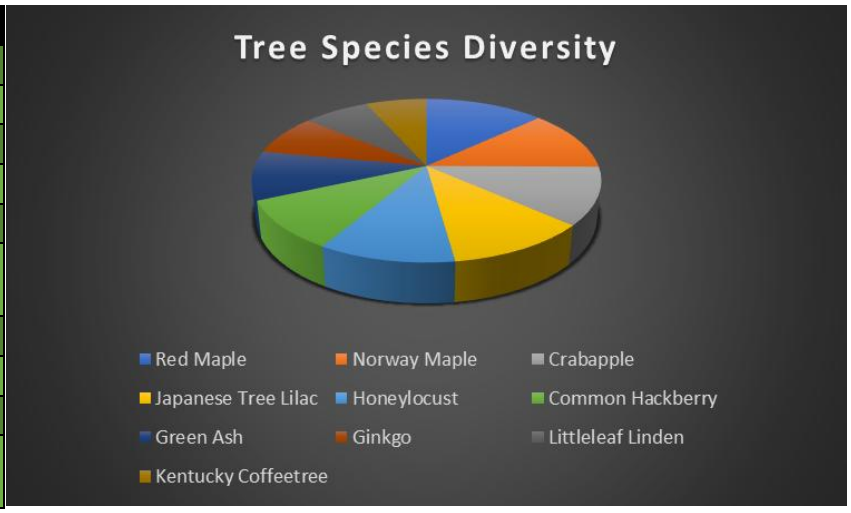
1. *Quercus alba* (White Oak)
2. *Quercus macrocarpa* (Bur Oak)
3. *Quercus bicolor* (Swamp White Oak)
4. *Quercus robur* (English Oak)

Optimally, try to have the greatest diversity of species that can be managed. The City has done an exceptional job improving tree diversity over the last 14 years. This has been accomplished by working with state nurseries to obtain irregular tree species and setting a demand for greater numbers of under-represented tree species. The City advocates for introducing new tree species, and supports this initiative financially with a substantial tree planting budget.

The 7,757 street trees contain 52 genera and 99 different species of trees. The top ten species break down as follows:

Table 1. Top Ten Public Street Tree Species.

Common Name	Count	Percent
Red Maple	578	7.5%
Norway Maple	533	6.9%
Crabapple	503	6.5%
Japanese Tree Lilac	497	6.4%
Honeylocust	475	6.1%
Common Hackberry	432	5.6%
Green Ash	425	5.5%
Ginkgo	357	4.6%
Littleleaf Linden	322	4.2%
Kentucky Coffeetree	295	3.8%

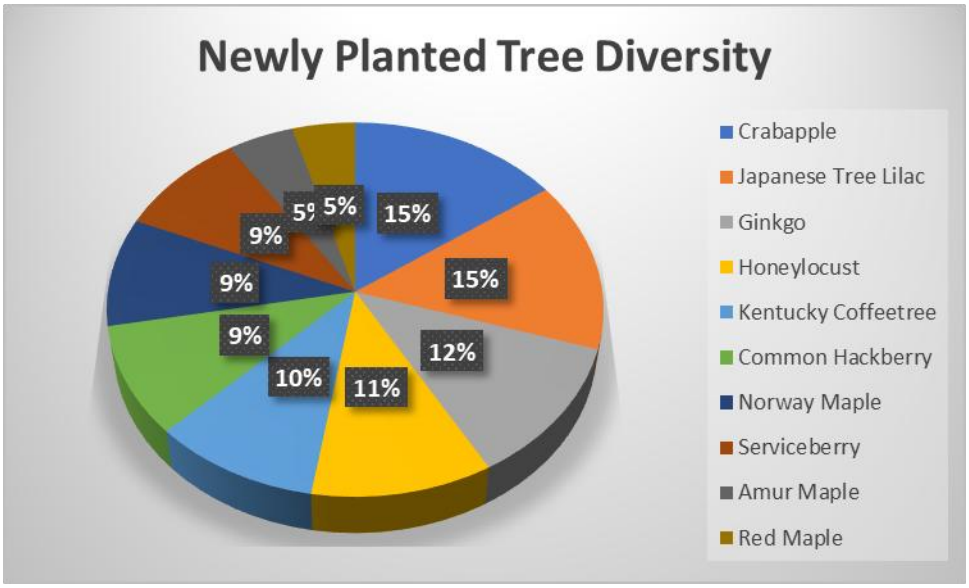


Red Maple, Norway Maple, Crabapple, Japanese Tree Lilac, and Honeylocust exceed the recommended 5% species threshold. Though these species only exceed the threshold 1-2%, these 5 tree species comprise **33% of all public street trees**. We recommend limiting future plantings of these tree species.

The *Acer* (Maples) genera exceed industry recommendations of 10% diversity and should be limited in future planting. The remaining tree species and genera within the City's public urban tree population are meeting diversity recommendations and can be increased in future planting plans.

Figure 1. Newly Planted Tree Diversity highlights the diversity of recently planted trees under 6" trunk diameter. The city has relied heavily on Crabapple and Japanese tree lilac in recent planting efforts. This is due to filling previously open small tree planting sites. We recommend the City continue their efforts to review planting lists every 3-4 years to monitor totals of different tree species that are being planted, to avoid overplanting any individual tree species. It is very promising that 94 different tree species, cultivars, and varieties are included in the young tree population of the city, there are too many to include in the following figure! There are many more tree species included in **Appendix B** to choose from as the city plans future plantings.

Figure 1. Newly Planted Street Tree Diversity



Within the public street tree population, the Maple tree genus *Acer* 22.3% (1,729 trees), significantly exceeds the recommendation of no more than 10% in one genus. Any problems with Maple (such as declining Norway Maples with girdling roots, Asian long-horned beetle) will create a significant problem for the City's urban forest and budgets.

Ash species (Green, White), have a combined total of 544 trees or 7% of the street tree population. The biggest threat to the native ash population is EAB. This is an exotic wood borer that was found attacking and killing ash trees in Michigan during 2002. EAB was found in the last undetected Wisconsin county in 2024, it is now confirmed across the entire state. Since its detection, EAB has killed millions of ash trees and is now found from the east coast of the United States west to Colorado, and from Texas north into Manitoba. EAB is easily spread through the movement of firewood, logs and nursery stock.

Crab Apples comprise 6.5% (503 trees) of the street tree population. Species within this genus are very prone to disease, such as apple scab. Apple scab is a disease that has increasingly impacted local crabapple populations. Under normal circumstances, apple scab only causes minor defoliation and reduction in overall tree health. Over the past several years, apple scab has been causing more extreme defoliation. This has largely impacted older crabapples, whereas younger trees tend to be more disease resistant. The City has done well to address this issue by planting disease resistant varieties. With all the challenges provided by managing crabapples in the urban landscape, it still provides a niche benefit. It is a small stature tree that fits well in limited growing spaces, and under overhead utilities. We recommend the City proceeds with caution when selecting and planting crabapples adjacent to streets to avoid overcommitting to one species group that has the potential to cause many headaches in the future.

Callery Pear has been planted in the City (limited to only 66 street trees) and should be monitored closely. This species has exhibited growth habits of an invasive tree species and is currently being considered for inclusion to the NR40 invasive species list. We recommend proactively banning any future plantings of Callery Pear on public property to avoid future problems.

Honeylocusts are 6.1% (474 trees) of the street tree population. Some common pests and diseases that impact Honeylocusts include plant bugs, leafhoppers and cankers. Plant bugs and leaf hoppers feed on the leaves of the tree causing distorted and damaged leaves. Severe infestations can cause tip dieback. Neither insect are a major health concern or management problem. Honeylocusts can also get cankers that will eventually girdle and kill the tree. The spread of these cankers can be reduced by ensuring young trees are being watered during droughts and trees are being pruned properly. Oftentimes, Honeylocusts don't suffer from pests and make good street trees that are very urban tolerant.

Spruce accounts for 1.6% (123 trees) of the street tree population. There are several common diseases which negatively impact these trees. Both Rhizosphaera needle cast and Cytospora canker cause needle loss and kill branches in the lower portion of the tree. These diseases destroy a tree's form and aesthetics, damage overall health and create a lot of pruning work. Conifer trees should not be used as street trees because of their pest problem, and they cause view and clearance obstructions in many street settings. They may not initially be a problem on a street, but as they grow, increasing in size, they can become problems. All conifers, including Spruce, should be watched to determine when they become a hazard so appropriate action can be taken to mitigate their risk.

Silver Maples make up 2.8% (214 trees) of the street tree population. This is very good. This tree may seem appealing when planting new trees, but their fast growth rate causes them to form weak wood and develop poor structure. These characteristics make Silver Maples prone to storm, wind and ice damage. They don't have any major pest problems that affect the overall health of the tree but given the prevalence of Maple trees within the community if a pest were to damage or kill off Maples trees it would have the same effect as EAB or DED.

It is important that the City continues planting trees with mature heights of 30 feet or less. Smaller scale tree options include Ironwood, Serviceberry, American Hornbeam, and Seven-Sons Flowertree (Heptacodium). These are important to use in areas with power lines where shorter trees are preferred or in smaller growth spaces (less than five feet between the back of curb and sidewalk). Disease resistant varieties of crabapples with persistent fruit should be specified for any new plantings, if used.

All future planting projects should continue to focus on adding more diversity and quantities to the species mix. The city has done an exceptional job growing diversity through the street tree population over the last 14 years. Based on current species totals, we recommend slowing down on planting Crabapple, Japanese tree lilac, Ginkgo, Honeylocust, and Kentucky Coffeetree.

iii. Street Tree Planting

Planting is an important component in the overall urban forest plan. Proper species selection is a key to reducing future problems and costs. Stevens Point Forestry is doing an exceptional job choosing appropriate trees suited for a given planting site. **Appendix B – Tree Species Recommendations** contains a list of recommended trees and ones to avoid.

The following modifications are recommended to be incorporated into the City's current forestry practices:

- Place an indefinite moratorium on the planting of Ash species, due to insect threats (EAB).
- Reduce the future number of Maples (22%), Crabapples (6.5%), Japanese tree lilac (6.4%), and Honeylocust trees (6.1%) due to high species frequency. A single tree genus should be no greater than 10%, a single tree species should be no greater than 5%.
- Whenever possible add groups of new species that are currently not being used to any great extent.

Early care is important. Trees will need watering for a two to five-year period depending on how bad the dry periods are. The longer the drought, the more the trees will need to be watered. Water is probably the single most important limiting factor to establishment and good growth in our harsh urban environment.

Pruning after the trees are established (Training Pruning) is also very important. Try to visit and prune newly planted trees, on average, at least every three years up until they are 6 inches in diameter. The frequency of training pruning will vary depending on the tree species. Some species of young trees, such as hybrid Elms, will require more frequent training pruning (one to two years) than other species, such as Oaks (three years or more). The City is currently performing yearly inspections of newly planted tree species for the first 10 years following tree planting to determine pruning needs. This will ensure that proper structural pruning is taking place. Branches that can be pruned from a young tree with a hand pruner or handsaw early on will require a chain saw in later years if not addressed. It is not only more expensive but is also more stressful on the tree to defer regular pruning. Early training pruning goes a long way to reduce costs and provides a safer urban forest by directing future growth. We recommend the City continue this practice of regularly pruning young trees (~2,000 trees annually), then move these trees into a rotational pruning cycle where pruning will occur once every 5-8 years.

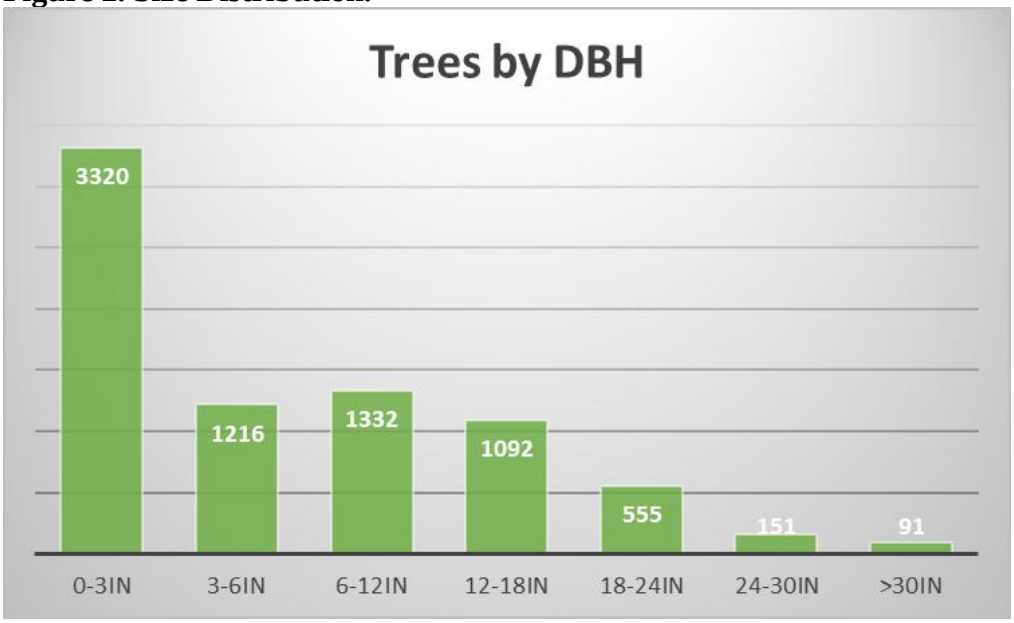
B. Public Tree Size, Condition and Value Discussion

i. Size Class Distribution

The City of Stevens Point's public tree inventory shows a population curve that is heavily weighted towards young trees (**Figure 2. Size distribution**). Most trees (58%) are in the tree diameter classes of 1"-6" DBH. This is a similar population component of the urban forest in 2010. Trees 6"-12" DBH make up ~17% of the total population. These trees are considered established in the landscape and will grow exponentially, adding value to the landscape. The size class distribution significantly tapers off in the larger size classes. ~25% of the total population are trees >12" DBH. We feel this is the result of aggressive planting of new trees in expanding redevelopment projects throughout the City.

The City is performing a great job providing regular maintenance to a large population of fast-growing, young trees. Starting regular maintenance on young trees early on is inherently less costly, requiring smaller tools and limited staff time per tree. As trees become larger, trying to correct issues of deferred maintenance becomes costlier and less effective. Many of the problems with form and structure can be corrected with regular maintenance while the trees are young or moderately young. This also extends tree life and reduces future maintenance costs. The overall condition of younger trees can be improved for less expense than with larger trees where poor structure and form have gotten to the point that they are no longer correctable.

Figure 2. Size Distribution.



ii. Condition Rating

The overall condition of the City's trees good. A majority of the trees (90%) are in good condition class or greater, which is ideal. This percentage is slightly up from the number of "Good" trees (87%) in 2010. The City of Stevens Point has had success planting high quality trees with good structure, as well as maintaining better structure of trees as they become established.

Many newly planted trees are growing aggressively and will benefit from training pruning. The condition of these trees will improve when pruning improves branch spacing and removes co-dominant stems. 80% (6,226) of all public trees are in good condition. "Good" trees are healthy trees that may have minor defects which can be corrected with minimal management.

There are ~5% (420) trees within the "Poor" to "Fair" condition classes. Trees in this range typically require significant maintenance to correct defects. These trees may be in such poor health that they warrant removal.

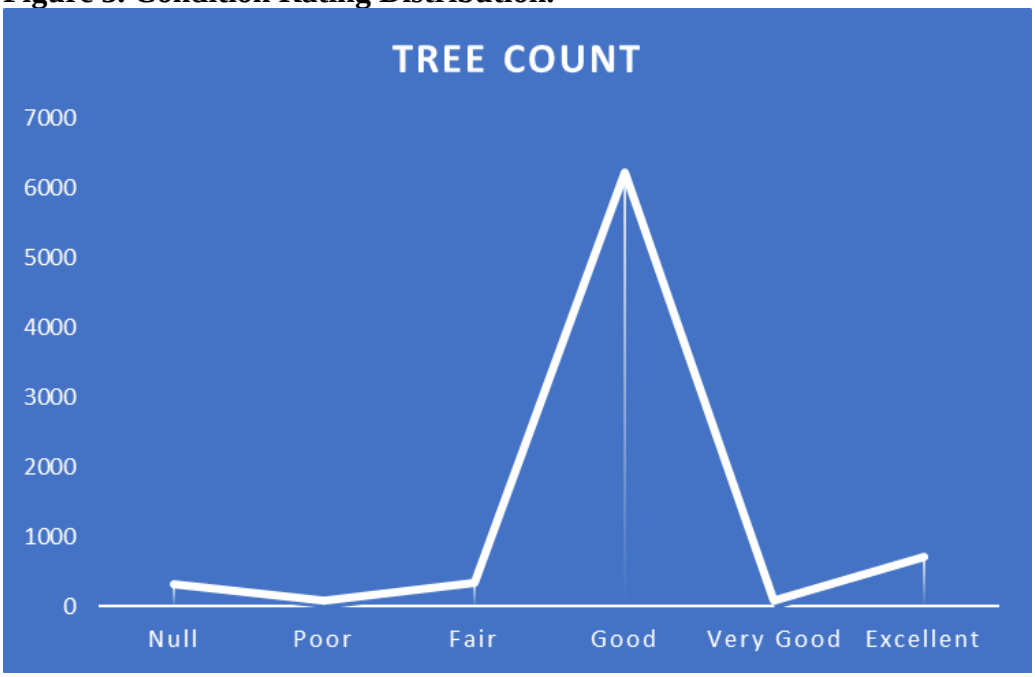
Younger trees (1 to 6 inches diameter) made up 58.5% (4,536 trees) of the tree population. Maintenance should be focused on some of the larger diameter trees in this group before structural problems become more difficult to correct. Younger trees that are having difficulty becoming established may need to be removed and replaced.

There is an opportunity to preserve condition ratings because younger trees tend to be more vigorous. They require more frequent pruning visits, once every two to three years versus every five to seven years for routine prune (trees greater than 6 inches in diameter). Supplemental watering for at least two years after transplanting is also a critical component of early tree maintenance. It is imperative to keep on top of the pruning and moisture requirements of younger trees, so their condition rating improves as they grow, and they don't become liabilities later in life. The key is to strive to maintain a high condition as the trees become older.

In the larger trees ranges (greater than 12 inches in diameter), 1,538 trees are in the condition classes "Good" or greater. The focus of routine pruning in these larger diameter size classes could result in a number of these trees moving into higher condition classes, if a five to seven-year routine pruning schedule can be sustained.

Note - 326 tree records had a null condition rating. These trees may or may not be dead, or a condition assessment may have not been recorded. It is not uncommon to have errors within a tree inventory of this size. This group of records is only 4% of the total street tree inventory population. We recommend that City Staff devote time in 2026 to double-check these tree records in the field and adjust any errors as needed.

Figure 3. Condition Rating Distribution.



iii. Maintenance

Overall, the City of Stevens Point's urban forest will require increasing attention in the coming years. The aggressive planting of expanding development and roadway reconstruction has resulted in a high population of young trees that will be fast growing and require attention to avoid poor structure in the future. Maintaining this focus will help guarantee the presence of healthy trees that add value to the community for many generations to come.

Table 2. Maintenance Needs.

	Diameter Range						
Maintenance Need		1"-6"	7"-12"	13"-24"	25"-30"	31"+	**Total**
	Remove	31	13	31	3	3	**81**
	Routine Prune	0	0	1481	131	75	**1687**
	Safety Prune	0	0	2	0	0	**2**
	Training Prune	4473	1225	0	0	0	**5698**
	Remove Stump	1	0	0	0	0	**1**

Stumps (1) should be removed. Handling stump removals within the City is not an issue, the City has an effective maintenance schedule to address stumps as needed.

Trees in poor condition with significant cracks, decay, or severe pest problems are classified for removal, as they pose a high risk and a hazard to the community. These trees should be removed within the first year of this plan, by the end of 2026.

The City should continue to prioritize planting a diverse selection of young trees across streets, parks, and public properties to develop a varied urban forest. Proper planting techniques are crucial to avoid issues like girdling roots, which can increase maintenance costs and harm the trees' health. New plantings require regular watering, especially during droughts or periods of low rainfall.
If tree stakes are used, they should be removed once the trees establish their root flare. Proper maintenance in the early years can greatly improve the trees' long-term health and value.

Training pruning is essential for young trees to promote good structure and reduce future maintenance needs. It should be done when trees are less than 7 inches in diameter, with priority given to those closer to this size to address structural issues before they become difficult to resolve. Pruning should occur every two to three years to gradually correct any structural problems and avoid the need for major cuts.

For trees over 8 inches in diameter, routine pruning should focus on those in fair to excellent condition. Maintaining a five- to seven-year pruning schedule can help these trees improve in health and potentially move into higher condition classes.

Conifers, such as spruce and pine, are not suitable for street planting and should be monitored every five years to ensure there are no clearance or sightline issues affecting sidewalks and streets. Hazardous conifers should be removed as needed.

Safety pruning reduces risks posed by trees with more than 15% deadwood in the canopy (2 inches or larger) or clearance issues. Clearance problems can include low branches over sidewalks and streets or conflicts with signs, lights, and visibility near intersections. Currently, 8 trees require safety pruning to eliminate these hazards. Young trees should also be pruned as they mature to avoid future clearance issues, but care should be taken not to raise the canopy too much at once, as it could harm the tree's health.

A focused approach to tree maintenance will help sustain and potentially increase the value of the City's urban forest.

iv. Ecosystem Services

The following figures were calculated using the 2024 inventory data by an iTree-Eco analysis which summarizes various ecosystem services provided by the City's public trees. This is a high-level review of that report. The complete report can be found as an attachment in Appendix I. *Note-when preparing the data for i-Tree analysis, the program rejected 500 tree records due to incomplete data/data corruption. A fully updated tree inventory will result in slightly different figures than what are highlighted below.

- Pollution removal by city trees was estimated using field data and recent available pollution and weather data available. Pollution removal was greatest for ozone. It is estimated that trees remove 1533 pounds of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM2.5), particulate matter less than 10 microns and greater than 2.5 microns (PM10*), and sulfur dioxide (SO2)) per year with an associated value of $4.28 thousand.

- Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new growth every year. The amount of carbon annually sequestered is increased with the size and health of the trees. The gross sequestration of city trees is about 33.74 tons of carbon per year with an associated value of $5.75 thousand. Additionally, city trees are estimated to store 1660 tons of carbon ($283 thousand). Of the species sampled, maple spp. stores and sequesters the most carbon (approximately 20.8% of the total carbon stored and 21% of all sequestered carbon.)

- Urban trees and shrubs are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. City trees and shrubs help to reduce runoff by an estimated 361 thousand gallons a year with an associated value of $3.2 thousand. Avoided runoff is estimated based on local weather from the user-designated weather station.

v. Public Tree Value

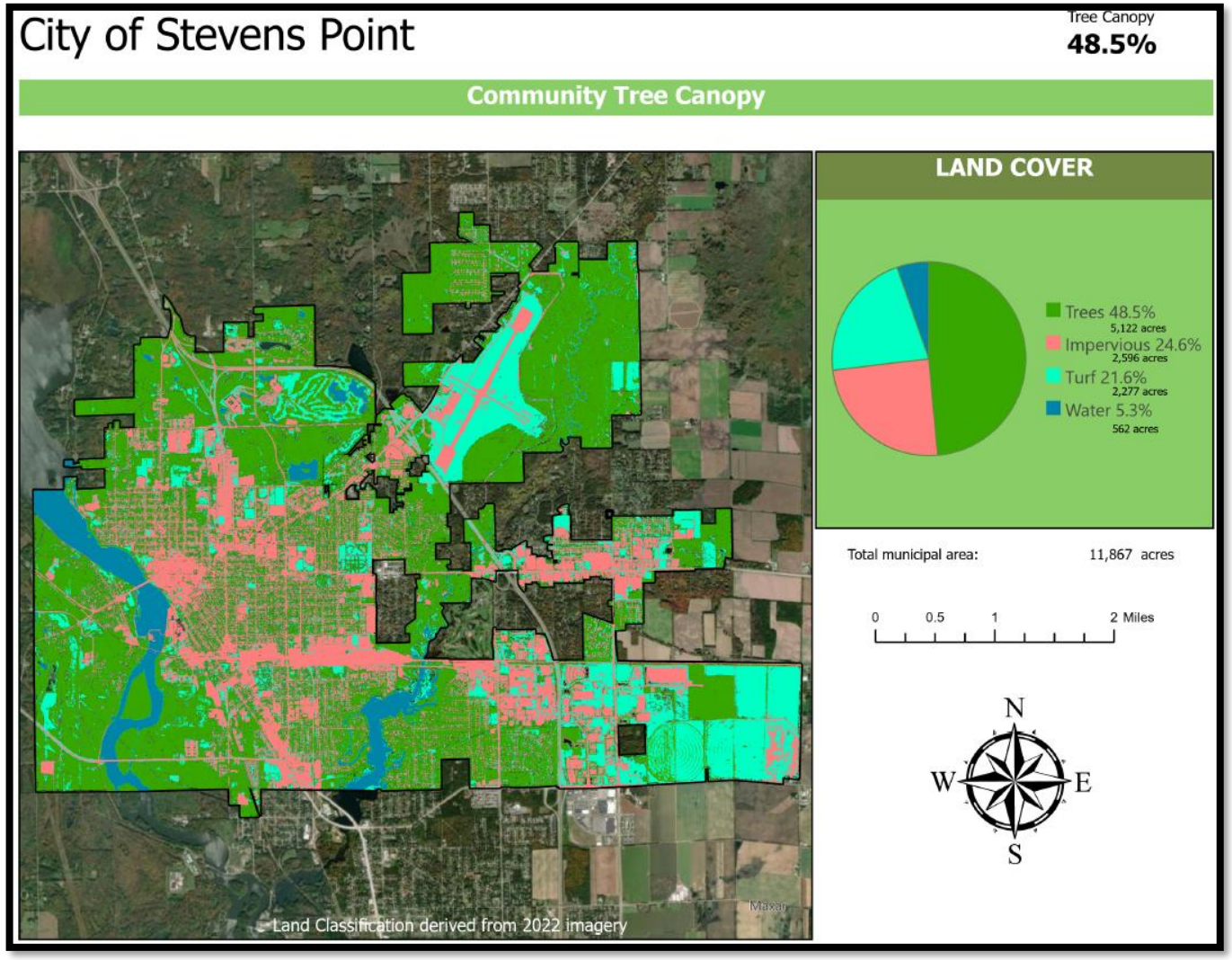
Total public tree value for the inventory of the City of Stevens Point is $7,670,600. This equates to an average value of ~$1,025 for each public tree or ~$138 per truck diameter inch in the City GIS database. This value is up from the estimated $87 per trunk diameter inch in 2010. Inflation accounts for much of this increase ($87 in 2010 = $125.46 in 2024). The remaining 9% difference can be accounted for in differences between valuation techniques.

