CITY OF LA CROSSE, WI

URBAN FOREST MANAGEMENT PLAN

FEBRUARY 2024

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February 2024

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Source: Explore La Crosse

INTRODUCTION

Plan Mission Statement

The City of La Crosse, in partnership with the state, community and stakeholders completed this Urban Forest Management Plan ("UFMP" or "the Plan") in 2024. This Plan is a roadmap to protect, enhance, and maintain La Crosse's tree canopy and the ecological benefits associated with this resource. The Urban Forest Management Plan provides long-term sustainable goals, strategies, and priorities to achieve a healthy, sustainable, and equitable canopy throughout the City. To achieve these goals set forth in the Plan requires a shared commitment and partnership between the City and the community, to sustain the thriving urban forest and the associated ecological benefits it provides to all residents of La Crosse.

Plan Purpose

City planning and management actions, particularly those occurring during redevelopment, significantly influence the character and well-being of the urban forest in La Crosse. A flourishing and well-maintained population of trees in public spaces and rights-of-way contribute to the Citywide urban forest and these trees offer diverse benefits to the community, contributing to economic vitality, environmental stability, and an improved quality of life. It is essential for the City, contractors, residents, and volunteers to collectively care for the natural environment to preserve and enhance the urban forest's quality and benefits, ensuring all members of La Crosse enjoy their access to nature.

To safeguard the prosperity of La Crosse's urban forest, the City has formulated a comprehensive Urban Forest Management Plan that addresses the unique needs of trees in the urban setting. Timely execution of necessary management actions is crucial to developing and maintaining the desired conditions for the urban forest's resources and programs. This Plan outlines strategic actions for public tree management, aiming to maximize the benefits of the Citywide urban forest where La Crosse staff and programs have the greatest authority and impact, while being mindful of the constraints of limited resources. The approach is designed to:

- Establish a baseline assessment of the urban forest resource, management resources, and community engagement framework.
- Conduct analyses of urban forest management criteria to support the Forestry Division within the City's Parks, Recreation & Forestry Department in achieving heightened levels of service.
- Define criteria for attaining sustainable urban forest management goals in a phased approach based on available resources and in alignment with the City's Climate Action Plan.
- Provide a framework and guidance for current and future tree managers in the City.
- Evolve as a living document by offering the framework and guidance for adaptive management, ensuring continuous improvement over time.

By implementing these measures, La Crosse aims to foster a resilient and thriving urban forest, recognizing the importance of proactive and sustainable management practices for the benefit of the entire community.

Executive Summary

The Urban Forest Management Plan for the City of La Crosse represents a concerted effort to strategically optimize the health and sustainability of the urban forest within the City limits. Acknowledging the multifaceted benefits of a robust urban forest and the City's authority to manage public trees, this Plan is crafted to articulate key strategies and tactical approaches aimed at maximizing tree canopy cover, fostering biodiversity, and nurturing a resilient urban environment.

Defining Tree Populations and Authority

The urban forest is comprised of trees across all city landscapes including streetscapes, boulevards, parks and open space, trail and waterway corridors, commercial and residential properties, among others such as the trees in natural areas. While the Plan primarily addresses public trees, all trees across ownership types and the care of these trees contribute to overall urban forest health, sustainability, and benefits. To present an analysis of the urban forest, tree populations in these landscapes are characterized by the type of setting and land ownership type (public or private) and the responsibility for maintenance (City, property owner, or other). Public trees consist of trees within public parkways, parkland, rights-of-way, or other public spaces and are under the purview of the City's Forestry Division within the Parks, Recreation & Forestry Department. City Ordinance 10.04 in Article V of Chapter 34 governs all boulevard trees within the City of La Crosse and is in place to keep the public safe.

Trees on private property such as those in residential backyards, parking lots, and planted or preserved as part of development projects are overseen by the City's Planning, Development & Assessment Department. Authority to regulate the planting, protection, and removal of trees on private property is determined by the City's Zoning Ordinance in Chapter 115 of the Code of Ordinances.

Figure 1. Illustration of the types and ownership of trees comprising La Crosse's urban forest

The Crucial Role of Urban Forests

Urban forests, often underappreciated, play an integral role in enhancing air and water quality, mitigating the urban heat island effect, and reducing energy consumption. They are essential contributors to the well-being of the community, influencing environmental sustainability, economic vitality, and social equity. Recognizing the importance of these factors, the Urban Forest Management Plan is designed as a blueprint for deliberate actions.

Strategic Approaches to Urban Forest Management

One of the primary focal points of the Plan is the alignment with the City's 2022 Climate Action Plan and the strategic expansion of tree canopy cover citywide. The Climate Action Plan was developed in response to the City's 2019 goal of reaching carbon neutrality community-wide in both energy and transportation by 2050. The Climate Action Plan aims to reduce City operations and community-wide greenhouse gas emissions by 40-50% below 2019 levels by 2030 and achieve carbon neutrality by 2050. A healthy urban forest and an expanding cover of tree canopy supports these goals to reduce emissions and to sequester and store carbon.

The Urban Forest Management Plan's strategies related to the Climate Action Plan were developed based on comprehensive analyses of the current distribution and composition of public trees; the structure, health, and maintenance needs of public trees; areas with lower canopy percentages; and City operations and programs that have an impact on the public trees and the urban forest. The phased approach to tree planting emphasizes the cultivation of a diverse mix of species to bolster ecological resilience.

In addition to the alignment of strategies with the City's Climate Action Plan, this Urban Forest Management Plan aims to achieve higher levels of service by implementing industry standards and best practices and engaging the community in tree stewardship, Furthermore, the Plan recognizes the significance of a robust planting program with goals for biodiversity and ecosystem health. To this end, the Plan proposes the implementation of a native species planting program, fostering biodiversity, and supporting local wildlife. Maintaining a sustainable urban forest also requires proactive pest and disease management strategies as integral components to the City's Forestry Division, safeguarding the long-term health of the urban forest ecosystem. A commitment to monitoring protocols ensures early detection and timely intervention in the face of potential threats.

Community Engagement and Education

At the heart of the Urban Forest Management Plan is the emphasis on community engagement and education. Tailored outreach programs seek to involve diverse segments of the community in tree planting and maintenance activities. Concurrently, educational initiatives aim to raise awareness about the ecological and social benefits of trees. Leveraging community partnerships facilitate hands-on involvement, creating a sense of shared responsibility for the urban forest.

Integration with Infrastructure Development

Collaboration with city planners and developers is paramount to the successful implementation of the Urban Forest Management Plan. This includes advocating for the integration of trees into urban infrastructure projects and promoting sustainable urban

design principles. Striking a balance between infrastructure development and the preservation and expansion of the urban forest is seen as a key factor in ensuring the City's long-term resilience.

Implementation and Resource Mobilization

The successful execution of the Urban Forest Management Plan hinges on collaborative efforts. Engaging governmental agencies, non-profit organizations, businesses, and the community is vital to securing the necessary funding, technical expertise, and resources. Pursuing grant opportunities, fostering partnerships, supporting existing plans such as the 2022 Climate Action Plan, and actively involving community volunteers are deemed as essential components of the Plan's ongoing success. In addition, the tree regulations, policies, and protocols must align with the current and future needs of the urban forest, the community, and the programs, while not conflicting with other priorities across the City.

In conclusion, the Urban Forest Management Plan for the City of La Crosse embodies a strategic roadmap toward cultivating a resilient and thriving urban forest. Through targeted interventions, technological innovation in monitoring, implementation of best practices and standards for public trees, and fostering community engagement, the City stands poised to realize sustained environmental, economic, and social benefits. As the Plan unfolds, it signifies a commitment to the harmonious coexistence of urban development and nature, fostering a cityscape where the urban forest is not just a passive backdrop but an active contributor to the City's resilience and vitality.

Source: WXOW News19 (2021)

The Urban Forest Management Plan's Process and Framework

THE PLANNING

PROCESS

The development of the La Crosse Urban Forest Management Plan was based on answering four key questions:

- What Do We Have?
- What Do We Want?
- How Do We Get There?
- How Are We Doing?

This structure, termed "adaptive management," is commonly used for resource planning and management and provides a useful conceptual framework for managing La Crosse's urban forest resource (Miller, 1988).

Figure 2. The process to develop La Crosse's Urban Forest Management Plan

The Urban Forest Management Plan for La Crosse is a data- and stakeholder-driven plan to guide programs and operations over the next 10 years. Developing the Plan applied the fundamentals of adaptive management by addressing the questions of "What do we have?", "What do we want?", "How do we get there?", and "How are we doing?". In turn, the Urban Forest Management Plan is organized into these categories.

What Do We Have?

The first step in the planning process involved a baseline assessment by completing an inventory of public street and boulevard trees in 2021 and a follow-up inventory of public trees in maintained areas of Pettibone Park in 2023. In addition, assessments of existing resources, plans, and procedures was completed to provide the context and to ensure alignment of City priorities.

What Do We Want?

The Plan is shaped by knowing what the urban forest needs, the resources required to manage it, and what the community desires. This was informed by stakeholder engagement throughout the planning process and drafting of the Urban Forest Management Plan.

How Do We Get There?

The goals and actions lay out the roadmap to achieve a shared vision that supports the needs of all members of the community. Recommended actions and the associated strategies are strategic, measurable, attainable, realistic, and time-bound (SMART) and have been developed through extensive research, analyses, consultations, engagement, benchmarking research, and gap analyses during the planning process.

How Are We Doing?

The City needs to continually monitor progress towards the Plan's goals. The Urban Forest Management Plan includes guidance for implementing actions. The planning approach for this Plan provides the framework for periodic monitoring and evaluation of efforts using by measuring benchmarks established during the planning process. It is recommended that the Plan be reviewed and updated every 10 years or as dramatic changes occur to the program or the resource. With this framework, the following goals were established.

Goals for Urban Forest Management

In being mindful of the key considerations referenced above, La Crosse's primary goals for the urban forest include the following:

1) Tree Planting

Goal: Increase the tree canopy coverage citywide, thereby contributing to environmental sustainability, enhancing local biodiversity. This goal will focus on planting a diverse range of tree species, suitable for the region's climate and soil conditions, to create a sustainable urban forest.

3) Administration

Goal: Foster a culture of innovation, collaboration, and adaptability, ensuring the program remains responsive to changing environmental conditions and community needs. The focus is on developing a holistic approach that seamlessly integrates all aspects of the program, from administrative efficiency and balancing priorities to community involvement while maintaining a strong commitment to public safety, environmental stewardship, and urban ecological health.

2) Tree Maintenance

Goal: Strengthen the comprehensive public tree maintenance program to support public safety, long-term sustainability, and health of our urban forest. This will be achieved by conducting regular and thorough tree health assessments, preserving and rejuvenating public tree condition, and implementing proactive measures against potential threats. Achieving these outcomes requires systematic pruning of boulevard trees and trees in maintained areas of public parks.

4) Regulation

Goal: Preserve tree canopy cover and the urban forest through sound but fair policies and regulations that align with shared priorities in the City and best practices. Our tree canopy will be enhanced by facilitating the planting of diverse and climate-resilient tree species while implementing more stringent regulations on tree removals to protect and preserve existing green spaces.

5) Engagement

Goal: Foster tree stewardship in our community through equitable and impactful community education and engagement. An engaged and educated community expands our capacity to sustainably manage the urban forest and offers opportunities for access to our natural environment.

Background

The City of La Crosse sits in the heart of an unglaciated area of the upper Midwest in La Crosse County, Wisconsin. Situated to the east of the Mississippi River, the City of La Crosse is comprised of towering bluffs, deep valleys, marshlands, and wooded hillsides. La Crosse is a 25.4 square mile city and is home to over 50,000 residents (2021 U.S. Census Bureau).

The City of La Crosse is dedicated to the care of its urban forest and has been designated by the Arbor Day Foundation as a Tree City USA community since 1989. The 20,000 trees that line La Crosse's streets help to control stormwater, improve air quality, reduce utility expenses, increase property value, provide habitat for birds and other wildlife, and improve neighborhood aesthetics.

Defining the Urban Forest

Any inhabited area that has trees and vegetation is considered a community forest, though more urbanized communities often refer to this resource as an urban forest. Based on La Crosse's population density, tree population, and the public interaction with and received benefits from trees, La Crosse's resource is referred interchangeably as an urban and community forest in this Plan. The Urban Forest Management Plan focuses on the City-owned trees in public rights-of-way and boulevards, as well as trees in maintained areas of public parks and properties. The Plan also has implications for the trees on private property, and attention to these is addressed through community outreach and education strategies and through recommendations pertaining to tree regulations for development and redevelopment projects.

The concept of urban and community forest management developed in the 1960s out of the death and devastation of the elm tree population throughout the United States due to Dutch Elm disease. The discipline of urban forestry strongly advocates for species and age diversity in a city's tree population to prevent the recurrence of events like the elm tree devastation of the 1960s. Unfortunately, native and invasive pests and diseases continue to spread.

Over the last six decades, urban forestry has evolved as researchers and practitioners learn more about the structure and function of trees and their unique role in providing environmental, economic, and social benefits to urban areas. Urban forestry provides each of these benefits in differing circumstances—as infrastructure, as part of design and development, and as efficient and productive providers of economic development.

While a plan is useful in helping educate and ensure future viability, it also will set up useful parameters for the daily operations and care of La Crosse's urban forest. A fresh look at all urban forestry-related policies currently in place brings into focus what is necessary for day-to-day activities to ensure the long-term viability and safety of the urban forest.

Services Provided by Urban Forests

A diverse and healthy urban forest works to the benefit of the community, the environment, and the economy. Following is a summary of some of the key benefits and services of trees, nature, and green spaces in urban areas that was compiled from research (ACTrees, 2011) to develop La Crosse's Urban Forest Management Plan.

Improve the Quality of Life

Trees make cities more livable by decreasing summer temperatures and improving well-being. Greater contact with natural environments correlates with lower levels of stress, improved performance, and less sick days. Residents in areas with more greenery are three times more likely to be physically active and less likely to be overweight than residents living in areas with little greenery. View the following section for additional details about La Crosse's urban forest improving the quality of life for residents.

Cooler Pavement Diminishes Urban Heat Islands

Tree canopy lowers temperatures by shading buildings, asphalt, and concrete. Trees deflect radiation from the sun and release moisture into the air, reducing surface temperatures by as much as 36 degrees. Lower temperatures diminish fumes from heated asphalt and mitigate the urban heat island effect.

Improve Air Quality

Trees produce oxygen and clean the air by removing pollutants that would otherwise contribute to human health problems such as asthma and other respiratory diseases.

Protect Wildlife and Ecosystems

Preserving and planting trees provides valuable habitat for wildlife, supports pollinator species, and provides favorable conditions for beneficial soil microorganisms.

Save Energy and Lower Energy Costs for Buildings

As natural screens, trees insulate homes and businesses from extreme weather, keeping buildings cooler and reducing air conditioning bills. Shade trees planted on a sunny exposure can provide savings of up to 50% in the summer. In winter, evergreen trees provide a barrier to cold winter winds.

Conserve Water and Soil

A tree's root system draws water into the soil and their canopy slows rainfall, reducing runoff and erosion while removing contaminants. In contrast, impervious surfaces like roads and parking lots allow water to run off unfiltered and at high volumes, increasing the likelihood of flooding and impaired water quality.

Other benefits include increased property values, reduced pavement wear, traffic calming, public safety, among others. View a compilation of research on urban forest benefits and services prepared by the Alliance for Community Trees (www.actrees.org). Tree benefits are quantified in the following section.

A Closer Look at Trees Improving the Quality of Life in La Crosse

Trees come in various forms— shade trees, flowering trees, trees with edible fruit and nuts, and trees with vibrant fall color. All types contribute benefits and services to the urban ecosystem— an ecosystem that brings nature into cities through tree canopy, parks, and interconnected green space. Many environmental benefits of trees in urban areas are identifiable and measurable, while other benefits are tangential and experiential, such as the feeling of walking a quiet tree-covered trail. The following provides a summary of the social and human health benefits of trees and green spaces.

The urban forest brings a myriad of social and health benefits to La Crosse's neighborhoods. Park and boulevard trees create a sense of community, offering opportunities for people to come together and engage in various activities. These shared spaces foster a sense of belonging and connection among residents. Additionally, La Crosse's urban forest provides a respite from the hustle and bustle of city life, offering peaceful retreats where individuals can relax, unwind, and enjoy nature.

Research summarized in the following paragraphs shows the presence of trees and greenery in urban areas reduces stress, improves mental well-being, and encourages physical activity, all of which contribute to healthier and happier communities. Moreover, La Crosse's urban forest creates opportunities for environmental education and volunteering, inspiring residents to learn about nature, participate in tree planting initiatives, and engage in environmental stewardship.

> "Addressing global warming could help lessen the harmful impacts of climate change on the ecosystems that now provide us with multiple benefits. Increasing La Crosse's community-wide tree canopy to meet the goals of this Climate Action Plan, for instance, could increase the economic benefit provided by the community's trees by as much as $250,000 annually while other actions can result in improved access to greenspace for residents."
>
> LA CROSSE 2022 CLIMATE ACTION PLAN

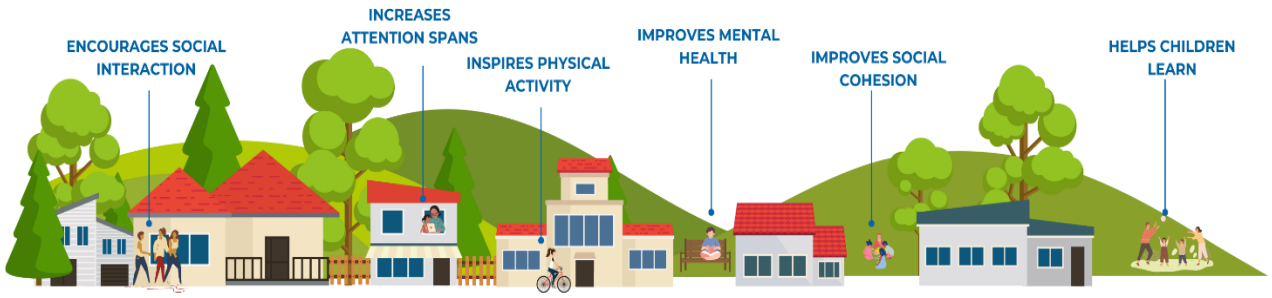


Figure 3. Human health and social benefits of trees

Overall, La Crosse's urban forest plays a crucial role in enhancing social interactions, well-being, human health, and community engagement, making La Crosse a more livable and enjoyable city.

Studies have found that the amount of trees and vegetation in common spaces such as parks are related to a sense of neighborhood safety and more social activity. In turn, greenery in cities enhances the strength of social ties among neighbors (Kim, et al., 2020).

Encounters with nature in cities also lead to enhanced positive attitudes, decreased stress levels, improved attention spans, and better performance on cognitive memory assessments (Wolf, et al., 2020).

Tree canopy cover and green spaces in cities motivate and provide opportunities for people to be physically active. The percentage of green space within a two mile radius of a person's home has been associated with the percentage of residents reporting good health, particularly among the elderly and those with lower socioeconomic status—groups that are typically less likely to get sufficient physical activity. Research shows that community residents are three times as likely to be physically active when living in areas with more green space (Ulmer, et al., 2016).

Opportunities to experience urban nature—whether it's a view of a street tree out a window or actually being outside in nature— are key to the mental well-being of city residents. People are happier, experience a greater sense of well-being, and have reduced stress levels when they live in areas with more green space nearby or on a tree canopied neighborhood street (White, et al., 2013).

More tree cover near schools also has a positive effect on student performance. Children with challenges concentrating are more focused following a 20-minute walk in an urban park or tree canopy covered sidewalk than they do after walks in other urban settings without trees and greenery (Taylor, et al., 2009). Trees in neighborhoods and parks connect children to nature.

The link between time spent in natural settings and health outcomes has been the center of focus for healthcare and insurance industries in recent years. Trees and green spaces have shown to increase longevity, reduce the risk of cancer and heart disease, reduce anxiety and depression, improve immune function, and reduce stress hormones. A study in 2016 of 108,000 people found a 12% lower rate of non-accidental mortality among those with the most greenery in a 820-foot (250 meters) radius around their homes (James, et al., 2016). In addition, hospital patients placed in rooms with views of nature experienced shorter stays in the hospital compared to patients in rooms that faced other buildings (Mihandoust, et al., 2021).

Environmental Benefits of Trees

Figure 4. La Crosse eagle viewing area (Source: La Crosse Tribune, 2018)

Research over the past several decades provides valuable quantified data on environmental benefits for urban forest researchers, managers, and practitioners. This data can be used to communicate tree benefits to residents and stakeholders and to incorporate trees into infrastructure design such as stormwater management. It can also be used to develop strategies that redress inequities.

A tree canopy assessment contracted by the City in 2022 determined that 30% of the City (4,198 acres or 6.6 square miles of canopy cover) was shaded by tree canopy (City of La Crosse Climate Action Plan, 2022). In 2021 and 2023, tree inventories were conducted to understand the composition and structure of public street and park trees. These datasets were used to calculate the following benefits of the Citywide urban forest and public tree population as noted.