2024 public tree value was calculated using the following equation:

- Stem Area (square inches) x unit price/square inch x Condition (%) x Location (%) x Species (%)
- Unit price was determined using the updated *Illinois Region 1 Appraisal Factors*.

This valuation is only an estimation. The most recent plant appraisal guide provides a detailed appraisal process to be applied to individual trees or small groupings of trees. Appraising a public urban forest as a single asset requires significant assumptions and estimations. As such, this valuation provides an idea that trees have real value. In the event a public tree is damaged and requires replacement, we highly recommend appraising that tree as an individual, considering specific tree and site variables when determining a final appraised value.

C. Urban Forest Canopy Cover



Public Tree Inventory Report & Management Plan
For the City of Stevens Point, WI
By Wachtel Tree Science (262)538-1900
October 2024

Urban canopy cover, or the layer of trees in a community, provides significant benefits that enhance environmental health, the quality of life, and economic stability. Trees play a critical role in managing stormwater by reducing runoff, preventing soil erosion, and promoting water absorption. Their roots help filter pollutants and protect water quality.

Green spaces improve mental health by providing calming environments that help reduce stress, depression, and anxiety. Trees also lower urban temperatures, reducing the risk of heat-related illnesses and improving overall public health. Neighborhoods with more trees tend to experience lower crime rates, as tree-lined streets promote a sense of safety and community. Urban trees attract businesses and shoppers by creating pleasant environments. Properties with trees have higher rental values, lower turnover rates, and increased property values by 10% or more.

The average urban forest canopy cover in Wisconsin municipalities typically ranges from 20% to 40%. However, this percentage can vary widely depending on the size of the municipality, development patterns, and local conservation efforts. Some cities may have canopy cover as low as 15%, while others with strong urban forestry programs might achieve cover levels above 40%.

Cities should generally aim for an urban canopy cover of at least 30% to 40% to maximize environmental and community benefits. When planning an ideal canopy cover goal, cities should consider factors such as existing canopy cover, population density, and available space for planting. Urban areas with limited green space might have to set realistic incremental goals to improve canopy cover gradually.

In this arena, the City of Stevens Point is doing an exceptional job. Cities that incorporate and are surrounded by forest land should strive for a benchmark 40% urban forest canopy coverage. For this management plan, we can acknowledge that the City's urban forest canopy cover is currently somewhere in the mid to upper 40th percentile. The data used to summarize Stevens Point urban forest canopy cover was released in the summer of 2024 through the WI DNR's most recent analysis of 2022 aerial imagery.

The City of Stevens Point canopy cover was previously estimated to be ~30% based on an analysis of 2013 aerial imagery. Unfortunately, it would be an overreach of this plan to conclude that City initiatives have increased canopy cover by 10-14% in the years between 2013 and 2022. More likely, 2013 was an underestimate of canopy cover due to variations in aerial imaging and limitations of data modeling at the time. Aerial imaging and data modeling have made significant improvements in the past 10 years. The current urban forest canopy analysis (based on 2022 imagery) is most likely a more accurate estimate of coverage throughout the community. Either way, The City has positioned itself strongly to provide residents significant benefits of the urban forest canopy.

IV. REVIEW AND CONCLUSION

The City of Stevens Point has a healthy urban forest with exceptional species diversity, size class distributions and tree conditions. All three metrics improved between the 2010 tree inventory assessment/management plan and this current assessment in 2024. The City should be commended for investing time and resources to grow and improve this value urban resource.

Tree inventories are a dynamic, powerful management tool. The City is committed to field operations and management of the changing forest resource. The City should also be committed to long-term strategic planning which includes tree inventory updates. The inventory should be updated to reflect work performed such as new planting and when trees are removed. The entire urban tree inventory should be re-inventoried and updated in 2029.

Public Tree Inventory Report & Management Plan
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URBAN FOREST MANAGEMENT PLAN

I. INTRODUCTION

The purpose of this management plan is to review the data collected in the public tree inventory and through analysis, develop management strategies. These management strategies will build upon current practices and provide cost effective suggestions that will improve the health, safety, and diversity of the City's urban forest.

The City of Stevens Point urban forest is young and healthy. Focus on structural pruning for young trees and regular maintenance of mature trees will improve the overall health over time. Focused maintenance (i.e. training pruning, proper mulching and young tree watering) early in a tree's life will be easier than trying to correct a lot of problems later. As it is, there will be continued work in the future due to changing maintenance needs as the trees grow older. This maintenance is imperative for the quality of life, property values and especially the safety of the City of Stevens Point citizens.

The priorities in the Management plan are:

1. Removals
2. Safety and Clearance pruning
3. Training pruning (72% of the inventoried trees need this service)
4. Yearly inspections of lower condition class trees
5. Identify any additional training needs for City crews to acquire proper tree skills (planting, pruning, hazard tree recognition, insect and disease identification, etc.)
6. Expand the recommended species list.
    a. Proper species selection and diversity are key to reduced future costs and a healthy urban forest
7. Regular maintenance pruning is needed to keep trees healthy

Removals and safety pruning must be given priority to eliminate hazards. Training pruning, performed early in a tree's growth cycle, establishes proper branching structure and reduces long term maintenance costs. Focus must be maintained, so that low priority items that are easy to complete are not moved up. It is imperative to deal with the most important problems first. As these are dealt with, maintenance costs will decrease, safety will be greatly improved and the value of the City of Stevens Point urban forest will increase.

II. STATEMENT OF PURPOSE AND SCOPE

A. Purpose

Build upon the foundation of the comprehensive urban forestry public tree inventory by prioritizing field operations along with policies and procedures as needed to enhance the management of the urban forest resource.

B. Scope

This plan provides an outline of the community's urban forestry goals. It gives citizens, community decision makers and the staff of the City of Stevens Point a clear set of strategies to achieve these goals. These goals and strategies, together with the accompanying management plan, propose a timetable of implementation and where possible, provide estimated costs to achieve the goals set forth.

III. MISSION STATEMENT

To enhance the quality of life in the community by promoting sustainable urban forests, improving air and water quality, and fostering a sense of environmental stewardship. The community is dedicated to planting, protecting, and maintaining trees in urban spaces, while empowering residents through education, collaboration, and active participation in creating a greener, healthier future for all.

IV. GOALS & STRATEGIES

A. GOAL 1: Maintain the City of Stevens Point urban forest in a cost effective, healthy and safe condition through proper care and maintenance of trees.

Strategies:

- Use the current public tree inventory results to support the existing maintenance plan.
- Implement maintenance goals from the management plan.
- Review yearly work plan with the City Board in the summer of each year prior to budget submission to the Board.
- Ensure safety with regular inspections of street, park, and municipal property trees.
- Promote homeowners to assume a sense of ownership in public trees by encouraging them to perform seasonal maintenance (i.e. mulching and watering).
    - City crews and contractors set an example by doing proper tree care
    - Collect information from (Arbor Day Foundation, DNR, etc.) to be shared with citizens. Set up public events to distribute information
    - Continued public engagement through City forestry website and social media.
    - Distribute signage and watering bags, encouraging residents to water street trees.
- Ensure safe and appropriate forestry operations are implemented in the urban forest

- Establish a "best management practices" manual that contains standards and specifications for performing tree work. Sample manual from Howard, WI: https://www.villageofhoward.com/DocumentCenter/View/362/Arboricultural-Specifications-Manual-2023-PDF?bidId=
- Continue City employee training in proper tree care
- Hold at least one membership in the Wisconsin Arborist Association (WAA) and have multiple employees attend WAA meetings
- Strive to maintain at least two people on staff as ISA Certified Arborists
- Consider hiring only private contractors that agree to adhere to proper American National Standards Institute (ANSI) standards and who employ Certified Arborists
- Enforce tree protection standards to be part of Public Works contract specifications
- Make sure the importance of the role other City departments in maintenance and development of the City's Urban Forest is made clear.

- On a regular basis, update inventory to ensure maintenance records are kept current.
  - Plan for a comprehensive public tree inventory update in 2029.

B. GOAL 2: Establish and maintain maximum tree cover, age and species diversity, with proper site and species selection to minimize hazards and maintenance costs.

Strategies:

- Implement planting goals from the management plan.
  - Review and update recommended species list as necessary

- Seek out additional ways to provide funding for planting.
  - State grants (DOT and DNR)
  - Federal grants (IRA forestry funding intitives)
  - Urban Forest Carbon Credits
  - Community groups
  - Businesses (discounts from nurseries where the City is purchasing planting stock)
  - Strengthen Developers agreements to reflect the City's management plan where they are utilized

C. GOAL 3: To have an educated public that knows what proper tree care is.

Strategies:

- Promote public awareness through publications and appearances at civic groups and schools.
- Continued public engagement through City forestry website and social media.
  - The forestry content available on the City website is excellent. Review this material every 2-3 years to ensure it stays consistent with industry standards. Update as necessary
- Continue to incorporate public tree appreciation events such as arbor day plantings
- Discuss the importance of tree care with City departments, contractors, and residents.

V. CURRENT SITUATION

A. Ordinances

Current ordinance language with respect to care and protection of public trees covers a variety of management activities and is currently located in one chapter. Chapter 11. City Forester and Forestry

This Chapter recently went through a comprehensive review and update and was adopted by the City Council in 2023. We reviewed this ordinance and find it to be thorough and strong. We do not have any recommendations for revisions or improvements.

B. Tree Administration

The responsibility for all trees is overseen by the Parks, Recreation, and Forestry Director, as carried out by the appointed City Forester. This management plan should help establish priorities and commitment in the City system for nurturing the public tree population.

The City forestry department currently employs 4 full-time staff members, 2 of which is are ISA Certified Arborists. Operations are carried out by a Superintendent of Forestry and Landscape Operations, 2 City Arborists, and 2 Parks Technicians. (5) Seasonal staff are utilized to assist full-time staff. Staff members are comfortable in forestry operations, utilize an expansive inventory of forestry equipment, and attend forestry training opportunities.

Research suggests that a program averaging 1,500-2,000 trees per full-time employee can be regarded as receiving enough support to maintain full stocking of well-maintained street trees (Miller et. al 2015). With this suggestion in mind, we can estimate the current capacity of the Stevens Point forestry program, and resources that would be needed if the public urban forest becomes full stocked:

- Current staffing can maintain an urban forest with approximately 7,500 trees
    - 3 full time staff with 1 full time supervisor
    - 5 part time staff
    - Of this group, estimate 5 full time staff dedicated to forestry, managing 1,500 trees/staff member
- A fully stocked public urban forest in Stevens Point of approximately 11,000 street trees would require 7-8 full time staff dedicated to forestry

With these figures in mind, considering the City currently maintains ~7,700 street trees, we can assume the City is operating at full capacity. This aligns with the sentiment of staff when we conducted interviews. They are comfortable with the number of staff and stocked equipment on hand. Increasing the city's urban forest will require increased budgets and/or staff to adequately maintain trees throughout the community.

The City currently plants 260 trees annually in-house. The City is committed to maintaining these young trees and monitors for tree loss. Trees are not permanent in our urban landscapes and routinely die. The City has done an exceptional job regularly replacing these trees. The financial and administrative support of the Mayor and elected officials is crucial to help in moving the urban forestry program forward with an overall focus on the goals and objectives.

Employees are regularly trained with the latest techniques and procedures in arboriculture. Appropriate training modules include tree planting, training pruning, chain saw safety, and felling techniques. Continued training will promote safe and efficient work practices. Through staff interviews, we are confident that staff are genuinely interested in forestry work and feel supported to improve their professional skills. There is positive communication between Department leaders and field employees, as well as positive feedback coming from the public that supports continuing forestry maintenance.

The City communicates forestry to the community through an up-to-date forestry webpage and social media. Regular updates are provided online regarding planned operations and notices for when residents can lend a helping hand, such as watering street trees during droughty weather.

Currently the Department is adequately stocked with forestry equipment such as chainsaws, various assorted small equipment, and various large loading, lifts, and chipping equipment. An updated chip truck setup was recently received by the City, and there is an opportunity to bring in new stump grinding attachments that work with existing loading equipment. This will further improve the efficiency of forestry operations.

The current space for wood residues has been sufficient. Wood mulch resulting from forestry operations is utilized in-house. Larger log wood has been made available to City residents. Recently, the City has partnered with artists that reuse wood in creative ways and provide public displays of art. This model has worked well for waste re-utilization.

i. Additional Funding Sources

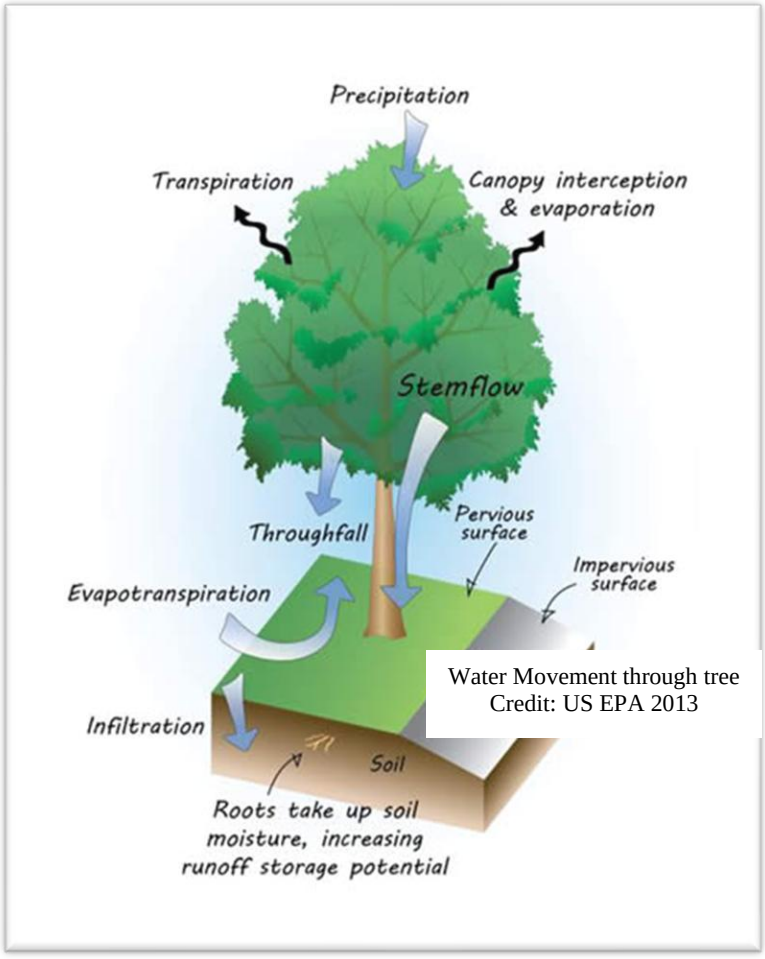
The City tree planting program is currently supplemented by the Stormwater Utility for a total of $30,000 annually. This is a good partnership between both departments. We suggest the city look into opportunities to expand this partnership between these departments, with increased stormwater utility investment in forestry operations. The City could utilize these supplemental budgets to over the current treatment program ($22,800 annually) and an increased contracted pruning budget to utilize qualified local contractors who utilize ISA Certified Arborists and are familiar with industry standards for best pruning practices. The current pruning budget is not sufficient to hire these types of contractors.

Communities like Racine, WI and Green Bay, WI fund 80%-100% of their forestry programs using storm water utility revenues. With an annual forestry budget of ~$370,000, there is an opportunity for increased revenue support of forestry operations by the storm water utility.

Why do communities utilize storm water utility revenues to support forestry? It is simple (yet complex). Urban trees are a key tool in the train of storm water management within a community:

1. Urban development impacts stormwater mitigation through various mechanisms. The utilization of impervious surfaces like roads, buildings, and parking lots impedes natural rainfall infiltration, prompting rapid runoff accumulation and heightened velocity. Alterations to drainage patterns can concentrate runoff, potentially increasing localized flooding events and landscape erosion if inadequately managed. Finally, increased development in urban centers exacerbates the urban heat island effect, driving up temperatures and altering precipitation patterns, thereby influencing the timing and magnitude of stormwater runoff events. These multifaceted impacts underscore the intricate relationship between urban development and stormwater management.

2. Urban trees are essential for effective stormwater management, employing a range of mechanisms to mitigate runoff and its associated challenges. Tree canopies intercept rainfall, slowing its descent to the ground and diminishing runoff volume. Tree roots foster soil permeability, facilitating water infiltration and groundwater recharge, consequently alleviating strain on drainage systems.



Water Movement through tree
Credit: US EPA 2013

3. Trees store water, mitigating peak stormwater flow and flash flood risks. Their transpiration process aids in the local water cycle, regulating air temperature and humidity while curbing runoff. Trees also act as natural filters, absorbing and metabolizing pollutants from stormwater, and offer shade that cools urban surfaces, curbing evaporation and runoff. Urban trees are indispensable in managing stormwater effectively. For these reasons, it makes logical sense that fees generated through a stormwater utility be provided to manage a healthier urban forest, which will in turn provide benefit back to the stormwater management program.

The City is currently looking into opportunities of the urban forest carbon credits market. Urban forestry carbon credits are a way for cities and local governments to generate revenue while contributing to climate change mitigation. The process involves municipalities managing their urban forests in ways that increase carbon sequestration and then selling the resulting carbon credits on carbon markets.

The process begins with an inventory of the city's tree canopy to assess the current amount of carbon stored in the trees. This inventory serves as a baseline for measuring future carbon sequestration. Municipalities create a plan to enhance or maintain the carbon storage capabilities of their urban forests. This could include planting new trees, maintaining existing trees, or adopting practices that promote long-term forest health. Projects must be verified by third parties to ensure that the carbon sequestration claims are accurate.

The carbon that is sequestered over time through these forestry activities is quantified. This involves calculating the net amount of carbon captured by the trees minus any carbon losses due to events like tree removal or natural disturbances. Municipalities can then sell these carbon credits to companies, governments, or individuals who want to offset their carbon emissions. Buyers may seek these credits to meet regulatory requirements or achieve voluntary sustainability goals.

The revenue generated is often reinvested into urban forestry programs. This can include expanding tree-planting initiatives, enhancing maintenance efforts, or supporting public education about tree care. Some municipalities use the funds to support other sustainability initiatives, such as renewable energy projects, water conservation, or community resilience programs. The funds can also help cover the costs associated with managing the forestry program, including staff salaries, equipment, and verification costs.

Despite their potential, municipal forestry carbon projects face several challenges, such as high upfront costs, complex verification processes, and the need for long-term maintenance commitments to ensure that carbon sequestration benefits are realized over time.

We received questions from City representatives about funding opportunities in carbon credit markets early in 2024. Throughout the year, we have had discussions with WIDNR Staff and industry colleagues both in the private and public sectors. Wachtel and partners are waiting for concrete standards in this new marketplace to be developed. At the time of this plan those standards are not available. When those standards become clear and are made available, we recommend the Stevens Point consider this opportunity for innovative forestry funding.

C. Inventory Summary – Street Trees

The City of Stevens Point has a healthy forest that will benefit from constant focus on improving species diversity, size distribution and condition ratings. All these components can be improved with focused management over the years.

The distribution of size classes is heavily weighted towards young trees with 58.5% of trees under 6 inches trunk diameter. There are many trees that will be growing into medium-aged tree classes that will require increased maintenance in the coming years. As these trees become larger, it may benefit the City to look towards tree care contractors that have a wide range of experience and equipment for tree care. Hiring qualified contractors that adhere to industry specifications will require greater budgets than the City currently allocates for forestry contractors. The City should prepare appropriate budgets and staff time to address these increasing forestry needs in future years.

Overall, the City is doing an exceptional job improving tree species diversity. The City can continue this success with simple revisions to preferred street tree species and utilizing under-represented tree species. There should be limited future planting of Red Maple, Norway Maple, Crabapple, and Honeylocust trees. There should be no future plantings of *Fraxinus* (Ash) due to the threat of emerald ash borer (EAB).

Maple trees make up a large portion (22%) of the overall forest. Efforts should be made to limit planting maple trees particularly and look to alternative tree species.

VI. REVIEW OF RESOURCE & DISCUSSION

A. Introduction

Priorities in the Goals section for the public trees were set with safety being the most important criteria. Therefore, the first items dealt with were removals (incl. stumps) and safety pruning. A routine pruning program should be implemented on a limited basis, while focusing on taking care of newly installed trees. Ongoing street tree planting is a high priority. The City should continue meeting a minimum of 260 trees planted annually. Training pruning needs constant attention given the high number of young trees that will be growing large in the coming years. Correcting structural issues now will avoid costly maintenance on large trees in the future.

It is important to stay focused on the priorities. **Table 3 – Estimated Costs for a Five-Year Implementation Schedule Public Trees – In House** summarizes the expenses by area and function per year. This table was compiled using the priorities from the Goals section and data from all the trees included in the inventory. As problems are corrected, there may be a reduction in cost over time. The yearly budgets are only suggestions and depend on overall funding levels available.

B. Estimated Costs

All projected costs in **Table 3** are made with the assumption that work will be performed by City crews with an average cost of $38.00 per hour (including fringe benefits) for full-time staff, and a contracted budget of $37,500 for removals/pruning and $22,800 for contracted/in-house tree treatments. Costs have been calculated managing all public trees as an urban forest. Actual costs could vary and no factor for inflation has been included.

Table 3. Estimated Costs for a Five-Year Urban Forest Implementation Schedule - Public Trees

Estimated costs for each activity			2025		2026		2027		2028		2029		Five Year Cost
Activity	Diameter Class	Cost/Tree ($)	# of trees	Total Cost	# of trees	Total Cost	# of trees	Total Cost	# of trees	Total Cost	# of trees	Total Cost	
TREE REMOVALS	1-6"	$50.00	31	$1,550.00									
	7-12"	$200.00	13	$2,600.00									
	13-24"	$600.00	31	$18,600.00									
	25"+	$875.00	6	$5,250.00									
Activity Totals			**(M)**	**$60,000.00**	**(M)**	**$60,000.00**	**(M)**	**$60,000.00**	**(M)**	**$60,000.00**	**(M)**	**$60,000.00**	**$300,000.00**
PRIORITY PRUNING (SAFETY, CLEARANCE, DEADWOOD)	1-6"	$25.00	0	$0.00									
	7-12"	$50.00	0	$0.00									
	13-24"	$100.00	2	$200.00									
	25"+	$200.00	0	$0.00									
Activity Totals			**(M)**	**$10,000.00**	**(M)**	**$10,000.00**	**(M)**	**$10,000.00**	**(M)**	**$10,000.00**	**(M)**	**$10,000.00**	**$50,000.00**
TRAINING PRUNING	1-6"	$38.00	1500	$57,000.00	1500	$57,000.00	1500	$57,000.00	1500	$57,000.00	1500	$57,000.00	
	7-12"	$77.50	500	$38,750.00	500	$38,750.00	500	$38,750.00	500	$38,750.00	500	$38,750.00	
Activity Totals			**2000**	**$95,750.00**	**2000**	**$95,750.00**	**2000**	**$95,750.00**	**2000**	**$95,750.00**	**2000**	**$95,750.00**	**$478,750.00**
ROUTINE PRUNING (MAINTENANCE)	7-12"	$75.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	
	13-24"	$200.00	225	$45,000.00	290	$58,000.00	300	$60,000.00	300	$60,000.00	300	$60,000.00	
	25"+	$300.00	150	$45,000.00	100	$30,000.00	100	$30,000.00	100	$30,000.00	100	$30,000.00	
Activity Totals			**375**	**$90,000.00**	**390**	**$88,000.00**	**400**	**$90,000.00**	**400**	**$90,000.00**	**400**	**$90,000.00**	**$448,000.00**
TREE PLANTING	Site Prep	$30.00	300	$9,000.00	300	$9,000.00	300	$9,000.00	300	$9,000.00	300	$9,000.00	
	Tree Cost	$150.00	300	$45,000.00	300	$45,000.00	300	$45,000.00	300	$45,000.00	300	$45,000.00	
	Planting	$50.00	300	$15,000.00	300	$15,000.00	300	$15,000.00	300	$15,000.00	300	$15,000.00	
Activity Totals			**300**	**$69,000.00**	**300**	**$69,000.00**	**300**	**$69,000.00**	**300**	**$69,000.00**	**300**	**$69,000.00**	**$345,000.00**
OTHER MAINTENANCE	Stake Removal	$12.50	300	$3,750.00	300	$3,750.00	300	$3,750.00	300	$3,750.00	300	$3,750.00	
	Watering (3x)	$75.00	300	$22,500.00	300	$22,500.00	300	$22,500.00	300	$22,500.00	300	$22,500.00	
	Mulching	$15.00	300	$4,500.00	300	$4,500.00	300	$4,500.00	300	$4,500.00	300	$4,500.00	
	Watch	$12.50	125	$1,562.50	125	$1,562.50	125	$1,562.50	125	$1,562.50	125	$1,562.50	
	Stump Removal	$8.00	6	$48.00	(M)	$3,000.00	(M)	$3,000.00	(M)	$3,000.00	(M)	$3,000.00	
	Treatment	-	(M)	$22,800.00	(M)	$22,800.00	(M)	$22,800.00	(M)	$22,800.00	(M)	$22,800.00	
				$55,160.50		**$58,112.50**		**$58,112.50**		**$58,112.50**		**$58,112.50**	**$287,610.50**
Totals per Year				**$379,910.50**		**$380,862.50**		**$382,862.50**		**$382,862.50**		**$382,862.50**	**$1,909,360.50**

(M) = REGULAR MAINTENANCE ITEM REOCCURRING YEARLY OR ON A CYCLE

In-House cost based on $38.00 per hour (including fringe benefits). Current Contractor Budget - $60,300

Public Tree Inventory Report & Management Plan
For the City of Stevens Point, WI
By Wachtel Tree Science (262)538-1900
October 2024

C. Summary

The data projected in **Table 3** was extrapolated directly from the database created from the public tree inventory export in 2024. The budget provides a starting point for City staff to see what the current needs are with respect to the public tree population. Staff will have to make some priority choices to keep cost within each annual budget allocation.

Overall cost projections for the first five-year period of the Implementation Schedule for all public trees averages ~$382,000 per year over the projected five years. According to a review of City budgets, this total is in line with the current forestry budget spent by the City Parks, Recreation, and Forestry Department annually. The forestry budget averages roughly 15.5% of annual Parks/Recreation/Foresty operating expenses. The City has an asset worth **$7.67 Million Dollars** in the public urban forest. Half of these trees are young trees that will be growing very fast in the very near future. It is encouraging to observe the City investing in this growing asset with significant budget dollars.

Supplementary funding might be secured through additional Urban Forestry Assistance Grants for implementation of this management plan. Additional funding sources include fundraising events in conjunction with the business community or possibly homeowners paying for the wholesale cost of the trees selected for street plantings and the City paying for the planting labor.

D. Implementation Detail

i. Tree and Stump Removal (see **Table 3**)

Tree removals (81 total) are taken care of during the first year of the budget. Larger trees within the 20-inch and greater diameter classes are likely the most hazardous. This activity is a regular maintenance item with $60,000.00 budgeted annually for this expense. Existing stump removals are addressed in Year one (2025) with $3,000.00 budgeted annually in years two through four. Staff reviews during this plan drafting process highlighted that the City pays contractors roughly half the expense of contractors that are located in more populated areas of the state. We recommend the City continue to monitor contractor proposals and prepare for increasing prices in the future.

ii. Safety and Clearance Pruning (see **Table 3**)

Safety pruning (deadwood, broken limbs hanging in trees and clearance issues) involves 2 trees in total. Of all inventory data, this assessment seems off. Even well managed community forests are exposed to seasonal storms that result in emergency maintenance. We have allocated $10,000.00 every year as a regular maintenance item.

Clearance Pruning is needed to eliminate hazards that interfere with foot and vehicle traffic and view obstructions. When raising trees, they do not have to be raised evenly. The street side can be raised to allow for truck clearance and the walk side can be left lower to keep more crown surface.

iii. Training Pruning (see **Table 3**)

Training pruning is the largest maintenance budget on an annual basis. Over half of the City's street tree population is 6" diameter or less. This category currently involves ~5,700 trees. The later years of training pruning rotation add additional trees to accommodate for newly planted trees, and young trees that will require a second pruning within the first five years.

Young trees, depending on the growth habit of the species, should be pruned every two to three years for the first ten years of the establishment period. This is very critical for maintaining street and sidewalk clearances. At the same time, a young tree cannot be raised up (removing lower limbs) too fast or it will not have enough crown area (leaf surface) and will become susceptible to other stresses.

Even more important than clearance pruning, training pruning creates proper structure in the trees. This not only makes the trees safer but will also greatly reduce future pruning expenses. The amount of time and money it takes to remove a one-inch branch with a hand pruner in year five as opposed to using a chainsaw at age 30 is obvious. This can greatly reduce future pruning expense and reduce tree decay along with stress.

iv. Routine Tree Pruning (see **Table 3**)

This is regular maintenance pruning for all trees (including mature tree pruning). It is crown cleaning pruning that includes training and clearance pruning as needed. As the trees grow older, this category will become even more important.

All trees should be on a five to seven-year pruning cycle to keep the trees at maximum health and to prevent most problems from developing. The number of trees requiring routine pruning increases over the course of the budget as resources previously allocated towards removals and safety pruning become available for regular maintenance such as routine pruning. This is a maintenance category where we recommend the City consider hiring qualified contractors who maintain industry credentials, and are comfortable performing large tree pruning to industry standards. Contractors that can provide an elevated degree of service may be more costly, however, trees that are properly maintained and live longer will provide exponentially increasing benefits back to the City.

Once the problems are corrected, not budgeting to this area may save money for a year or two. However, problems will reappear needing more money to correct and compromising the safety of citizens. The most cost effective and safe way to manage trees is with routine maintenance pruning. You don't wait for trucks to breakdown before changing the oil because usually it is too late by then! Tree maintenance prevents problems, extends the life of the tree and reduces costs.

v. Tree Planting (see **Table 3**)

The City currently plants approximately 260 trees per year (in-house). As I've mentioned, tree loss is natural and should be planned for. Committing to replanting trees beyond what is annually lost is one strategy to fostering a growing forest asset in the City. It is important to continue introducing new tree species into the street tree population to keep and improve the diversity of the population.

If the City uses outside contractors for planting, a primary focus should be to establish planting and aftercare specifications (see **Appendix F – Planting Specifications**) that will be adhered to by all private contractors planting in the public ROW. Inspection and enforcement of the specifications is critical at planting time.

When possible, where the terrace is particularly wide, trees should be planted in the back portion of the right-of-way away from the street. Unless they are small scale trees, they should be at an approximate 45' to 50' spacing. This gives enough room for the mature crown to grow (reducing pruning) and can lessen the potential spread of a future pathogen through root grafts. Also, in many areas a larger vision corner should be left by staying farther away from the corner with plantings.

The planting that does take place should only be trees from the list of Recommended Tree Planting List (**Appendix B: Tree Species Recommendations**). This is set up to ensure that the proper size tree is used under utility wires or in a narrower tree terrace situation.

Better quality (single leader) planting stock should be specified and required when ordering nursery stock. The City should expect to receive quality nursery stock from its suppliers that do not exhibit poor structural problems. By using quality nursery stock, the City will be able to reduce the amount of training pruning time spent correcting problems created in the nursery. This is best accomplished by purchasing plant material from nursery firms that are members of the Wisconsin Nursery and Landscape Association (WNLA).

vi. Tree Stake Removal (see **Table 3**)

Stake removal is important to prevent potential damage to the trunks of these trees. If the stakes are left on too long and are extremely taut, there is a risk of girdling taking place and causing restriction of water and nutrient flow between the roots and crown, potentially leading to dieback in the crown.

Tree stakes should not be left on for more than two growing seasons. Starting in 2025, hours are budgeted to remove stakes systematically from trees that were planted one year previously.

vii. Young Tree Watering (see **Table 3**)

A most critical phase of new tree establishment is young tree watering. Through public awareness and education most newly planted street trees can be watered by the adjoining property owner. This saves the City substantial employee hours that can be redirected towards other tree maintenance activities including new park/municipal property tree watering. Supplemental watering of newly planted trees during the first two to three years after planting is crucial to their survival, becoming established and beginning vigorous growth. This initial care sets the course for getting trees started on the right path and reduces their chances of succumbing to insects, diseases or environmental stresses in the future. Minimal dollars have been budgeted to provide two visits to newly established trees during the summer.

It is important to realize more plants are lost to over-watering than to underwating. Roots need air just as much as they need water. Always check the moisture level under the mulch before watering.

viii. Mulching (see **Table 3**)

Creating mulched beds around street trees is important to reduce damage to the base of the trees from mowing and string trimmer equipment. It also creates a superior rooting area for improved tree vigor and better aesthetics. When trees are being mulched, care should be taken to avoid piling mulch against the trunk (see **Appendix F** – **Planting Specifications**). Maintenance funds need to be budgeted every year beginning in 2025 to maintain the mulch at a two to three-inch thickness. This mulch can be wood chips from City tree care operations (free) or shredded hardwood mulch (will stay in place better, last longer and look nicer, but must be purchased).

ix. **Watch** (see **Table 3**)

There is also a projected budget amount that includes watch trees as identified in the inventory. These trees may all be conifers which rarely require any maintenance; however, they need to be checked periodically for sight clearance issues where they are planted in the street terrace and general overall health and vigor.

x. **Treatment** (see **Table 3)**

Since the last plan was drafted in 2010, the city has removed Ash trees down to the current 544 trees. The Ash tree component of the street tree population in 2010 was 15%, it is now 7%. This is a good management strategy to bring the Ash tree component to a manageable level. The city should continue treating the remaining Ash trees to preserve the benefits that are provided to the community. If the opportunity presents itself that individual Ash trees no longer warrant treatment (conflict with planned construction, storm damage), it is acceptable to continue to remove trees until Ash becomes a 5% component of the street tree population (~375-400 trees). We recommend that an indefinite moratorium continue against all future Ash plantings.

What makes a good ash management strategy? The answer: whatever makes sense for your community while addressing risk and preserving benefits as possible. If a community wants to remove every public ash tree, the argument could be made it is done to preserve safety. In that case, it is a very good idea to replant ash trees that have been lost with a diverse population of high-quality, fast-growing trees to replace the benefits that were lost. If a community wants to preserve ash trees through treatment, that also makes sense. There are benefits that will be lost for a generation if we lose every ash tree in our communities. In our opinion, Stevens Point urban foresty program and City leaders are following a well-planned strategy removing worst condition ash trees and preserving the best condition trees that provide the most benefit. The $22,800 referenced in our sample budget was provided by City staff. That figure is the current annual budget to treat City ash and elm trees using some in-house staff labor/materials, as well as contractors when needed. The city is also replanting with a significantly more diverse selection of trees, strengthening the overall health of the urban forest.

E. Disease & Insect Problems

i. Dutch Elm Disease

Dutch Elm Disease (DED) is a devastating fungal disease that affects elm trees and has significantly impacted the landscape in the Midwest United States. The disease was first identified in Europe in the early 1900s, caused by the fungus *Ophiostoma ulmi*, and was likely introduced to the U.S. via imported lumber in the 1930s. By the 1950s and 60s, the disease had spread rapidly through the Midwest, killing millions of elm trees, which were a common urban and rural landscape feature.

The spread of DED is primarily facilitated by bark beetles, which carry the fungus from infected trees to healthy ones. Once a tree is infected, the fungus blocks the water-conducting vessels, causing the tree to wilt and eventually die. Elms with interconnecting root systems can also transmit the disease underground, compounding the spread.

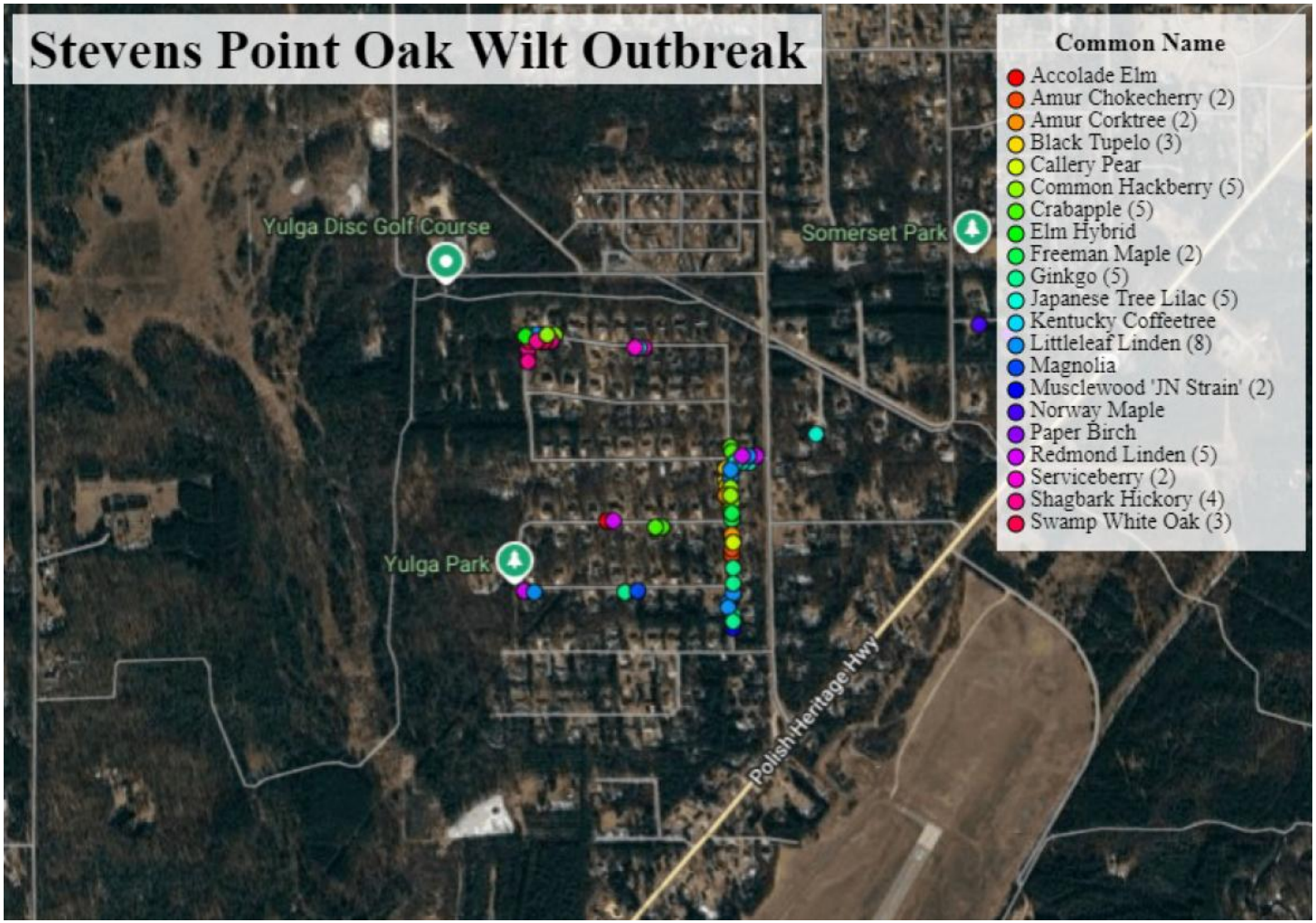
Efforts to manage DED in the Midwest have included sanitation (removal and disposal of infected trees), fungicide injections, and the development of disease-resistant elm varieties. While these strategies have helped mitigate the impact, the disease remains a persistent threat. The loss of elm trees has significantly altered urban and natural environments, prompting reforestation efforts with diverse species to avoid similar devastation from future pathogens.

There are 399 Elm Spp. (5%) in the entire inventory for the City. This includes a variety of hybrid species that are less susceptible to DED. Regular inspections are still necessary, and removal of infected elm trees should be programmed into the maintenance schedule to help break the disease cycle and to keep dead or dying trees from endangering the public. The City currently treats approximately 30 American Elms to preserve these majestic tree specimens. These trees should continue to be treated into the future to preserve benefits that would be lost for a generation if these trees die.

The City has planted several varieties of disease resistant hybrid elms. This is a great way to keep the *Ulmus* genus part of the species diversity mix. The low planting rate of these trees provides an opportunity for greater tree diversity in the City's urban forest. A note of caution, these young hybrid trees grow fast. Without regular structural pruning (every 2-3 years for a period of 15 years), these trees can develop poor form and become a hazard. Remember, there is no "set it and forget it" solution with newly planted trees!

ii. Oak Wilt

Oak wilt was detected in the following City neighborhood during our July 2024 tour:



Oak wilt is a serious fungal disease that affects oak trees, caused by the fungus *Bretziella fagacearum*. The disease spreads through interconnected root systems and by sap-feeding beetles that transfer the fungus from infected trees to healthy ones. Once the fungus invades the tree's vascular system, it disrupts the flow of water and nutrients, causing leaf discoloration, wilting, and eventually death.

Different types of oak trees vary in their susceptibility to oak wilt. Red oaks are highly vulnerable and often die within weeks to months after infection. White oaks are more resistant and may survive longer with slower disease progression. Preventative measures include avoiding tree wounding during the growing season, treating high-risk trees with fungicides, and disrupting root connections to limit underground spread. The disease is found primarily in the eastern and central United States, including the Midwest.

The Red Oak group is more susceptible to the disease than White, Swamp White or Bur Oak. The breakdown of oak species inventoried includes: 67 Swamp White Oak, 68 Red Oak, 45 Swamp White x Bur Oak Hybrid, 92 Bur Oak, 97 English Oak, 1 Scarlet Oak, 2 Shingle Oak, 65 Pin Oak, and 24 Oak spp. The Oak family accounts for ~6% (461 trees) of all the public trees that were inventoried in the City. Planting more *Quercus* tree species is an excellent opportunity for increasing tree diversity in the City.

Once detected, Oak Wilt becomes very challenging to control. The Minnesota Department of Natural Resources has developed a detailed online guide for managing Oak Wilt: https://files.dnr.state.mn.us/assistance/backyard/treecare/forest_health/oak-wilt/oak-wilt-guide.pdf . The following are some general guidelines to attempt managing this destructive disease:

1. Preventative Measures:

- Avoid Pruning During High-Risk Periods: Do not prune or wound oaks during the high-risk period when the sap-feeding beetles (which can carry the fungus) are most active, typically from April through September. If pruning is necessary, do it during the dormant season (late fall or winter).
- Seal Wounds Immediately: If an oak tree is wounded during the high-risk period, seal the wound immediately with a wound dressing or latex paint to prevent beetle attraction.
- Proper Tree Care: Keep oaks healthy through regular watering during droughts and proper mulching. A healthy tree is more resilient to disease.

2. Identification and Monitoring:

- Recognize Symptoms Early: Oak wilt symptoms vary by tree species. In red oaks, leaves wilt and drop suddenly, often starting at the top of the tree and progressing downward. In white oaks, the symptoms are less severe, with leaves turning dull green or bronze and wilting gradually.
- Conduct Diagnostic Testing: If oak wilt is suspected, confirm the diagnosis with laboratory testing of affected tissue samples.

3. Containment and Management of Infected Trees:

- Remove Infected Trees Carefully: Infected red oaks often die rapidly and should be removed and properly disposed of (e.g., chipped, burned, or buried) to prevent fungal spread. Tree removal should only occur during dormant season months. Avoid storing infected wood for firewood unless it is debarked and dried.
- Trench Around Infected Trees: To prevent the disease from spreading through interconnected root systems, trenching around infected trees is recommended. Trenches should be at least 4 feet deep. The following figures have been provided by the WIDNR to determine distances for planning trench routes:

Combined DBH (inches)	Potential root graft distance		
	Sandy soil	Loamy sand	Sandy loam
2	4	3	2
4	8	6	5
6	12	9	7
8	16	12	9
10	19	15	11
12	23	19	13
14	27	22	16
16	31	25	18
18	35	28	20
20	39	31	22
22	43	34	25
24	47	37	27
26	50	40	29
28	54	43	31
30	58	46	34
32	62	49	36
34	66	53	38
36	70	56	40
38	74	59	43
40	78	62	45
42	82	65	47
44	85	68	49
46	89	71	51
48	93	74	54

Table 1: *Measure the diameters of an oak infected with oak wilt and a nearby healthy-looking oak at 4½ feet above the ground. Add the diameters to calculate the potential root-graft distance between them. Measure the actual distance between the two oaks and determine if the healthy-looking oak is within or outside the potential root-graft distance. Use the appropriate soil type for root severing methods but always use sandy soil distances for girdle herbicide methods. Adapted from Bruhn, J.N. and Heyd, R.L. 1992. Biology and Control of Oak Wilt in Michigan Red Oak Stands. Northern Journal of Applied Forestry, 9(2) 47-51.*

Marking a pocket for control

For each of the following active management options, you will need to know which oak trees are root-grafted to dead and diseased oak trees. To determine the trees to manage:

1. Measure the diameter (in inches) of recently dead or dying oaks at 4½ feet above the ground (Diameter at Breast Height, or DBH). Then measure the DBH of nearby healthy-looking oak trees. DBH of multi-stemmed trees should be combined.
2. Also measure the distances (in feet) between infected and nearby healthy-looking trees.
3. Determine the soil type of the impacted stand (sandy, loamy sand or sandy loam/loam).
4. Use Table 1 with the information gathered in steps 1, 2, and 3 to determine if apparently healthy trees are root-grafted to dead or diseased oaks. Add the diameter of a diseased oak with a nearby healthy oak and identify the distance in the appropriate soil-type column. If the distance between the trees is less than that shown in Table 1, then the healthy tree is root-grafted to the diseased tree. **Note:** If an oak is just outside root-graft distance, it may still be appropriate to mark for management. Consult your local DNR forest health specialist, a forester or a trained arborist for advice.
5. Using flagging or paint, mark all oaks that are root-grafted to dead or diseased oaks. The treatment method, chosen from the following sections, should encompass all marked and diseased trees or encircle the outer edge of the group of oaks that have been marked.

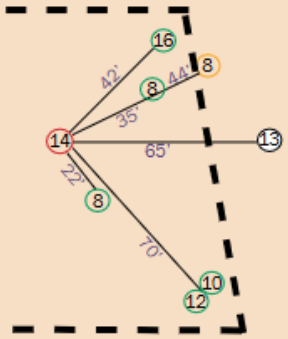


Figure 2: *A red oak (left, red circle) of 14-inch DBH is confirmed to be infected with oak wilt through a lab test. Based on Table 1, the physical root barrier is represented by the dotted line. Red oaks that are included within the physical root barrier (green circles), going clockwise, measure 16 inches, 8 inches, 22 inches (double stem 12 and 10), and 8 inches. These should be girdled and treated with herbicide (always use sandy soil distances for this method). Another 8-inch DBH red oak (orange circle) is just beyond root-graft distance, but it has another red oak directly in line between it and the infected tree. The landowner or manager could be aggressive and include this tree during treatment. Or, they could keep the tree, deciding the reduced risk of it getting infected is acceptable. The 13" DBH tree in the middle is well outside root graft distance and does not need to be included during management.*

Control method: Root severing

Root severing is an effective way to physically break root connections. Typically, a trencher, vibratory plow or other heavy equipment is used to cut roots to at least four (preferably five) feet deep. This method is costly and may not be possible in rocky ground or steep terrain.

Properly locating the root graft barrier is critical to successfully containing oak wilt. Work with your local DNR forest health specialist, a forester or a trained arborist

For more information, visit https://dnr.wisconsin.gov/topic/foresthealth/oakwilt

- Fungicide Treatment: High-value oak trees can be treated with a systemic fungicide (e.g., propiconazole) as a preventive measure or in the early stages of infection. Fungicides are injected into the tree's root flare to inhibit fungal growth.

4. Handling Firewood and Tree Debris:

- Do Not Move Firewood: Avoid transporting firewood from infected areas, as the fungus can survive in the wood for several months, potentially spreading the disease.
- Debark or Cover Infected Wood: If infected wood is stored, it should be debarked or covered with plastic sheeting sealed at the ground for at least 6 months to prevent fungal spores from spreading.

5. Community-Wide Management Efforts:

- Coordinate with Neighbors: Since oak wilt can spread through root grafts between trees on different properties, community-wide cooperation is essential for effective management.
- Educate the Public: Raise awareness about oak wilt, its symptoms, prevention, and management. Encourage residents to avoid pruning during high-risk periods and report any signs of oak wilt.

6. Long-Term Monitoring:

- Regular Inspections: Continuously monitor both treated and adjacent trees for signs of new infection. Long-term vigilance is necessary to prevent outbreaks.
- Maintain and Update Records: Keep records of oak wilt cases, treatments, and trenching locations to track the disease and guide future management decisions.

Implementing these guidelines can help control oak wilt spread, protect valuable trees, and maintain healthy oak populations in urban and forested landscapes.

iii. Spongy Moth

Spongy moth (Lymantria dispar) infestations have been a persistent problem in Wisconsin, where the pest threatens hardwood forests and urban trees. The state first detected the spongy moth in the 1970s, and since then, efforts have been ongoing to manage and contain the pest.