Citywide Tree Canopy Benefits

The Citywide tree canopy across public and private land provides an annual estimated ecosystem benefit amounting to nearly $3.7 million annually (paleBLUEdot LLC, 2022) by reducing air pollutants and energy usage. Note, the 2022 study that examined La Crosse's canopy cover and the associated benefits does not include benefit or savings values for stormwater reduction, property value enhancements, carbon services, health savings, among others. While the 2022 study did not quantify the benefits of these other services, it determined the quantities. It was found that the 4,198 acres of tree canopy cover in La Crosse capture the following amount of pollutants annually:

- 30,250 pounds of carbon monoxide
- 165,357 pounds of nitrogen dioxide
- 1,578,980 pounds of ozone
- 99,999 pounds of sulfur dioxide
- 77,317 pounds of fine particulates (PM2.5)
- 516,902 pounds of coarse particulates (PM10)
- Total pounds of pollutants captured annually: 2,468,805 pounds

According to the USDA Forest Service's i-Tree research (itreetools.org), the 2.5 million pounds of pollutants removed annually equates to an approximate value of $1.2 million. In addition, it is estimated that all trees across the City uptake approximately 93.3 million gallons of stormwater annually (paleBLUEdot LLC, 2022) valued at $675,500 (itreetools.org), and reduce the annual energy usage in the amount of 18.1 million kilowatt hours or 3.8 million Therms valued at $2.5 million (paleBLUEdot LLC, 2022). According to the 2022 study, La Crosse's trees also capture or sequester 16.7 million pounds of carbon annually. Addition research and analysis is required to accurately quantify the benefits of carbon sequestration, but based on i-Tree research, the 16.7 million pounds of carbon sequestered may equate to a $390,600 annual value (itreetools.org). When combining the 2022 ecosystem benefit study and the i-Tree research estimates, La Crosse's tree canopy cover provides approximately $4.8 million annually. A summary is provided on the following page. Updates to the 2022 tree canopy assessment should include ecosystem benefit calculations and analyses of change in canopy cover and associated benefits.

*Figure 5. Summary graphic of the ecosystem benefits and services provided by 4,198 acres of tree canopy cover Citywide (Source: + = i-Tree, * = paleBLUEdot LLC, 2022)*

Public Tree Benefits

The City's inventory of 18,479 public trees (see the Structure and Composition of Public Trees section for additional details) was collected in proprietary software (pg-cloud.com/LaCrosseWI) that automatically calculates ecosystem benefits based on i-Tree research (itreetools.org). Based on a total of 18,479 public trees in the database at the time of the analysis, ecosystem benefits amount to $111,237 annually. This value includes carbon services, air quality, and stormwater benefits.

Based on 18,479 public trees in the inventory, a total of 16.3 million gallons of stormwater is intercepted and 4.0 million gallons of stormwater runoff avoided annually. Reducing or preventing these gallons of stormwater equate to a savings of over $35,700 annually. In terms of air quality improvements, the public trees capture or remove nearly 10,100 pounds of pollutants annually equating to a value of $46,700. It is estimated that the 18,479 maintained public trees sequester (capture) 1.2 millions pounds of carbon dioxide annually equating to a value of $28,800 of the $111,237 total value. Over the life of the public trees, over 51.5 million pounds of carbon dioxide are stored in the public trees resulting in a savings of $1.2 million.

Therefore, the annual value of ecosystem services for the 18,479 maintained public trees equates to $111,237 while the cumulative benefit of carbon storage values the public trees at $1,309,553. Using the cumulative benefits of $1,309,553 for the 18,479 maintained public trees result in an average of $71 in benefits per tree, and $25 per capita (2021 population). The estimated asset value of the public tree population amounts to $5.1 million (average of $274 per tree).

A comprehensive public tree inventory that captures all trees in maintained areas of all public parks would more accurately estimate the value and benefits of trees. View a summary of the ecosystem benefits provided by the public trees (estimated) below.

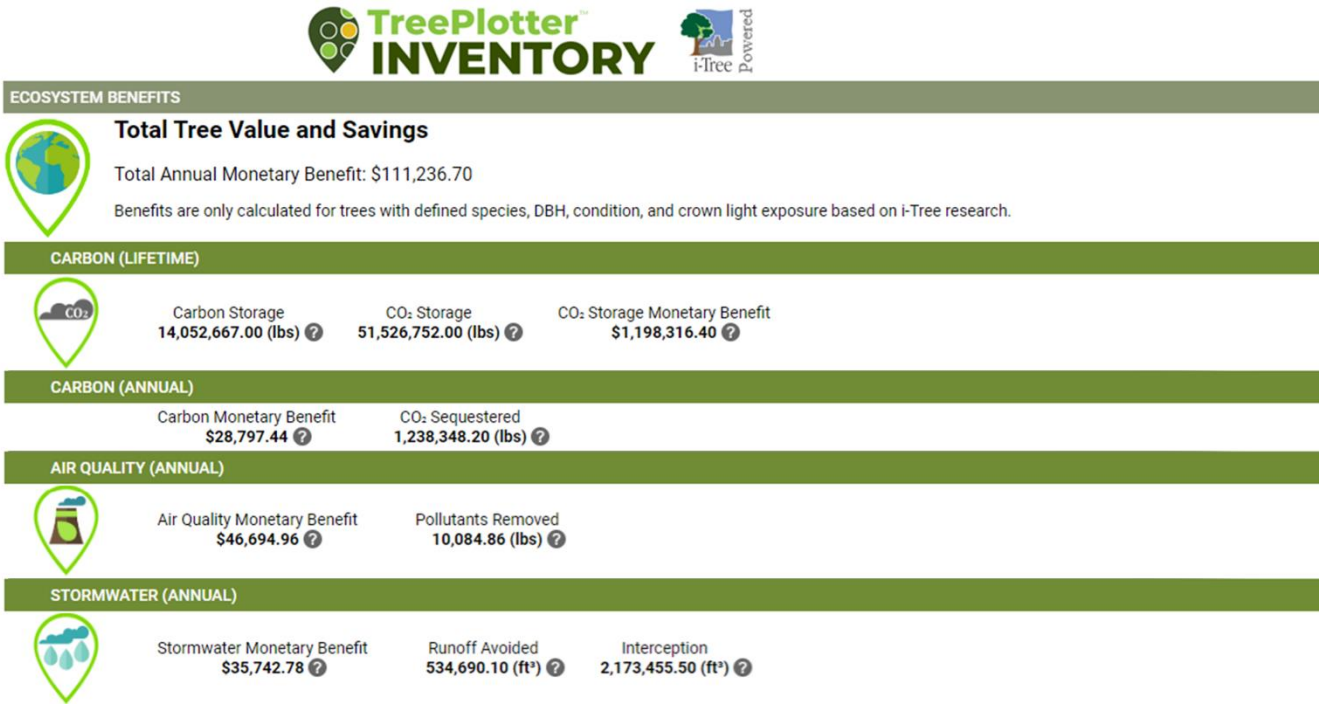


Figure 6. Summary graphic of the ecosystem benefits provided by 18,479 public trees inventoried (Source: PlanIT Geo, Inc. TreePlotter)

Challenges Facing Urban Forests

Urban trees in La Crosse face challenges common to their counterparts globally, including harmful pests and diseases, a changing climate, soil and air pollution, compacted soils, limited growing spaces, development pressures, and resource constraints. To overcome these challenges and harness the benefits of these valuable tree assets, strategic and efficient planning and care for the urban forest are imperative.

External Challenges

Urban forests across the country face common stressors including urban heat, poor air quality, weather extremes, pressure from development, and invasive plants, pests, and diseases. These challenges are often intensified by conflicting priorities and a shortage of resources.

La Crosse's urban forest and individual trees across public lands have been growing and changing as development and redevelopment occurs in the City. Like many cities, the tree canopy cover of public trees in La Crosse is not equitably distributed across the City. As a result, some neighborhoods experience higher surface and ambient temperatures, poorer air quality, and more frequent flooding than neighborhoods with greater canopy cover. Additionally, the lack of access to trees and green space impacts residents' physical and mental health, sense of community, and overall well-being.

Climate change is an overarching challenge that is compounding the issues facing La Crosse's trees. In addition to the known pests, diseases, and weather that the native trees have evolved to withstand, the new changes in temperature and weather extremes bring a new onslaught of pests, diseases, and wet/drought cycles.

Healthy trees can play a significant role in making La Crosse more resilient to weather and climate extremes by sustaining the natural ecosystem health. Yet the ability of community trees and forests to achieve their full potential is often significantly limited due to poor tree health stemming from reactive fixes instead of holistic solutions, limited training of tree care professionals, and insufficient municipal budgets.

Internal Challenges

- Proper and timely management of the trees in accordance with current best management practices.
- The need for updated tree-related regulations that preserve, protect, and grow the urban forest aligned with best practices and City priorities.
- Limited financial and operational resources to address the gradual and immediate impacts of climate change.
- Concerns regarding the organizational structure and communications with having multiple groups working in different City departments.
- Addressing emerald ash borer and other emerging tree pests and diseases.
- Strategic tree planting programs and initiatives needed to sustain and expand tree canopy and the associated benefits.
- Educating and revitalizing community tree stewardship.

The Time is Now


Source: Explore La Crosse

It is critical for La Crosse's environment, economy, and community well-being that the City act now to sustainably manage the public tree population and the Citywide urban forest as feasible. The City has a Comprehensive Plan for how La Crosse will grow and change with development. Just as important, the City's 2022 Climate Action Plan lays the foundation and precedent for sustainable management of La Crosse's urban forest in the face of climate change. La Crosse's Urban Forest Management Plan supports and builds on the goals and policies of these plans and supplements those with vital analyses, studies, metrics, and strategies relating to the City's natural environment and specifically, the urban forest.

La Crosse's Urban Forest Management Plan provides the roadmap with goals and supporting recommendations to manage, grow, preserve, and strengthen the urban forest through invigorated partnerships that align with City and community priorities. The following section of this Plan, "What do we have?", is an overview of the current state of La Crosse's urban forest and will serve as a baseline to measure future progress. Following the current state of the urban forest is an overview of La Crosse's priorities for the urban forest, "What do we want?", which were identified through community and stakeholder input which informed the Plan's goals, strategies, and priority actions. The "How do we get there?" section details the implementation guidelines, and the "How are we doing?" section and supporting resources in the Appendix provide additional information and studies to support adaptive management and monitoring of the Urban Forest Management Plan.

Let's begin by exploring La Crosse's urban forest.

Source: Explore La Crosse

WHAT DO WE HAVE?

Program Overview

The City of La Crosse employs a comprehensive and strategic approach to urban forestry management, engaging in various initiatives to enhance tree health, respond to community needs, and address potential challenges. From routine maintenance and community engagement efforts to disaster planning and collaborative partnerships, the City prioritizes the well-being of its urban forest. This involves a multifaceted strategy, including ongoing monitoring, feedback collection from residents, and collaborations with external organizations. While successes have been celebrated, there remains a commitment to continuous improvement, with suggestions for programs like a summer arborist internship and acknowledgment of challenges, such as the need to streamline homeowner requests for more effective tree maintenance cycles. Overall, La Crosse's urban forestry approach embodies a balance between proactive planning, community involvement, and adaptability to ensure a thriving urban forest. This approach and commitment is exemplified by La Crosse's recognition as a Tree City USA community by the Arbor Day Foundation since 1989.

Program Structure and Services

Currently, the management of trees is overseen by the Parks, Recreation & Forestry Department and the Planning, Development & Assessment Department, with support from other City departments. The Parks, Recreation & Forestry Department is organized into the following divisions— Administration, Parks, Recreation, Aquatics, Facilities, and Forestry.

The Forestry Division is the primary division for public tree management. In 2023, the Forestry Division planted 225 boulevard trees, hosted two community information sessions, informs homeowners of boulevard tree violations, completed an inventory of trees in Pettibone Park, and hired and trained one new certified arborist. In addition to these services and programs, the Forestry Division completed the City's first-ever comprehensive inventory of boulevard trees in 2021 and in 2022, the Forestry Division addressed all hazard trees identified in the inventory and replanted all trees where ash trees were removed due to emerald ash borer. Note, throughout the Urban Forest Management Plan, the Forestry Division is also referred to as the Forestry Program or the Urban Forestry Program.

Several factors play into the effective management of the City's urban forest, but the Parks & Forestry Coordinator within the Forestry Division plays a crucial role in managing various aspects of urban forestry. Responsibilities include communicating with the public on topics such as public and private tree maintenance, tree planting, removal, replacement, education, community engagement, and other general forestry concerns. The individual also helps to coordinate Arbor Day and memorial tree plantings, submits grant requests, maintains the electronic work order system, and serves as a liaison with arborists for tree maintenance in residential areas. They also issue orders to correct ordinances for the removal of privately owned hazardous trees, contact local contractors for park projects, coordinate cleanup activities, and management of geospatial urban forestry data to effectively manage maintenance needs.

The Parks & Forestry Coordinator for the City acts as a liaison between the community and City officials regarding forestry concerns. In addition, three City arborists are

responsible for determining treatment, trimming, removal, and replacement of boulevard and park trees within City limits and the Parks Crew Leader assists in coordinating park tree maintenance. The maintenance of park trees and street trees are identical except for clearance requirements between the two.

Public Tree Maintenance and Planting

Maintenance needs for the City of La Crosse's trees encompass a comprehensive approach. This includes routine maintenance, which involves the systematic care of boulevard trees on a rotating basis. In total, the City conducts roughly 2,500 structure pruning, 500 tower pruning, and 500 tree maintenance activities for street signs, stop signs, light poles, and low branches. To accomplish tree care related needs and tasks, in-house arborists utilize City-owned vehicles and equipment for tree maintenance and removals. While most needs and requests are taken care of in-house, some tree maintenance is supplemented occasionally by local contractors.

Prioritization of tasks includes rotating maintenance of City boulevard trees, logging and prioritizing resident concerns weekly, maintaining spring and fall planting schedules, and grouping stump removals for efficiency. Technology tools like Geographic Information System (GIS) mapping and TreePlotter inventory aid in property assessment and data management.

Tree planting and initial care is another crucial part of the Forestry Division's responsibilities, of which is managed by City staff and contractors. Tree plantings usually occur during fall and spring. Homeowners are permitted to purchase and plant boulevard trees upon approval, with evaluation by City arborists ensuring adherence to City ordinances, safety considerations, and tree diversity. Tree plantings and initial care have been opportunities for the City to engage the community and provided educational opportunities. Since 2017, over 1,500 City-provided trees have been planted in La Crosse's boulevards. City residents are also able to request a City-provided tree, which the City will accommodate up to 110 annually. Homeowners may also purchase and plant a boulevard tree upon approval from the Department

Collaborations play a vital role, with citizens providing feedback on trail and tree maintenance needs. The Forestry Division collaborates with Xcel Energy for clearing distribution and transmission, and utilizes contracted services for tree maintenance and removals for trees outside of the City arborist crew's capacity or equipment capabilities.

Public Engagement

Examples of engagement with the community include the annual Arbor Day celebration where kindergarten and elementary school students participate in tree planting and education. Aside from the general community participating in engagement, elected council members are invited to attend Park, Recreation & Forestry events. Typically, public tours and informational sessions are conducted in a centralized City park, providing expertise on revitalization tree planting projects. To help communicate public engagement opportunities, the City utilizes social media platforms, advertising, a website, and press releases to inform residents about program achievements and upcoming events. Feedback and public input are gathered through resident surveys, particularly during investigations such as the emerald ash borer eradication project.

Tree Risk Management

The City places a strong emphasis on risk, disaster, and threat management through continuous monitoring by arborists throughout the year, accompanied by resident education on best care practices. Additionally, the City implements response plans and protocols for mitigation, an emergency response plan, and the occasional hiring of local contractors. Pest and disease management include efforts against pests like emerald ash borer (EAB) and oak wilt.

The introduction of EAB in 2012 caused devastation to La Crosse's urban forest and has resulted in the City removing about 6,500 ash trees over the past several years and replacing them with appropriate tree species. This was largely completed in-house by the Forestry Division's arborist crews. Over 200 trees have been planted by homeowners since 2017 at the homeowner's expense.

In terms of disaster planning, funds are allocated in the operating budget to absorb storm-related expenses, and the City Forestry Division oversees disaster planning for urban forestry needs. Although there are no current protocols, the City has not experienced qualifying FEMA events, with routine storms and straight-line winds posing challenges in tree management during natural disasters.

Care for New Trees

The City also provides watering assistance, offering residents newly planted trees watering bags and instructions, and city employees water new park trees to encourage initial tree care and success of new plantings. This comprehensive strategy ensures the well-being and diversity of La Crosse's urban forest.

Volunteer groups contribute to park cleanup efforts, while City-owned trees in boulevards or parks are maintained by City staff. Volunteers have been helpful in managing public parks and spaces.

Figure 7. City requests residents to water boulevard trees during periods of drought (Source: La Crosse Tribune, 2020)

Training and Funding

Arborists receive continuing education credits to maintain certifications and attend workshops, conferences, and seminars for ongoing learning. The budget is a critical aspect, with increased funding sought for additional planting, maintenance, and equipment. Allocation of funds to removals is also deemed helpful. The operating budget is regularly set for tree pruning, maintenance, and removal, while the capital improvement budget addresses planting projects, heat zones, low-density areas, and tree canopy needs. External funding sources, such as the Urban Forest Management Grant and Paul E. Stry Foundation funding, contribute to the City's efforts, along with revenue from special park accounts generated through long-term lease agreements.

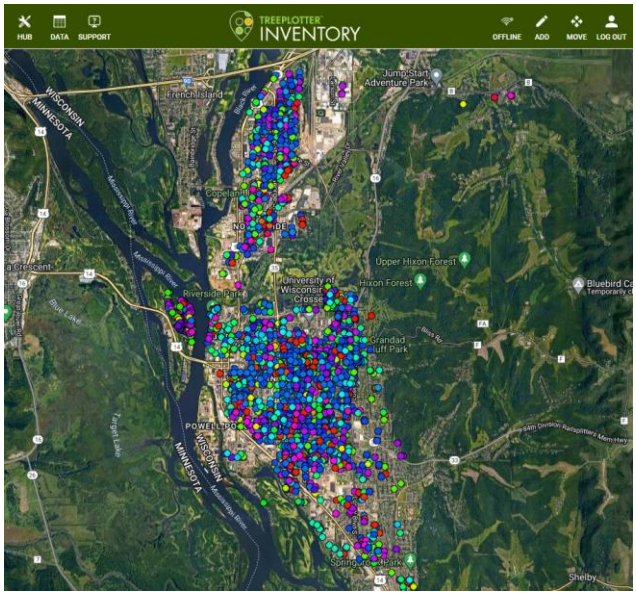


Figure 8. The City of La Crosse secured a state grant to fund the public tree inventory project

Tree Regulations

The City maintains a municipal code of ordinances governing trees within City limits. The City has the capacity to enforce these ordinances, issuing Official Orders to Correct Conditions of Premises (OTC) to citizens with private trees creating hazardous conditions. However, there are conflicting regulations related to property line rights-of-way (ROW) and county and railroad adjacent properties.

Innovative Data-driven Solutions

In 2023, the City utilized the street tree inventory to analyze potential causes for tree health decline and develop solutions to improve condition and preserve existing trees. The trees along Cass Street, Main Street, State Street, 5th Avenue, and 7th Avenue were specifically noted as having poor condition due to standard sidewalk cut-outs, soil conditions, and limited space in downtown business districts. In these circumstances, trees typically have a lifespan of only about seven years. The City needed to take proactive measures to evaluate their health and improve or replace them as necessary. To plan for the long-term survival of trees in the downtown business districts, La Crosse secured funding through the American Rescue Plan Act (ARPA) to augment tree coverage, install deeper soil solutions for root establishment, and plant a diverse range of trees in historically treeless areas of downtown. The team of City staff and consultants used the inventory data to prioritize essential enhancements, including tree maintenance, spacing adjustments, pruning, and disease management, while identifying locations requiring tree replacements. The program aims to incorporate guidelines for the selection of appropriate tree species to ensure a resilient and sustainable urban canopy. Through these efforts, it is anticipated that a 12-block tree planting program will be implemented, soil aeration tubes incorporated into eight tree pits where compacted soil will be removed to increase gas exchange within the soil, and soil cells for 50 trees downtown may be installed to support the pedestrian pavement. Lastly, the strategy will likely include details on the proper long-term care and maintenance needed for the existing and newly planted trees downtown (SEH, 2023). As of February 2024, the project has not yet been awarded.

Figure 9. La Crosse's Downtown Tree Program planted trees in historically treeless areas downtown (Source: La Crosse Tribune, 2023)

Structure and Composition of Public Trees

Understanding the composition and structure of public trees is crucial for effective and sustainable management. La Crosse has a comprehensive dataset of the City-managed urban forest that includes public trees along streets and boulevards, and in maintained areas parks.

This inventory set is only part of the full urban forest as it only contains data about the City-managed public trees. The larger urban forest composition and structure includes private trees and natural lands that play pivotal roles in the overall management of this resource.

This Plan focuses on the City-managed public trees under the City's jurisdiction and provides insights into this natural resource.

The following sections begin with a combined summary of the 2021 street / boulevard tree inventory and the 2023 tree inventory of Pettibone Park, followed by a summary by City Work District. Each section describes the composition, structure, and maintenance needs for public trees which informed the strategies in this Plan. The analysis of this data occurred in March 2023. A separate summary of trees in key public parks including Pettibone, Myrick, and Riverside is provided in Appendix 5.