Infestations typically peak every 8-12 years, with outbreaks causing widespread defoliation, particularly in oak forests, which are highly susceptible. The larvae feed on the leaves, and repeated defoliation over several years can weaken trees, making them more prone to disease and other pests, and sometimes leading to tree death.

Spongy Moth management strategies in Wisconsin include:

- Monitoring and Trapping: The Wisconsin Department of Natural Resources (DNR) uses pheromone traps and aerial surveys to monitor moth populations and predict outbreaks.
- Biological Control: The state uses the fungus Entomophaga maimaiga and other natural predators to help control larval populations.
- Chemical Treatments: Insecticides like Bacillus thuringiensis (Bt) are applied during severe infestations, primarily targeting caterpillars in high-risk areas.

- Slow the Spread Program: This federal-state partnership aims to reduce the rate of expansion of spongy moth populations by treating areas at the leading edge of the infestation.

These efforts aim to minimize the ecological and economic impact of the spongy moth in Wisconsin's forests and communities.

iv. Emerald Ash Borer

The EAB is an exotic wood borer that was found attacking and killing ash trees in Michigan during 2002. Since its detection, EAB has killed millions of ash trees and is now found across the eastern United States, west to Colorado, south to Texas, and north into Canada. EAB is easily spread through the movement of firewood, logs and nursery stock and is why people have been the greatest cause for the rapid spread of EAB over the past decade.

EAB is a very destructive pest. This insect attacks and kills white, green, blue, black and all horticultural varieties of ash. This insect attacks not only stressed ash trees but healthy and vigorous ash trees as well. The larvae of this insect feed under the bark undetected, disrupting the flow of nutrients and water between the roots and crown of ash trees. The first visible signs are usually crown dieback. By this time it is usually too late to save trees.

The City has been actively managing their ash tree population with aggressive removal/replanting efforts, and treating their best looking Ash trees. The City should continuing treating these trees (544), and removing/replanting these trees as they are lost to natural causes.

The following website is an excellent Wisconsin resource with current information on EAB:

http://dnr.wi.gov/topic/UrbanForests/EABToolBox.html

a. Wisconsin DNR EAB Toolbox for Wisconsin Communities
b. Designed for the planning and response needs of municipal governments, including such topics as: “Is Your Community Ready for EAB (video), “EAB: The Opportunity of a Lifetime”, “Readiness Checklist”, “What Will Happen if EAB is Found in Your Community?” and “EAB University”

v. Asian Long Horned beetle

The Asian long-horned beetle (*Anoplophora glabripennis*) (ALB) is an invasive wood-boring insect native to China and Korea. It poses a significant threat to hardwood trees in North America, including maples, elms, willows, and birches. The beetle was first detected in the United States in the 1990s, likely introduced through infested wood packing materials.

The beetle's larvae tunnel into tree trunks and branches, disrupting the flow of nutrients and water, which eventually weakens and kills the tree. This activity also makes the trees more susceptible to other stressors and can result in widespread tree mortality. The beetle's infestation not only affects forest ecosystems but also has significant economic and aesthetic impacts on urban and suburban landscapes, where trees play a crucial role.

Regular inspections are conducted in affected and high-risk areas to detect new infestation of ALB. If ALB is found, infested trees are removed and destroyed to prevent the spread. Quarantine zones are established to restrict the movement of potentially infested wood.

The Asian long-horned beetle is important because its spread poses a severe threat to hardwood forests, urban trees, and associated industries, making management and eradication efforts essential. Almost 1/4 of the City’s public tree population is comprised of maples. The city has a lot to lose if ALB becomes established and should actively monitor for trees displaying signs/symptoms of ALB infestation.

vi. Spotted Lantern Fly

The spotted lanternfly (*Lycorma delicatula*) (SLF) is an invasive insect native to China, India, and Vietnam that has become a significant pest in the United States. Pennsylvania was the first state to identify this insect in 2014. The population of SLF is rapidly spreading and was detected in Iowa and Illinois in 2023. It feeds on the sap of a wide range of plants, including grapes, fruit trees, hops, and hardwoods, with a particular preference for the invasive tree of heaven (*Ailanthus altissima*).

The insect poses a serious threat to agriculture, forestry, and horticulture industries due to its feeding habits. The spotted lanternfly's feeding can weaken plants, making them more vulnerable to disease and other stress factors. It also excretes a sticky substance called honeydew, which promotes the growth of sooty mold, further damaging plants and creating a nuisance in infested areas.

Treatments for SLF include soil insecticides and contact sprays. Although treatment is available, it may not be necessary for your trees. Larger, more mature trees are not at risk and should sustain minimal to negligible damage. Smaller ornamental trees may require treatment if the insect population is large.

vii. Other Pest Problems (by tree species):

Honeylocust

Leafhoppers and plant bugs (leaf sucking insects that defoliates the tree)

- Relatively easy to control, but the public is often not comfortable with spraying. Can be controlled with a soil injected material for individual high value trees (like park trees or business district area).

Nectria canker

- A fungus that causes a dead area in the bark, usually at a branch crotch area. Important to keep the tree growing vigorously and out of drought stress. Proper pruning cuts and dormant pruning during dry, lower humidity conditions are important.

Linden

Boring insects

- Can be very serious on individual trees. Usually attack branch crotch areas. Buying good planting stock and good training pruning can do a lot to limit this problem. Keeping existing plants healthy and out of stress is very important. Can trunk inject specimen trees, but is expensive.

Spruce

Spruce needle casts (Rhizosphaera)

- Rows of black dots (fruiting bodies) on needles. Loss of innermost needles. Shade and irrigation compound the problem.

Cytospora canker

- Dieback and eventual death of lower branches. Disease progresses upward in tree over time. Prune out infected branches during dry conditions. Mulching, supplemental watering and fertilization reduce disease incidence.

Crabapple

Apple scab

- A fungus causing leaf spots, which causes premature leaf drop, and disfigured fruits. Can be treated with two to three foliar sprays annually. Plant disease-resistant varieties.

F. Crew Training

The City should continue to allocate funding each year for continued forestry training. Staff members are regularly exposed to various forestry events. The City currently supports employees attending Wisconsin Arborist Association meetings, and supports employees pursuing ISA certified arborist credentials. This is all very positive. Attending various meetings produced by the WAA and/or the DNR's Urban Forestry working group can provide additional avenues to secure technical training.

VII. REVIEW OF PLAN

It is vital to the success of the urban forestry program that this Plan be evaluated to see that desired results are being attained. It must be remembered that a Management Plan is a dynamic document. There will certainly be a need to change or add goals, strategies and priorities as time goes on. It will be the responsibility of the appropriate City departments to review all of the goals, strategies, actions, tasks, and priorities in the Plan in the summer of every year, prior to budget submission, to see that they are achieving the overall Mission and Purpose. Any additions and/or adjustments to the Plan will be made at the time of the review. The City Board should be informed of these accomplishments. A comprehensive public tree inventory update should take place in 2029. A review of this data and update of the plan should take place in **2030** by an outside urban forestry consulting firm.

VIII. CONCLUSION

It has been the pleasure of Wachtel Tree Science to assess the data and policies that comprise Stevens Point's Urban Forest. The City's Urban Forest has been exceptionally planted with trees. This is a testament to the commitment to Stevens Point's Urban Forest on behalf the City 's residents, administration, and motivated individuals within the City's staff. The City should be commended on an exceptional job promoting diversity within the street tree population!

Additionally, the City is doing a tremendous job implementing an aggressive pruning plan to set proper structure of these newly planted trees. With ongoing focus and attention to detail, the City will be able to maintain the overall health and structure of the urban forest, building upon the foundation of today's beautiful trees for years to come.

The City of Stevens Point has a wonderful living, growing resource. The urban forest needs to be managed to avoid serious problems and to achieve its full potential. When managed properly, it will increase in value, giving many benefits to the citizens from cleaner air, cooler homes, increased property values and making the City of Stevens Point a more beautiful community to visit, work and live in.

APPENDICES

Appendix A: Stevens Point Tree Species Diversity Table

COMMONNAME	SPECIES
FIR, BALSAM	Abies balsamea
FIR, WHITE	Abies concolor
MAPLE, HYBRID CELEBRATION	Acer freemanii "Celebration"
MAPLE, HYBRID AUTUMN FANTASY	Acer freemanii 'Autumn Fantasy'
MAPLE, AMUR	Acer ginnala
MAPLE, STATE STREET	Acer miyabei 'Morton'
MAPLE, BOX ELDER	Acer negundo
MAPLE, NORWAY	Acer platanoides
MAPLE, NORWAY CLEVELAND	Acer platanoides 'Cleveland'
MAPLE, NORWAY COLUMNAR	Acer platanoides 'Columnare'
MAPLE, NORWAY CRIMSON KING	Acer platanoides 'Crimson King'
MAPLE, NORWAY DEBORAH	Acer platanoides 'Deborah'
MAPLE, NORWAY EMERALD LUSTRE	Acer platanoides 'Emerald Lustre'
MAPLE, NORWAY EMERALD QUEEN	Acer platanoides 'Emerald Queen'
MAPLE, NORWAY ROYAL RED	Acer platanoides 'Royal Red'
MAPLE, NORWAY SCHWEDLER	Acer platanoides 'Schwedleri'
MAPLE, REGAL PETTICOAT SYCAMORE	Acer pseudoplantus 'Tunpetti'
MAPLE, NORTHERN GLOW JAPANESE	Acer pseudosieboldianum x palmatum
MAPLE, RED	Acer rubrum
MAPLE, RED DRAKE	Acer rubrum 'Drake'
MAPLE, RED SUNSET	Acer rubrum 'Red Sunset'
MAPLE, SILVER	Acer saccharinum
MAPLE, SUGAR	Acer saccharum
MAPLE, SUGAR FALL FIESTA	Acer saccharum "Fall Fiesta"
MAPLE, TATARIAN	Acer tataricum
MAPLE, MANCHURIAN STRIPED JOE WITT	Acer tegmentosum 'Joe Witt'
MAPLE, THREE FLOWERED	Acer triflorum
MAPLE, HYBRID CRIMSON SUNSET	Acer truncatum x Acer platanoides 'JFS-kw202'
MAPLE, HYBRID MORGAN	Acer x freemanii 'morgan'
MAPLE, HYBRID SIENNA GLEN	Acer x fremanii 'Sienna Glen'
MAPLE, HYBRID AUTUMN BLAZE	Acer x fremanii, 'Autumn Blaze'
BUCKEYE, OHIO	Aesculus glabra
BUCKEYE, OHIO EARLY GLOW	Aesculus glabra 'Early Glow'
BUCKEYE, OHIO SUNSET	Aesculus glabra 'Sunset'
HORSECHESTNUT, BAUMANN	Aesculus hippocastanum 'Baumanii'
BUCKEYE, AUTUMN SPLENDOR	Aesculus x arnoldiana 'Autumn Splendor'

HORSECHESTNUT, RED FORT MCNAIR	Aesculus x carnea 'Ft. McNair'
ALDER, MANCHURIAN PRAIRIE HORIZON	Alnus hirsuta 'Harbin'
ALDER, SPAETHS	Alnus x spaethii
SERVICEBERRY, CUMULUS	Amelanchier laevis 'Cumulus'
SERVICEBERRY, SPRING FLURRY	Amelanchier laevis 'JFS-Arb'
SERVICEBERRY, AUTUMN BRILLIANCE	Amelanchier X grandiflora 'Autumn Brilliance'
BIRCH, RIVER	Betula nigra
BIRCH, PAPER	Betula papyrifera
HORNBEAM, EUROPEAN FRANS FONTAINE	Carpinus betulus 'Frans Fontaine'
HORNBEAM, EUROPEAN COLUMNAR LUCAS	Carpinus betulus 'Lucas'
HORNBEAM, LUCAS	Carpinus betulus 'Lucas'
MUSCLEWOOD	Carpinus caroliniana
MUSCLEWOOD, FIRESPIRE	Carpinus caroliniana 'Firespire'
MUSCLEWOOD, FIRE KING	Carpinus caroliniana 'J.N. Select A' PP29969
HICKORY, BITTERNUT	Carya cordiformis
PECAN	Carya illinoinensis
HICKORY, SHAGBARK	Carya ovata
CATALPA, NORTHERN	Catalpa speciosa
HACKBERRY, COMMON	Celtis occidentalis
HACKBERRY, CHICAGOLAND	Celtis occidentalis 'Chicagoland'
KATSURATREE	Cercidiphyllum japonicum
REDBUD, EASTERN	Cercis canadensis
YELLOWWOOD	Cladrastis kentukea
DOGWOOD, GALILEAN	Cornus kousa 'Galilean'
DOGWOOD, TRI-SPLENDOR	Cornus kousa 'Tri-Splendor'
DOGWOOD, GOLDEN GLORY CORNELIAN CHERRY	Cornus mas 'Golden Glory'
DOGWOOD, SAFFRON SENTINEL CORNELIAN CHERRY	Cornus mas 'JFS PN4Legacy'
FILBERT, TURKISH	Corylus colurna
SMOKETREE, GRACE PURPLE	Cotinus x 'Grace'
HAWTHORN, CRIMSON CLOUD	Crataegus laevigata (Superba)
HAWTHORN, THORNLESS COCKSPUR	Crataegus crusgalli inermis
HAWTHORN, VAUGHN	Crataegus crusgalli X phaenopyrum
HAWTHORN, THORNLESS COCKSPUR	Crataegus laevigata (Superba)
HAWTHORN, WASHINGTON	Crataegus phaenopyrum
PERSIMMON	Diospyros virginiana
BEECH, AMERICAN	Fagus grandifolia
BEECH, RED OBELISK	Fagus sylvatica 'Red Obelisk'
BEECH, EUROPEAN TRICOLOR	Fagus sylvatica 'Tricolor'
ASH, WHITE	Fraxinus americana
ASH, WHITE AUTUMN APPLAUSE	Fraxinus americana 'Autumn Applause'

ASH, WHITE AUTUMN PURPLE	Fraxinus americana 'Autumn Purple'
ASH, GREEN	Fraxinus pennsylvanica
ASH, GREEN MARSHALLS SEEDLESS	Fraxinus pennsylvanica 'Marshalls Seedless'
ASH, GREEN PATMORE	Fraxinus pennsylvanica 'Patmore'
ASH, GREEN PRAIRISPIRE	Fraxinus pennsylvanica 'Prairispire'
ASH, GREEN SUMMIT	Fraxinus pennsylvanica 'Summit'
GINKGO	Ginkgo biloba
GINKGO, AUTUMN GOLD	Ginkgo biloba 'Autumn Gold'
GINKGO, MAGYER	Ginkgo biloba 'Magyer'
GINKGO, PRINCETON SENTRY	Ginkgo biloba 'Princeton Sentry'
GINKGO, WINDOVER GOLD	Ginkgo biloba 'Windover Gold'
HONEYLOCUST	Gleditsia triacanthos
HONEYLOCUST, FAIRVIEW	Gleditsia triacanthos inermis 'Fairview'
HONEYLOCUST, IMPERIAL	Gleditsia triacanthos inermis 'Imperial'
HONEYLOCUST, SHADEMASTER	Gleditsia triacanthos inermis 'Shademaster'
HONEYLOCUST, SKYLINE	Gleditsia triacanthos inermis 'Skyline'
HONEYLOCUST, STREET KEEPER	Gleditsia triacanthos inermis 'Street Keeper'
HONEYLOCUST, SUNBURST	Gleditsia triacanthos inermis 'Sunburst'
HONEYLOCUST, NORTHERN ACCLAIM	Gleditsia triacanthos inermis, 'Northern Accl'
KENTUCKY COFFEETREE, ESPRESSO	Gymnocadus dioicus 'Espresso'
KENTUCKY COFFEETREE	Gymnocladus dioicus
KENTUCKY COFFEETREE, DECAFINATED	Gymnocladus dioicus 'Decafinated'
KENTUCKY COFFEETREE, ESPRESSO	Gymnocladus dioicus 'Espresso'
KENTUCKY COFFEETREE 'PRAIRIE TITAN'	Gymnocladus dioicus 'Prairie Titan'
WALNUT, BLACK	Juglans nigra
JUNIPER, CHINESE	Juniperus chinensis
JUNIPER, CHINESE MOUNTBATTEN	Juniperus chinensis 'Mountbatten'
CEDAR, RED	Juniperus virginiana
LARCH, EUROPEAN	Larix decidua
LARCH, AMERICAN	Larix laricina
SWEETGUM, WORPLESDON	Liquidambar styraciflua 'Worplesdon'
TULIPTREE	Liriodendron tulipifera
TULIPTREE, EMERALD CITY	Liriodendron tulipifera 'JFS Oz'
MAACKIA, AMUR MAACNIFICENT	Maackia amur 'Maacnificient'
MAACKIA, AMUR	Maackia amurensis
MAACKIA, AMUR STARBURST	Maackia amurensis 'Starburst'
MAGNOLIA, YELLOW BIRD	Magnolia accuminata 'Yellow Bird'
MAGNOLIA, CUCUMBER	Magnolia acuminata
MAGNOLIA, JANE	Magnolia liliflora 'Reflorescens'
MAGNOLIA, MERRILL	Magnolia loebneii 'Merrill'
MAGNOLIA, MOONGLOW	Magnolia virginiana 'Moonglow'

MAGNOLIA, GOLD STAR	Magnolia x Gold Star
MAGNOLIA, ANN	Magnolia, 'Ann'
MAGNOLIA, BUTTERFLIES	Magnolia, Butterflies
FLOWERING CRAB, ADIRONDAK	Malus 'Adirondak'
FLOWERING CRAB, AMERICAN BEAUTY	Malus 'American Beauty'
FLOWERING CRAB, BIRDLAND	Malus 'Birdland'
FLOWERING CRAB, CENTURION	Malus 'Centurion'
FLOWERING CRAB, CARDINAL	Malus 'Cardinal'
APPLE, COMMON	Malus domestica
FLOWERING CRAB, DONALD WYMAN	Malus 'Donald Wyman'
FLOWERING CRAB, EMERALD SPIRE	Malus 'Emerald Spire'
FLOWERING CRAB, GOLDEN RAINDROPS	Malus 'Golden Raindrops'
FLOWERING CRAB, HARVEST GOLD	Malus 'Harvest Gold'
FLOWERING CRAB, IVORY SPEAR	Malus 'Ivory Spear'
FLOWERING CRAB, STARLITE	Malus jeflite 'Starlite'
FLOWERING CRAB, PINK SPARKLES	Malus 'Pink Sparkles'
FLOWERING CRAB, PINK SPIRES	Malus 'Pink Spires'
FLOWERING CRAB, PRAIRIEFIRE	Malus 'Prairiefire'
FLOWERING CRAB, PURPLE PRINCE	Malus 'Purple Prince'
FLOWERING CRAB, RASPBERRY SPEAR	Malus 'Raspberry Spear'
FLOWERING CRAB, RED BARRON	Malus 'Red Barron'
FLOWERING CRAB, RED JEWEL	Malus 'Red Jewel'
FLOWERING CRAB, PINK SPIRES	Malus 'Pink Spires'
FLOWERING CRAB, ROBINSON	Malus 'Robinson'
FLOWERING CRAB, ROYAL RAINDROPS	Malus 'Royal Raindrops'
FLOWERING CRAB, SENTINEL	Malus 'Sentinel'
CRABAPPLE	Malus spp.
FLOWERING CRAB, SPRING SNOW	Malus 'Spring Snow'
FLOWERING CRAB, SUGAR TYME	Malus 'Sugar Tyme'
FLOWERING CRAB, WHITE CANDLE	Malus 'White Candle'
FLOWERING CRAB, WINTER GOLD	Malus 'Winter Gold'
FLOWERING CRAB, GLADIATOR	Malus x adstringens 'Durleo'
MULBERRY, RED	Morus rubra
BLACK GUM	Nyssa sylvatica
BLACK GUM, MAJESTIC	Nyssa sylvatica 'Majestic'
IRONWOOD	Ostrya virginiana
CORKTREE, AMUR HIS MAJESTY	Phellodendron amuense 'His Majesty'
CORKTREE, AMUR	Phellodendron amurense
CORKTREE, AMUR EYESTOPPER	Phellodendron amurense 'Eye Stopper'
CORKTREE, AMUR EYE STOPPER	Phellodendron amurense 'Eye Stopper'
SPRUCE, NORWAY	Picea abies

SPRUCE, WHITE	Picea glauca
SPRUCE, COLORADO	Picea pungens
PINE, JACK	Pinus banksiana
PINE, AUSTRIAN	Pinus nigra
PINE, RED	Pinus resinosa
PINE, WHITE	Pinus strobus
PINE, SCOTCH	Pinus sylvestris
SYCAMORE, EASTERN	Platanus occidentalis
SYCAMORE, EASTERN EXCLAMATION	Platanus occidentalis, 'Exclamation'
POPLAR, WHITE	Populus alba
COTTONWOOD	Populus deltoides
QUAKING ASPEN	Populus tremuloides
CHOKECHERRY, AMUR	Prunus maackii
CHERRY, SARGENT COLUMNAR	Prunus sargentii 'Columnaris'
CHERRY, SARGENT SPRING WONDER	Prunus sargentii 'Hokkaido Normandale'
CHERRY, SARGENT PINK MYST	Prunus sargentii 'JFS KW21PS'
CHERRY, PINK FLAIR	Prunus sargentii 'JFS-KW58'
CHERRY, BLACK	Prunus serotina
CHOKECHERRY	Prunus virginiana
CHOKECHERRY, SCHUBERT RED LEAF	Prunus virginiana 'Schubert'
HOPTREE	Ptelea Triofoliata
PEAR, CALLERY AUTUMN BLAZE	Pyrus calleryana "Autumn Blaze"
PEAR, CALLERY BRADFORD	Pyrus calleryana 'Bradford'
PEAR, CALLERY CLEVELAND SELECT	Pyrus calleryana 'Cleveland Select'
OAK, WHITE	Quercus alba
OAK, SWAMP WHITE	Quercus bicolor
OAK, SWAMP WHITE AMERICAN DREAM	Quercus bicolor 'JFS-KW12'
OAK, SHINGLE	Quercus imbricaria
OAK, SCARLET	Quercus coccinea
OAK, BUR	Quercus macrocarpa
OAK, BUR URBAN PINNACLE	Quercus macrocarpa 'Urban Pinnacle'
OAK, PIN	Quercus palustris
OAK, CHESTNUT	Quercus prinus
OAK, HYBRID KINDERED SPIRITS	Quercus robur 'Fastigata x Quercus bicolor'
OAK, HYBRID REGAL PRINCE	Quercus robur x bicolor 'Long'
OAK, NORTHERN RED	Quercus rubra
OAK SPECIES	Quercus spp.
OAK, HYBRID HERITAGE	Quercus x macdanielii 'Clemons'
OAK, HYBRID SWAMPWHITE * BURR	Quercus x schuettei
SUMAC, STAGHORN	Rhus typhina
BLACK LOCUST	Robinia pseudoacacia

MOUNTAIN ASH, EUROPEAN	Sorbus aucuparia
MOUNTAIN ASH, OAK LEAF	Sorbus x hybrida
LILAC, PEKIN SUMMER CHARM	Syringa pekinensis 'Summer Charm'
LILAC, JAPANESE TREE	Syringa reticulata
LILAC, SNOWCAP JAPANESE TREE	Syringa reticulata cv. 'Elliot'
LILAC, JAPANESE TREE IVORY SILK	Syringa reticulata 'Ivory Silk'
LILAC, TREE IVORY PILLAR	Syringa reticulata 'Williamette'
ARBORVITAE	Thuja occidentalis
LINDEN, AMERICAN	Tilia americana
LINDEN, KROM	Tilia americana 'Krom"
LINDEN, REDMOND	Tilia americana 'Redmond'
LINDEN, SENTRY	Tilia americana 'Sentry'
LINDEN, LITTLELEAF	Tilia cordata
LINDEN, FAIRVIEW	Tilia cordata 'Fairview'
LINDEN, GREENSPIRE	Tilia cordata 'Greenspire'
LINDEN, HYBRID HARVEST GOLD	Tilia x mongolica 'Harvest Gold'
HEMLOCK, CANADA	Tsuga canadensis
ELM, HYBRID TRIUMPH	Ulmus "Morton Glossy"
ELM, AMERICAN	Ulmus americana
ELM, AMERICAN JEFFERSON	Ulmus americana 'Jefferson'
ELM, AMERICAN LIBERTY	Ulmus americana' Liberty'
ELM, AMERICAN NEW HARMONY	Ulmus americana 'New Harmony'
ELM, AMERICAN PRAIRIE EXPEDITION	Ulmus americana 'Prairie Expedition'
ELM, AMERICAN PRINCETON	Ulmus americana 'Princeton'
ELM, AMERICAN VALLEY FORGE	Ulmus americana 'Valley Forge'
ELM, AMERICAN LIBERTY	Ulmus americana,' Liberty'
ELM, HYBRID NORTHERN EMPRESS	Ulmus Davidson 'Northern Empress'
ELM, HYBRID TRIUMPH	Ulmus 'Morton Glossy'
ELM, SIBERIAN	Ulmus pumila
ELM, HYBRID FRONTIER	Ulmus spp. ' Frontier'
ELM, HYBRID ACCOLADE	Ulmus spp. 'Accolade'
ELM, HYBRID DISCOVERY	Ulmus spp. 'Discovery'
ELM, HYBRID FRONTIER	Ulmus spp. 'Frontier'
ELM, HYBRID NEW HORIZON	Ulmus spp. 'New Horizon'
ELM, HYBRID REGAL	Ulmus spp. 'Regal'

Appendix B: Tree Species Recommendations

RECOMMENDED TREE PLANTING LIST

This list is provided as a guide to some of the most appropriate trees for urban settings in USDA Hardiness Zone 4b/5a for the City of Stevens Point. There is no single perfect tree. These species have been selected for use in our demanding street tree situations. Before selecting any particular species or variety, each site should be evaluated as to: rooting space, soil texture, soil pH, drainage, exposure, overhead wires, and surrounding buildings (crown space). The most important thing to remember is to plant the right tree in the right place.

SMALL TREES (Below 30' Maximum Height) – Acceptable trees for terraces with overhead power lines and/or if terrace is 3-5 feet wide. May be planted in wider terraces.

Scientific Name	Common Name	Cultivars
Amelanchier arborea	Downy Serviceberry	
Amelanchier x grandiflora	Apple Serviceberry	'Autumn Brilliance', 'Robin Hill'
Amelanchier laevis	Allegheny Serviceberry	'Cumulus', 'Lustre'
Carpinus caroliniana	American Hornbeam	'Firespire'
Cercis canadensis	Eastern Redbud	Focus on cold hardy selections such as 'Columbus' or 'Columbus Strain'
Crataegus crusgalli inermis	Thornless Cockspur Hawthorn	
Crataegus phaenopyrum	Washington Hawthorn	
Crataegus viridis	Winter King Hawthorn	'Winter King'
Maackia amurensis	Amur Maackia	'Starburst', 'Summertime', 'JFS-Schichtel1'
Malus spp.	Flowering Crabapple	'Adirondack', 'Jewelcole', 'Bob White', 'Harvest Gold', 'Jackii', 'Prairiefire', 'Professor Sprenger', 'Red Bud', 'Royal Raindrops', 'Sugar Tyme', 'Lanzam', 'Hargozam'
Ostrya virginiana	Ironwood	
Syringa pekinensis	Peking Lilac	'China Snow'
Syringa reticulata	Japanese Tree Lilac	'Ivory Silk', 'Summer Snow', 'Snowcap', 'Ivory Pillar', 'Snowdance'

Cornus mas	Cornelian Cherry Dogwood	'Golden Glory'
Prunus sargentii	Sargent Cherry	'JFS-KW58'

MEDIUM TREES (30'-45' Maximum Height) – Acceptable trees for terraces that are 5-8 feet wide. May be planted in wider terraces.

Scientific Name	Common Name	Cultivars
Aesculus glabra	Ohio Buckeye	'Sunset'
Cladrastis kentuckea	American Yellowwood	
Carpinus betulus	Hornbeam	'JFS-KW1CB'; 'Fastigiata'
Phellodendron amurense	Amur Cork tree	
Nyssa sylvatica	Black Tupelo	
Tilia spp.	Linden	'Crimean'; 'Harvest Gold'; 'Sterling'; PNI 6051'

LARGE TREES (Above 45' Maximum Height) – Acceptable trees for terraces 8 foot and wider.

Scientific Name	Common Name	Cultivars
Aesculus flava	Yellow Buckeye	
Carya cordiformis	Bitternut Hickory	
Celtis occidentalis	Hackberry	'Prairie Pride', 'Chicagoland', 'Windy City', 'JFS-KSU1'
Cercidiphyllum japonicum	Katsuratree	
Corylus colurna	Turkish Filbert	Autumn Gold'
Gingko biloba	Gingko (male only)	Autumn Gold', 'Magyar', 'Princeton Sentry'
Gleditsia triacanthos inermis	Thornless Honeylocust	Imperial', 'Shademaster', 'Skyline/Skycole', 'Sunburst', 'Street Keeper/Draves'
Gymnocladus dioicus	Kentucky Coffeetree	'Espresso', 'Prairie Titan', 'Decaf'
Liriodendron tulipifera	Tuliptree	
Platanus x acerifolia	London Planetree	'Exclamation'
Quercus bicolor	Swamp White Oak	
Quercus x 'Crimschmidt'	Crimson Spire Oak	
Quercus macrocarpa	Bur Oak	
Quercus robur	English Oak	'Skymaster', 'Regal Prince', 'JFS-KW1QX'
Quercus rubra	Red Oak	

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Quercus x macdanielii 'Clemons'	Heritage Oak	
Quercus muehlenbergii	Chinkapin Oak	
Quercus x schuettei	Swamp x Bur Oak	
Ulmus x	Hybrid Elm	'Accolade', 'New Horizon', 'Regal', 'Triumph', 'Discovery', 'Frontier', 'Pioneer', 'Cathedral'
Ulmus parvifolia	Lacebark Elm	

EVERGREENS TREES – Do not plant on streets, evergreens obstruct visibility making them hazardous on street locations. Acceptable trees for parks and non-street tree locations.

Scientific Name	Common Name	Cultivars
Abies concolor	White Fir	
Xanthocyparis nootkatensis	Nootka Cyprus	
Juniperus chinensis	Chinese Juniper	Iowa', 'Mounntbatten'
Juniperus x	Star Power Juniper	JN Select Blue'
Picea glauca var. densata	Black Hills Spruce	
Picea omorika	Serbian Spruce	
Pinus bungeana	Lacebark Pine	
Pinus flexilis	Limber Pine	Vanderwolf's Pyramid'
Pinus strobus	Eastern White Pine	Fastigiata'
Pinus sylvestris	Scotch Pine	
Pseudotsuga menziesii	Douglasfir	
Thuja occidentalis	Arborvitae	Smaragd', 'Hetz Wintergreen', 'Sunkist', 'Techny'
Thuja plicata	Western White Cedar	
Tsuga canadensis	Canadian Hemlock	
*Metasequoia glyptostroboides**	Dawn Redwood*	'Gold Rush'
*Taxodium distichum**	Baldcypress*	'Shawnee Brave'

**Note*:* *Dawn Redwood and Baldcypress are technically not "Evergreen" trees. However, both these tree species maintain the same growth habit as traditional "Evergreen" trees. New tree plantings of these species should be limited to parks or open growing spaces that can accommodate the spreading lower canopy growth.*

UNACCEPTABLE STREET TREE PLANTING LIST

The following is a list of trees that are considered unacceptable for planting in the road right of way. This list should be evaluated periodically, and species may be added or removed as seen fit.

Scientific Name	Common Name	Reason
Acer x freemani	Freeman Maple	Poor structure, weak wooded
Acer negundo	Boxelder	Weak wooded, attracts boxelder bug
Acer platanoides	Norway Maple	Over-planted, invasive, girdling roots
Acer rubrum	Red Maple	Intolerant of alkaline soils
Acer saccharinum	Silver Maple	Weak wooded, aggressive roots, heavy seed crop
Ailanthus altissima	Tree-of-Heaven	'Restricted' on NR40 list; Weak wooded
Elaeagnus angustifolia	Russian Olive	Disease problems, weak wood
Fraxinus spp.	Ash	Emerald Ash Borer
Gingko biloba (female)	Gingko (female)	Messy and smelly fruit
Morus spp.	Mulberry	Littering fruit
Populus spp.	Poplar, Cottonwood	Weak wooded, aggressive roots, heavy seed crop
Pyrus calleryana	Callery Pear	Poor structure, invasive tendencies
Robinia pseudoacacia	Black Locust	Weak wooded, thorns, invasive
Sorbus americana	American Mountainash	Susceptible to insects and disease
Sorbus aucuparia	European Mountainash	Susceptible to insects and disease
Ulmus pumila	Siberian Elm	Weak wooded, aggressive roots

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ACCEPTABLE PARK TREE PLANTING LIST

The following is a list of trees that are generally considered unacceptable for planting in the road right of way, however, they can be exceptional trees in park-like settings or planted in “urban orchards”.

Scientific Name	Common Name
Betula nigra	River Birch
Catalpa spp.	Catalpa
Juglans nigra	Black Walnut
Malus spp.	Apple
Prunus serotina	Black Cherry
Pyrus spp.	Pear
Quercus palustris	Pin Oak
Salix spp.	Willow

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Appendix C: Definitions

American National Standards Institute (ANSI)	Non-profit organization that develops national consensus standards for various industries.
ANSI A3100 Standards	Industry-developed, national consensus standards of practice for tree care.
ANSI Z133.1 Standards	Industry-developed, national consensus safety standards of practice for tree care.
Arborist	Professional who possesses the technical competence gained through experience and related training to provide for or supervise the management of trees and other woody plants in residential, commercial, and public landscapes.
Best Management Practices (BMP)	Best-available, industry-recognized courses of action, in consideration of the benefits and limitations, based on scientific research and current knowledge.
Canopy	Collective branches and foliage of a tree or group of trees.
Superintendent Public Works	Individual in charge of enforcing the provisions of these specifications
Chlorosis	A whitish or yellowish leaf discoloration caused by a lack of chlorophyll, often caused by nutrient deficiency.
Co-dominant Branches or Co-dominant Stems	Forked branches nearly the same size in diameter, arising from a common junction and lacking normal branch union.
Construction Damage	Damage to a tree (branches, trunk or roots) usually from excavating, filling, grade changes, compaction, etc. It can take up to five years for visible signs of this damage to show up in a tree and ten years for a tree to die.
Crown	Upper part of a tree, measured from the lowest branch, including all the branches and foliage.
Crown Cleaning	Removing dead, dying, diseased, and/or broken branches from the tree crown.
Crown Rot	Disease or other decay at the base of a tree or root crown.
Cultivar	Cultivated variety of a plant; cannot be reproduced without human assistance; usually propagated asexually (cloned); compare to variety.
Deadwooding	Removing dead and dying branches from a tree.
Diameter-at-Breast-Height (DBH)	A standard measure of tree trunk size measured at 4.5’ above ground level, on the uphill side.
Dieback	Condition in which the branches in the tree crown die from the tips toward the center.

Directional Pruning	A pruning technique that is used to "train" trees to grow in a certain direction (usually away from utility lines or buildings). The most important aspect involves always pruning back to a lateral branch to try and reestablish a leader in that area of the tree.
Flagging	Symptom in which leaves on a branch wilt and may ultimately turn brown without falling from the shoot.
Genus	Taxonomic group of species having similar fundamental traits: botanical classification under the family level and above the species level.
Girdling Roots	Roots located above or below ground whose circular growth around the base of the trunk or over individual roots applies pressure to the bark area, ultimately restricting sap flow and trunk/root growth, frequently resulting in reduced vitality and/or death of the plant.
Hanger	Broken or cut branch that is hanging in a tree.
Hardiness	Genetically determined ability of a plant to survive low temperatures.
Hazard Tree	Any tree or tree part that has a major structural fault that could lead to catastrophic loss and it has an identifiable target (people or property).
Included Bark	Bark that becomes embedded in a crotch (union) between branch and trunk or between codominant stems; causes a weak union.
ISA Certified Arborist	An individual who is trained in the art and science of planting, caring for and maintaining individual trees. And one who has passed the certification examination sponsored by the International Society of Arboriculture and who maintains a current certification.
Leader	Primary terminal shoot or trunk of a tree; large, usually upright stem; a stem that dominates a portion of the crown by suppressing lateral branches.
Live Crown Ratio	Ratio of the height of the crown containing live foliage to the overall height of the tree.
Mature Height	Maximum height that a plant is likely to reach if the conditions of the planting site are favorable.
Pruning Cycle	In municipal arboriculture, the length of time between each maintenance (routine) pruning for a given geographic area.
Qualified Arborist	A worker who, through related training and on-the-job experience, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, and with the equipment used in such operations, and has demonstrated his/her ability in the performance of the special techniques involved.
Raising or Lifting	Selective removal of lower limbs from a tree to provide clearance.
Root Crown or Collar	Area where the main roots join the plant stem, usually flared at the tree trunk base.
Routine Pruning	Pruning done on a regular basis (usually every five to seven years) that is done mostly for sanitation, therapeutic or maintenance reasons to keep

	trees healthy. Usually involves a combination of crown cleaning, raising and training pruning.
Safety Pruning	Pruning to remove a potential hazard such as large deadwood, broken branches, or branches impeding traffic or pedestrian travel. This type of pruning also includes branches obstructing street signs and light or obstructing vision at intersections and drive approaches.
Significant Trees	Trees that provide significant aesthetic and environmental benefits such as reduction of storm water runoff, preservation of wildlife habitat, enhancement of air quality, and contributes to overall forest health by providing species and size class diversity.
Species	Taxonomic group of organisms composed of individuals of the same genus that can reproduce among themselves and have similar offspring.
Speciman Tree(s) or Stand	Any tree or group of trees which has been determined to be of high value because of its species, size, age, historic significance or other criteria as designated by the City of Stevens Point.
Structural Defects	Any naturally occurring or secondary conditions such as cavities, poor branch attachments, cracks, or decayed wood in the trunk, crown, or roots of a tree that may contribute to structural failure.
Training Pruning	Pruning done to young trees (or sometimes neglected older trees) to establish proper branching structure, critical for long term health and safety of trees. Best if performed on a two to four year cycle.
Tree Protection Zone (TPZ)	A fenced area around a tree or group of trees that will not be disturbed by construction activities.
Trunk Formula Method	Method to appraise the monetary value of trees considered too large to be replaced with nursery or field-grown stock, or a method to produce a fairly accurate monetary value of a large grouping of public trees.
Watch Tree	These are trees that need to be checked yearly due to problems such as poor structure or decay. These are marginal trees that are not bad enough to make the safety prune or removal list, but due to their condition, they may need work in the next few years. They have a higher potential for problems and should be checked regularly due to this.
Utility Prune	Pruning around or near utility facilities with the objective of maintaining safe and reliable utility service.
Variety	Naturally occurring subdivision of a species having a distinct difference and breeding true to that difference; compare to cultivar.

Appendix - C

Appendix D: References and Resources

HAZARD TREES

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WEBSITES FOR INFORMATION ON TREES

Wisconsin's Emerald Ash Borer Resource https://dnr.wisconsin.gov/topic/foresthealth/emeraldashborer

Wisconsin's Spongy Moth Resource https://dnr.wisconsin.gov/topic/foresthealth/spongymoth

Insect Diagnostic Lab, UW-Madison http://labs.russell.wisc.edu/insectlab/

Plant Disease Diagnostic Clinic, UW-Madison https://pddc.wisc.edu/

UW-Extension Wisconsin Horticulture https://hort.uwex.edu/

Tree Care Information http://www.treesaregood.org/

Wisconsin Arborist Association http://www.waa-isa.org/

Appendix E: Standards and Guidelines – Tree Preservation

These provisions are intended to provide standards and guidelines for the preservation of trees as part of the land development and/or building construction process. The City of Stevens Point finds that such preservation is necessary to promote the general health and welfare of the community by making the city a more attractive place to live, protect watercourses and ecology, provide a healthy living environment, and to better maintain control of flooding, noise, glare, and soil erosion. The city further finds that trees provide beneficial oxygen while reducing the levels of harmful carbon dioxide and reduce air pollution, purify water, and stabilize soil. Trees also provide wildlife habitat and shade, cool the land, reduce noise, and provide an aesthetic value to the land.

Definitions of trees worthy of preservation measures:

Desirable Tree - Trees worthy of protection based on their ecological, social, and aesthetic value. The City will prioritize native trees and those well-adapted to the local climate and soil conditions, have a minimum 6" trunk diameter at breast height, and are of "Good" or "Excellent" condition. (See following page on condition assessments).

Historic or Heritage Trees - Trees that have historical significance, unique characteristics, or are rare species that merit special protection.

Table 4. Sample Desirable Tree List

SPECIES	Min. DBH	SPECIES	Min. DBH
American Basswood	20"	Common Hackberry	16"
Sugar Maple	12"	American Beech	12"
All Serviceberries	6"	All Oaks	12"
Musclewood	6"	White Pine	12"
All Hickories	12"	Butternut	12"
Black Walnut	12"	Black Cherry	12"
Eastern Red Cedar	8"	Ironwood	6"
Tamarack or Larch	12"	White Cedar	12"
Kentucky Coffeetree	12"		

Assessment of plant condition considers health, structure, and form. Each may be described in rating categories that can be translated into a percent rating. (Note the plant appraiser can/should weight each condition component and develop the condition rating that best reflects a thoughtful and credible condition rating. (Adapted from CTLA 2019)

Rating category	**Condition Components**			**Percent Rating**
	Health	**Structure**	**Form**	
Excellent	High vigor and nearly perfect health with little or no twig dieback, discoloration, or defoliation.	Nearly ideal and free of defects.	Nearly ideal for the species. Generally symmetric. Consistent with the intended use.	81% to 100%
Good	Vigor is normal for the species. No significant damage due to diseases or pests. Any twig dieback, defoliation, or discoloration is minor.	Well-developed structure. Defects are minor and can be corrected	Minor asymmetries/ deviations from species norm. Mostly consistent with the intended use. Function and aesthetics are not compromised.	61% to 80%
Fair	Reduced vigor. Damage due to insects or diseases may be significant and associated with defoliation bur is nor likely to be fatal. Twig dieback, defoliation, discoloration, and/or dead branches may comprise up to 50% of the crown.	A single defect of a significant nature or multiple moderate defects. Defects ace not practical to correct or would require multiple treatments over several years.	Major asymmetries/deviations from species norm and/or intended use. Function and/or aesthetics are compromised.	41% to 60%
Poor	Unhealthy and declining in appearance. Poor vigor. Low foliage density and poor foliage color are present. Potentially fatal pest infestation. Extensive twig and/or branch dieback.	A single serious defect or multiple significant defects. Recent change in tree orientation. Observed structural problems cannot be corrected. Failure may occur at any rime.	Largely asymmetrical/abnormal. Detracts from intended use and/or aescl1ecics to a significant degree.	21% to40%
Very Poor	Poor vigor. Appears to be dying and in the last stages of life. Little live foliage.	Single or multiple severe defects. Failure is probable or imminent.	Visually unappealing. Provides little or no function in the landscape.	
Dead				0% to 5%

Appendix - E

Table 5. Size and Tolerance of Tree Species to Construction Impacts.

This table represents information from three publications: Tree Characteristics, Protecting Trees from Construction Damage, Minnesota Extension Service, University of Minnesota; The Response of Ohio's Native and Naturalized Trees to Construction Activity, T. Davis Sydnor, School of Natural Resources, The Ohio State University; and Relative Tolerance of Tree Species to Construction Damage, Kim D. Coder, The University of Georgia Cooperative Extension Service, Forest Resources Unit.

Tolerance to construction impact can vary greatly according to site characteristics such as soil depth, individual tree characteristics such as rooting habit, prevailing weather conditions such as drought, and the degree of construction impact.

SPECIES	ROOT SEVERANCE	SOIL COMPACTION AND FLOODING	MATURE CROWN SPREAD (FEET)	HAZARD POTENTIAL RATING*	COMMENTS
Norway Spruce	tolerant	tolerant	20-30	medium	vulnerable to windthrow
Colorado Spruce	intermediate	tolerant	20-30	medium	vulnerable to windthrow
White Pine	tolerant	sensitive	40-60	medium	sensitive to drainage changes
Austrian Pine	tolerant	sensitive	30-50	medium	sensitive to poor drainage
Scotch Pine	tolerant	sensitive	30-50	medium	sensitive to poor drainage
Tamarack or Larch	tolerant	tolerant	15-25	medium	
Red Cedar	tolerant	sensitive	10-20	low	
White Cedar	tolerant	tolerant	10-20	low	
All Firs	tolerant	sensitive	10-20	medium	
Horsechestnut	sensitive	sensitive	30-40	medium	
Kentucky Coffeetree	intermediate	intermediate	40-50	medium	
Butternut	sensitive	sensitive	50-60	medium	
Redbud	intermediate	intermediate	25-35	low	sensitive to increased light and heat
All Mulberries	tolerant	tolerant	35-50	high	
Sycamore	tolerant	tolerant	60-80	low	
Pagoda Dogwood	intermediate	intermediate	15-20	low	sensitive to increased light and heat
Ironwood	sensitive	sensitive	20-30	low	
Musclewood	sensitive	sensitive	20-30	low	
All Hickories	intermediate	sensitive	30-40	medium	
Amur Corktree	intermediate	intermediate	30-40	medium	
Hackberry	tolerant	intermediate	40-50	low	
Ohio Buckeye	sensitive	sensitive	30-40	medium	
Catalpa	intermediate	tolerant	30-50	medium	
Bur Oak	tolerant	tolerant	40-80	low	
Red Oak	tolerant	sensitive	40-50	low	
White Oaks	sensitive	sensitive	50-90	low	
Sugar Maple	tolerant	sensitive	60-80	medium	sensitive to fill
Red Maple	tolerant	tolerant	40-60	medium	sensitive to wounding
Norway Maple	tolerant	tolerant	60-80	medium	
Black Cherry	intermediate	sensitive	40-50	low	
White Ash	tolerant	intermediate	40-70	medium	
All Serviceberries	intermediate	intermediate	15-20	low	
American Beech	sensitive	sensitive	30-50	medium	sensitive to fill
European Beech	sensitive	sensitive	40-60	medium	sensitive to fill
Honeylocust	tolerant	tolerant	50-75	medium	
Black Walnut	sensitive	intermediate	50-70	medium	

TABLE 6. Guidelines for Tree Protection Zones

SPECIES TOLERANCE TO IMPACTS	TREE AGE	DISTANCE FROM TRUNK* (feet per inch of DBH)
tolerant	young	0.5'
	<1/4 life expectancy	
	middle aged	0.75'
	1/4 - 3/4 life expectancy	
	mature	1.0'
	>3/4 life expectancy	
intermediate	young	0.75'
	middle aged	1.0'
	mature	1.25'
sensitive	young	1.0'
	middle aged	1.25'
	mature	1.5'

Calculating the Optimal Tree Protection Zone

1. Evaluate the species tolerance of impact: tolerant, intermediate, sensitive (see Table 6).

2. Identify specimen tree age: young, mature, or overmature.

3. Using **Table 6**, find the distance (in feet) from the trunk that should be protected per inch of trunk diameter.

4. Multiply the distance by the trunk diameter to calculate the optimum radius (in feet) for the tree protection zone.

Examples:

A healthy 50-year-old, 15" diameter Northern Red Oak (*Quercus rubra*) (good tolerance, mature age):

0.75' x 15" = 11.25' radius for Tree protection zone

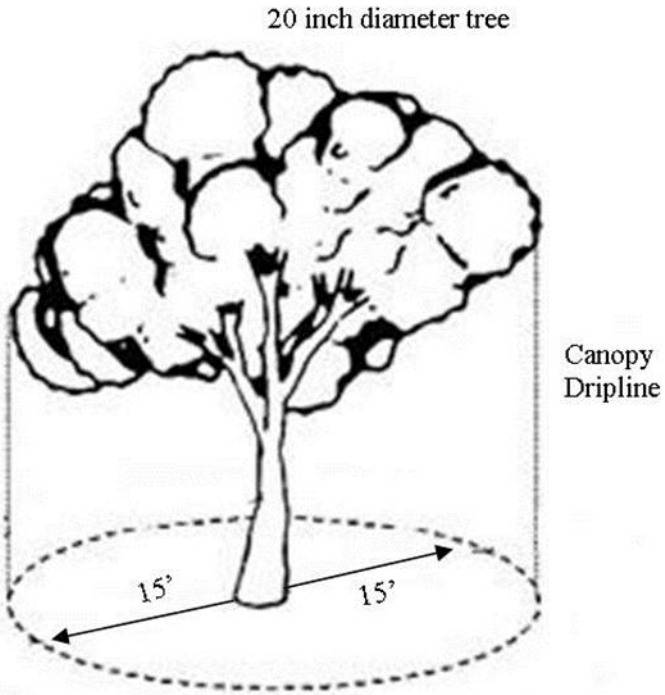
A declining 90-year-old, 26" diameter Shagbark hickory (*Carya ovata*) (intermediate tolerance, overmature age):

1.25' x 26" = 32.5' radius for Tree protection zone

The tables and formulas are strictly guidelines, not an absolute rule, and may need to be adjusted in the field to meet local conditions and design criteria. It is best and least expensive to protect trees in groupings during construction. Groupings offer the best protection for soil, root systems and associated plants.

Site Clearing Specifications

Figure 4. Extent of Tree Protection Zone.



The following work must be accomplished before any demolition or site clearing activity occurs within 50 feet of specimen trees:

1. The site clearance/demolition contractor is required to meet with the City Forester at the site prior to beginning work to review all work procedures, access and haul routes, and tree protection measures.

2. Limits of all TPZ(s) shall be staked by the contractor in the field. A 4-foot plastic, wood or chain link fence with posts sunk in the ground at no more than 10' on center shall be erected to enclose each TPZ. Weather resistant signs with the wording: KEEP OUT – TREE PROTECTION ZONE shall be erected by the contractor at each TPZ. Signs shall be placed a minimum of 30' on center on the TPZ fencing. Each TPZ shall have a minimum of one sign.

3. Tree(s) to be removed that have branches extending into the canopy of tree(s) to remain must be removed by a qualified arborist and not by demolition or construction contractors. The qualified arborist shall remove the tree in a manner that causes no damage to the tree(s) and understory to remain.