Public Street, Boulevard, and Pettibone Park Trees

Number of Alive Trees:	18,336
Number of Dead Trees:	53
Total Data Points:	18,389

Table 1. The status and count of public trees in the inventory database (Note: all subsequent data summaries are based on 18,389 trees unless otherwise specified)

Distribution of Trees by Land Use

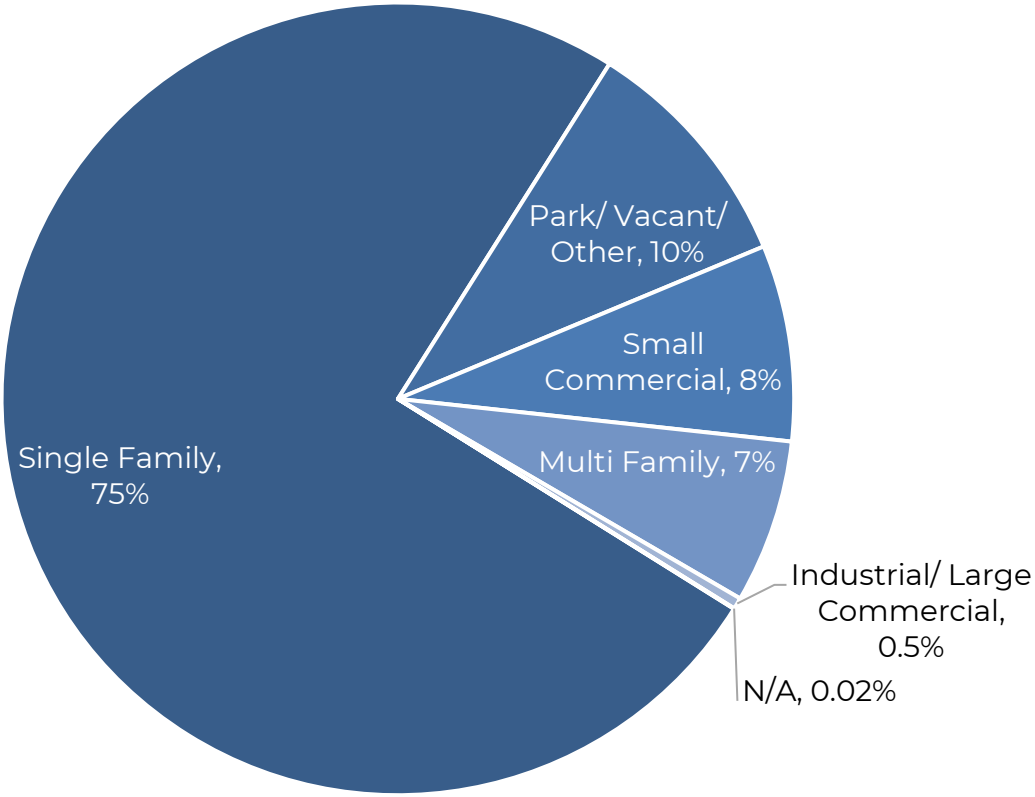


Figure 10. Distribution of City-managed public trees by adjacent land use

According to the 2021 inventory, most public trees are adjacent to the single family land use (75%). The "Park/Vacant/Other" land use means the tree may be in a park, adjacent to a park, or within park grounds but is serving as a street tree or it may be located in a large vacant swath of space.

Understanding the type of land use adjacent to street trees is fundamental for developing strategies since land use types may influence tree health, tree risk management, and tree species selection for planting. Different land uses introduce varying levels of stressors to street trees. For instance, trees bordering commercial zones might endure higher pollution levels and soil compaction from increased foot and vehicular traffic, there may be more above and below ground utilities, business owners may desire better views of their business signs, and impervious surfaces may be more prevalent in commercial areas. Conversely, trees near residential areas may face fewer stressors but still require specific attention to mitigate potential issues like root intrusion into underground utilities or branch interference with overhead power lines and clearance requirements for sidewalks. In addition, adjacent property owners may be more attentive to a tree's condition or the care needed and may be in support of caring for their street tree.

By discerning the land use context, City planners and tree managers can prioritize maintenance efforts effectively, ensuring that resources are allocated where they are most needed to uphold tree health and longevity. Moreover, the type of land use surrounding street trees influences their role in enhancing urban aesthetics and fostering environmental resilience.

Growing Spaces

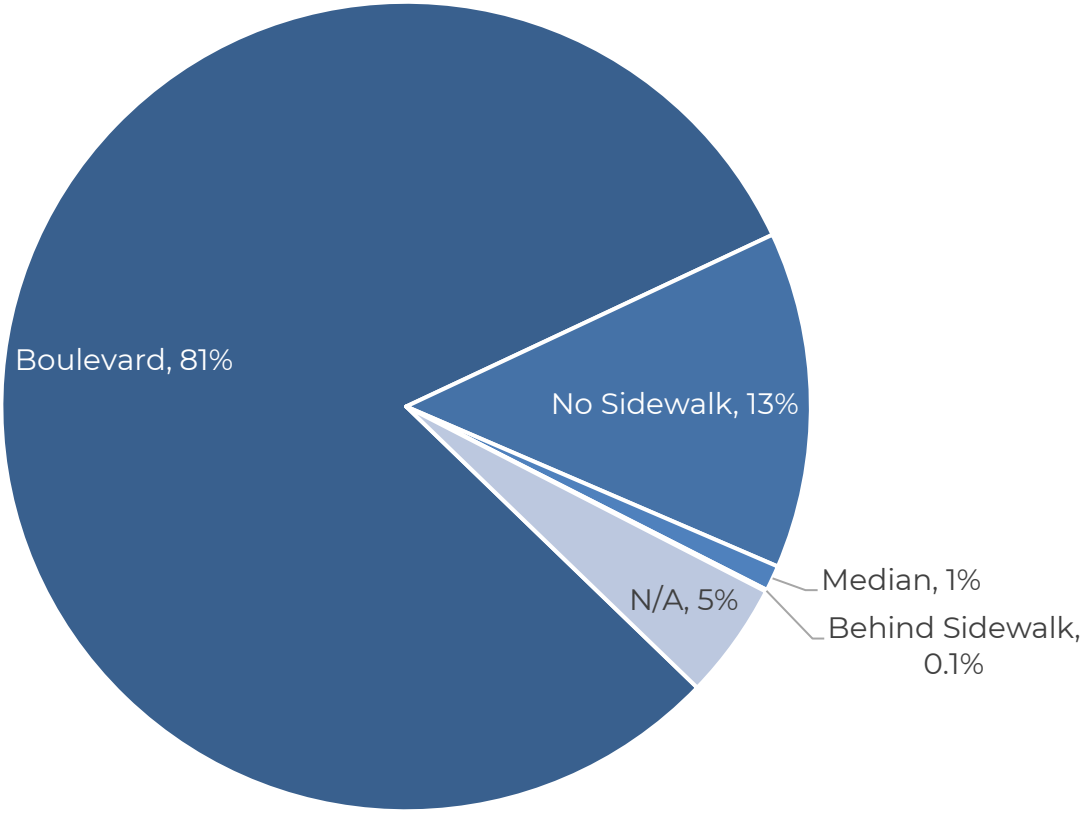


Figure 11. Distribution of City-managed public trees by growing space type

Most of the inventoried trees are growing within boulevard spaces (81%) followed by areas where there is no sidewalk (13%). Only 1% of trees inventoried are growing within median areas and 0.1% are growing behind sidewalks.

Understanding the type of space street and boulevard trees are growing in allows for informed analysis of tree condition over time and enables assessments of tree species survivability in different growing space types. By monitoring trees in various environments, the City can identify patterns of growth, stress, and resilience associated with specific growing conditions, facilitating the selection of suitable tree species for future plantings.

Tree Composition: Genera

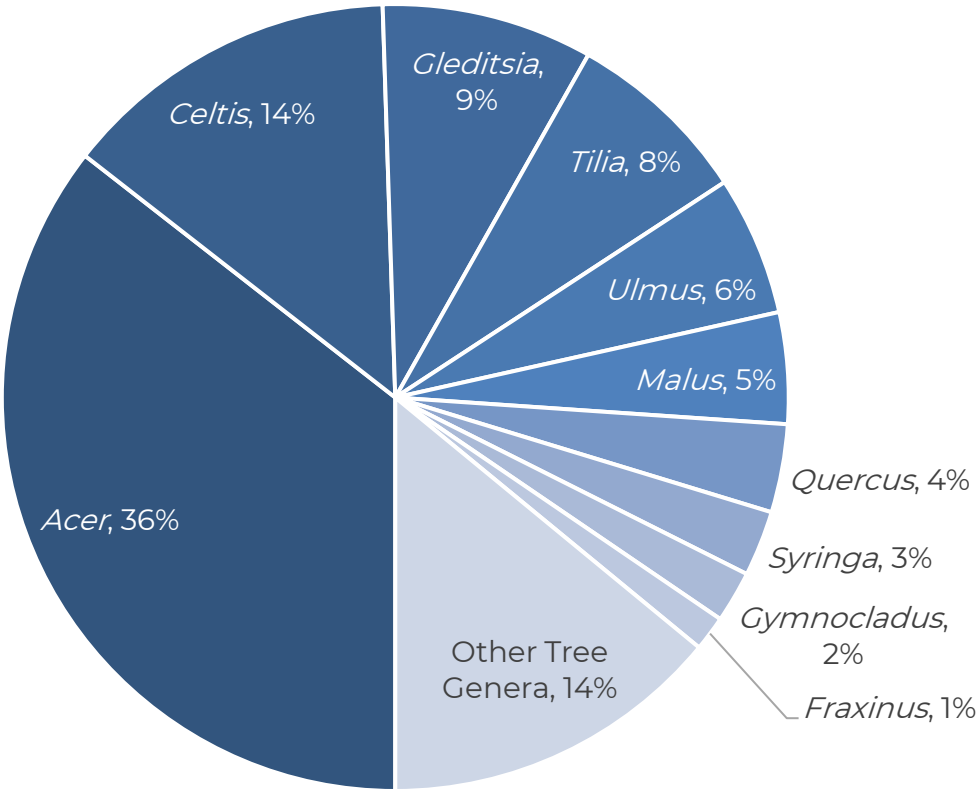


Figure 12. Most common public street tree genera (top 10)

The public street trees are comprised of **52 unique genera**. The most common tree genera include *Acer* or maples (36%), *Celtis* or hackberry (14%), *Gleditsia* or honeylocust (9%), *Tilia* or lindens and basswood (8%), *Ulmus* or elm (6%), *Malus* or crabapple (5%), *Quercus* or oaks (4%), *Syringa* or lilacs (3%), *Gymnocladus* or Kentucky coffeetree (2%), and *Fraxinus* or ash (1%). The top ten most common tree genera comprise 86% of the public street tree population which is a relatively high distribution according to the urban forestry consultants who analyzed the data.

The 10-20-30 rule in urban forestry is a guideline for biodiversity in urban tree populations. It suggests that no single tree species should make up more than 10% of the trees in any urban area, no single genus should make up more than 20%, and no single family should make up more than 30%. This rule aims to increase diversity among urban trees, thereby reducing the risks associated with pests and diseases and increasing the resilience of the urban forest. When trees of the same genus are planted together, they are more susceptible to being attacked by a single pest or disease, which can spread rapidly and cause significant damage. Diversifying plantings can significantly reduce the risk of large-scale damage from species-specific threats.

Based on this rule, *Acer* or maples are exceeding the threshold with 36% compared to the recommended 20% for genus. It may be recommended to reduce or halt the planting of maples as street trees until other tree species are planted. The City should monitor the diversity of public trees by periodically updating its inventory.

Tree Composition: Species

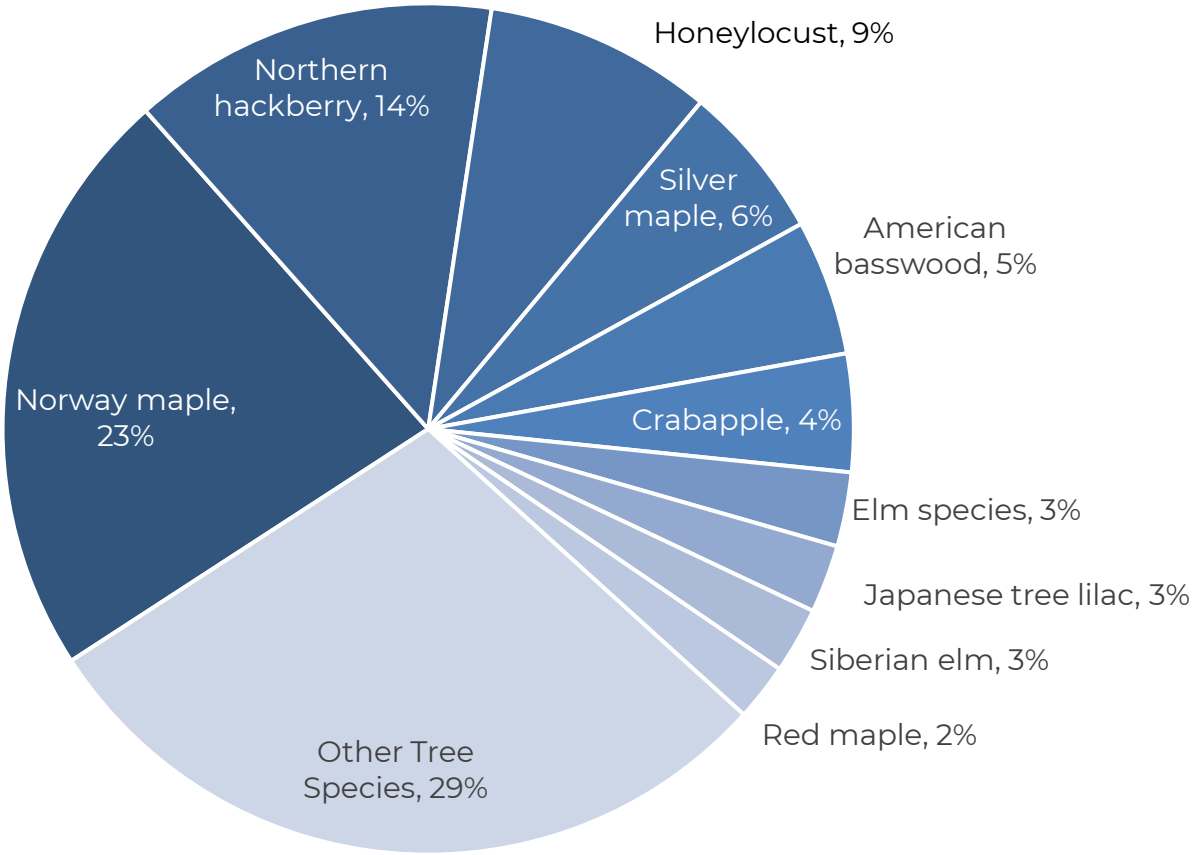


Figure 13. Most common public street tree species (top 10)

La Crosse has **137 unique tree species** growing along streets and boulevards. The most common tree species include 23% Norway maple (*Acer platanoides*), 14% northern hackberry (*Celtis occidentalis*), 9% honeylocust (*Gleditsia triacanthos*), 6% silver maple (*Acer saccharinum*), and 5% American basswood (*Tilia americana*). The top ten most common tree species make up 71% of all public street trees. Generally, 60% or lower is recommended according to the urban forestry consultants who analyzed the data.

Using the 10-20-30 rule at the species level both Norway maple and northern hackberry are over the 10% species recommendation with 22% and 14%, respectively. Honeylocust are close to the 10% rule making up 9% of public trees. It should also be noted that Norway maples are considered invasive species and having 4,101 (22%) of this species suggests the City should consider reducing or eliminating the planting of these maples.

As stated earlier, planting similar species of trees in one area, also known as a monoculture and can have negative impacts on the environment and ecosystem and puts the public tree population at risk to harmful pests and diseases. A lack of diversity can also lead to a reduction in biodiversity. A diverse ecosystem typically supports a wider variety of wildlife, but monocultures may not provide the necessary habitat diversity for many species, leading to a decline in wildlife populations.

Climate Vulnerability Ratings

A supporting study for the City's Climate Action Plan (paleBLUEdot LLC, 2022) included a region-specific assessment of tree species' vulnerability to climate change. The study utilized the USDA Forest Service's Climate Change Tree Atlas ("Tree Atlas") and the Forest Adaptation Workbook (NIACS, forestadaptation.org) to examine the change in habitat suitability for local tree species as climate change projections take hold. The following provides a summary of the vulnerability ratings along with an analysis of the vulnerability based on the inventoried trees (view the 2022 study for methodology and criteria).

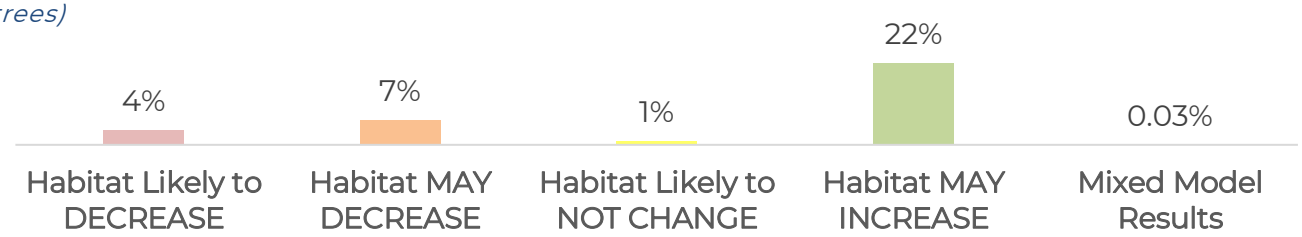
*Table 2. Summary of tree species vulnerability to climate change and the proportion of individual species in La Crosse's inventoried public tree population**

Rating	Tree Species	# in Inventory (18,389 trees)	% in Inventory (18,389 trees)	Additional Considerations
Habitat Likely to DECREASE	Bigtooth aspen		0%	Drought susceptible
	Eastern white pine	59	0%	Drought and insects susceptible
	Northern pin oak	31	0%	Tolerates drought and fire
	Northern red oak	142	1%	Insect pests and oak wilt susceptible
	Paper birch	9	0%	Susceptible to insects and drought
	Quaking aspen	35	0%	Heat and drought susceptible
	Red maple	399	2%	Disturbance tolerant
	Red pine	42	0%	Pests and disease susceptible
% Trees		**717**	**4%**	
Habitat MAY DECREASE	American basswood	947	5%	Tolerates shade, fire susceptible
	Sugar maple	292	2%	Tolerates shade
	White oak	6	0%	Fire-adapted
% Trees		**1,245**	**7%**	
Habitat Likely to NOT CHANGE	Black oak	12	0%	Tolerates drought, pests and diseases susceptible
	Bur oak	175	1%	Tolerates drought and fire
	Slippery elm		0%	Dutch elm disease (DED susceptible, tolerates shade
% Trees		**187**	**1%**	

Rating	Tree Species	# in Inventory (18,389 trees)	% in Inventory (18,389 trees)	Additional Considerations
Habitat MAY INCREASE Note: this list is not all inclusive nor is meant to serve as a definitive guide. Identifying viable tree species is an ever-evolving process. The City will decide on the types of species to be approved.	American elm	21	0%	DED susceptible
	Bitternut hickory	2	0%	Drought tolerant, shade intolerant
	Black walnut	73	0%	Drought and shade intolerant
	Black willow		0%	Drought and fire susceptible
	Boxelder	12	0%	Tolerates drought
	Eastern redcedar	36	0%	Tolerates drought, fire and pests susceptible
	Green ash	228	1%	Emerald ash borer (EAB) susceptible
	Hackberry	2,565	14%	Tolerates drought, fire susceptible
	Shagbark hickory	2	0%	Insects and fire susceptible
	Silver maple	1,091	6%	Tolerates wet soils, vulnerable to drought
	White ash	30	0%	EAB susceptible
% Trees		**4,060**	**22%**	
Mixed Model Results	Black cherry	6	0%	Insects and fire susceptible, drought tolerant
	Ironwood		0%	Shade tolerant
% Trees		**6**	**0%**	

* Table recreated from the paleBLUEdot LLC 2022 study supporting La Crosse's Climate Action Plan)

Figure 14. Summary of vulnerability ratings for La Crosse's inventoried public tree population (18,389 trees)



According to the study, 717 trees (4%) are most likely vulnerable to climate change, 7% (1,245 trees), are slightly vulnerable, 1% (187 trees) will have habitats likely not affected by climate change, and 22% or 4,060 trees will have favorable habitat conditions due to climate change. The above list is not meant to serve as a standalone guide for the City to update its recommended tree species list for planting but offers insights into the Plan's strategies.

Distribution of Tree Size and Relative Age Classes

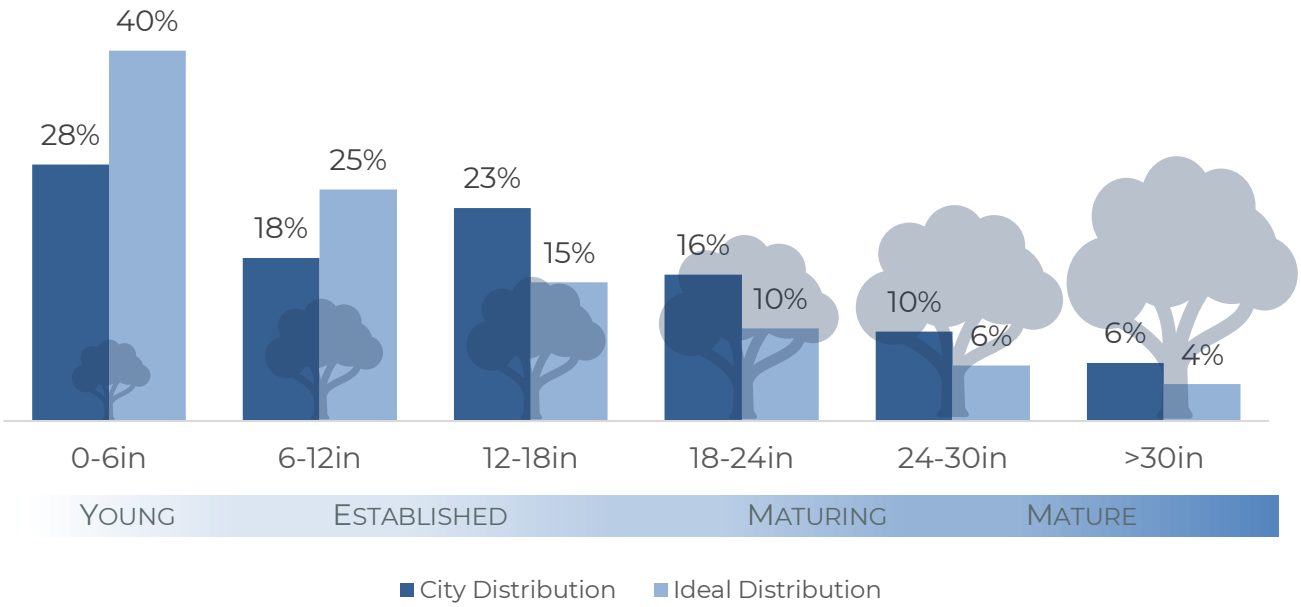


Figure 15. Comparison of La Crosse's public tree size classes (left) to the Ideal Distribution (right, Richards, 1993)

To determine size and relative age classes of public trees, the Diameter at Standard Height— or DSH measured at 4.5-feet above grade— was measured for each public tree inventoried.

Based on the inventory, most of the public street trees, boulevard trees, and Pettibone Park trees are in the 0-6-inch class with 28% of the population. The 12-18-inch class has the second highest proportion with 23% followed by the 6-12-inch class (18%), 18-24-inch class (16%), 24-30-inch class (10%), and trees greater than 30 inches DSH (6%).