4. Any brush clearing required within the TPZ shall be accomplished by a qualified arborist using hand-operated equipment.

5. Trees to be removed shall be felled so as to fall away from TBZ(s) and to avoid pulling and breaking of roots to remain.

6. Trees to be removed within the tree protection zone shall be removed by a qualified arborist. The trees shall be cut near ground level and the stump ground out.

7. All downed brush and trees shall be removed from the TPZ either by hand or with equipment sitting outside the TPZ. Extraction shall occur by lifting the material out, not by skidding it across the ground.

8. Brush shall be chipped and hauled offsite or stored to be used as a buffer over root zones.

9. Structures and underground features to be removed within the TPZ shall use the smallest equipment possible and operate from outside the TPZ. The City Forester shall be on site during all operations within the TPZ to monitor demolition activities.

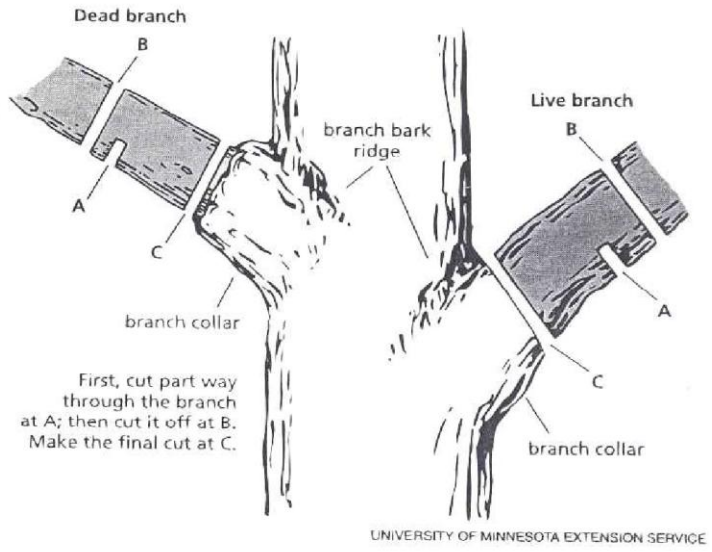
10. All trees to be pruned in accordance with the provided Pruning Specifications.

11. Any damage to trees due to clearing or demolition activities shall be reported to the City Forester within 6 hours so remedial action can be taken. Timeliness is critical to tree health.

12. If temporary haul or access roads must pass over the root areas of trees to be retained, a roadbed shall be constructed by laying appropriate geo-textile fabric on the surface and covering with 8 inches of mulch or gravel to protect the soil from compaction. The road bed material shall be replenished as necessary to maintain an 8-inch depth.

Pruning Specifications

Figure 5. Proper Pruning Techniques.



1. All pruning shall be performed by a qualified arborist under the direct, on-site supervision of a Certified Arborist.

2. All pruning shall be in accordance with the ANSI A300 Pruning Standard (American National Standard for Tree Care Operations) and adhere to the most recent edition of ANSI Z133.1 Safety Requirements for Tree Care Operations.

3. Where temporary clearance is needed for access, branches shall be tied back to hold them out of the clearance zone.

4. Pruning shall not be performed on Oaks or Elms during the time period of April 15th thru October 1st due to the potential spread of Oak Wilt and Dutch Elm disease.

5. Interior branches shall not be stripped out.

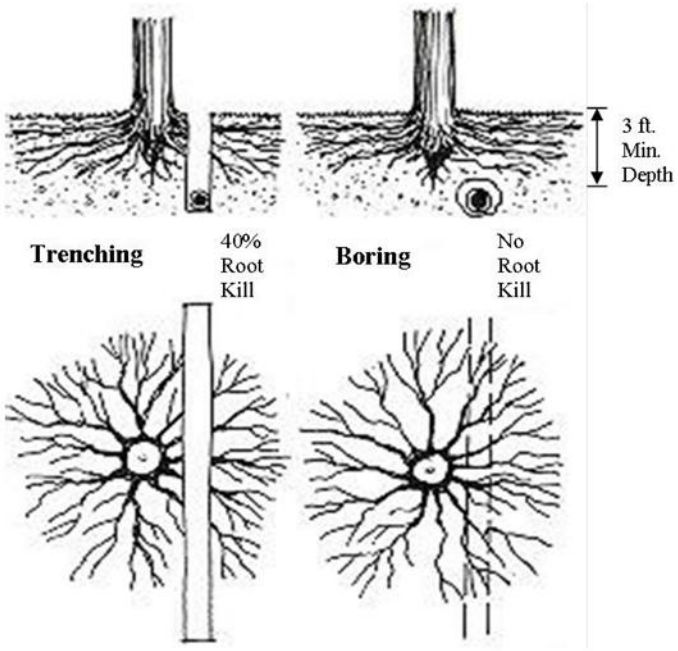
6. Pruning cuts larger than 4 inches in diameter, except for deadwood, shall be avoided.

7. No more than 20 percent of live foliage shall be removed within the trees.

8. Brush shall be chipped, and chips shall be spread underneath trees within the TPZ to a maximum depth of 6 inches, leaving the trunk clear of mulch.

Construction Specifications

Figure 6. How Boring Saves Trees.



1. Before beginning work, the contractor is required to meet with the City Forester at the site to review all work procedures, access routes, utility corridors, storage areas, and tree protection measures.

2. Fences have been erected and sign have been posted to protect trees to be preserved. Fences define a specific protection zone for each tree or group of trees. Fences and signs are to remain until all site work has been completed. Fences or signs may not be relocated or removed without the permission of the City Forester.

3. Construction trailers and traffic and storage areas must remain outside fenced areas at all times.

4. All underground utilities and drain or irrigation lines shall be routed outside the TPZ. If lines must traverse the protection area, they shall be tunneled or bored under the tree. (See Figure 6). Utilities shall be placed in a common trench where practical. Soil removed from trenches shall be placed on the side away from trees and replaced as soon as possible. Trench walls shall be shored rather than sloped to reduce trench width.

Table 7. Trench Augering Distances

The distance from tree face for augering in each direction if trench is located within a particular radius of a TPZ (Morell 1984).

Tree Diameter (DBH)	Auger distance from face of tree
0-2"	1'
3-4"	2'
5-9"	5'
10-14"	10'
15-19"	12'
over 19"	15'

5. No materials, equipment, spoil, or waste or washout water may be deposited, stored, or parked within the TPZ.

6. Additional tree pruning required for clearance during construction must be performed by a qualified arborist and not by construction personnel.

7. Any herbicides placed under paving materials must be safe for use around trees and labeled for that use. Any pesticides used on site must be tree-safe and not easily transported by water.

8. If injury should occur to any tree during construction, it should be evaluated as soon as possible by the City Forester so that appropriate treatments can be applied.

9. Any grading, construction, demolition, or other work that is expected to encounter tree roots must be monitored by the City Forester. Specific locations or tree tag numbers shall be identified prior to work commencing.

10. Erosion control devices such as silt fencing, debris basins, and water diversion structures shall be installed to prevent siltation and/or erosion within the TPZ.

11. Before grading, pad preparation, or excavation for foundations, footings, walls, or trenching, specimen tag # trees, shall be root pruned 1 foot outside the TPZ by cutting all roots cleanly to a depth of 36 inches, normal depth of root penetration. Roots shall be cut manually digging a trench and cutting exposed roots with a saw, vibrating knife, rock saw, a narrow trencher with sharp blades, or other approved root-pruning equipment.

12. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw or other appropriate sharp cutting instrument.

13. If temporary haul or access roads must pass over the root areas of trees to be retained, a roadbed shall be constructed by laying appropriate geo-textile fabric on the surface and covering with 8 inches of mulch or gravel to protect the soil from compaction. The road bed material shall be replenished as necessary to maintain an 8-inch depth.

14. Spoil from trenches, basements, or other excavations shall not be placed within the TPZ, either temporarily or permanently.

15. No burn piles or debris pits shall be placed within the TPZ. No ashes, debris, or garbage may be dumped or buried within the TPZ.

16. Maintain fire-safe areas around fenced areas. Also, no heat sources, flames, ignition sources, or smoking is allowed near mulch or trees.

Grading

1. Maintain the root flare at the bottom of trees. Do not bury the trunk flare.

2. For small grade changes (1 to 2 feet) slope to natural grade rather than construct a retaining wall. For larger grade changes, retaining walls can increase the distance of natural grade and therefore should be considered.

3. Within or in close proximity to a TPZ, adjust surrounding grades to match base trunk elevation as closely as possible.

4. Where grade must be raised, determine the location of the proposed structure on the fill area, plus required overbuild. If within a TPZ, a retaining wall may be required at that location.

5. If TPZ is in a low area that will collect water, a drain shall be installed as far from the tree as possible, near the retaining wall. Fine grade the area by hand to create flow to the drain.

6. Where required grade changes prohibit the establishment of an adequate TPZ, the tree/trees shall be removed and replanting of appropriate trees (per mitigation requirements). Planting for that location shall be performed after final grades are installed.

Mitigation Requirements for Desirable Trees

1. Report any damage or injury to specimen trees within 6 hours to the City Forester so that mitigation can take place.

2. If inadvertent compaction occurs in the upper 12" of soil within the TPZ, the soil shall be loosened by a method approved by the City Forester, such as vertical mulching or soil fracturing.

3. Irrigate to wet the soil within the TPZ during periods of drought as specified by the City Forester.

4. Where roots 2" and larger are encountered in trenches, they must be cleanly cut back to a sound lateral root. All exposed root areas within the TPZ shall be backfilled or covered within one hour. If this cannot be accomplished, then the roots shall be covered with layered wet burlap until backfilling can occur to reduce evaporation from trench walls.

5. If bark or trunk wounding should occur, current bark tracing and treatment methods shall be performed by a qualified arborist within two days.

6. Where injury occurs to branches, within 5 days, the broken or torn branch shall be cut back to an appropriate branch capable of resuming terminal growth. Work shall be performed by a qualified arborist. If foliage is heat scorched from equipment exhaust pipes, the City Forester shall be informed within 6 hours.

7. Where a desirable tree is removed by design or error, replacement shall be at a ratio of 1" of DBH of replacement for every 1" of DBH of removal. Replacement trees shall be of a size and species as determined by the City of Stevens Point.

8. If a desirable tree incurs significant damage to its roots, bole or crown, the City Forester will determine the Tree Appraisal value. This will be determined by adjusting the tree's basic value by its condition, functional limitations, and external limitations using the most recent edition of the *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers. The formula and appraisal methods used shall be noted.

Alternative Construction Techniques

1. Where grades are to be raised, excavation towards trees is minimized with L-type footings, with the L of the footing extending towards the fill and away from the tree. In cuts, the footing shall extend towards the cut and away from the tree.

2. For grade changes over 5 feet, two or more smaller retaining walls shall be considered and stepped down the slope to reduce the mass of a larger single wall.

3. Where structures must be placed close to a TPZ, alternative footing designs shall be considered. These include: the use of custom footings in the vicinity of trees that bridge over

tree roots; cantilevering the structure, so the building extends outward from the footing; and installing a raised foundation with discontinuous footings (piers).

Addressing Sidewalk and Tree root conflicts

Prune the tree canopy a year in advance to reduce dynamic loading stress on the roots and to allow recovery before the tree receives additional trauma from root cutting.

Do sidewalk work early in the spring and end all root cutting by mid-summer. This will allow maximum root recovery before dormancy.

Provide a coordinated service in which the municipality does the pruning, then fertilizes immediately following construction. A soil injected, soluble compound that is low in nitrogen and high in phosphorus and potassium is recommended for aiding root recovery.

Provide residents who are affected by sidewalk replacement with literature about adequate watering (slow application of at least 1 inch of water per week.)

Write into any contract that excavated roots will be back-filled the same day to prevent drying. When this method is not possible, roots should be covered with wet burlap and watered. Cleanly prune off the jagged ends of cut roots.

Require that digging near tree roots be done by hand rather than with a backhoe. Assign an arborist to monitor construction.

Aftercare

1. Avoid putting trees in stress for several years after construction. Water during periods of drought and treat for insect and disease infestations when they arise.

2. Contact a Certified Arborist about whether fertilizing trees is appropriate. Be sure not to overdo it. Trees with damaged roots can't take up and utilize excessive amounts of fertilizer. Also consider mycorrhizae applications to assist with root regeneration and Cambistat (a plant growth regulator) to redirect the root to shoot ratio to producing more root growth.

3. Aerate compacted soils if there are large trees on the site where roots are growing in compacted areas of the site. Aeration can be done to shallow depth with standard core aerators or to deeper depths by vertical mulching with air spades or gas powered augers.

3. If root damage or loss should occur, estimate the percentage of damage or loss and thin out the top in direct proportion to root loss.

4. Protect root zones of both existing and newly planted trees with 3 to 4 inches of organic mulch. Keep mulch several inches away from the trunk base and mulch all the way to the dripline where feasible.

5. Keep competing vegetation especially grass away from trees. Consider alternative landscaping in the areas beneath trees. Use native plants and groundcovers that can provide a variety of sizes, colors and forms beneath preserved trees. These plantings preserve tree root systems, conserve water and reduce the reliance on fertilizers and pesticides.

Standards and Guidelines References

American National Standards Institute. 2017. ANSI Z133.1 Safety Requirements. *American National Standards for Arboricultural Operations – Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements.* New York, NY: American National Standards Institute. 74 pp.

American National Standards Institute. 2023. ANSI A300-2023 Tree Care Standards – *for trees, shrubs, palms, and other woody landscape plants.* Tree Care Industry Association, Inc. Manchester, NH, 152pp.

Council of Tree and Landscape Appraisers, 2019. "Guide for Plant Appraisal (10th ed.)" Inter. Soc. of Arboriculture, Champaign, IL, 181 pp.

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Harris, R.W. 1992. *Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines.* 2nd ed. Englewood Cliffs, NJ: Prentice Hall. 674 pp.

Matheny, N., and J. Clark. 1998. *Trees and Development: A Technical Guide to Preservation of Trees During Land Development.* Champaign, IL: International Society of Arboriculture. 183 pp.

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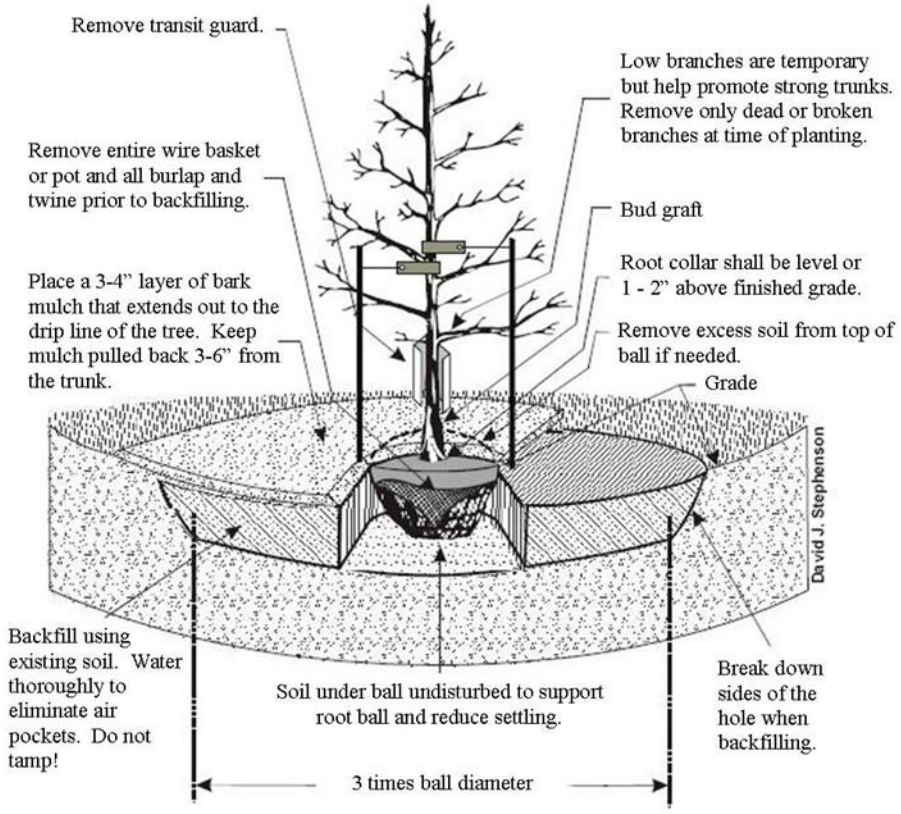
Appendix F: Planting Specifications

Figure 7. Tree Planting Detail.



a) All plant material shall be true to name and type, and first-class representatives of their species or variety. They shall have normal, well-developed branches, be healthy, vigorous plants free from defects, plant disease, and all forms of infestation or objectionable disfigurements. Either bare root or balled and burlaped trees are acceptable. All plant material shall conform to American Standard for Nursery Stock (ANZI Z60.1-2004 or later).

b) Diggers Hotline will be contacted to mark all planting areas before any work is carried out.

c) Site Disturbances: Take precautions to insure that equipment and vehicles do not disturb or damage existing site grading, walks, drives utilities, plants, etc. Replace and/or return to original condition any damage caused by Contractor's negligence at no cost to Owner.

d) The trees shall be planted according to the planting plan. Unless otherwise approved, the trees shall also be located five (5) feet from all sewer and water laterals, and ten (10) feet from driveways, light poles and fire hydrants. No trees shall be planted within 25 feet of any street corner.

e) All trees planted shall be of minimum size of 1.5" to 2.5" in caliper. Said caliper reading shall be taken 6" above the ground surface.

f) Plants stored on site must be mulched and watered. The root balls can not dry out.

g) The size for the tree installation hole shall preferably be two to three times the root ball in diameter where feasible. Trees shall be planted with the root collar (root flare) exposed and at or slightly above the surface level. For balled trees, the hole shall be at least 18" larger than the largest diameter of the ball and no deeper than the ball. Place no soil on top of the root ball.

h) Care should be taken to remove as much planting material from the root ball as possible without compromising the structure of the root ball. At a minimum, all planting material must be removed from the top half of the root ball. Planting twine must be removed, especially twine that comes into contact with the tree trunk, to prevent any future trunk girdling issues. It is recommended that burlap and wire be removed during the plant installation process.

i) Soil for backfilling around roots and/or root balls shall be the existing soil from the excavation. Where existing soil is rocky and poor quality, the local brown topsoil may be used. Soil shall be pulverized and screened. All material dug from the plant holes and not used shall be removed from the site and disposed of. Immediately after planting, soil around roots and balls shall be thoroughly watered.

j) At the time of planting, trees shall be pruned to remove dead, broken, or diseased branches or cross branches that rub. As much of the leaf surface as possible shall be maintained to create food for the tree. Trees shall appear symmetrical in shape and appearance. Trees shall have a single, straight leader.

k) Persons installing street trees shall take all necessary precautions to minimize the damage to existing lawns. Any damage to existing lawns shall be repaired by placing topsoil and seed in the damaged area.

l) Plants shall be lifted and handled from the bottom of the ball only. Not dragged, lifted or pulled by the trunk or foliage parts in a manner that will loosen the roots in the ball.

m) All plants shall be mulched over the root system with a 3 - 4 inch layer of wood chips or bark immediately after planting. Mulching material shall be pulled back no less than 2 - 3" and no more than 6" from the trunk. Mulch between the plants may be deeper depending upon the individual plan.

n) Only those plants designated by the Purchaser shall be wrapped, staked and/or guyed. Staking shall consist of a minimum of two posts or stakes. The minimum length of the posts shall be the depth of the bore plus one-half the height of the tree. The posts shall be installed at least one foot outside the diameter of the tree planting hole. The tree shall be connected to the posts with a 2"x 1/16" strap of such design so as not to damage the tree. The tree shall be planted as plumb as possible, and the contractor shall maintain tree plumbness throughout the guarantee period. All stakes shall be removed within one year of planting.

o) Trees planted between June 1 and September 15, shall be balled and burlapped.

p) All installation must be inspected by the City Forester, or a representative. If, in the sole opinion of the City Forester, additional remedies are needed to assure the stocking and maintenance of healthy tree specimens, additional remedies may be required.

Appendix G: Tree and Soil Specifications

Minimum tree soil volume specifications for new construction are essential to ensure that trees have enough space to grow and thrive. The amount of soil volume required depends on the tree's size at maturity, general guidelines recommend 1 to 3 cubic feet of soil per square foot of canopy. Use the follow recommendations:

1. **Soil Volume Requirements by Tree Size:**
   - **Small Trees (under 30 feet mature height):** At least 400 cubic feet of soil.
   - **Medium Trees (30-50 feet mature height):** At least 800 cubic feet of soil.
   - **Large Trees (over 50 feet mature height):** At least 1,200 cubic feet of soil.
2. **Depth and Soil Quality:**
   - **Soil Depth:** A minimum depth of 24 inches is recommended to accommodate the tree's root system. The depth should consist of high-quality, well-draining soil.
   - **Soil Quality:** The soil should be loamy, with a balanced composition of sand, silt, and clay. Aim for about 40% sand, 40% silt, and 20% clay. Incorporate 2”-4” of organic matter into the top 12” of soil to support healthy root growth.
3. **Shared Soil Volume for Multiple Trees:**
   - If trees are planted in a continuous planting strip or connected soil areas (e.g., linear trenches or shared tree pits), the total soil volume can be distributed across multiple trees. Each additional tree should have at least 50% of the individual tree's recommended soil volume.
4. **Soil Cell or Structural Soil Use:**
   - In areas with limited space, such as urban streetscapes, soil cells or structural soil systems can be used to provide adequate soil volume under paved surfaces. These systems support root growth while allowing for necessary infrastructure like sidewalks or roads. *Note – Plan for slightly more volume needed for structural soils to support a single tree than traditional loam soils.
5. **Permeable Surfaces and Drainage:**
   - Wherever possible, use permeable pavements or surface treatments near tree planting areas to allow water and air to reach the roots. Good drainage is also essential to avoid waterlogged conditions that can harm tree roots.
6. **Tree Planting in Raised Planters:**
   - When planting in raised planters, ensure that the soil volume meets the minimum specifications and that planters have proper drainage to prevent water accumulation.

Providing adequate soil volume in new construction helps ensure healthy tree growth, reduces maintenance costs, and maximizes the long-term benefits of urban canopy cover.

Appendix H: Urban Trees Drought Management Strategy

Objective

To ensure the survival and establishment of newly planted urban street trees during periods of drought by providing adequate water, minimizing stress, and promoting long-term resilience.

Strategy Components

1. Site Selection and Preparation

- **Species Selection:** Plant drought-tolerant and diverse tree species that are well-adapted to local climate and soil conditions.
- **Soil Preparation:** Improve soil quality before planting by incorporating organic matter to enhance water retention and reduce compaction. (Appendix G - Soil Specifications)
- **Mulching:** Apply a 3 – 4-inch layer of organic mulch around the base of trees to conserve soil moisture, regulate soil temperature, and reduce evaporation.

2. Efficient Irrigation Practices

- **Watering Schedule:** Provide deep and infrequent watering to encourage deep root growth. Water newly planted trees 2–3 times per week during the first growing season and taper off as they establish.
- **Irrigation Methods:** Use drip irrigation systems, soaker hoses, or tree watering bags to deliver water directly to the root zone while minimizing waste.
- **Monitoring:** Adjust watering based on soil moisture levels using soil moisture sensors or simple manual testing. Manual testing includes pulling mulch back and testing soil by feel of hand. Cool, moist, crumbly soil is appropriate. Dry and dusty soil needs moisture, oversaturated and muddy soil requires reducing watering.

3. Stress Mitigation

- **Pruning:** In early years, prune only to remove dead or damaged branches, minimizing stress from over-pruning. Once trees are established (2 – 3 years), begin pruning for structure.
- **Weed Control:** Remove competing vegetation to ensure the tree has access to available water.

4. Community Engagement and Education

- **Awareness Campaigns:** Educate the public on the importance of watering street trees during drought. Leave behind door hangers.
- **Adopt-a-Tree Programs:** Encourage residents and local businesses to take responsibility for watering and monitoring specific trees. Consider donating “water bags” to an adjacent residence where a street tree was recently planted.
- **Signage:** Install signage near newly planted trees to highlight their water needs and care instructions.

5. Monitoring and Maintenance

- **Regular Inspections:** Assess tree health, soil moisture, and structural integrity periodically.
- **Data Collection:** Use Geographic Information Systems (GIS) to map and track the health of urban street trees for adaptive management.

Implementation Plan

Phase 1: Preparation (0–3 Months)

- Conduct soil testing and site assessments. Record these assessments in the City Forestry GIS tool.
- Procure drought-tolerant trees and necessary materials (mulch, irrigation systems).
- Train staff and volunteers on tree planting and drought management techniques.

Phase 2: Planting and Initial Care (3–12 Months)

- Plant trees during the rainy season to take advantage of natural moisture.
- Install mulch and irrigation systems.
- Begin community outreach programs.

Phase 3: Monitoring and Adaptation (1–3 Years)

- Conduct quarterly inspections and adjust irrigation schedules as needed.
- Engage with community groups for regular updates and participation.
- Implement adaptive management practices (supplemental watering routes) based on monitoring data.

This strategy ensures newly planted street trees are equipped to withstand drought conditions while promoting sustainable urban forestry practices.