In urban forestry, the Diameter at Standard Height measurement is a valuable tool for estimating the ages of trees based on their diameters. This measurement, taken at 4.5 feet above ground, provides essential insights into the age, size, and health of urban trees, which are vital for sustainable urban development. DSH data plays a significant role in strategic tree planting, helping urban planners and foresters to identify gaps in the age and size distribution of trees.

This knowledge is crucial for selecting appropriate species and sizes for new plantings to ensure a balanced and diverse urban canopy. Such diversity is essential for a healthy urban forest, making it less susceptible to pests, diseases, and more resilient to environmental changes.

Overall, the size and relative age distribution of La Crosses' public tree population are similar to the ideal age distribution. The ideal distribution is based on a street tree study conducted to determine the appropriate proportions of tree sizes for maximizing benefits while keeping maintenance and management costs at a manageable level (Richards, 1983 and 1993). As the figure above shows, the City could plant more trees to more closely align with the 40% target for the 0-6-inch size class. Over time, this would balance the other size classes as long as the trees survive and continue to grow.

Tree Condition

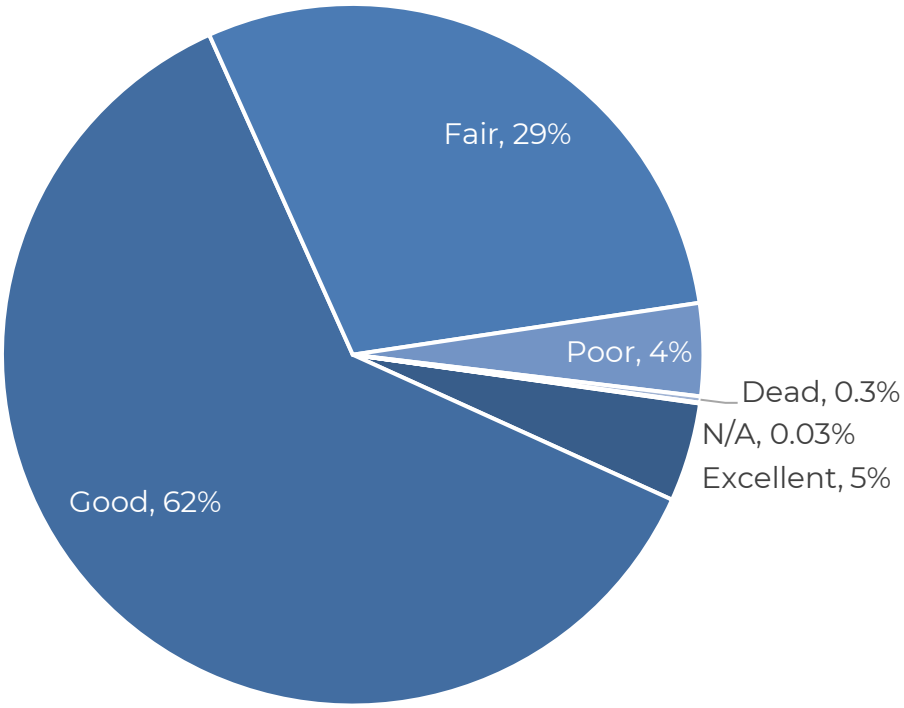


Figure 16. Summary of public tree condition

The assessment of each individual tree indicates that the majority of the trees are in good condition (62%). 29% of public trees are in fair condition and 4% are poor while only 0.3% or 53 trees were noted as dead at the time of the inventory.

The condition of public trees is influenced by a number of factors such as the tree's age, the location, the history of maintenance and plant health care, and possible stressors that are caused by biotic and abiotic elements. In many cases where a tree's health is rated less than good, defects and observations recorded show mechanical damage (caused by mowers or weed trimmers), trunk decay or cavities, poor structure, dieback, or a combination of these. Many of these defects causing declining tree health could possibly be prevented or remediated by continuing a proactive pruning program, proper tree and site selection during planting, plant health care (e.g., pest and disease management, watering, mulching), tree protection from construction or mower damage, public education and training, and/or young tree pruning. It is recommended that the City address the dead trees, further examine the trees in fair condition to determine if the tree's health can improve, and continue to maintain the trees in good condition. If the trees that are in poor condition have no effective or realistic means to recovery, then those trees should be planned for removal in the coming years.

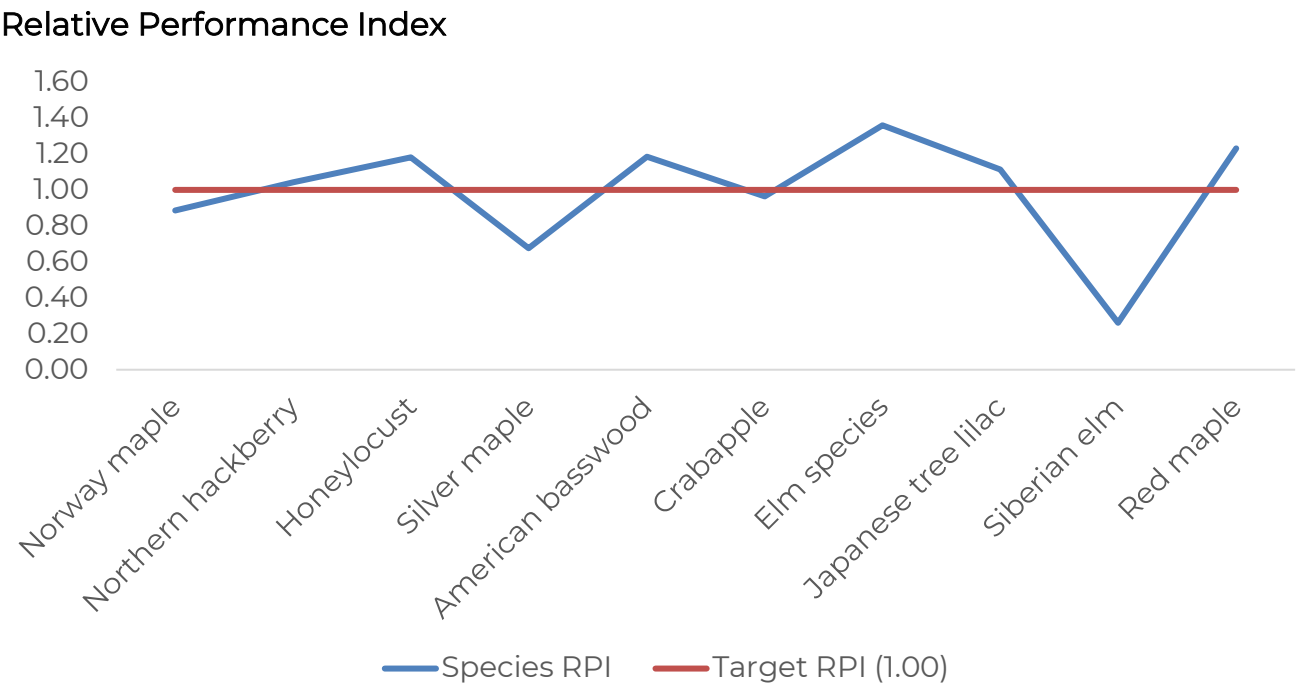


Figure 17. Relative Performance Index (RPI) of the most common public trees

In addition to understanding the overall condition of La Crosse's inventoried public trees to inform management strategies, an analysis of performance was also conducted for the ten most prevalent tree species using the Relative Performance Index approach. Relative Performance Index (RPI) is a comparison of a species' condition rating of "Good" and the tree population's "Good" rating. Using the percent of Good trees for a given species divided by the tree population percentage of Good trees gives a value of equal to 1, less than 1, or greater than 1. A value equal to 1 means the particular species is as healthy as the overall tree population. A value less than 1 means the species is not as healthy as the overall tree population. A value greater than 1 means the species is healthier than the overall tree population.

RPI answers the question of how well a species is performing in terms of health compared to the entire inventoried population. For the inventoried public trees, , honeylocust, elm (*Ulmus* spp), Japanese tree lilac, and red maple are performing better than the overall public tree population. Northern hackberry, American basswood, and crabapple are performing similar to the overall population of public trees, but Norway maple, silver maple, and Siberian elm are underperforming. The results are in line with the research and evidence of tree species condition and performance for the region. Of note, it is well-known that the condition of silver maples and Siberian elms tends to worsen as they grow larger in size. These tree species are also known to periodically shed branches and the wood is brittle. Similarly, Norway maples are prone to decay as they age.

Interestingly, red maple has the highest RPI value with 1.23. This is an example of how the City needs a strategic planting plan given red maple is performing well as a public tree but maples (*Acer*) are exceeding the diversity threshold of 20% for a tree genera.

Tree Observations

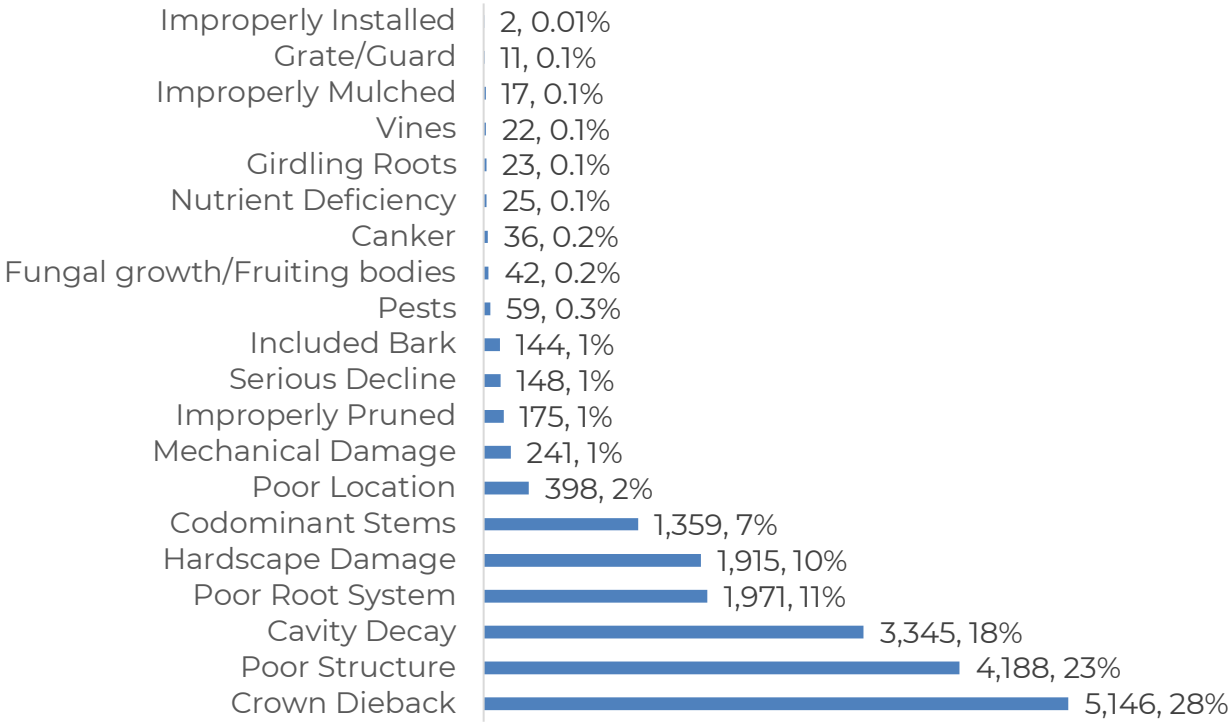


Figure 18. Count and percentage of public trees with an observation or defect recorded

Tree observations (or defects) were recorded during the inventory to further describe a tree's health, structure, or location when more detail was needed. A total of 20 unique observation options were included in the inventory, 10,282 trees (56%) had one or more defects, and a total of 19,267 observations were recorded.

Of the observations recorded, crown dieback was the most frequent observation recorded (28% or 5,146 trees). 23% or 4,188 trees were noted as having poor structure, 18% or 3,345 trees had a cavity decay, 11% or 1,971 trees have a poor root system, and 10% or 1,915 trees were noted as contributing to or existing around hardscape damage.

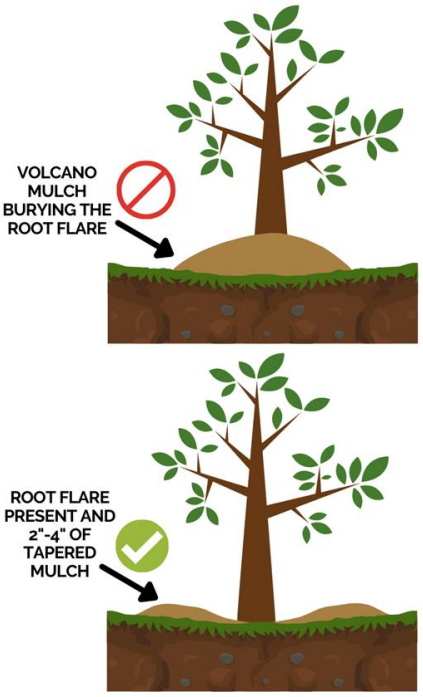


Figure 19. Illustration of the correct and incorrect way to mulch a tree

Of the total observations made, 57% are likely preventable or mendable meaning the defects or concerns observed are primarily human-caused. For example, poor structure can be prevented or limited with proper young tree pruning, implementing best practices and standards would prevent or reduce the number of improperly pruned trees, and poor root systems can be prevented by choosing quality tree nursery stock, proper planting, and amending soils. Trees with hardscape damage observations could have been prevented by choosing the appropriate species for the site and ensuring adequate root space. Lastly, adequate mulch rings, growing space, grates, and awareness would reduce the count of mechanical damage observations.

Recommended Tree Work

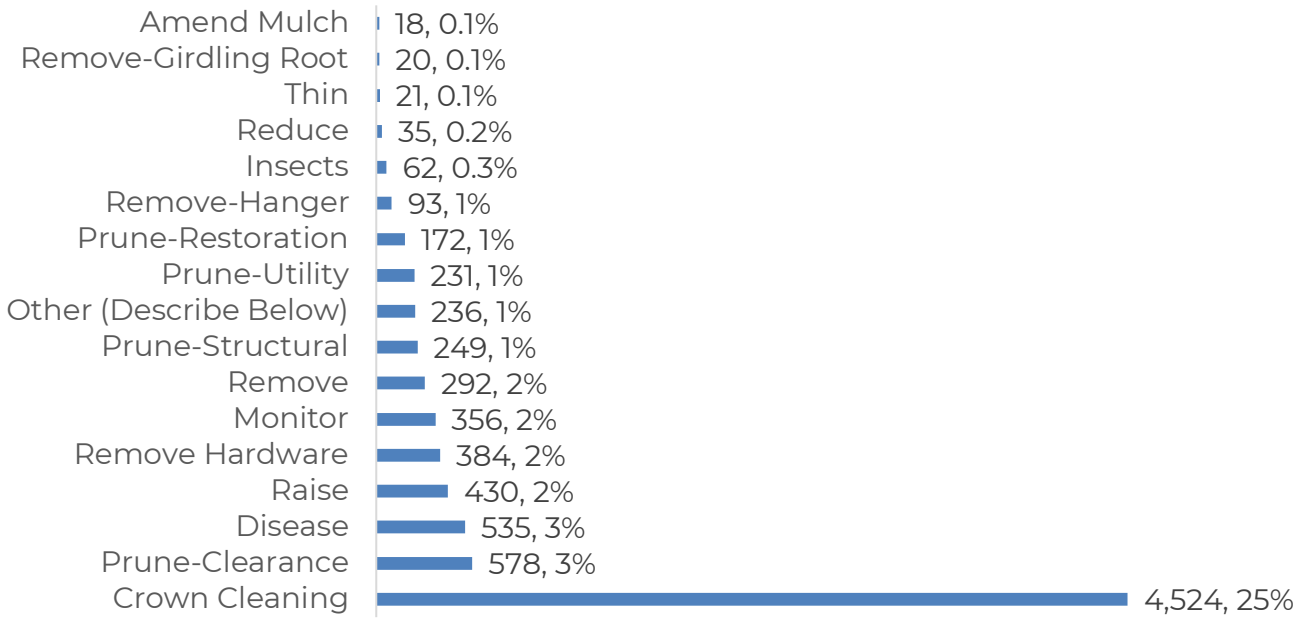


Figure 20. Count and percentage of public trees with a tree work recommendation(s)

To inform maintenance strategies, the inventory included a checklist of recommended tree work options for each public tree inventoried. A total of 17 tree work categories were available for multiple selection. From the inventory, a total of 6,839 (37%) were noted as needing tree work and a total of 8,236 tree work selections were made.

Most of the tree work recommendations relate to tree pruning (28%). Of the 6,839 trees assigned a tree work task, the majority (4,524 or 25%) require crown cleaning and the next highest recommendation is pruning for clearance with 578 trees or 3%. 3% of trees were noted as having some sort of tree disease. All remaining tree work categories represent 2% or less of the public tree population at the time of the inventory.

The tree work tasks including crown cleaning, prune-structural, prune-clearance, prune-utility, remove hardware, remove-invasive species, prune-restoration, raise, reduce, remove-hanger, amend mulch, and thin can all likely be addressed by continuing with a robust programmed pruning cycle. This proactive approach aims to address all public trees within a 5- to 7-year cycle as recommended by industry standards and best practices. Studies show this is the optimal range for program efficiency, tree health, and public safety. Pruning more frequently does not have a large impact on tree health and public safety though pruning less frequently begins to impact the tree health, public safety, and program efficiency due to the compounded effects of deferred maintenance.

Emerald Ash Borer Management

Based on the inventory of public street, boulevard, and Pettibone Park trees, there are a total of 264 ash (*Fraxinus*) trees. The majority of ash trees are 18-24 inches in diameter (37%) or 12-18 inches (36%), primarily along streetscapes (99.6%), 86% are green ash (*Fraxinus pennsylvanica*), and in good (67%) to fair (31%) condition. Appendix 1 in this Urban Forest Management Plan details the management strategies and considerations for emerald ash borer.

Summary of Public Street Tree Characteristics by City Work Districts

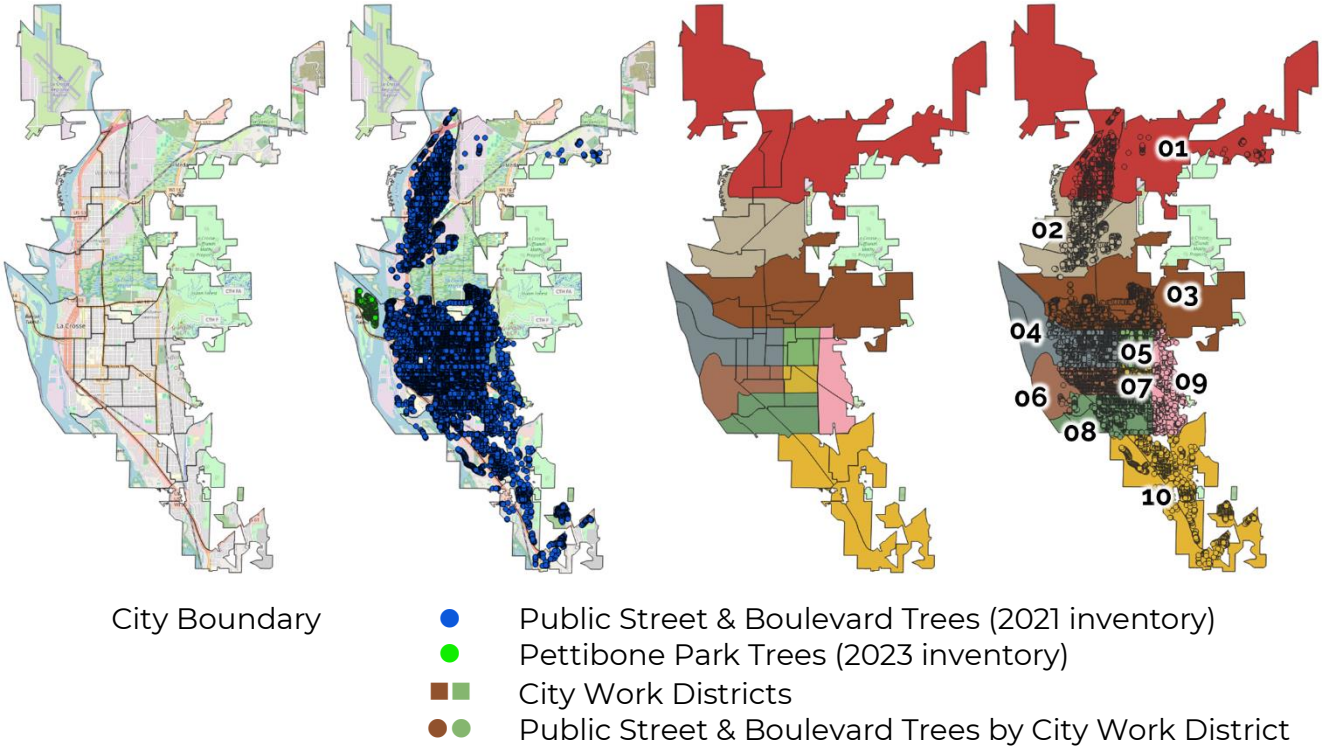


Figure 21. Map displaying the City Work Districts within La Crosse and the public street trees by Work District

Work District	Public Street & Boulevard Tree Count
01	1,787
02	1,763
03	3,098
04	2,332
05	2,167
06	1,850
07	1,118
08	1,667
09	755
10	1,272
TOTAL	17,809

Table 3. Count of public street and boulevard trees by City Work District

According to the City's 10 Work Districts provided in September 2023 and the data for 18,389 trees analyzed from March 2023 through September 2023, there 17,809 trees along streets and boulevards. A total of 580 trees are in Pettibone Park and are not included in the following summaries. Of the 10 Work Districts, District 03 has the most trees with 3,098 and District 09 has the least number of trees with 755. The average count of trees for all 10 Work Districts is 1,781 trees.