Sample door hanger draft. (City of Racine as part of their WDNR Urban Forestry Grant Project)

Appendix - H

Appendix I: i-Tree Eco Reporting Figures

Since 2006, i-Tree has been a cooperative, public/private partnership between the USDA Forest Service, Davey Tree Expert Company, The Arbor Day Foundation, Urban and Community Forestry Society, International Society of Arboriculture, Casey Trees, and SUNY College of Environmental Science and Forestry.
i-Tree is a registered trademark

i-Tree Ecosystem Analysis

Stevens Point Eco Analysis

Urban Forest Effects and Values
December 2024

Summary

Understanding an urban forest's structure, function and value can promote management decisions that will improve human health and environmental quality. An assessment of the vegetation structure, function, and value of the Stevens Point Eco Analysis urban forest was conducted during 2024. Data from 7439 trees located throughout Stevens Point Eco Analysis were analyzed using the i-Tree Eco model developed by the U.S. Forest Service, Northern Research Station.

- Number of trees: 7,439
- Tree Cover: 37.21 acres
- Most common species of trees: Red maple, Apple spp, Japanese tree lilac
- Percentage of trees less than 6" (15.2 cm) diameter: 60.7%
- Pollution Removal: 1533 pounds/year ($4.28 thousand/year)
- Carbon Storage: 1.657 thousand tons ($283 thousand)
- Carbon Sequestration: 33.74 tons ($5.75 thousand/year)
- Oxygen Production: 89.96 tons/year
- Avoided Runoff: 360.8 thousand gallon/year ($3.22 thousand/year)
- Building energy savings: N/A – data not collected
- Avoided carbon emissions: N/A – data not collected
- Replacement values: $4.17 million

Ton: short ton (U.S.) (2,000 lbs)
Monetary values $ are reported in US Dollars throughout the report except
where noted. Ecosystem service estimates are reported for trees.
With Complete Inventory Projects, oxygen production is estimated from gross carbon sequestration and does not account for decomposition. Oxygen production in Plot Inventory Projects is estimated from net carbon sequestration.

Air Pollution Removal by Urban Trees

Poor air quality is a common problem in many urban areas. It can lead to decreased human health, damage to landscape materials and ecosystem processes, and reduced visibility. The urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings, which consequently reduces air pollutant emissions from the power sources. Trees also emit volatile organic compounds that can contribute to ozone formation. However, integrative studies have revealed that an increase in tree cover leads to reduced ozone formation (Nowak and Dwyer 2000).

Pollution removal[1] by trees in Stevens Point Eco Analysis was estimated using field data and recent available pollution and weather data available. Pollution removal was greatest for ozone (Figure 7). It is estimated that trees remove 1533 pounds of air pollution (ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than

2.5 microns (PM2.5), particulate matter less than 10 microns and greater than 2.5 microns (PM10*)[2], and sulfur dioxide (SO2)) per year with an associated value of $4.28 thousand.

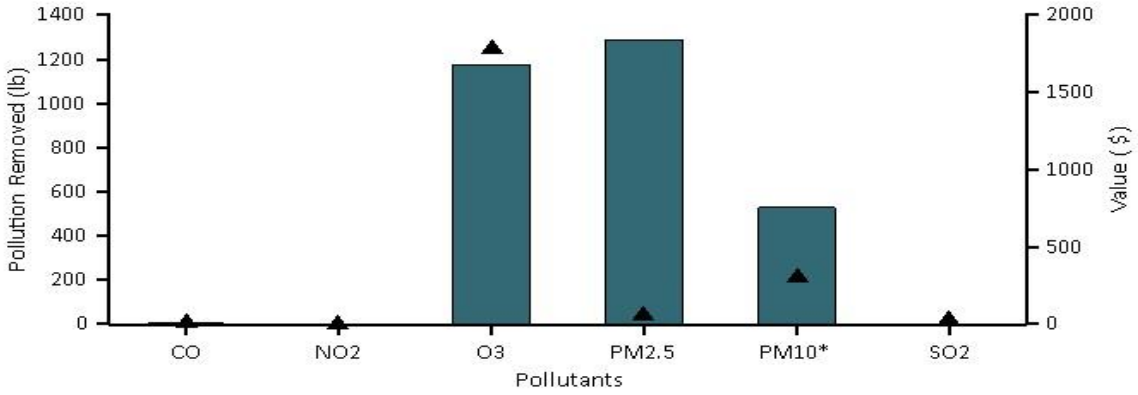


Figure 7. Annual pollution removal (points) and value (bars) by urban trees, Stevens Point Eco Analysis

In 2024, trees in Stevens Point Eco Analysis emitted an estimated 439.6 pounds of volatile organic compounds (VOCs) (150.7 pounds of isoprene and 288.8 pounds of monoterpenes). Emissions vary among species based on species characteristics (e.g. some genera such as oaks are high isoprene emitters) and amount of leaf biomass. Thirty- three percent of the urban forest's VOC emissions were from Pin oak and Bur oak. These VOCs are precursor chemicals to ozone formation.[3]

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[1] PM10* is particulate matter less than 10 microns and greater than 2.5 microns. PM2.5 is particulate matter less than 2.5 microns. If PM2.5 is not monitored, PM10* represents particulate matter less than 10 microns. PM2.5 is generally more relevant in discussions concerning air pollution effects on human health.

[2] Trees remove PM2.5 and PM10* when particulate matter is deposited on leaf surfaces. This deposited PM2.5 and PM10* can be resuspended to the atmosphere or removed during rain events and dissolved or transferred to the soil. This combination of events can lead to positive or negative pollution removal and value depending on various atmospheric factors.

[3] Some economic studies have estimated VOC emission costs. These costs are not included here as there is a tendency to add positive dollar estimates of ozone removal effects with negative dollar values of VOC emission effects to determine whether tree effects are positive or negative in relation to ozone. This combining of dollar values to determine tree effects should not be done, rather estimates of VOC effects on ozone formation (e.g., via photochemical models) should be conducted and directly contrasted with ozone removal by trees (i.e., ozone effects should be directly compared, not dollar estimates). In addition, air temperature reductions by trees have been shown to significantly reduce ozone concentrations (Cardelino and Chameides 1990; Nowak et al 2000), but are not considered in this analysis. Photochemical modeling that integrates tree effects on air temperature, pollution removal, VOC emissions, and emissions from power plants can be used to determine the overall effect of trees on ozone concentrations.

Carbon Storage and Sequestration

Climate change is an issue of global concern. Urban trees can help mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in tissue and by altering energy use in buildings, and consequently altering carbon dioxide emissions from fossil-fuel based power sources (Abdollahi et al 2000).

Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new growth every year. The amount of carbon annually sequestered is increased with the size and health of the trees. The gross sequestration of Stevens Point Eco Analysis trees is about 33.74 tons of carbon per year with an associated value of $5.75 thousand.

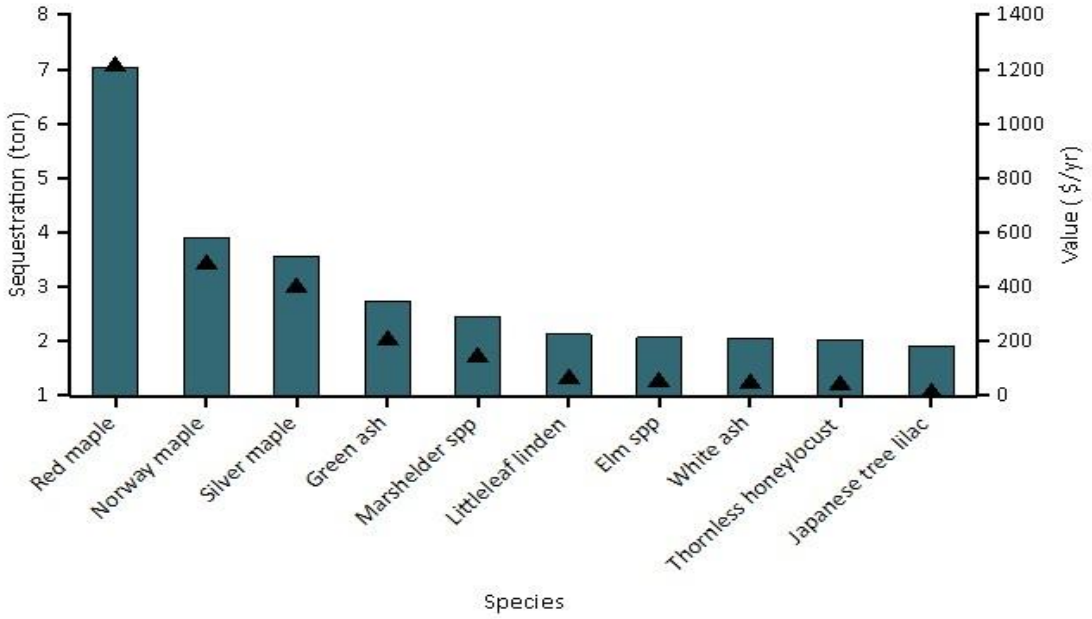

Figure 8. Estimated annual gross carbon sequestration (points) and value (bars) for urban tree species with the greatest sequestration, Stevens Point Eco Analysis

Carbon storage is another way trees can influence global climate change. As a tree grows, it stores more carbon by holding it in its accumulated tissue. As a tree dies and decays, it releases

much of the stored carbon back into the atmosphere. Thus, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose. Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions (Nowak et al 2002c). When a tree dies, using the wood in long-term wood products, to heat buildings, or to produce energy will help reduce carbon emissions from wood decomposition or from fossilfuel or wood-based power plants.

Trees in Stevens Point Eco Analysis are estimated to store 1660 tons of carbon ($283 thousand). Of the species sampled, Red maple stores and sequesters the most carbon (approximately 20.8% of the total carbon stored and 21% of all sequestered carbon.)

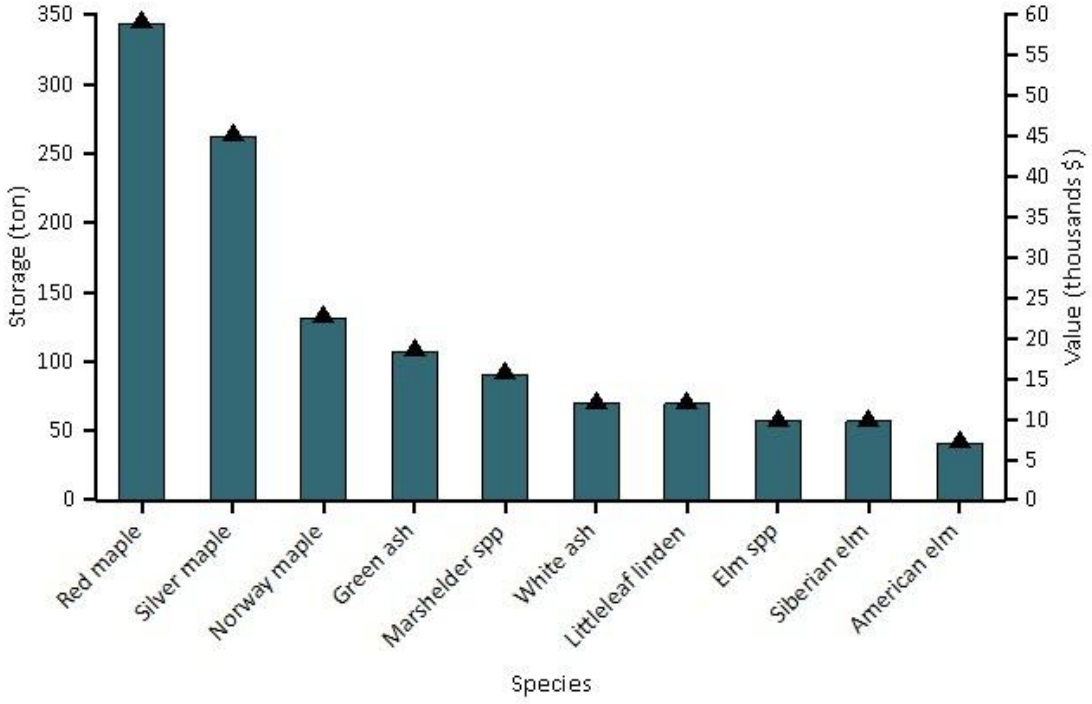

Figure 9. Estimated carbon storage (points) and values (bars) for urban tree species with the greatest storage, Stevens Point Eco Analysis

Oxygen Production

Oxygen production is one of the most commonly cited benefits of urban trees. The annual oxygen production of a tree is directly related to the amount of carbon sequestered by the tree, which is tied to the accumulation of tree biomass.

Trees in Stevens Point Eco Analysis are estimated to produce 89.96 tons of oxygen per year.[4] However, this tree benefit is relatively insignificant because of the large and relatively stable amount of oxygen in the atmosphere and extensive production by aquatic systems. Our atmosphere has an enormous reserve of oxygen. If all fossil fuel reserves, all trees, and all organic matter in soils were burned, atmospheric oxygen would only drop a few percent (Broecker 1970).

Table 2. The top 20 oxygen production species.

Species	*Oxygen (ton)*	*Gross Carbon Sequestration (ton/yr)*	*Number of Trees*	*Leaf Area (acre)*
Red maple	18.85	7.07	541	28.61
Norway maple	9.12	3.42	404	11.27
Silver maple	7.98	2.99	208	19.74
Green ash	5.42	2.03	291	22.27
Marshelder spp	4.56	1.71	128	4.41
Littleleaf linden	3.52	1.32	244	9.44
Elm spp	3.35	1.26	193	8.14
White ash	3.31	1.24	110	9.39
Thornless honeylocust	3.23	1.21	421	5.41
Japanese tree lilac	2.84	1.06	487	1.51
Siberian elm	2.43	0.91	83	3.53
Apple spp	2.19	0.82	490	1.75
Freeman maple	1.96	0.73	122	4.11
Pin oak	1.73	0.65	65	4.55
American elm	1.51	0.57	29	2.95
American basswood	1.49	0.56	195	5.70
Northern red oak	1.20	0.45	68	2.64
Northern hackberry	0.99	0.37	427	13.49
Black locust	0.94	0.35	28	1.11
Sugar maple	0.88	0.33	58	2.42

Avoided Runoff

Surface runoff can be a cause for concern in many urban areas as it can contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff (Hirabayashi 2012). In urban areas, the large extent of impervious surfaces increases the amount of surface runoff.

Urban trees and shrubs, however, are beneficial in reducing surface runoff. Trees and shrubs intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees and shrubs of Stevens Point Eco Analysis help to reduce runoff by an estimated 361 thousand gallons a year with an associated value of $3.2 thousand. Avoided runoff is estimated based on local weather from the user-designated weather station. In Stevens Point Eco Analysis, the total annual precipitation in 2021 was 24.9 inches.

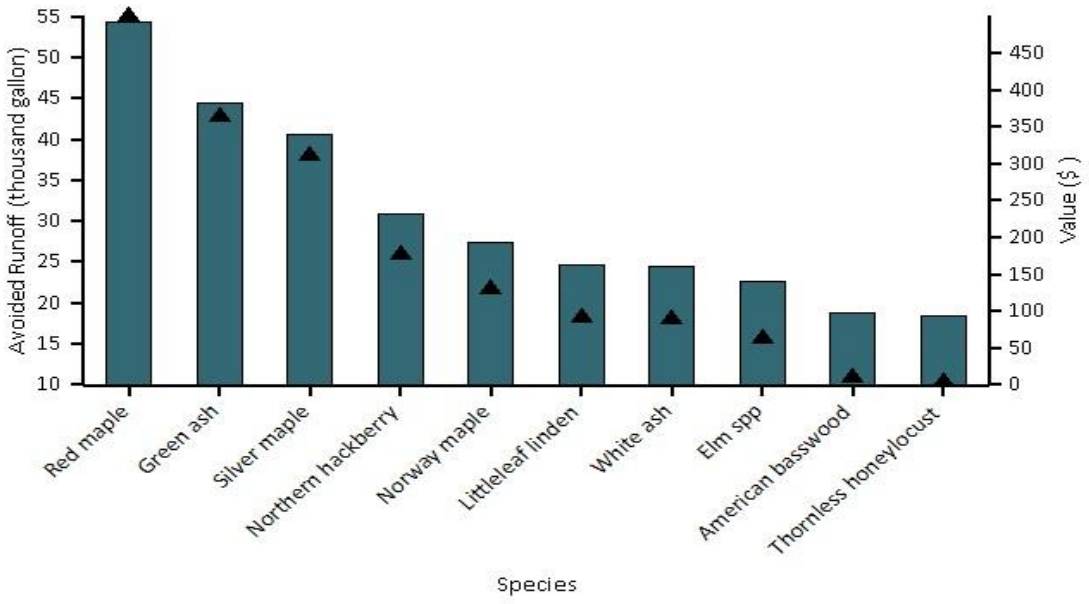

Figure 10. Avoided runoff (points) and value (bars) for species with greatest overall impact on runoff, Stevens Point Eco Analysis

Replacement and Functional Values

Urban forests have a replacement value based on the trees themselves (e.g., the cost of having to replace a tree with a similar tree); they also have functional values (either positive or negative) based on the functions the trees perform.

The replacement value of an urban forest tends to increase with a rise in the number and size of healthy trees (Nowak et al 2002a). Annual functional values also tend to increase with increased number and size of healthy trees. Through proper management, urban forest values can be increased; however, the values and benefits also can decrease as the amount of healthy tree cover declines.

Urban trees in Stevens Point Eco Analysis have the following replacement values:

- Replacement value: $4.17 million
- Carbon storage: $283 thousand

Urban trees in Stevens Point Eco Analysis have the following annual functional values:

- Carbon sequestration: $5.75 thousand
- Avoided runoff: $3.22 thousand
- Pollution removal: $4.28 thousand
- Energy costs and carbon emission values: $0

(Note: negative value indicates increased energy cost and carbon emission value)

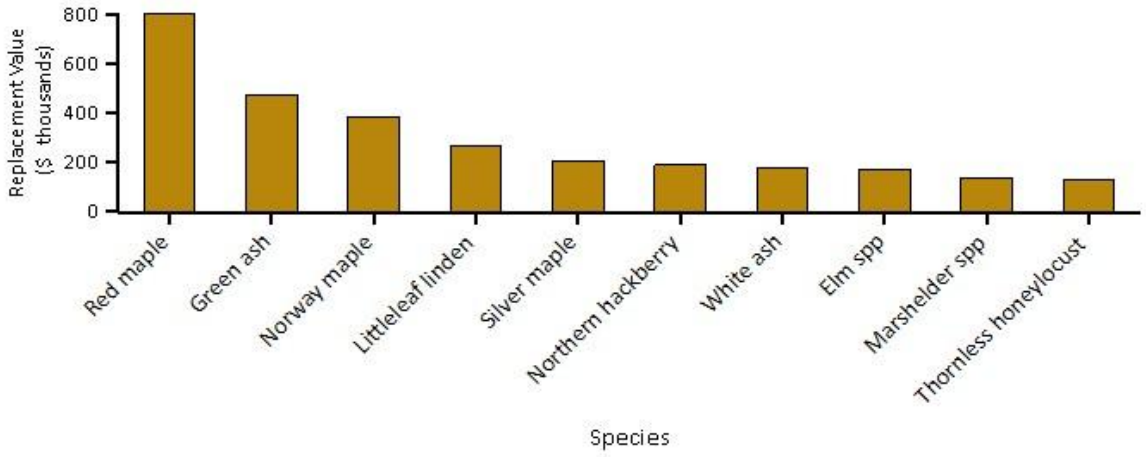

Figure 11. Tree species with the greatest replacement value, Stevens Point Eco Analysis

Potential Pest Impacts

Various insects and diseases can infest urban forests, potentially killing trees and reducing the health, replacement value and sustainability of the urban forest. As pests tend to have differing tree hosts, the potential damage or risk of each pest will differ among cities.Fifty-three pests were analyzed for their potential impact and compared with pest range maps (Forest Health Technology Enterprise Team 2014) for the conterminous United States to determine their proximity to Portage County. Twelve of the fifty-three pests analyzed are located within the county. For a complete analysis of all pests, see Appendix VII.

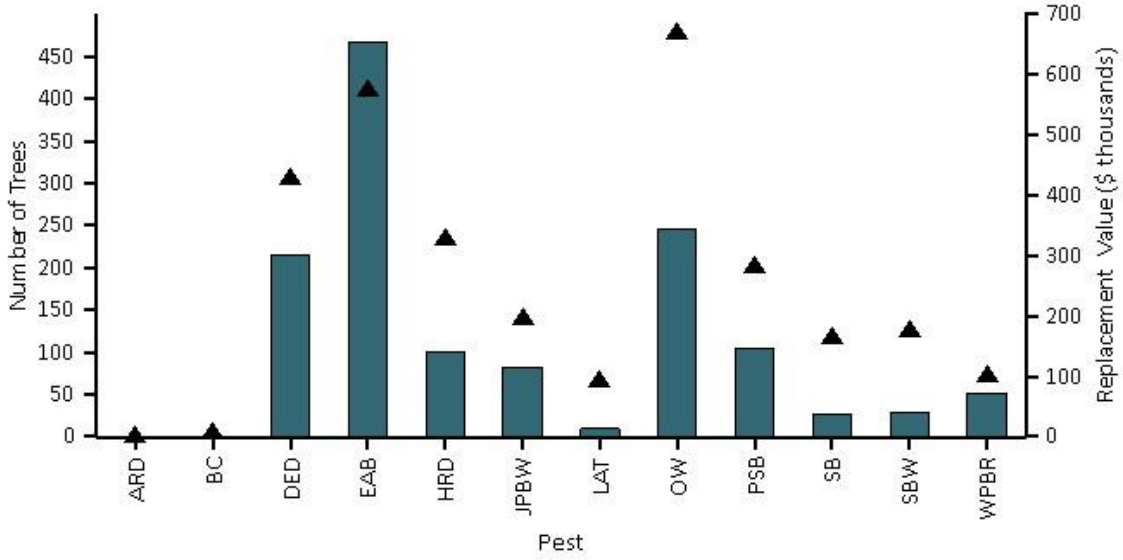

Figure 12. Number of trees at risk (points) and associated compensatory value (bars) for most threatening pests located in the county, Stevens Point Eco Analysis

Armillaria Root Disease (ARD) poses a threat to 0.0 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $0 in replacement value.
Butternut canker (BC) (Ostry et al 1996) is caused by a fungus that infects butternut trees. The disease has since caused significant declines in butternut populations in the United States. Potential loss of trees from BC is 0.1 percent ($911 in replacement value).
American elm, one of the most important street trees in the twentieth century, has been devastated by the Dutch elm disease (DED) (Northeastern Area State and Private Forestry 1998). Since first reported in the 1930s, it has killed over 50 percent of the native elm population in the United States. Although some elm species have shown varying degrees of resistance, Stevens Point Eco Analysis could possibly lose 4.1 percent of its trees to this pest ($301 thousand in replacement value).

Emerald ash borer (EAB) (Michigan State University 2010) has killed thousands of ash trees in parts of the United States. EAB has the potential to affect 5.5 percent of the population ($655 thousand in replacement value).

Heterobasidion Root Disease (HRD) poses a threat to 3.1 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $141 thousand in replacement value. Jack Pine Budworm (JPBW) poses a threat to 1.9 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $116 thousand in replacement value.

Quaking aspen is a principal host for the defoliator, large aspen tortrix (LAT) (Ciesla and Kruse 2009). LAT poses a threat to 0.9 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $13.1 thousand in replacement value.

Oak wilt (OW) (Rexrode and Brown 1983), which is caused by a fungus, is a prominent disease among oak trees. OW poses a threat to 6.4 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $344 thousand in replacement value.

The pine shoot beetle (PSB) (Ciesla 2001) is a wood borer that attacks various pine species, though Scotch pine is the preferred host in North America. PSB has the potential to affect 2.7 percent of the population ($146 thousand in replacement value).

Spruce beetle (SB) (Holsten et al 1999) is a bark beetle that causes significant mortality to spruce species within its range. Potential loss of trees from SB is 1.6 percent ($38.4 thousand in replacement value).

Spruce budworm (SBW) (Kucera and Orr 1981) is an insect that causes severe damage to balsam fir. SBW poses a threat to 1.7 percent of the Stevens Point Eco Analysis urban forest, which represents a potential loss of $41.4 thousand in replacement value.

Since its introduction to the United States in 1900, white pine blister rust (Eastern U.S.) (WPBR) (Nicholls and Anderson 1977) has had a detrimental effect on white pines, particularly in the Lake States. WPBR has the potential to affect 1.0 percent of the population ($71.8 thousand in replacement value).

i-Tree Eco Model and Field Measurements

i-Tree Eco is designed to use standardized field data and local hourly air pollution and meteorological data to quantify urban forest structure and its numerous effects (Nowak and Crane 2000), including:

- Urban forest structure (e.g., species composition, tree health, leaf area, etc.).
- Amount of pollution removed hourly by the urban forest, and its associated percent air quality improvement throughout a year.
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power sources.
- Replacement value of the forest, as well as the value for air pollution removal and carbon storage and sequestration.
- Potential impact of infestations by pests, such as Asian longhorned beetle, emerald ash borer, spongy moth, and Dutch elm disease.

Typically, all field data are collected during the leaf-on season to properly assess tree canopies. Typical data collection (actual data collection may vary depending upon the user) includes land use, ground and tree cover, individual tree attributes of species, stem diameter, height, crown width, crown canopy missing and dieback, and distance and direction to residential buildings (Nowak et al 2005; Nowak et al 2008).

During data collection, trees are identified to the most specific taxonomic classification possible. Trees that are not classified to the species level may be classified by genus (e.g., ash) or species groups (e.g., hardwood). In this report, tree species, genera, or species groups are collectively referred to as tree species.

Tree Characteristics:

Leaf area of trees was assessed using measurements of crown dimensions and percentage of crown canopy missing. In the event that these data variables were not collected, they are estimated by the model.

An analysis of invasive species is not available for studies outside of the United States. For the U.S., invasive species are identified using an invasive species list (Wisconsin Department of Natural Resources 2012a; 2012b)for the state in which the urban forest is located. These lists are not exhaustive and they cover invasive species of varying degrees of invasiveness and distribution. In instances where a state did not have an invasive species list, a list was created based on the lists of the adjacent states. Tree species that are identified as invasive by the state invasive species list are cross-referenced with native range data. This helps eliminate species that are on the state invasive species list, but are native to the study area.

Air Pollution Removal:

Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter less than 2.5 microns, and particulate matter less than 10 microns and greater than 2.5 microns. PM2.5 is generally more relevant in discussions concerning air pollution effects on human health.

Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multi-layer canopy deposition models (Baldocchi 1988; Baldocchi et al 1987). As the removal of carbon monoxide and particulate matter by vegetation is not directly related to transpiration, removal rates (deposition velocities) for these pollutants were based on average measured values from the literature (Bidwell and Fraser 1972; Lovett 1994) that were adjusted depending on leaf phenology and leaf area. Particulate removal incorporated a 50 percent resuspension rate of particles back to the atmosphere (Zinke 1967). Recent updates (2011) to air quality modeling are based on improved leaf area index simulations, weather and pollution processing and interpolation, and updated pollutant monetary values (Hirabayashi et al 2011; Hirabayashi et al 2012; Hirabayashi 2011).

Trees remove PM2.5 and PM10* when particulate matter is deposited on leaf surfaces (Nowak et al 2013). This deposited PM2.5 and PM10* can be resuspended to the atmosphere or removed during rain events and dissolved or transferred to the soil. This combination of events can lead to positive or negative pollution removal and value depending on various atmospheric factors. Generally, PM2.5 and PM10* removal is positive with positive benefits. However, there are some cases when net removal is negative or resuspended particles lead to increased pollution concentrations and negative values. During some months (e.g., with no rain), trees resuspend more particles than they remove. Resuspension can also lead to increased overall PM2.5 and PM10* concentrations if the boundary layer conditions are lower during net resuspension periods than during net removal periods. Since the pollution removal value is based on the change in pollution concentration, it is possible to have situations when trees remove PM2.5 and PM10* but increase concentrations and thus have negative values during periods of positive overall removal. These events are not common, but can happen.

For reports in the United States, default air pollution removal value is calculated based on local incidence of adverse health effects and national median externality costs. The number of adverse health effects and associated economic value is calculated for ozone, sulfur dioxide, nitrogen dioxide, and particulate matter less than 2.5 microns using data from the U.S. Environmental Protection Agency's Environmental Benefits Mapping and Analysis Program (BenMAP) (Nowak et al 2014). The model uses a damage-function approach that is based on the local change in pollution concentration and population. National median externality costs were used to calculate the value of carbon monoxide removal (Murray et al 1994).

For international reports, user-defined local pollution values are used. For international reports that do not have local values, estimates are based on either European median externality values (van Essen et al 2011) or BenMAP regression equations (Nowak et al 2014) that incorporate user-defined population estimates. Values are then converted to local currency with user-defined exchange rates.

For this analysis, pollution removal value is calculated based on the prices of $1,488 per ton (carbon monoxide), $2,691 per ton (ozone), $0 per ton (nitrogen dioxide), $80 per ton (sulfur dioxide), $87,354 per ton (particulate matter less than 2.5 microns), $6,996 per ton (particulate matter less than 10 microns and greater than 2.5 microns).

Carbon Storage and Sequestration:

Carbon storage is the amount of carbon bound up in the above-ground and below-ground parts of woody vegetation. To calculate current carbon storage, biomass for each tree was calculated using equations from the literature and measured tree data. Open-grown, maintained trees tend to have less biomass than predicted by forest-derived biomass equations (Nowak 1994). To adjust for this difference, biomass results for open-grown urban trees were multiplied by 0.8. No adjustment was made for trees found in natural stand conditions. Tree dry-weight biomass was converted to stored carbon by multiplying by 0.5.

Carbon sequestration is the removal of carbon dioxide from the air by plants. To estimate the gross amount of carbon sequestered annually, average diameter growth from the appropriate genera and diameter class and tree condition was added to the existing tree diameter (year x) to estimate tree diameter and carbon storage in year x+1.

Carbon storage and carbon sequestration values are based on estimated or customized local carbon values. For international reports that do not have local values, estimates are based on the carbon value for the United States (U.S. Environmental Protection Agency 2015, Interagency Working Group on Social Cost of Carbon 2015) and converted to local currency with user-defined exchange rates.

For this analysis, carbon storage and carbon sequestration values are calculated based on $171 per ton.

Oxygen Production:

The amount of oxygen produced is estimated from carbon sequestration based on atomic weights: net O2 release (kg/yr) = net C sequestration (kg/yr) × 32/12. To estimate the net carbon sequestration rate, the amount of carbon sequestered as a result of tree growth is reduced by the amount lost resulting from tree mortality. Thus, net carbon sequestration and net annual oxygen production of the urban forest account for decomposition (Nowak et al 2007). For complete inventory projects, oxygen production is estimated from gross carbon sequestration and does not account for decomposition.

Avoided Runoff:

Annual avoided surface runoff is calculated based on rainfall interception by vegetation, specifically the difference between annual runoff with and without vegetation. Although tree leaves, branches, and bark may intercept precipitation and thus mitigate surface runoff, only the precipitation intercepted by leaves is accounted for in this analysis.

The value of avoided runoff is based on estimated or user-defined local values. For international reports that do not have local values, the national average value for the United States is utilized and converted to local currency with user-defined exchange rates. The U.S. value of avoided runoff is based on the U.S. Forest Service's Community Tree Guide Series (McPherson et al 1999; 2000; 2001; 2002; 2003; 2004; 2006a; 2006b; 2006c; 2007; 2010; Peper et al 2009; 2010; Vargas et al 2007a; 2007b; 2008).

For this analysis, avoided runoff value is calculated based on the price of $0.01 per gallon.

Building Energy Use:

If appropriate field data were collected, seasonal effects of trees on residential building energy use were calculated based on procedures described in the literature (McPherson and Simpson 1999) using distance and direction of trees from residential structures, tree height and tree condition data. To calculate the monetary value of energy savings, local or custom prices per MWH or MBTU are utilized.
For this analysis, energy saving value is calculated based on the prices of $148.90 per MWH and $8.34 per MBTU.

Replacement Values:

Replacement value is the value of a tree based on the physical resource itself (e.g., the cost of having to replace a tree with a similar tree). Replacement values were based on valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak et al 2002a; 2002b). Replacement value may not be included for international projects if there is insufficient local data to complete the valuation procedures.

Potential Pest Impacts:

The complete potential pest risk analysis is not available for studies outside of the United States. The number of trees at risk to the pests analyzed is reported, though the list of pests is based on known insects and disease in the United States.

For the U.S., potential pest risk is based on pest range maps and the known pest host species that are likely to experience mortality. Pest range maps for 2012 from the Forest Health Technology Enterprise Team (FHTET) (Forest Health Technology Enterprise Team 2014) were used to determine the proximity of each pest to the county in which the urban forest is located. For the county, it was established whether the insect/disease occurs within the county, is within 250 miles of the county edge, is between 250 and 750 miles away, or is greater than 750 miles away. FHTET did not have pest range maps for Dutch elm disease and chestnut blight. The range of these pests was based on known occurrence and the host range, respectively (Eastern Forest Environmental Threat Assessment Center; Worrall 2007).

Relative Tree Effects:

The relative value of tree benefits reported is calculated to show what carbon storage and sequestration, and air pollutant removal equate to in amounts of municipal carbon emissions, passenger automobile emissions, and house emissions.

Municipal carbon emissions are based on 2010 U.S. per capita carbon emissions (Carbon Dioxide Information Analysis Center 2010). Per capita emissions were multiplied by city population to estimate total city carbon emissions.

Light duty vehicle emission rates (g/mi) for CO, NOx, VOCs, PM10, SO2 for 2010 (Bureau of Transportation Statistics 2010; Heirigs et al 2004), PM2.5 for 2011-2015 (California Air Resources Board 2013), and CO2 for 2011 (U.S. Environmental Protection Agency 2010) were multiplied by average miles driven per vehicle in 2011 (Federal Highway Administration 2013) to determine average emissions per vehicle.

Household emissions are based on average electricity kWh usage, natural gas Btu usage, fuel oil Btu usage, kerosene Btu usage, LPG Btu usage, and wood Btu usage per household in 2009 (Energy Information Administration 2013; Energy Information Administration 2014)

- CO2, SO2, and NOx power plant emission per KWh are from Leonardo Academy 2011. CO emission per kWh assumes 1/3 of one percent of C emissions is CO based on Energy Information Administration 1994. PM10 emission per kWh from Layton 2004.
- CO2, NOx, SO2, and CO emission per Btu for natural gas, propane and butane (average used to represent LPG), Fuel #4 and #6 (average used to represent fuel oil and kerosene) from Leonardo Academy 2011.
- CO2 emissions per Btu of wood from Energy Information Administration 2014.
- CO, NOx and SOx emission per Btu based on total emissions and wood burning (tons) from (British Columbia Ministry 2005; Georgia Forestry Commission 2009).

Relative Tree Effects

The urban forest in Stevens Point Eco Analysis provides benefits that include carbon storage and sequestration, and air pollutant removal. To estimate the relative value of these benefits, tree benefits were compared to estimates of average municipal carbon emissions, average passenger automobile emissions, and average household emissions.

Carbon storage is equivalent to:

- Amount of carbon emitted in Stevens Point Eco Analysis in 4 days
- Annual carbon (C) emissions from 1,170 automobiles
- Annual C emissions from 480 single-family houses

Carbon monoxide removal is equivalent to:

- Annual carbon monoxide emissions from 0 automobiles
- Annual carbon monoxide emissions from 0 single-family houses

Nitrogen dioxide removal is equivalent to:

- Annual nitrogen dioxide emissions from 0 automobiles
- Annual nitrogen dioxide emissions from 0 single-family houses

Sulfur dioxide removal is equivalent to:

- Annual sulfur dioxide emissions from 111 automobiles
- Annual sulfur dioxide emissions from 0 single-family houses

Annual carbon sequestration is equivalent to:

- Amount of carbon emitted in Stevens Point Eco Analysis in 0.1 days
- Annual C emissions from 0 automobiles
- Annual C emissions from 0 single-family houses

Comparison of Urban Forests

A common question asked is, "How does this city compare to other cities?" Although comparison among cities should be made with caution as there are many attributes of a city that affect urban forest structure and functions, summary data are provided from other cities analyzed using the i-Tree Eco model.

I. City totals for trees

City	*% Tree Cover*	*Number of Trees*	*Carbon Storage (tons)*	*Carbon Sequestration (tons/yr)*	*Pollution Removal (tons/yr)*
Toronto, ON, Canada	26.6	10,220,000	1,221,000	51,500	2,099
Atlanta, GA	36.7	9,415,000	1,344,000	46,400	1,663
Los Angeles, CA	11.1	5,993,000	1,269,000	77,000	1,975
New York, NY	20.9	5,212,000	1,350,000	42,300	1,676
London, ON, Canada	24.7	4,376,000	396,000	13,700	408
Chicago, IL	17.2	3,585,000	716,000	25,200	888
Phoenix, AZ	9.0	3,166,000	315,000	32,800	563
Baltimore, MD	21.0	2,479,000	570,000	18,400	430
Philadelphia, PA	15.7	2,113,000	530,000	16,100	575
Washington, DC	28.6	1,928,000	525,000	16,200	418
Oakville, ON , Canada	29.1	1,908,000	147,000	6,600	190
Albuquerque, NM	14.3	1,846,000	332,000	10,600	248
Boston, MA	22.3	1,183,000	319,000	10,500	283
Syracuse, NY	26.9	1,088,000	183,000	5,900	109
Woodbridge, NJ	29.5	986,000	160,000	5,600	210
Minneapolis, MN	26.4	979,000	250,000	8,900	305
San Francisco, CA	11.9	668,000	194,000	5,100	141
Morgantown, WV	35.5	658,000	93,000	2,900	72
Moorestown, NJ	28.0	583,000	117,000	3,800	118
Hartford, CT	25.9	568,000	143,000	4,300	58
Jersey City, NJ	11.5	136,000	21,000	890	41
Casper, WY	8.9	123,000	37,000	1,200	37
Freehold, NJ	34.4	48,000	20,000	540	22

II. Totals per acre of land area

City	*Number of Trees/ac*	*Carbon Storage (tons/ac)*	*Carbon Sequestration (tons/ac/yr)*	*Pollution Removal (lb/ac/yr)*
Toronto, ON, Canada	64.9	7.8	0.33	26.7
Atlanta, GA	111.6	15.9	0.55	39.4
Los Angeles, CA	19.6	4.2	0.16	13.1
New York, NY	26.4	6.8	0.21	17.0
London, ON, Canada	75.1	6.8	0.24	14.0
Chicago, IL	24.2	4.8	0.17	12.0
Phoenix, AZ	12.9	1.3	0.13	4.6
Baltimore, MD	48.0	11.1	0.36	16.6
Philadelphia, PA	25.1	6.3	0.19	13.6
Washington, DC	49.0	13.3	0.41	21.2
Oakville, ON , Canada	78.1	6.0	0.27	11.0
Albuquerque, NM	21.8	3.9	0.12	5.9
Boston, MA	33.5	9.1	0.30	16.1
Syracuse, NY	67.7	10.3	0.34	13.6
Woodbridge, NJ	66.5	10.8	0.38	28.4
Minneapolis, MN	26.2	6.7	0.24	16.3
San Francisco, CA	22.5	6.6	0.17	9.5
Morgantown, WV	119.2	16.8	0.52	26.0
Moorestown, NJ	62.1	12.4	0.40	25.1
Hartford, CT	50.4	12.7	0.38	10.2
Jersey City, NJ	14.4	2.2	0.09	8.6
Casper, WY	9.1	2.8	0.09	5.5
Freehold, NJ	38.3	16.0	0.44	35.3

General Recommendations for Air Quality Improvement

Urban vegetation can directly and indirectly affect local and regional air quality by altering the urban atmosphere environment. Four main ways that urban trees affect air quality are (Nowak 1995):

- Temperature reduction and other microclimate effects
- Removal of air pollutants
- Emission of volatile organic compounds (VOC) and tree maintenance emissions
- Energy effects on buildings

The cumulative and interactive effects of trees on climate, pollution removal, and VOC and power plant emissions determine the impact of trees on air pollution. Cumulative studies involving urban tree impacts on ozone have revealed that increased urban canopy cover, particularly with low VOC emitting species, leads to reduced ozone concentrations in cities (Nowak 2000). Local urban management decisions also can help improve air quality.

Urban forest management strategies to help improve air quality include (Nowak 2000):

Strategy	*Result*
Increase the number of healthy trees	Increase pollution removal
Sustain existing tree cover	Maintain pollution removal levels
Maximize use of low VOC-emitting trees	Reduces ozone and carbon monoxide formation
Sustain large, healthy trees	Large trees have greatest per-tree effects
Use long-lived trees	Reduce long-term pollutant emissions from planting and removal
Use low maintenance trees	Reduce pollutants emissions from maintenance activities
Reduce fossil fuel use in maintaining vegetation	Reduce pollutant emissions
Plant trees in energy conserving locations	Reduce pollutant emissions from power plants
Plant trees to shade parked cars	Reduce vehicular VOC emissions
Supply ample water to vegetation	Enhance pollution removal and temperature reduction
Plant trees in polluted or heavily populated areas	Maximizes tree air quality benefits
Avoid pollutant-sensitive species	Improve tree health
Utilize evergreen trees for particulate matter	Year-round removal of particles

Invasive Species of the Urban Forest

The following inventoried tree species were listed as invasive on the Wisconsin invasive species list (Wisconsin Department of Natural Resources 2012a; 2012b):

Species Name[a]	*Number of Trees*	*% of Trees*	*Leaf Area (ac)*	*Percent Leaf Area*
Amur maple	154	2.1	1.2	0.6
Siberian elm	83	1.1	3.5	1.9
Amur corktree	48	0.6	0.3	0.1
Black locust	28	0.4	1.1	0.6
White poplar	1	0.0	0.0	0.0
Total	**314**	**4.22**	**6.08**	**3.24**

[a] Species are determined to be invasive if they are listed on the state's invasive species list

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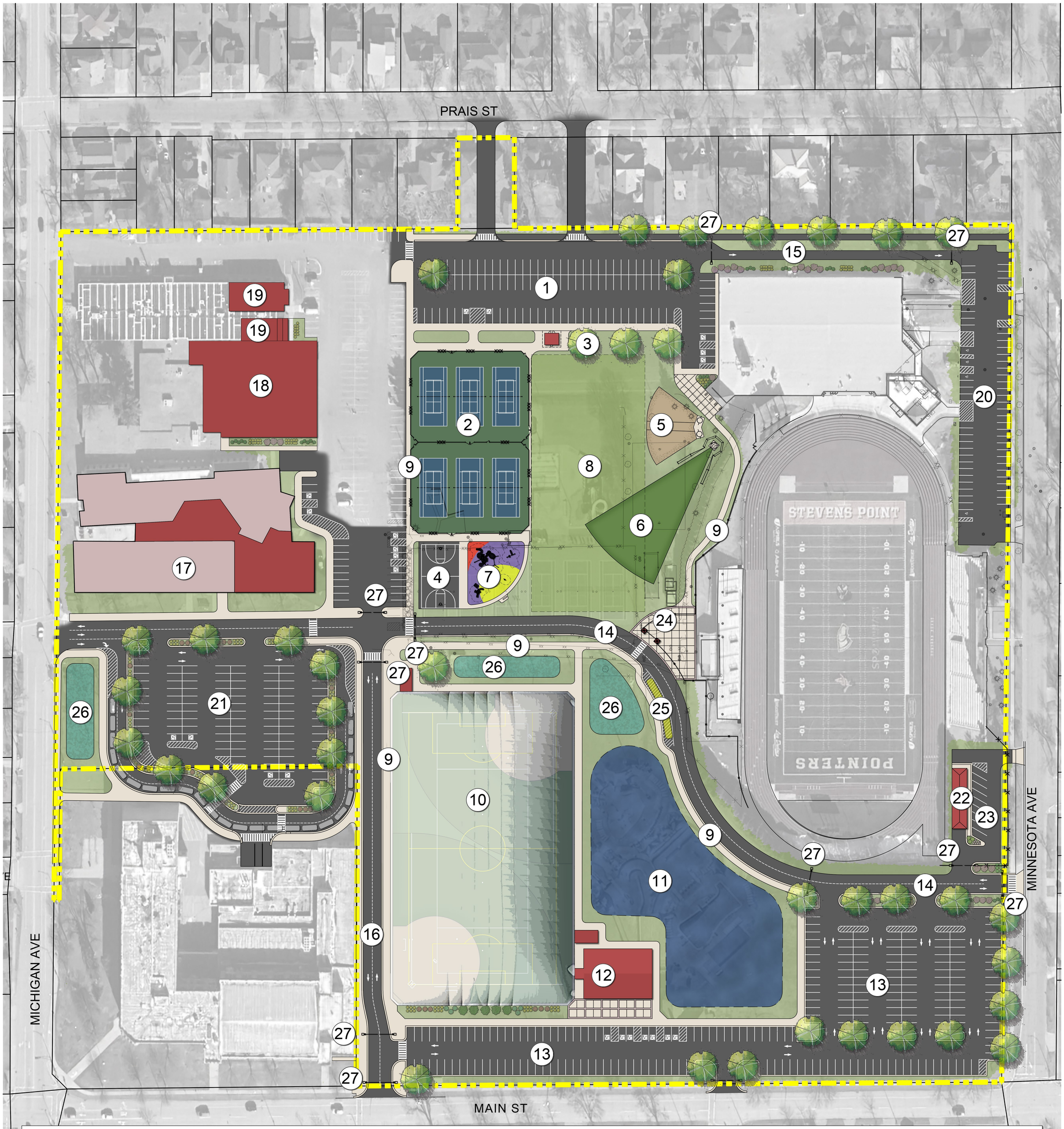
Appendix - I



KEYNOTES

1. NORTH PARKING AREA (~100 SPACES) (SUBSURFACE DETENTION)
2. (6) TENNIS COURTS (WITH PICKLEBALL STRIPING)
3. RESTROOM BUILDING (WITH DRINKING FOUNTAIN)
4. BASKETBALL COURT
5. SHOT PUT
6. DISCUS
7. PLAYGROUND (WITH BENCHES)
8. GREEN SPACE/OVERFLOW PRACTICE FIELD/LIT ICE RINK (150'x340')
9. CONNECTING WALKS
10. INFLATABLE DOME (OVER MULTIUSE SYNTHETIC FIELD)
11. AQUATICS AREA (50,000 sf)
12. AQUATICS/DOME SUPPORT BUILDING AND PLAZA(CONCESSIONS/RESTROOM/AQUATICS/DOME)
13. SOUTH PARKING AREA (~225 SPACES) (SUBSURFACE DETENTION)
14. PARK ACCESS/SERVICE DRIVE (SOUTH)
15. PARK ACCESS/SERVICE DRIVE (NORTH)
16. BUS LANE WITH DROP OFF AREA
17. POTENTIAL BOYS AND GIRLS CLUB EXPANSION/ COMMUNITY GYMNASIUMS
18. FUTURE CITY GARAGE ADDITION
19. FUTURE PARKS, REC, & FORESTRY DEPT LOCATION
20. RESURFACE EXISTING PARKING AREA
21. REDESIGNED PARKING AREA WITH DROP OFF LANE (~105 SPACES) (NORTH OF PJ JACOBS)
22. TEAM ROOMS/FLEXIBLE USE/STORAGE BUILDING
23. VIP PARKING AREA (9 SPACES)
24. ENTRY ARCH AND PLAZA
25. (2) BUS PARKING SPACES
26. STORM WATER MANAGEMENT AREA
27. GATE

CITY OF STEVENS POINT

GOERKE PARK ▪ MASTER PLAN ▪ PREFERRED CONCEPT

1100 MINNESOTA AVE, STEVENS POINT, WI 54481

N

0' 50' 100' 150'

RETTLER CORP. PROJECT # ▪ 24.039
DATE ▪ 01.28.25

RETTLER corporation
▪ 3317 BUSINESS PARK DRIVE, STEVENS POINT, WI 54482
▪ TELEPHONE ▪ 715 - 341 - 2633, FAX ▪ 715 - 341 - 0431
EMAIL INFO @ RETTLER.COM, WEBSITE WWW.RETTLER.COM

KEYNOTES

1. 300' SYNTHETIC TURF SOFTBALL FIELD
2. NEW BLEACHERS (750 SEATS)
3. REPLACE FIELD LIGHTING
4. DUGOUTS (WITH STORAGE AREA)
5. BULLPEN/BATTING CAGES
6. MOVEABLE 200' SOFTBALL OUTFIELD FENCE
7. CONCOURSE IMPROVEMENTS (CONCRETE)
8. RESURFACE EXISTING PARKING LOT
9. PERIMETER FENCING
10. POTENTIAL STORM WATER MANAGEMENT AREA

WETLANDS DELINEATED IN 2016

WIS DNR WETLANDS

WIS DNR WETLAND INDICATOR SOILS

R75.00'

300.00'

WETLAND

WETLAND

CITY OF STEVENS POINT

ZENOFF PARK ▪ SOFTBALL FIELD ADDITION ▪ CONCEPT 2

1001 2ND ST N, STEVENS POINT, WI 54481

N

0' 40' 60' 90'

RETTLER CORP. PROJECT # ▪ 24.039

DATE ▪ 01.28.25

RETTLER corporation

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▪ TELEPHONE ▪ 715 - 341 - 2633, FAX ▪ 715 - 341 - 0431

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KEYNOTES

1. 200'/215'/200' SYNTHETIC TURF SOFTBALL FIELD (WITH LIGHTING)
2. BLEACHERS (750 SEATS)
3. NEW PARKING LOT (~200 SPACES)
4. DUGOUTS (WITH STORAGE AREA)
5. DOUBLE BULLPEN/BATTING CAGES
6. SCORERS BOOTH
7. SPECTATOR ACCESS
8. MAINTENANCE ACCESS
9. PERIMETER FENCING
10. STORM WATER MANAGEMENT AREA
11. POTENTIAL ADDITIONAL PARKING AREA (40 SPACES)
12. SCULPTURE PARK ENTRANCE

WETLANDS DELINEATED IN 2016

WIS DNR WETLANDS

WIS DNR WETLAND INDICATOR SOILS

CITY OF STEVENS POINT

ZENOFF PARK ▪ SOFTBALL FIELD ADDITION ▪ CONCEPT 1

1001 2ND ST N, STEVENS POINT, WI 54481

N

0' 40' 60' 90'

RETTLER CORP. PROJECT # ▪ 24.039

DATE ▪ 01.13.25

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