Work District	Tree Count	Most Common Genera	Most Common Species
01	1,787	*Acer* (maple): 40% *Celtis* (hackberry): 17% *Tilia* (basswood): 6%	Norway maple: 26% Northern hackberry: 17% Honeylocust: 6%
02	1,763	*Acer* (maple): 34% *Celtis* (hackberry): 19% *Gleditsia* (honeylocust): 9%	Norway maple: 21% Northern hackberry: 19% Honeylocust: 9%
03	**3,098**	*Acer* (maple): 26% *Celtis* (hackberry): 13% *Gleditsia* (honeylocust): 9%	Norway maple: 17% Northern hackberry: 13% Honeylocust: 9%
04	2,332	*Acer* (maple): 32% *Celtis* (hackberry): 20% *Gleditsia* (honeylocust): 11%	Norway maple: 24% Northern hackberry: 20% **Honeylocust: 11%**
05	2,167	*Acer* (maple): 38% *Celtis* (hackberry): 14% *Gleditsia* (honeylocust): 9%	Norway maple: 26% Northern hackberry: 14% Honeylocust: 9%
06	1,850	*Acer* (maple): 36% ***Celtis* (hackberry): 21%** *Gleditsia* (honeylocust): 9%	Norway maple: 24% **Northern hackberry: 21%** Honeylocust: 8%
07	1,118	***Acer* (maple): 44%** *Gleditsia* (honeylocust): 9% *Tilia* (basswood): 9%	**Norway maple: 34%** Honeylocust: 9% Northern hackberry: 7%
08	1,667	*Acer* (maple): 40% *Celtis* (hackberry): 12% ***Tilia* (basswood): 10%**	Norway maple: 28% Northern hackberry: 12% Honeylocust: 8%
09	755	*Acer* (maple): 38% *Gleditsia* (honeylocust): 10% ***Ulmus* (elm): 8%**	Norway maple: 24% Honeylocust: 10% Crabapple: 8%
10	1,272	*Acer* (maples): 38% *Gleditsia* (honeylocust): 11% ***Malus* (crabapple): 10%**	Norway maple: 16% **Honeylocust: 11%** **Crabapple: 9%**
TOTAL	17,809 Trees		

Bold font = notable finding

Table 4. Public street and boulevard tree composition by City Work District

Work District	Size Classes (DSH*)	Condition
01	28% = 0-6 inches 22% = 12-18 inches 18% = 18-24 inches	Good: 67% Fair: 18% Poor: 2% Dead: 0.3%
02	24% = 12-18 inches 23% = 6-12 inches 23% = 0-6 inches	Good: 73% Fair: 17% Poor: 3% Dead: 0.2%
03	**35% = 0-6 inches** 20% = 12-18 inches 19% = 6-12 inches	Good: 66% Fair: 20% Poor: 5% Dead: 0.5%
04	30% = 0-6 inches 20% = 12-18 inches 18% = 6-12 inches	Good: 59% Fair: 33% Poor: 5% Dead: 0.3%
05	28% = 12-18 inches 28% = 0-6 inches 18% = 18-24 inches	Good: 63% Fair: 29% Poor: 5% Dead: 0.2%
06	25% = 12-18 inches 22% = 0-6 inches 17% = 18-24 inches	**Good: 75%** Fair: 20% Poor: 4% Dead: 0.1%
07	30% = 0-6 inches 25% = 12-18 inches **19% = 18-24 inches**	Good: 62% Fair: 33% Poor: 3% Dead: 0.2%
08	27% = 0-6 inches 25% = 12-18 inches 18% = 18-24 inches	Good: 51% Fair: 42% Poor: 5% Dead: 0.2%
09	26% = 0-6 inches 25% = 12-18 inches 18% = 6-12 inches	**Good: 33%** **Fair: 61%** Poor: 4% Dead: 0.1%
10	32% = 0-6 inches 26% = 12-18 inches 23% = 6-12 inches	Good: 53% Fair: 43% Poor: 2% Dead: 0.2%
TOTAL	17,809 Trees	

* DSH = Diameter at Standard Height, measured 4.5-feet above natural grade

Bold font = notable finding

Table 5. Structure and condition of public street and boulevard trees by City Work District

According to the previous two tables, the 17,809 public street and boulevard trees across 10 City Work Districts are primarily maple (*Acer*), hackberry (*Celtis*), honeylocust (*Gleditsia*), basswood (*Tilia*), elm (*Ulmus*), or crabapple (*Malus*). In all 10 Work Districts, maples are exceeding the recommended limit of 20% for any tree genera, and in Work District 06 hackberry is exceeding the recommended limit. Work Districts 7 through 10 are the only district where maple, hackberry, and honeylocust comprise the top three most common tree genera. The composition of trees by Work District enabled the development of finer-scale planting recommendations in this Plan.

When looking at the structure of trees across 10 Work Districts, it was found that District 03 has the greatest proportion of small trees (0-6 inches in Diameter at Standard Height, or DSH measured 4.5-feet above natural grade) with 35%. District 07 has the greatest proportion of maturing 18-24-inch trees with 19%. Of the 10 districts, District 06 has the lowest proportion of small trees (0-6 inches DSH) with 22%. The average across 10 districts is 28% for the 0-6-inch DSH class. The proportion of size classes and relative age provide insights into the distribution of benefits and services associated with public trees and informs planting and maintenance decisions such as the timing for new plantings and trees that will likely require removal eventually when they overmature and begin to decline.

Similarly, tree condition examined by Work District informs current and projected maintenance demands. District 06 has the greatest proportion of trees in good condition with 75%, whereas District 09 has the lowest proportion of trees in good condition with 33%. As a result, District 09 has the highest proportion of trees in fair condition with 61%. Several districts have 5% distribution of trees in poor condition, these districts include 03, 04, 05, and 08. These trees in poor condition should be monitored to determine if they are beyond remediation and require removal in the near- or long-term. Trees in fair condition could likely benefit from rejuvenation maintenance and plant health care or perhaps improve in condition through routine pruning. Lastly, those trees recommended for removal should be replaced with a new tree if the growing space allows for replanting and if it aligns with the planting strategy in this Plan.

The Citywide analysis of public street / boulevard and park trees, the analysis of street and boulevard trees by City Work District, and the appendix about the trees specifically in key public parks provided insights into the development of strategies and recommendations in this Plan.

For analyses and summaries specifically of the inventoried trees in public parks including Pettibone, Myrick, and Riverside, see Appendix 5.

The Citywide Urban Forest Tree Canopy Cover

The Citywide urban forest across public and private boundaries in La Crosse is measured with high-resolution urban tree canopy (UTC) assessments using various imagery and geographic information system (GIS) processes or through point-sampling techniques (i-Tree Canopy, itreetools.org) using online GIS interfaces. For La Crosse, the latter was utilized to support the development of the City's Climate Action Plan. The results and methodology are detailed in the Climate Action Plan and the supporting study, "Ground Cover, Heat Island and Carbon Sequestration Study" prepared by paleBLUEdot LLC in 2022 (paleBLUEdot LLC, 2022).

The primary goal of this type of assessment is to identify a baseline and benchmark of the City's tree canopy and analyze the land cover class across a range of geographic boundaries. This analysis identifies areas for tree canopy preservation as well as the opportunities for new urban tree canopy cover.

"i-Tree Canopy is a web browser application that can be used to determine the amount of an area of interest covered by tree canopy and other user-defined surfaces. It automatically generates random plot points within your study area boundaries. You simply visit each point and assign a land cover category to it."

i-TREE CANOPY, USDA FOREST SERVICE

www.canopy.itreetools.org

La Crosse's 2022 Tree Canopy Assessment (TCA) included an analysis of tree canopy cover, grass, and impervious (paved) surface cover Citywide and by U.S. Census Tract. The point-sampling technique to assess these land cover classes generated 8,149 randomized points on aerial imagery across 14 Census Tracts in La Crosse. As a result, an average of 580 plots per neighborhood were generated and achieved a standard error (SE) between 0.2 and 2%.

While this Urban Forest Management Plan focuses on public trees along streetscapes and in parks, understanding the Citywide urban forest provides context and enables alignment of public tree management efforts with broader City goals such as those established in the Climate Action Plan. The following section provides a summary of the canopy study prepared for the Climate Action Plan along with analyses conducted by the urban forestry consultants in 2023 to develop the Urban Forest Management Plan.

Canopy Assessment Study Area

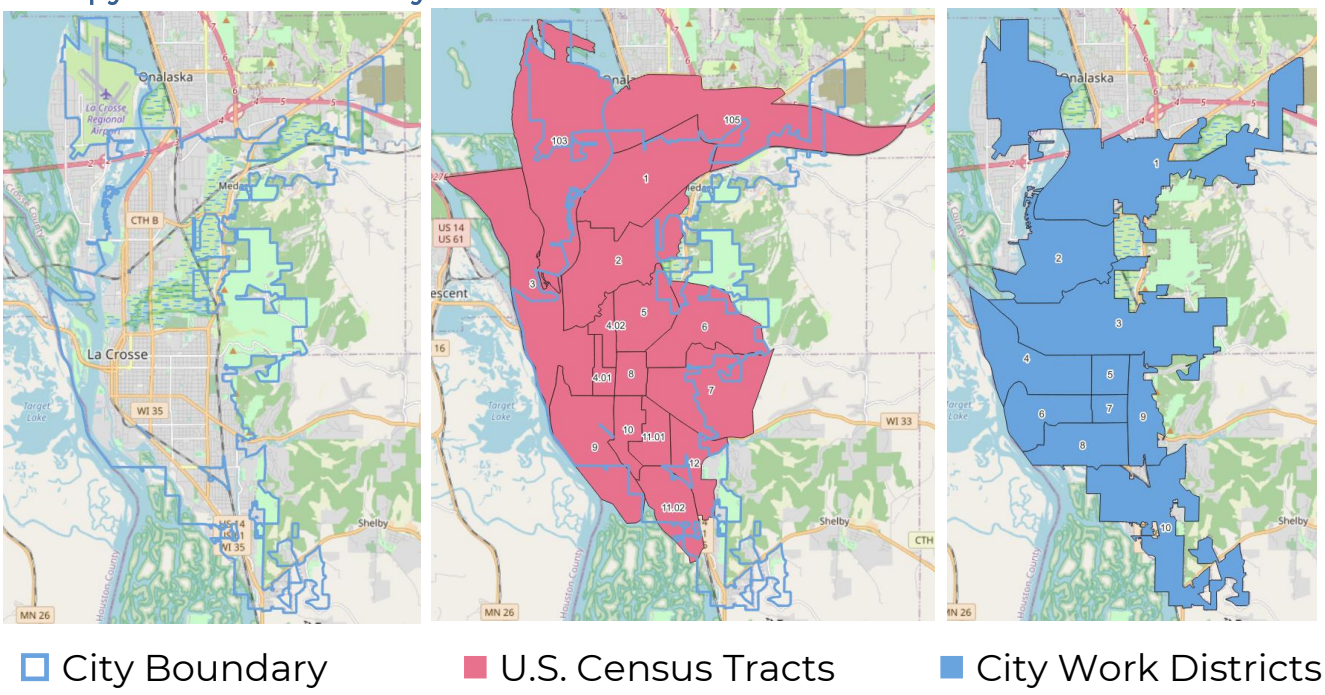


Figure 22. Maps displaying the geographies utilized in analyzing the 2022 tree canopy assessment

As described in the previous section, the 2022 study utilized U.S. Census Tracts to understand the distribution canopy cover. The Census Tracts (CTs) do not follow the same boundaries as the City of La Crosse's municipal boundary nor does the 2022 study include canopy data by City Work District. Understanding the distribution of canopy cover by Work District was needed for the development of the Urban Forest Management Plan since most public tree maintenance and planting activities and strategies in the Plan utilize these districts. Therefore, the urban forestry consultants for the Plan utilized the 2022 study to perform additional analyses by Work District. Note, the following summaries pertaining to Work Districts are estimates. The City should consider follow-up canopy assessments that more accurately examine canopy cover by Work District. The City may utilize the Work District summaries in the following section as a starting point to understand how public tree management affects the Citywide urban forest.

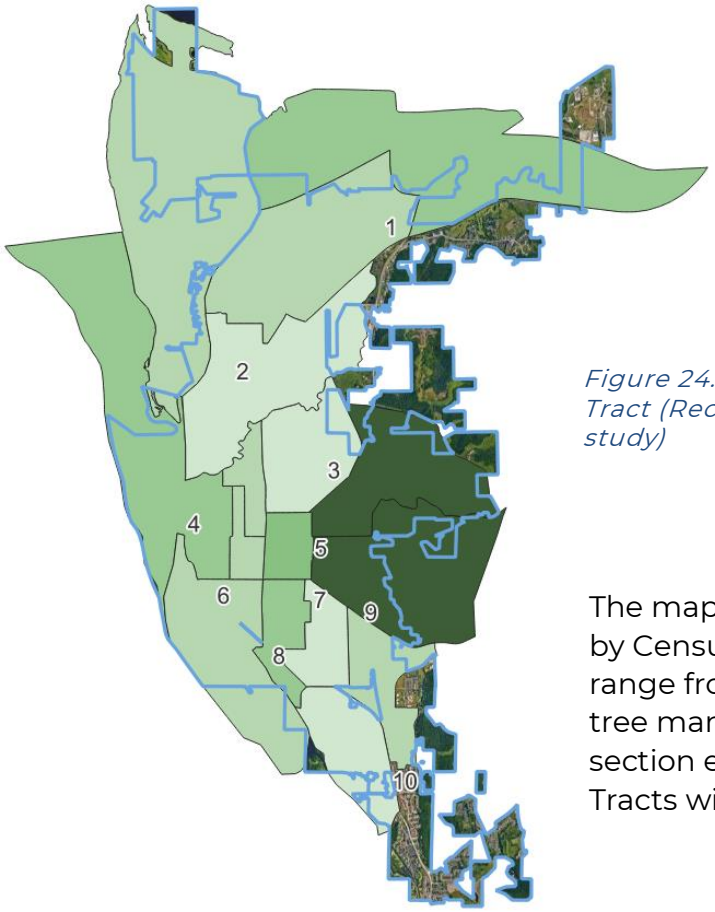
Citywide Tree Canopy Cover

According to the City of La Crosse's Climate Action Plan and the supporting study (paleBLUEdot LLC, 2022), the average canopy cover Citywide is 30%. Based on La Crosse's land area of 13,993 acres, 30% canopy translates to 4,198 acres of cover when viewed from above. Another way to look at the extent of this resource— 4,198 acres of canopy cover is equivalent to 6.5 square miles and La Crosse's total land area (13,993 acres) is 21.9 square miles.

30% Average Tree Canopy Coverage | 30% Maintained Lawn Coverage | 12% Impervious Surface Coverage

Figure 23. Summary of the assessment of land cover classes (Source: City of La Crosse, WI Climate Action Plan, 2022)

Canopy Cover by Census Tract



Census Tract Urban Tree Canopy Cover (UTC)
- <21% UTC
- 21-26% UTC
- 26-33% UTC
- 33-35% UTC
- 42-90% UTC

1-10 Work Districts labeled

City boundary

Figure 24. Canopy cover distribution by U.S. Census Tract (Recreated from the 2022 Climate Action Plan study)

The map shows the distribution of canopy cover by Census Tract. The canopy cover percentages range from less than 21% to 90%. To inform public tree management strategies, the following section examines the tree canopy cover of Census Tracts within each City Work District.

Canopy Cover by City Work District

As described in the previous section, the 2022 canopy study to inform La Crosse's Climate Action Plan did not examine canopy cover by Work District, only by Census Tract. Public tree maintenance strategies are arranged by Work District; therefore, the following section provides a (draft) summary of canopy cover by Work District.

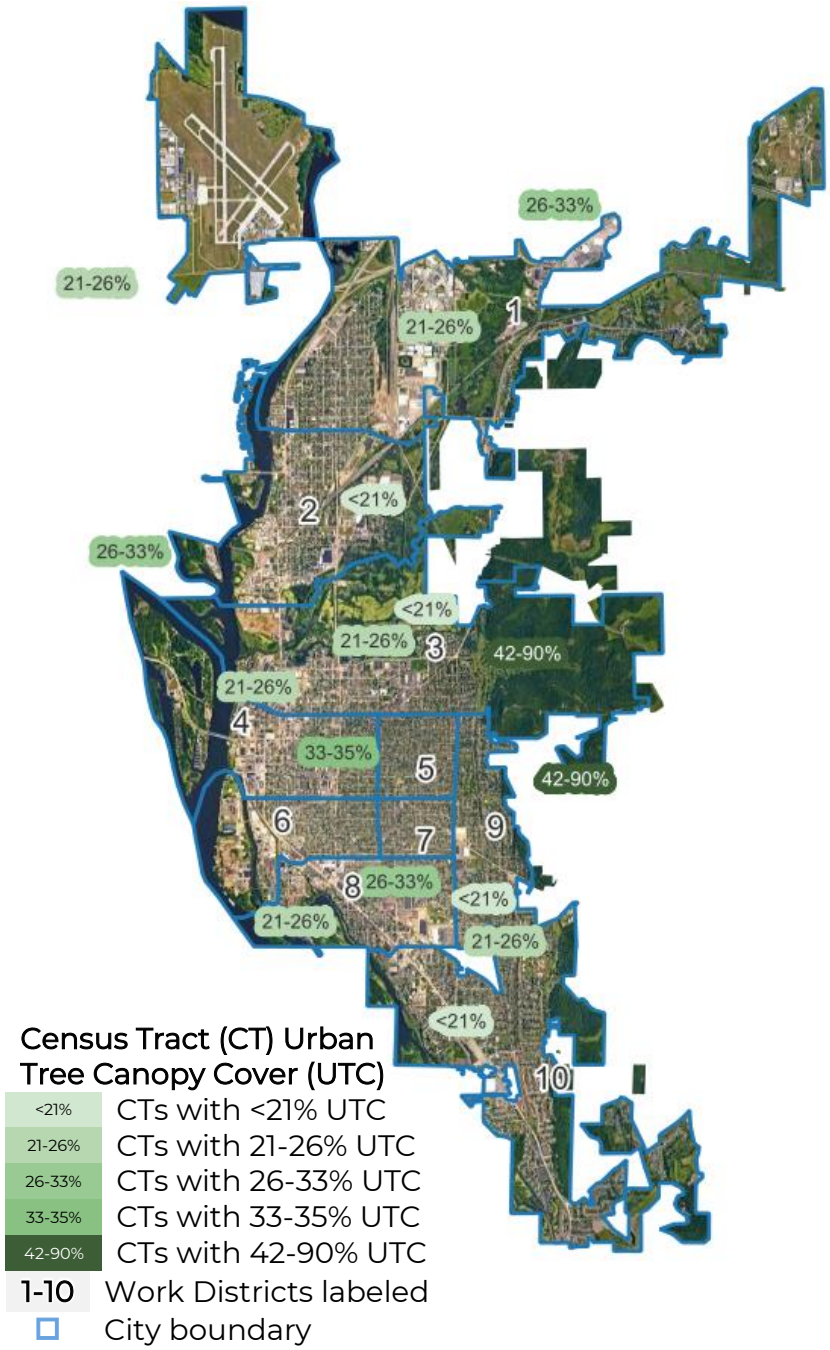


Figure 25. Map displaying City Work Districts and the canopy cover percentages of Census Tracts within La Crosse (Recreated with data from the 2022 Climate Action Plan study)

The Census Tract boundaries and the Word District boundaries do not align, therefore, the canopy cover by Work District includes a range of percentages since multiple CTs comprise or are within a Work District.

Work District	Existing Canopy %
1	21-33%
2	<21%
3	<21-90%
4	21-35%
5	33-90%
6	21-33%
7	<21-33%
8	<21-33%
9	21-90%
10	<21-26%

Table 6. Canopy cover ranges by Work District (Recreated from the 2022 Climate Action Plan study)

Since most Work Districts include multiple CTs, it is not clear the exact percentage of canopy cover in any of the 10 districts, but the table above provides some insights. For example, District 2 has less than 21% canopy cover, and most districts include a CT with less than 21% canopy cover except for District 5 which has a range of canopy cover of 33-90%.

Recommended Public Tree Removals

As part of the public tree inventory project and to develop the Urban Forest Management Plan, trees that are recommended for removal were recorded in the database. These public street trees and trees in Pettibone Park contribute to La Crosse's 30% overall canopy cover and once removed, will reduce this amount. Therefore, a strategy in the Plan aims to replant all removed public trees either onsite or at another location. By examining the number of trees recommended for removal by City Work District, the impacts and strategies for replanting were developed. View a map of the trees recommended for removal below.

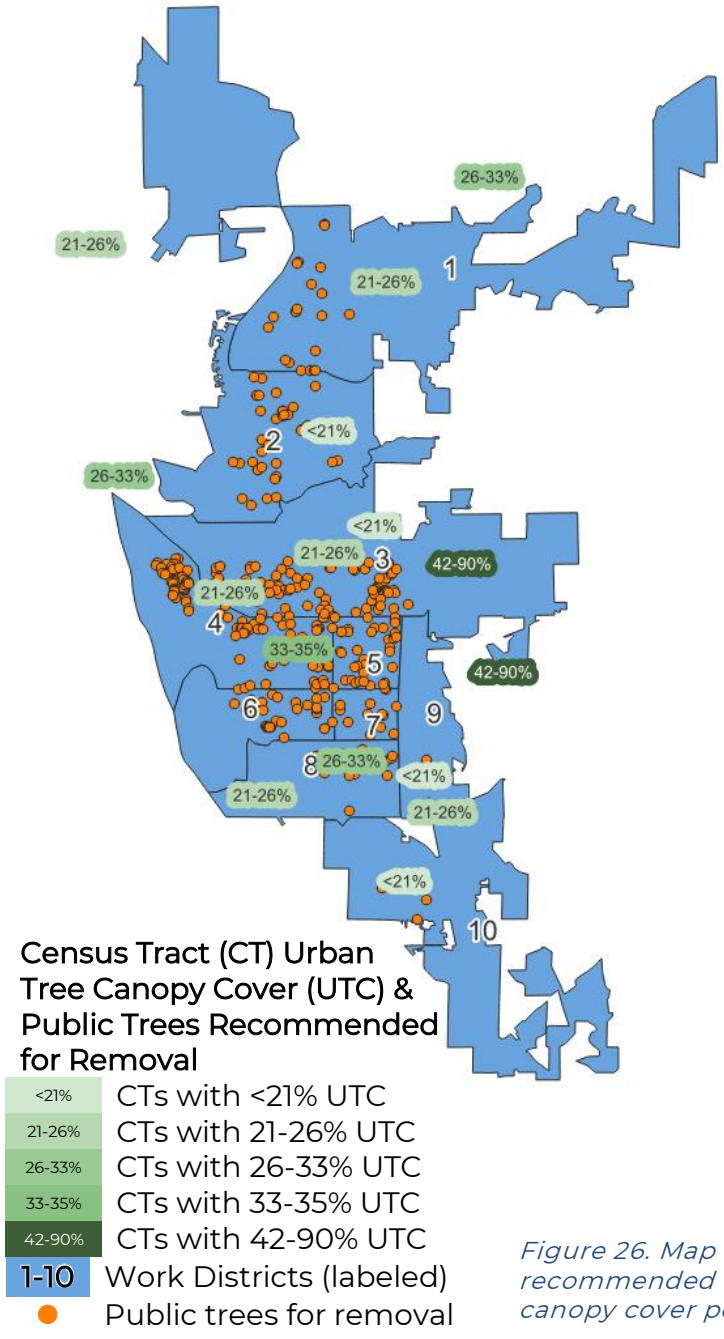


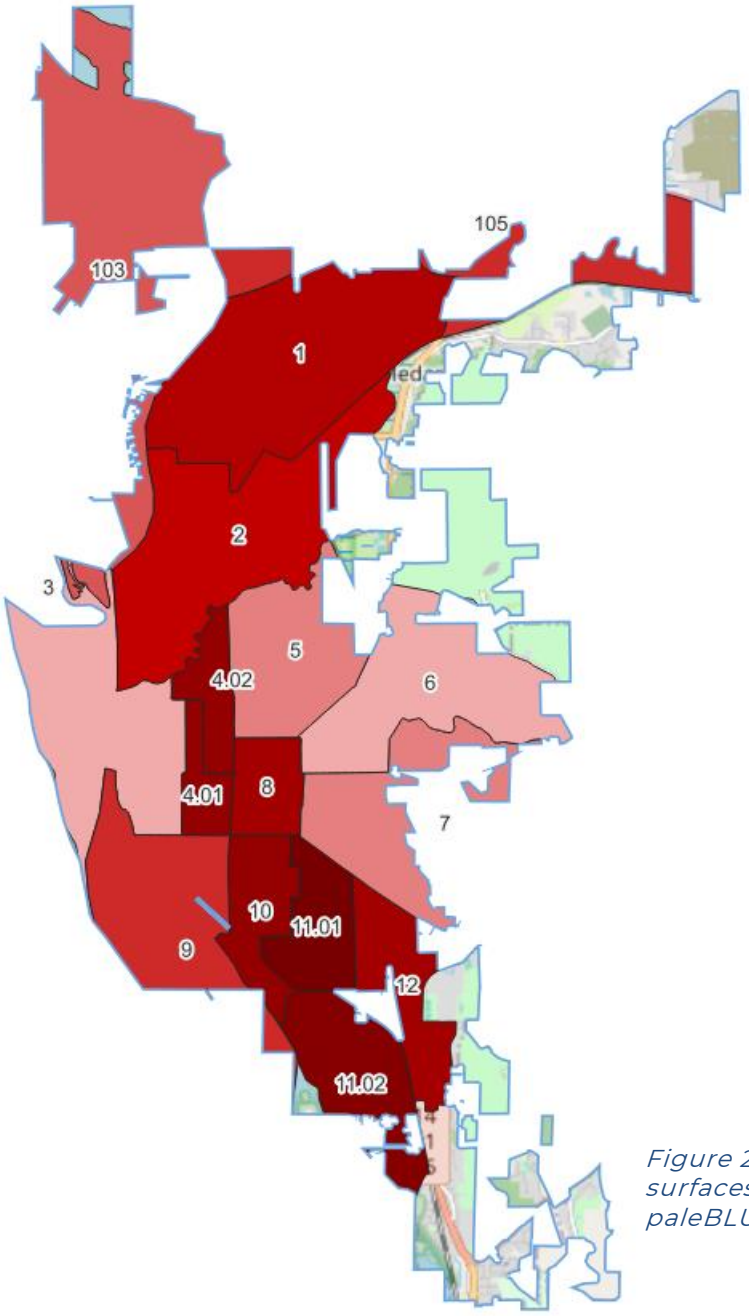
Figure 26. Map displaying the location of public trees recommended for removal by City Work District and the canopy cover percentages by Census Tracts

Table 7. Summary of tree canopy cover and public trees recommended for removal by City Work District

Work District	Existing Canopy %	# of Trees for Removal
1	21-33%	21
2	<21%	36
3	<21-90%	83
4	21-35%	105
5	33-90%	38
6	21-33%	29
7	<21-33%	12
8	<21-33%	17
9	21-90%	2
10	<21-26%	4
TOTAL	30% average	347 trees

As the table and figure show, a total of 347 public trees are recommended for removal based on the 2021 and 2023 inventories. Work District 4 has 105 trees for removal and the canopy cover ranges from 21 to 35%. Work District 9 only has two trees recommended for removal and a canopy coverage amount of 21 to 90%. In the "What do we want?" section, canopy goals by Census Tract and Work District along with public tree management impacts are summarized.

Urban Heat



Census Tract (CT) Urban Heat Impacts (temperature increase in degrees Fahrenheit)*

- <0.9
- 0.9 to 2.1
- 2.1 to 3
- 3 to 3.6
- 3.6 to 4.4
- 4.4 to 5.2
- 5.2 to 5.9
- 5.9 to 6.9
- 6.9 to 7.7
- 7.7 to 8.5
- >8.5
- ## Census Tracts (labeled)
- City Boundary

* The numbers shown below for each Census Tract represents the increase in summer temperatures that a city would experience if the entire region had impervious land characteristics identical to that Census Tract. For example, with the amount of impervious surfaces in Census Tract #10, the summer heat island contribution is an increase of 7.7 to 8.5 degrees in temperature. If the entire city has the same percentage of impervious surfaces as Census Tract #10, then the entire city would experience an increase in 7.7 to 8.5 degrees in the summer time due to the urban heat island effect (Source: paleBLUEdot LLC, 2022).

Figure 27. Heat island contribution of impervious surfaces by U.S. Census Tract (Recreated from paleBLUEdot LLC, 2022)

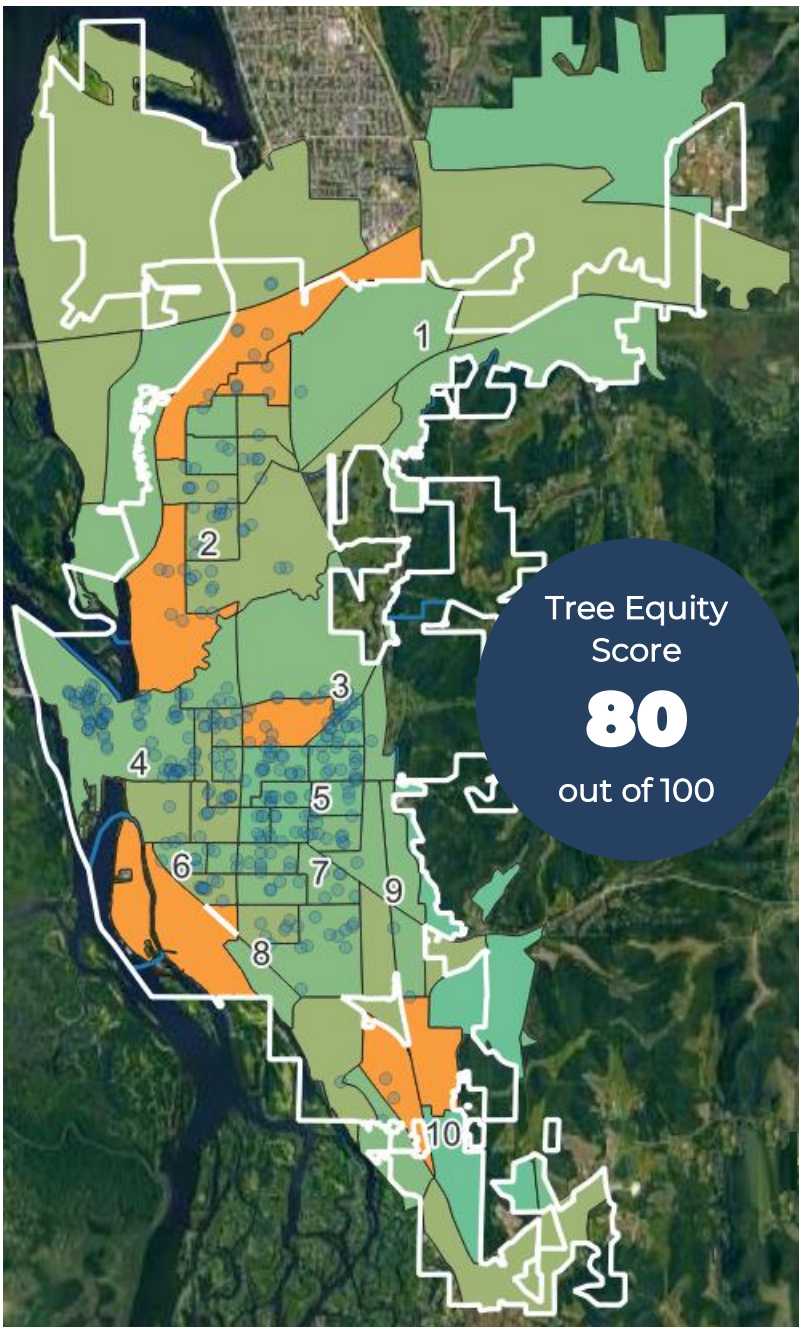
The 2022 study that supported the City's Climate Action Plan (paleBLUEdot LLC, 2022) included an analysis of impervious surfaces and heat islands by U.S. Census Tract (CT). According to the study, based on the amount of impervious surfaces and the urban heat island effect, the increase in temperature ranges from 1.7 degrees Fahrenheit in CT 3 to 10.1 degrees in CT 11.01 (view map above for reference). According to the 2022 study, the temperature increases by CT means that if the entire city were to have the same percentage of impervious surfaces as the respective CT, then the entire city would experience a summer temperature increase similar to the projections of that CT.

The strategies for maintaining and preserving existing canopy cover and adding new trees are based in part on this analysis of impervious surfaces and urban heat. The goals and strategies in the following section are a culmination of data analyses— public street trees, Pettibone Park trees, existing canopy cover, and urban heat projections.

Tree Equity Score

Tree canopy is often not distributed equitably across city landscapes and ownership types. The American Forests organization created the Tree Equity Score (TES, www.treeequityscore.org) tool to measure tree equity across 150,000 U.S. neighborhoods and 486 municipalities in urban areas. Each community's TES indicates whether there are enough trees for everyone to experience the health, economic, and climate benefits that trees provide.

The scores are based on how much tree canopy and surface temperature align with income, employment, race, age, and health factors. A 0- to-100-point system makes it easy to understand how a community is doing.



With the knowledge the score provides, La Crosse community leaders, tree advocates, and residents alike can address climate change and public health through the lens of social equity, attract new resources, factor the scores into technical decisions, guide implementation of the 2024 Urban Forest Management Plan, and track progress toward achieving tree equity.

A score of 100 represents tree equity. Based on a 2023 analysis, La Crosse's overall tree equity score is 80 out of 100. Based on the nationwide dataset for 197,505 U.S. Census-defined urban areas, the average score is 85 (as of 2023).

Figure 28. Map displaying the Tree Equity Scores for Census Block Groups in La Crosse (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

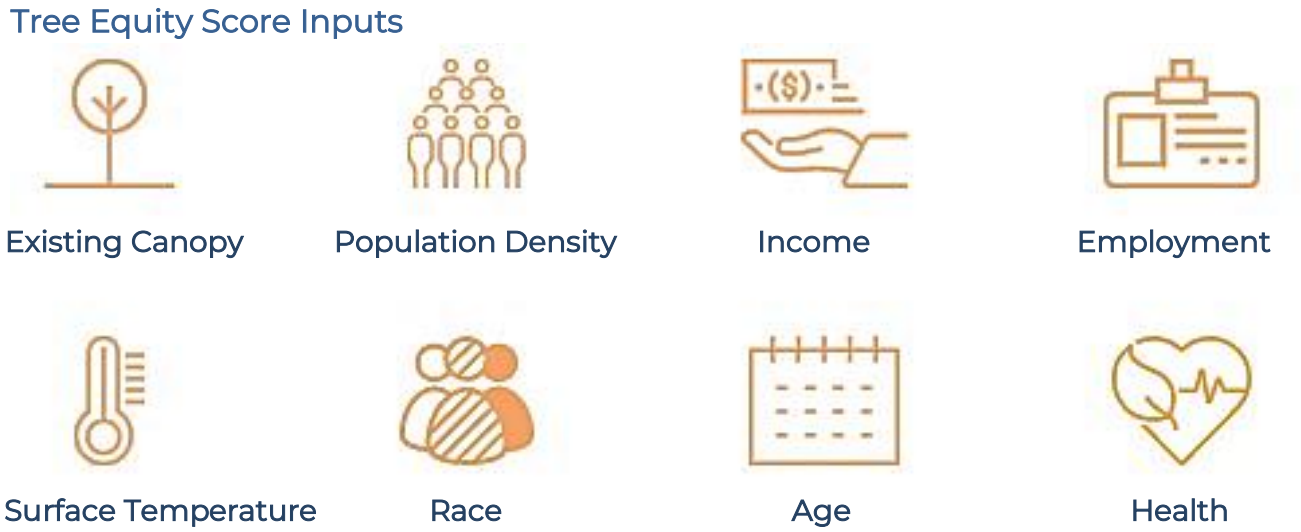


Figure 29. Inputs for La Crosse's Tree Equity Score (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

The map on the previous page displays the Tree Equity Scores for each U.S. Census Block Group within the City of La Crosse based on the data inputs listed in the figure above.

Tree Equity Score Comparisons

Compared to other cities in the state, La Crosse's Tree Equity Score of 80 is slightly above the average of 81 for 15 Wisconsin cities assessed as part of the study (see figure below) and is below the national average of 85 as of 2023. The score for La Crosse is based on a combination of metrics listed in the figure above for 567 Census Block Groups (CBG) comprising the City and averaged for a combined total score. The summaries on the following page provide insights into the distribution of canopy cover across 567 Census Block Groups and sociodemographic data including the proportion of people of color, people in poverty, and change in temperature by CBG. As the charts show, most CBGs are in the 80-89 score range (44%), CBGs with 70-87% people of color have 2% less canopy cover than the Citywide average, CBGs with 71-98% people in poverty have 3% less canopy cover, and CBGs with more than 10 degrees difference than the City average have 9% less canopy cover than the Citywide average. This data should be utilized in prioritizing public and private tree plantings to redress inequities and low canopy cover.

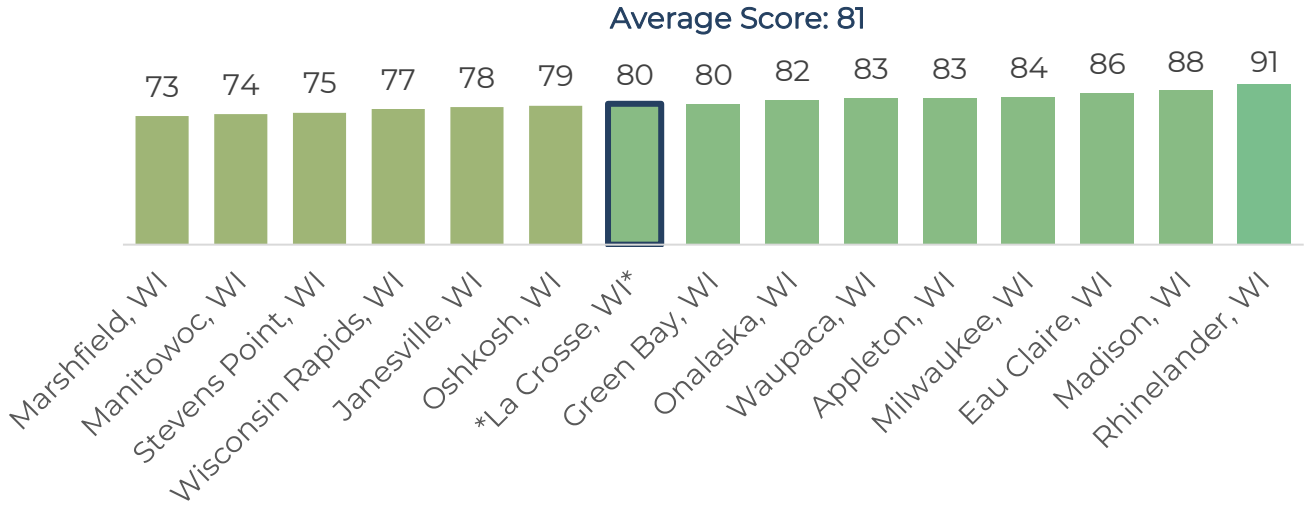


Figure 30. Comparison of Tree Equity Scores for select Wisconsin cities based on a 2023 study (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

Tree Equity Score Analysis

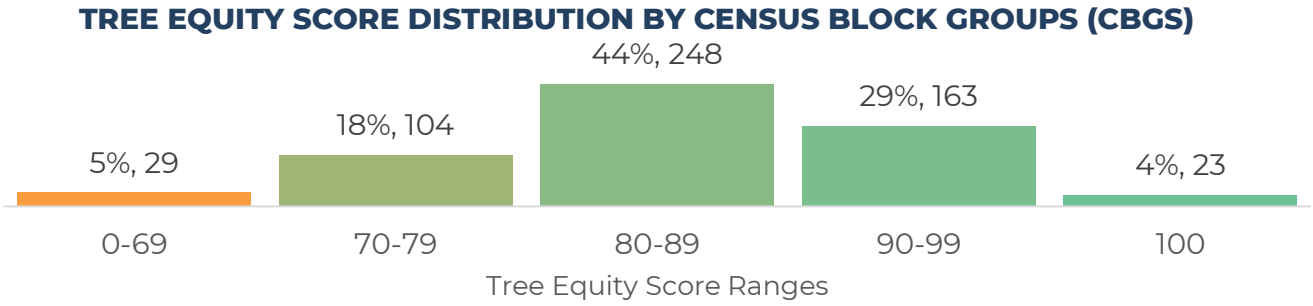


Figure 31. Count and percent of Census Block Groups by Tree Equity Score ranges (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

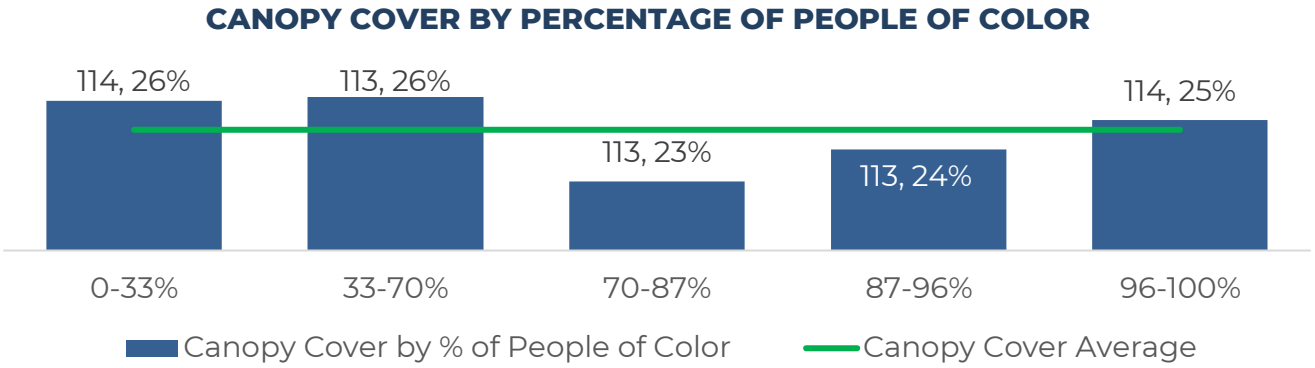


Figure 32. Canopy cover (%) and count of Census Block Groups by ranges of people of color (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

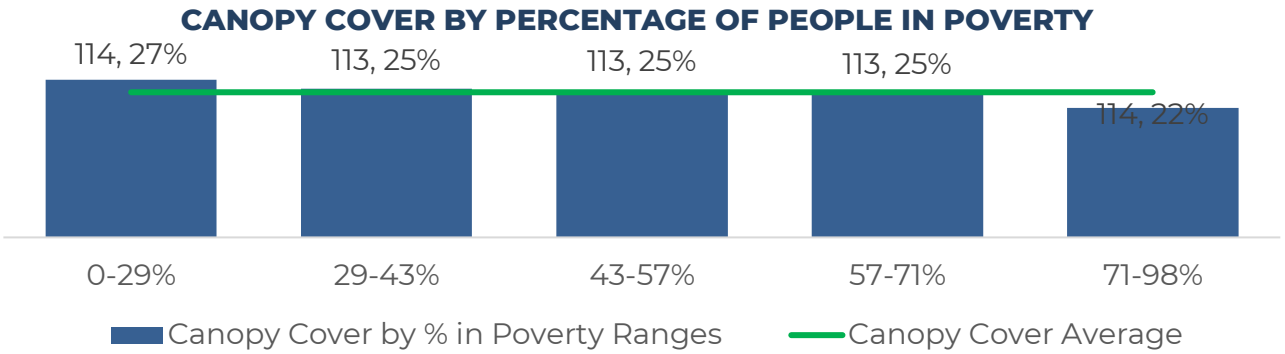


Figure 33. Canopy cover (%) and count of Census Block Grouups by ranges of people in poverty (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

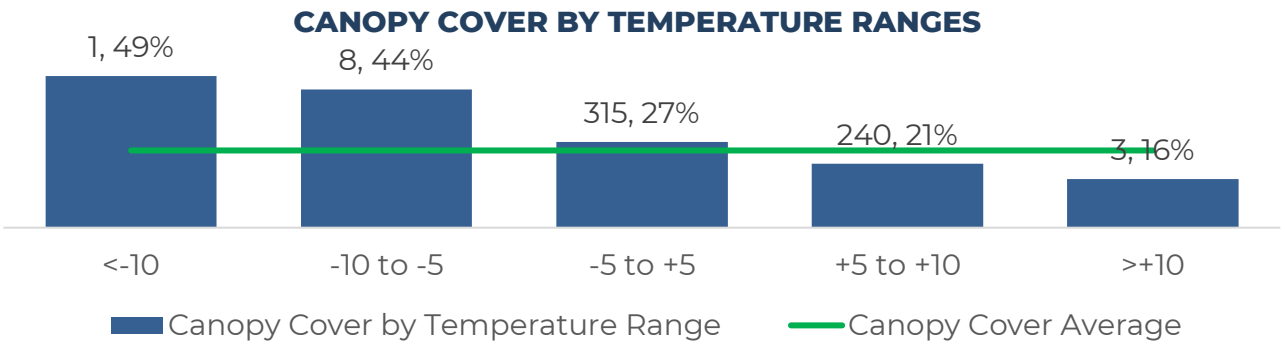


Figure 34. Canopy cover (%) and count of Census Block Groups by temperature ranges in degrees Fahrenheit (Source: American Forests' Tree Equity Score Tool, treeequityscore.org)

Summary

This section detailed the composition, structure, observations, and maintenance needs of public trees that line City streets and boulevards and the trees that are in maintained areas of Pettibone Park. While additional inventories should be completed to address all public parks, these datasets provide insights into current conditions, trends, and opportunities. In addition, the summary of canopy cover across all public and private boundaries connects the public tree management with the broader urban forest ecosystem.

The nearly 19,000 public trees that were inventoried are primarily maples, hackberries, honeylocusts, basswoods, elms, and crabapples. There are a wide variety of tree species being planted but several exceed the recommended threshold. There also still remains over 260 ash trees according to the 2023 analysis that are susceptible to emerald ash borer. In addition, pests and diseases were noted a number of other street and park tree species. Overall, the City could plant more trees to align the tree distribution with that of an ideal distribution for a continual flow of tree canopy cover and associated benefits. And, to maximize these benefits for the long-term, it is recommended that trees in fair condition be examined more closely to determine if it is feasible to improve the health and longevity of the trees. Lastly, the City should continue its proactive maintenance efforts to address the pruning needs identified during the inventory.

The analysis of the urban forest and the City's public tree population provides the foundation for measuring progress, communicating the resource with stakeholders, and establishing clear goals and priorities. The following section describes the goals and objectives based on current conditions, stakeholder priorities, industry standards and best practices, and the needs of La Crosse's trees.


WHAT DO WE
WANT?

Framework to Achieve the Vision for La Crosse's Urban Forest

Introduction

This section provides guidance and recommendations for the City of La Crosse to continue to provide high levels of service now and into the future over the next 10 years. The Urban Forest Management Plan's recommendations include those that may only take a few months and others that will require a coordinated effort that may need to continue on beyond the 10-year timeframe.

Plan Vision Statement

"Healthy Trees, Healthy City: Our vision for La Crosse's urban forest is to cultivate a thriving, diverse, and well-maintained tree canopy that enhances the livability, health, and sustainability of our community for current and future generations."

Goals, Strategies, and Actions

A series of guiding principles supported by goals, strategies, and actions are provided to serve as a 10-year roadmap toward the urban forest vision. Strategies and priority actions are detailed in the "How do we get there?" section.

Vision

What does the urban forest and its programs look like 10 years from now?
The vision guides direction on where La Crosse is headed and helps guide recommendations for the future.

Goals

How do we achieve our principles and vision?
The goals are specific opportunities for the City to move toward the 10-year vision.

Strategies

What is the approach to take?
Strategies provide the general direction or method to take to achieve the goals.

Priority Actions

What is the next step?
This is the prioritized list of steps to take.

Figure 35. Description of the long-term framework for La Crosse's Urban Forest Management Plan

Overview of the Guiding Principles and Goals

La Crosse's Urban Forest Management Plan was designed to guide the City in managing, protecting, and growing its urban forest, with a focus on the public tree population. The goals, strategies, and priority actions were developed based on research and analysis of available data, extensive stakeholder engagement, and an evaluation of urban forest standards and best practices. The resulting goals and recommendations address the current conditions, existing and potential challenges, and shared priorities described in previous sections of the Plan. The long-term framework supports the shared vision for La Crosse's urban forest.

To achieve the vision for the urban forest, a Citywide canopy cover goal was established in La Crosse's 2022 Climate Action Plan. This goal serves as the cornerstone metric for tracking progress in implementing the Urban Forest Management Plan. This Plan focuses on the public trees' impact on the Citywide canopy cover goal.

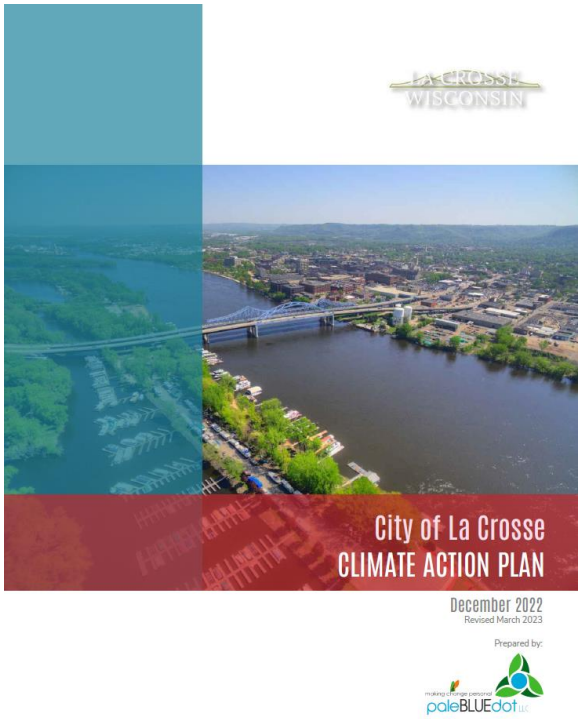


Figure 36. The City of La Crosse's 2022 Climate Action Plan included a canopy cover study and strategies to increase canopy cover

The canopy goal embodies the City's commitment to sustainability and community well-being. This metric can be used by the City for tracking and monitoring the urban forest and it resonates with residents, creating a tangible and shared vision of a lush and vibrant urban environment. Moreover, the canopy cover goal aligns with other goals and priorities in the City such as environmental stewardship, climate change resilience, public health, air quality enhancement, and temperature moderation. By using canopy cover as an overarching measure, La Crosse ensures a comprehensive approach that not only improves the urban ecosystem but also fosters a sense of pride, unity, and responsibility among its residents.

Based on the City's Climate Action Plan, 30% of the City is shaded by the canopy of trees that comprise La Crosse's urban forest. The Climate Action Plan or CAP and the supporting canopy study (paleBLUEdot LLC, 2022) included recommended canopy cover goals. Strategy GS 1 in the CAP calls for the City to "increase community-wide tree cover from 30% to 32.5% by 2030 and 35% by 2040."

Strategy GS 1

"Increase community-wide tree cover from 30% to 32.5% by 2030 and 35% by 2040."

City of La Crosse Climate Action Plan
December 2022, Rev. March 2023

The following section provides a summary of the urban forest's role along with recommended canopy goals for the public tree population and it describes how public tree management guided by this UFMP can support the citywide goals of 32.5% and 35% canopy cover.

Detailing the Urban Forest Management Plan's Alignment with the Climate Action Plan

The alignment of the Urban Forest Management Plan with the Climate Action Plan represents a strategic and comprehensive approach to foster a sustainable urban forest, while effectively addressing climate change challenges. This integration ensures that the strategies and actions of both plans support and reinforce each other, leading to a more cohesive and impactful effort.

The Urban Forest Management Plan's strategies to expand canopy cover and to ensure public trees reach their maximum potential will contribute to the carbon sequestration goals of the Climate Action Plan. By expanding and maintaining the urban tree canopy, La Crosse will increase its capacity to absorb atmospheric carbon dioxide, a key step in reducing the City's overall greenhouse gas emissions.

Strategies in the Urban Forest Management Plan also impact the urban heat island effect, a significant concern in La Crosse's Climate Action Plan. By increasing tree coverage in heat-prone areas and in areas with the greatest amount of impervious surfaces, the City aims to reduce local temperatures, thereby enhancing the comfort and health of its residents, especially during hotter seasons. This will also reduce the energy demand for cooling, aligning with the City's goals for energy efficiency and conservation.

Air quality improvement is another area of synergy. Trees are natural air filters, and their increased presence in La Crosse will contribute to cleaner air, aligning with the Climate Action Plan's strategies to reduce pollution and promote public health. This is particularly important in urban areas where traffic and industrial activities can compromise air quality. Also, high temperatures can also impact the dispersal of air pollutants. The canopy of trees cooling the air reduces the impact and cooling of the air can also reduce asthma-causing conditions.

The management of stormwater runoff is a crucial aspect where these plans intersect. The Urban Forest Management Plan prioritizes tree planting in areas prone to flooding and runoff. This will not only help in managing increased rainfall events, predicted under climate change scenarios, but also protect water quality, aligning with environmental conservation goals.

The Urban Forest Management Plan also focuses on tree species diversity and resilience, ensuring that La Crosse's urban forest can withstand the impacts of a changing climate. This involves selecting species that are resilient to pests, diseases, and extreme weather conditions, thereby contributing to the long-term sustainability of the urban forest.

Community engagement and education are also key components where these plans converge. By involving local communities in tree planting and maintenance, La Crosse aims to raise awareness about the importance of urban forests in climate mitigation and adaptation. This grassroots approach not only fosters community stewardship of the environment but also promotes broader public support for the City's climate goals.

The integration of the Urban Forest Management Plan with the Climate Action Plan ensures these plans are mutually reinforcing and leverage limited resources. The following describes the public tree's impact on canopy cover goals and other related goals to grow a healthier, more resilient, and sustainable urban forest for La Crosse.

Public Tree Canopy Goals to Support the Citywide Goal

Table 8. Tree canopy cover goal scenarios for public trees

10-year Canopy Goal Scenario	New Canopy % (30% currently)	Total Trees Added	Total Added Benefits	Total Carbon Seq. (lbs)*	Average Trees Per Year	Estimated Annual Cost	Estimated 10-Year Cost
A) 1:1 replacement	30.1%	347	$6,439	64,886	35	$12,839	$128,390
B) 2:1 replacement	30.1%	694	$11,691	86,514	69	$25,678	$256,780
C) 3:1 replacement	30.2%	1,041	$23,332	194,657	104	$38,517	$385,170
D) 4:1 replacement	30.2%	1,388	$25,758	259,542	139	$51,356	$513,560
E) 5:1 replacement	30.3%	1,735	$32,197	324,428	174	$64,195	$641,950
F) 5% canopy increase	35.0%	28,750	$533,528	5,375,963	2,875	$1,063,750	$10,637,500
G) 0:1 replacement	29.2%	(4,850)+	($90,004)	(906,902)	(485)	($179,450)	($1,794,500)

* Seq. = sequestered. Based on i-Tree research (itreetools.org). + Parentheses "( )" indicate a negative value.

Table 9. Inputs and considerations for drafting public tree canopy goal scenarios

	INPUTS			
10-year Canopy Goal Scenario	% large-statured trees at maturity to be planted	% small-statured trees at maturity to be planted	Implementation timeframe (years)	Average planting cost per tree*
A) 1:1 replacement	75% Large Statured	25% Small Statured	10 years	$370
B) 2:1 replacement	75% Large Statured	25% Small Statured	10 years	$370
C) 3:1 replacement	75% Large Statured	25% Small Statured	10 years	$370
D) 4:1 replacement	75% Large Statured	25% Small Statured	10 years	$370
E) 5:1 replacement	75% Large Statured	25% Small Statured	10 years	$370
F) 5% canopy increase	75% Large Statured	25% Small Statured	10 years	$370
	INPUTS			
	Acres of canopy loss per year	Average surface area of tree	Implementation timeframe (years)	Average planting cost per tree*
G) 0:1 replacement	14 acres	1,256.6 square feet	10 years	$370

* Boulevard tree purchase and installation cost for subcontracted services provided by La Crosse Parks & Forestry Coordinator in December 2023.

As shown in the previous tables, a series of canopy goal scenarios were developed for the City's consideration. Setting canopy cover goals for public trees will support the efforts to achieve a Citywide canopy cover goal of 32.5% by 2030 and 35% by 2040 as recommended in La Crosse's Climate Action Plan.

According to the tables, seven scenarios are shared for consideration. Most scenarios provide a recommendation to proportionally replant trees wherever a public street, boulevard, or park tree (in maintained areas) is removed. The replacement tree may be replanted at the site of the removal or offsite when appropriate. Based on the 2021 street and boulevard tree inventory and the 2023 inventory at Pettibone Park, a total of 347 trees are recommended for removal. Using 347 as a baseline for the removal-replacement scenarios, the following public tree canopy goal scenarios are offered for consideration:

A) **1:1 replacement –** One tree is planted for each public street tree or park tree removed. Requires a total of 347 trees over a 10-year period or 35 trees per year. Based on an estimated contracting cost of $370 per tree (purchase and installation, provided by the City of La Crosse in December 2023), the annual cost is $12,839 or $128,390 over a 10-year period (based on 2023 US Dollars). **Results in a 0.1% increase in canopy cover Citywide and $6,439 in added annual ecosystem benefits.**

B) **2:1 replacement –** Two trees are planted for each public tree removed. Requires a total of 694 trees over a 10-year period or 69 trees per year. Annual costs are estimated at $25,678 or $256,780 over a 10-year period. **Results in a 0.1% increase in canopy cover Citywide and $11,691 in added annual ecosystem benefits.**

C) **3:1 replacement –** Three trees are planted for each one public tree removed. Requires a total of 1,041 trees over a 10-year period or 104 trees per year. Annual costs are estimated at $38,517 or $385,170 over a 10-year period. **Results in a 0.2% increase in canopy cover Citywide and $23,332 in added annual ecosystem benefits.**

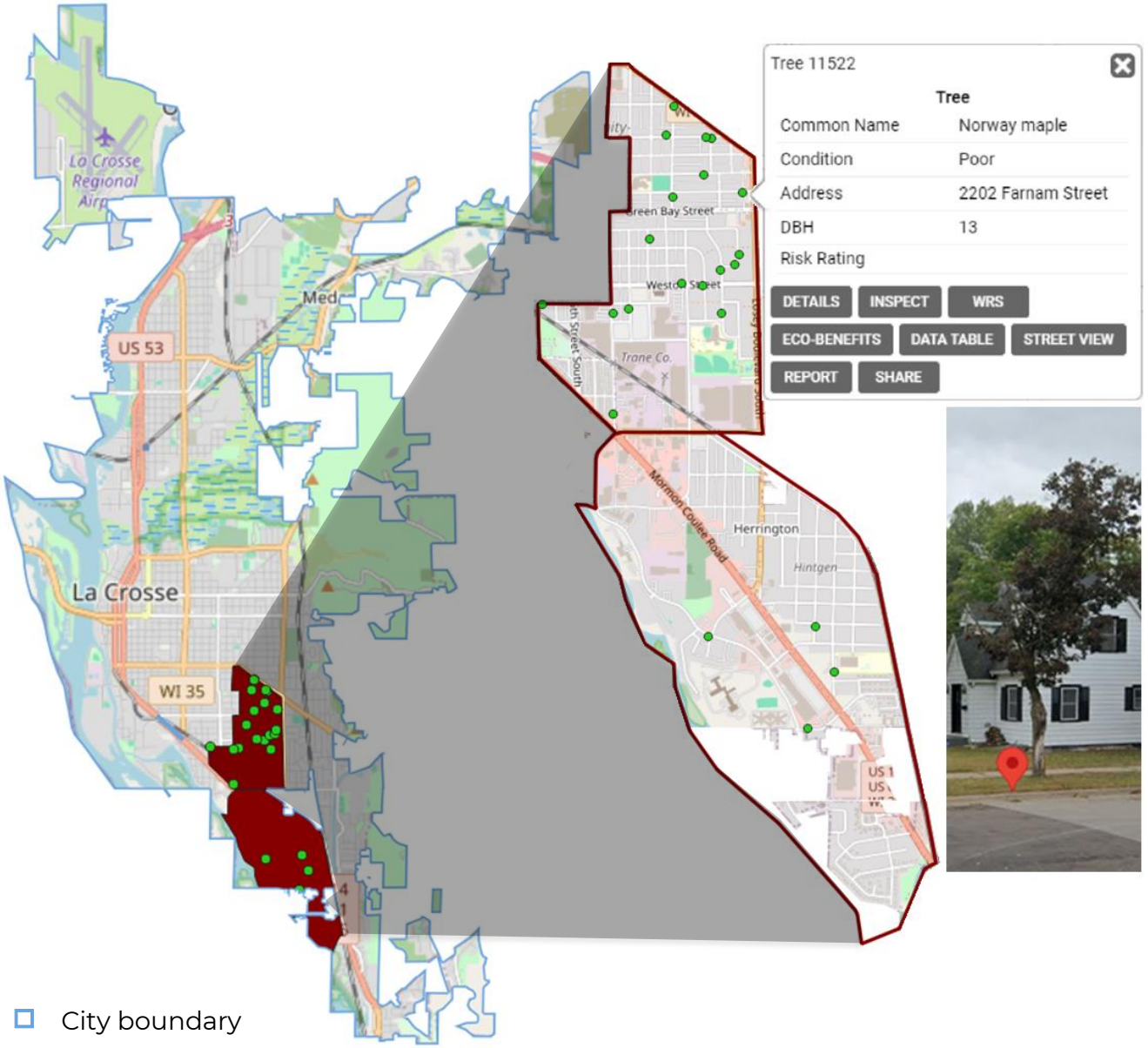
D) **4:1 replacement –** Four trees are planted for each public tree removed. Requires a total of 1,388 trees over a 10-year period or 139 trees per year. Annual costs are estimated at $51,356 or $513,560 over a 10-year period. **Results in a 0.2% increase in canopy cover Citywide and $25,758 in added annual ecosystem benefits.**

E) **5:1 replacement –** Five trees are planted for each public tree removed. Requires a total of 1,735 trees over a 10-year period or 174 trees per year. Annual costs are estimated at $64,195 or $641,950 over a 10-year period. **Results in a 0.3% increase in canopy cover Citywide and $32,197 in added annual ecosystem benefits.**

F) **5% canopy increase –** A total of 28,750 trees are required over a 10-year period or 2,875 trees per year. Implementing this scenario would also require a "no-net-loss" approach for public trees. Annual costs are estimated at $1,063,750 or $10,637,500 over a 10-year period. **Results in public trees contributing a 5% increase in canopy cover Citywide and $533,528 in added annual ecosystem benefits.**

G) 0:1 replacement – No trees are replanted for any public tree removed. The scenario is provided as a hypothetical situation in which no resources are committed to tree planting in public spaces. **Results in a loss of 0.8% canopy cover and $90,004 in opportunity benefits.** Based on an average of 14 acres of canopy loss per year and an average surface area of 1,256.6 square feet for a single tree (canopy diameter of 40 feet).

Priority Planting Areas in Public Spaces



- City boundary
- Public tree recommended for removal
- Recommended Priority Census Tract (<21% canopy, urban heat index of 7.7 or greater)
- Priority Census Tract (<21% canopy, urban heat index of 7.7 or greater) to show location of public tree recommended for removal within a recommended priority area

Figure 37. Example of a priority planting area located at a site where a public tree is recommended for removal (Source of data: City of La Crosse Climate Action Plan and 2021 public tree inventory)

By identifying priority planting areas to achieve the canopy goal for public spaces like boulevards and parks, tree planting and maintenance can be strategically targeted where trees will have the most beneficial impact. The figure above provides an example of prioritizing replanting in Census Tracts that have less than 21% canopy cover and an urban heat index of 7.7 or greater (paleBLUEdot LLC, 2022). Census Tracts 11.01 and 11.02 meet this criterion and within these two tracts there is a combined total of 22 public street or boulevard trees recommended for removal. The following section details the goals and strategies that support the Climate Action Plan and the long-term vision for the urban forest.

Data- and Stakeholder-driven Goals

During the analysis of data, collection of information, and gathering of stakeholder input, a series of overarching themes and shared goals emerged that helped to set the Plan's direction and solidify its foundation. The following five themes and corresponding goals summarize the priorities and are reinforced by the feedback received from internal stakeholder engagement sessions. These priorities along with the tree management worksheets will guide the City's public tree management program over the next 10 years to support a vision for a sustainable urban forest in La Crosse.

1) Tree Planting

Goal: Increase the tree canopy coverage citywide, thereby contributing to environmental sustainability, enhancing local biodiversity. This goal will focus on planting a diverse range of tree species, suitable for the region's climate and soil conditions, to create a sustainable urban forest.

2) Tree Maintenance

Goal: Strengthen the comprehensive public tree maintenance program to support public safety, long-term sustainability, and health of our urban forest. This will be achieved by conducting regular and thorough tree health assessments, preserving and rejuvenating public tree condition, and implementing proactive measures against potential threats. Achieving these outcomes requires systematic pruning of boulevard trees and trees in maintained areas of public parks.

3) Administration

Goal: Foster a culture of innovation, collaboration, and adaptability, ensuring the program remains responsive to changing environmental conditions and community needs. The focus is on developing a holistic approach that seamlessly integrates all aspects of the program, from administrative efficiency and balancing priorities to community involvement while maintaining a strong commitment to public safety, environmental stewardship, and urban ecological health.

4) Regulation

Goal: Preserve tree canopy cover and the urban forest through sound but fair policies and regulations that align with shared priorities in the City and best practices. Our tree canopy will be enhanced by facilitating the planting of diverse and climate-resilient tree species while implementing more stringent regulations on tree removals to protect and preserve existing green spaces.

5) Engagement

Goal: Foster tree stewardship in our community through equitable and impactful community education and engagement. An engaged and educated community expands our capacity to sustainably manage the urban forest and offers opportunities for access to our natural environment.

Source: WIZM News Talk, April 2021

HOW DO WE GET THERE?

Plan Implementation: Strategies and Actions

Implementing an urban forest management plan effectively after it is approved or adopted requires a committed group or team— likely consisting of members from the city and from the community— that organizes, manages, monitors, reports, and adjusts strategies and actions using an adaptive management approach. This approach is a structured, iterative process of robust decision making in the face of uncertainty and as changes to programs and resources arise. The goal of this approach is to reduce the uncertainty over time through systematic monitoring and to ensure the plan remains relevant and impactful.

For La Crosse's 2024 Urban Forest Management Plan, the goals and strategies detailed in the "What do we want?" section were informed by the tree canopy and public tree inventory data, stakeholder input, reviews of existing plans and policies, and the alignment with industry standards and best practices that were detailed in the "What do we have?" section. With this framework, the roadmap to achieve the goals and strategies is provided in this section, "How do we get there?" by detailing the recommended or priority actions and the supporting guidance that follows the five themes and goals:

Primary Themes for La Crosse's Urban Forest Management Plan's Goals

1) Tree Planting
2) Tree Maintenance
3) Administration
4) Regulation
5) Engagement

Each section includes the goal statement as a reminder of how the recommended or priority action supports the Plan's long-term framework. Each action listed in the section includes a reference to the strategy number as well. In addition to the actions or steps described in this Plan, a supporting worksheet was provided to support the implementation of these actions.

Lastly, an icon and a reference number are provided for the following strategies or actions that directly support or build off of the strategies in the City's Climate Action Plan:

: This icon symbolizes a goal or strategy that supports the City's Climate Action Plan.

"GS1-2": The reference number at the end of a strategy indicates alignment with the City's Climate Action Plan's strategy.

Additional Climate Action Plan Achievements

Urban forests and trees are a dynamic ecosystem and being so, they have multifaceted functions and can benefit La Crosse in various ways. Several of the Urban Forest Management Plan's strategies include a reference to a strategy in the City's Climate Action Plan. In addition to these, there are several other Climate Action Plan strategies that will be complemented by the implementation of the Urban Forest Management Plan. These additional Climate Action Plan strategies are listed in the following table.

Climate Action Plan (CAP Strategy #	CAP Strategy	UFMP Strategy Supporting the CAP Strategy
✪BE-1	Reduce community-wide residential, commercial, educational, and industrial building energy consumption by 15% by 2030.	UFMP Tree Planting Strategies
✪BE5-5	Use green infrastructure and other nature-based approaches (e.g., floodplain restoration) to reduce the vulnerability of buildings to flooding, with particular focus on critical facilities (e.g., hospitals, schools, police/fire stations, etc.).	UFMP Tree Planting Strategies
✪LH4-1	Based on the City's Ground Cover, Tree Canopy, Heat Island, and Carbon Sequestration Study, identify vulnerable urban tree canopy and street tree sections and develop policies to incentivize, encourage, or require strategic tree planting for heat island mitigation (e.g., around heat islands and in areas that need air conditioning such as schools or city facilities).	UFMP Tree Planting and Regulation Strategies
✪LH 4- 2	Add or modify park and boulevard plantings with a priority focus on areas with high heat island potential and those currently underserved by park and green space.	UFMP Tree Planting Strategies
✪LH 4- 3	Decrease impervious surfaces to mitigate heat island effects, especially in neighborhoods with a high proportion of vulnerable populations.	UFMP Tree Planting Strategies
✪LH 4- 4	Increase maintenance to sustain mature tree canopy, decrease tree hazards and delay tree replacement needs.	UFMP Tree Maintenance Strategies
✪LH 3- 5	Enhance stormwater system plans and infrastructure to handle an increase in severe weather events based on climate change projections rather than historic trends.	UFMP Tree Planting Strategies
✪HS 1- 4	Incorporate climate change and CAP goals into the Community Health Improvement Plan and Health Impact Assessments.	UFMP Tree Planting and Tree Maintenance Strategies
✪E1	Capture local economic potential of climate action.	UFMP Tree Planting and Tree Maintenance Strategies

Table 10. List of additional strategies in the City's Climate Action Plan that the Urban Forest Management Plan supports

1) Tree Planting Implementation and Guidance

Goal: Increase the tree canopy coverage citywide, thereby contributing to environmental sustainability, enhancing local biodiversity. This goal will focus on planting a diverse range of tree species, suitable for the region's climate and soil conditions, to create a sustainable urban forest.

Goal 1 Strategies

- 1A) Increase community-wide tree cover from 30% to 32.5% by 2030 and 35% by 2040 (350 acres added by 2030, 700 acres added by 2040). ✪GS1
- 1B) Plant shade trees around municipal buildings to reduce indoor cooling needs, and around parks, playgrounds, and other outdoor spaces to reduce outdoor temperatures. ✪GS1-2
- 1C) Increase street tree planting along bicycle routes to provide comfortable, shaded travel, especially in low-income and minority neighborhoods. ✪GS1-5
- 1D) Identify public property that could be converted to forest instead of lawns. ✪GS1-6
- 1E) Set a percentage maximum of each City-planted tree species to improve diversity, with an emphasis on species that are well-suited to future climate conditions. ✪GS2-6
- 1F) Develop neighborhood tree goals and create guidance and training to increase community stewardship of trees (e.g., opportunities for residents to learn about and take care of their neighborhood trees). ✪GS1-7

Recommended Priority Actions for Tree Planting

1) *Support the community-wide canopy goal by reviewing and committing to a tree canopy goal for public spaces.* Begin by reviewing the scenarios in the UFMP (refer to the Framework to Achieve the Vision for La Crosse's Urban Forest section).
2) *Formalize a tree planting initiative for public spaces.* To grow an urban forest that is sustainable and resilient to climate change, pests and diseases, and urban development pressures, a strategic planting initiative guided by short- and long-term canopy goals and planting targets is needed. The UFMP and the Climate Action Plan contain data that will support this initiative. For example, an example of identifying priority planting areas in public spaces is provided in the UFMP and in the Climate Action Plan's supporting study, "Ground Cover, Heat Island and Carbon Sequestration Study" (paleBLUEdot LLC, 2022), Appendix A2, "Climate Adaptive Tree Species" provides climate change projections and the vulnerability ratings for common tree species in La Crosse.
3) *Conduct a high-resolution tree canopy assessment as an update and periodically reassess canopy cover to monitor changes and trends.* The 2022 canopy study that informed the City's Climate Action Plan utilized a point-sampling technique. An updated high-resolution canopy assessment utilizes GIS, image analyst, and other techniques to more accurately assess tree canopy cover. The assessment should include identifying possible planting areas by themes such as areas for reducing stormwater or energy usage.

2) Tree Maintenance Implementation and Guidance

Goal: Strengthen the comprehensive public tree maintenance program to support public safety, long-term sustainability, and health of our urban forest. This will be achieved by conducting regular and thorough tree health assessments, preserving and rejuvenating public tree condition, and implementing proactive measures against potential threats. Achieving these outcomes requires systematic pruning of boulevard trees and trees in maintained areas of public parks.

Goal 2 Strategies

- 2A) Incorporate consideration of climate change impacts into forest management plans and practices to increase climate resilience, retain biodiversity, and ensure continued ecosystem function and services. ✪GS24-1
- 2B) Implement and strategize improved pruning and maintenance cycles on the City-managed public trees.
- 2C) Develop a young tree pruning and watering program.
- 2D) Continue to request and secure funding for necessary tree equipment and technology.

Recommended Priority Actions for Tree Maintenance

1) *Formalize a five-year Public Tree Management Program.* Base the program on the tree inventory data, service request demands, tree emergency response, and the guidance provided in the UFMP. It is recommended that the City utilize the 10 City Work Districts to strengthen its programmed pruning cycle for public trees.
2) *Design the Public Tree Management Program to reduce tree risk and address tree removals.* Establish protocols that prioritize tree removal and pruning, and to improve tree health and structure through proactive pruning cycles. Reducing risk and implementing an updated Public Tree Management Program should include protocols for managing emerald ash borer and the remaining 264 ash trees in the inventory.
3) *Increase public tree maintenance and management capacity*. Utilize the supporting study to this UFMP for building a budget request for increased capacity. Achieve this through a combination of interdepartmental trainings, community tree stewardship training programs, contracted services, more in-house tree maintenance crews, internship and seasonal assistance, and partnerships. The Tree Management Program requires dedicated staff, resources, and equipment to support a safe and healthy work environment. Implementation of regular training, certifications, and continuing education credits ensures that the Urban forestry staff are aware of industry standards and use best management practices on a day-to-day basis.
4) *Update and maintain the public tree inventory.* As maintenance, removals, and plantings occur, update the database to reflect the changes. Establish protocols for data management and workflows across departments, programs, and contractors.

Supporting Details

TREEPLOTTER MAP

La Crosse's public tree inventory data can be easily accessed by any device that supports internet or cellular data at www. www.pg-cloud.com/LaCrosseWI/. Using this mapping tool, the City can focus on varying neighborhoods and areas for maintenance by utilizing the filters to showcase the most critical tree removal and pruning needs.

TREE MANAGEMENT PRIORITIZATION WORKBOOK:

This workbook provides the full inventory delivery, tree lists detailing priority removals and maintenance, and the inventory analysis results. Guidance is provided in the first tab with links for easy navigation throughout the workbook. The table below summarizes the tree maintenance and removal prioritization criteria and process:

La Crosse Public Tree Management Prioritization Parameters		
Priority Ranking	**Filters Applied**	**Justification**
Priority 1 **Immediate Removal**	Status = Dead, or Condition = Dead	These trees are the most critical to address first in maintenance to reduce risk and create new planting spaces.
Priority 2 **Removal**	Status = Alive Condition = Poor Tree Work = Remove	Trees that have the potential to be a high risk and need to be maintained.
Priority 3 **Routine Maintenance** **(5-year cycle)**	Diameter at Standard Height (DSH) >6" Status = Alive Condition ≠ Dead or poor Tree Work ≠ Remove	These trees require routine maintenance to maintain their health over time. **13,024 trees are eligible** (as of September 2023)
Priority 4 **Young Tree Pruning** **(3-year cycle)**	DSH <6" Status = Alive Condition ≠ Dead or poor Tree Work ≠ Remove	These are young trees and are being maintained to reduce future structure and pruning issues in the future. **4,997 trees are eligible** (as of September 2023)

Table 11. Summary of the public tree maintenance and removal prioritization criteria and process

The Public Tree Management Prioritization Workbook provides an in-depth five-year guide for tree work according to the tree inventory data results and the prioritization analysis. The entire workbook is based on estimated costs for tree work locally. It is categorized by maintenance priority and DSH class for a detailed understanding of where program resources are or should be allocated. Included in the budget are annual tree planting costs to replace planned and anticipated tree removals.

Table 12. Recommended public tree management priorities, counts, and timing

Priority Task	Counts	Description	Timing
Priority 1	52	Total Priority 1 tree removals	Years 1-3
Immediate Removal	17	Trees per year	
Priority 2	295	Total Priority 2 tree removals	Years 3-5
Removal	98	Trees per year	
Priority 3	13,024	Total Priority 3 tree pruning	5-year cycle
Routine Pruning (>6")	2,605	Trees per year	
Priority 4	4,997	Total Priority 4 young tree pruning	3-year cycle
Young Tree Pruning (<6")	1,666	Trees per year	
Priority 5	347	Total stumps removed	5-year cycle
Stump Removal	50	Stumps per year	

As shown in the table above, the Public Tree Management Prioritization Workbook identified five priority levels beginning with immediate and necessary tree removals, routine pruning for established and newly planted trees, and stump removals. The counts are based on the City's public tree inventory as of September 2023. The workbook includes a section for inputs to update the tree counts which in turn updates the prioritization counts. By implementing this recommended five-year Public Tree Management Program, within three years the 52 immediate removals will be addressed, 98 other removals will occur in years three through five, a total of 2,605 established trees are pruned per year, and 1,666 young trees are pruned for structure and health annually. Based on the removals and the recommendation to replant where removals occur, a total of 50 stumps require removal per year over a five-year cycle.

Table 13. Summary of estimated costs for the recommended five-year Public Tree Management Program

Priority Task	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Priority 1 Immediate Removals	$15,633	$13,883	$4,583	$0	$0	**$34,100**
Priority 2 Removals	$0	$0	$118,417	$118,417	$118,417	**$355,250**
Priority 3 Routine Pruning	$547,370	$547,370	$547,370	$547,370	$547,370	**$2,736,850**
Priority 4 Young Tree Pruning	$102,667	$102,667	$102,667	$45,550	$45,450	**$399,000**
Priority 5 Stump Removals	$1,435	$1,260	$11,195	$10,695	$10,695	**$35,280**
TOTAL	$667,105	$665,180	$784,232	$722,032	$721,932	$3,560,480

* Costs are based on 2023 US Dollars and local averages for contracted services. For in-house services, wage rates and hours can be applied to the tree counts for estimated "costs"

As the table above shows, implementing the recommended five-year Public Tree Management Program has an average annual cost of $712,096 or a total five-year cost of $3,560,480. The following sections provide additional guidance for tree management.

ROUTINE (PROACTIVE) PRUNING OF ESTABLISHED PUBLIC TREES

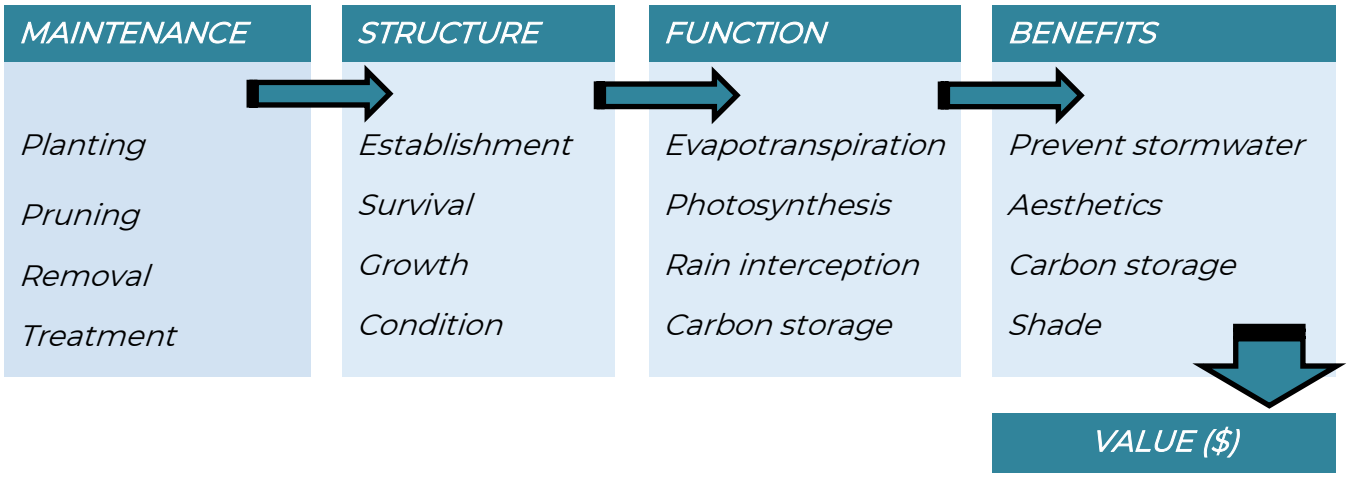
Designed to create structurally sound trunk and branch architecture, maximize the lifespan of a healthy tree, and manage potential tree risks, this "routine pruning" or "proactive / programmed pruning" will sustain a tree's benefits to the longest extent possible until the tree ideally reaches a natural point of senescence— a process of deterioration that occurs as trees age. Proactive or programmed pruning is typically implemented citywide or in prioritized maintenance corridors on a rotation of five to seven years depending on the tree species, density of trees, frequency of pedestrians and vehicles, available budget, and other factors. This means that each tree in the proactive pruning cycle is pruned for clearance, risk, health, and/or structure at least once within the programmed cycle (e.g., five to seven years). The goal with mature trees is to develop and maintain a sound structure to minimize risks such as branch failure. This task is easier provided a good structure was established earlier in the tree's life. When properly executed, a variety of benefits are derived from pruning. Benefits include reduced risk of branch and stem breakage, better clearance for vehicles and pedestrians, improved health and appearance, and enhanced view.

Proactive pruning should continue to be a prominently positioned component of La Crosse's Public Tree Management Program for the City-maintained public trees. Proactive pruning plans as well as tree risk mitigation should complement the City's overall street and park tree management program goals, align with the Urban Forest Management Plan, and should be fully integrated with the tree planting, plant health care, and emergency response programs to grow an equitable and resilient urban forest.

The level of care or maintenance performed on a planted tree is linked to tree establishment, survival, growth, condition, and longevity. Survival, growth, and condition are closely connected to one another and to the structure of a tree (size, leaf area) and of the urban forest (canopy cover, diversity, age distribution). As a result, tree structure impacts the functions provided by the urban forest and ultimately the level of benefits generated by the tree. Thus, less than optimal maintenance may lead to decreased benefits produced by the urban forest. The benefits lost are the "costs" of not maintaining trees.

The Impacts of Proactive Pruning

Figure 38. Diagram showing the impacts maintenance has on tree structure, function, and benefits



In recent years, the City prunes approximately 3,500 public trees annually. With 18,389 trees in the inventory database, this translates to a five-year pruning program. It should be noted though, not all trees in maintained areas of public parks are in the inventory database. If the City has more than 24,500 public trees, then 3,500 trees pruned per year will not fit within a recommended five- or seven-year pruning program.

According to the City's public tree inventory database of 18,389 trees, a total of 13,024 public trees (71%) are eligible for a routine pruning program. This means that if the City were to continue pruning 3,500 trees per year on average, the Public Tree Management Program will maintain a routine pruning cycle with less than five-year intervals. Going forward, the City should evaluate this metric, public tree needs, and demands for services to adjust its staffing and associated resources to maintain a five- to seven-year pruning cycle for public trees.

Of the 13,024 public trees that are eligible for a routine pruning program, most are between 12 and 18 inches in diameter (32%), followed by the 6-12-inch class (24%), the 18-24-inch class (22%), and the 24-30-inch class (13%). Only 9% of trees are greater than 30 inches in diameter. The analysis of size classes is a key component of estimating the annual and five-year costs for the Public Tree Management Program (see tables 13 and 14 in the previous section).

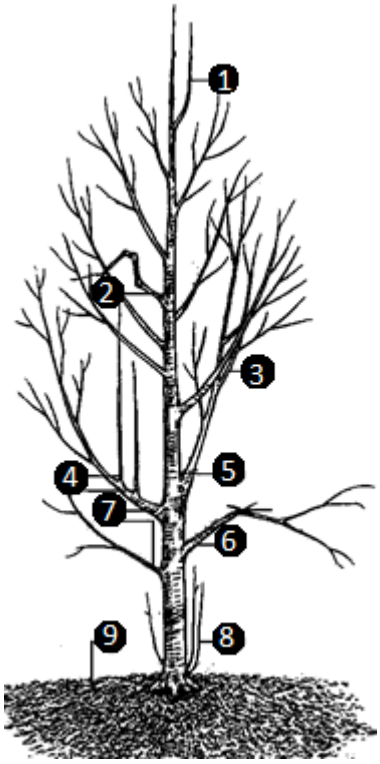
YOUNG TREE TRAINING (STRUCTURAL) PRUNING

Young tree training pruning is performed to improve tree form or structure; the recommended length of young tree pruning cycles is three years since young trees tend to grow at faster rates (on average) than more mature trees. The young tree cycle differs from a routine pruning cycle in that these trees generally can be pruned from the ground with a pole pruner or pruning shear.

The objective is to increase structural integrity by pruning for one dominant leader in most cases for most tree species. Young tree training pruning is species-specific, since many trees may naturally have more than one leader. For such trees, young tree training pruning is performed to develop a strong structural architecture of branches so that future growth will lead to a healthy, structurally sound tree. In addition to training pruning, young trees may also require additional maintenance such as added or amended mulch, watering, added or removed stakes and ties, and/or clearance of debris and litter. These needs can potentially be addressed during young tree training pruning.

Trees included in the young tree training pruning cycle are generally less than six inches DSH. These younger trees sometimes have branch structures that can lead to potential problems as the tree ages. Potential structural problems include codominant leaders, multiple limbs attaching at the same point on the trunk, crossing/interfering limbs, or dead/diseased/damaged limbs. If these problems are not corrected, they may worsen as the tree grows, increasing risk and creating potential liability.

Within La Crosse's public tree inventory, there are 4,997 trees (27%) are under six inches in diameter, not dead, and are not recommended for removal. These trees may qualify for a young tree pruning regiment under the Public Tree Management Program. View tables 12 and 13 for the recommended pruning cycle and associated costs for young tree pruning.



Young Tree Training

1. Prune competing leader
2. Prune malformed branches
3. Remove crossing branches
4. Remove water sprouts
5. Remove branches with poor angles
6. Prune broken or damaged branches
7. Prune temporary branches over time
8. Remove suckers
9. Apply 2-3" of mulch

Figure 39. Illustration and description of the young tree training pruning methods and considerations (Source: Arbor Day Foundation)

PESTS AND DISEASES

La Crosse's Urban Forest Management Plan places a strong emphasis on tree pest and disease management to maximize the benefits of trees for the long-term by keeping them healthy and growing. For La Crosse, there are many native and invasive forest and urban forest pests and diseases that can either directly cause mortality or weaken a tree to the point at which it is susceptible to other physical or biological stressors. These pests and diseases often attack trees already weakened by poor soils, drought, or storm damage.

The primary threatening pests and diseases facing La Crosse's public trees include the disease oak wilt, and the emerald ash borer (EAB) pest, which have the potential to significantly alter the canopy of public trees.

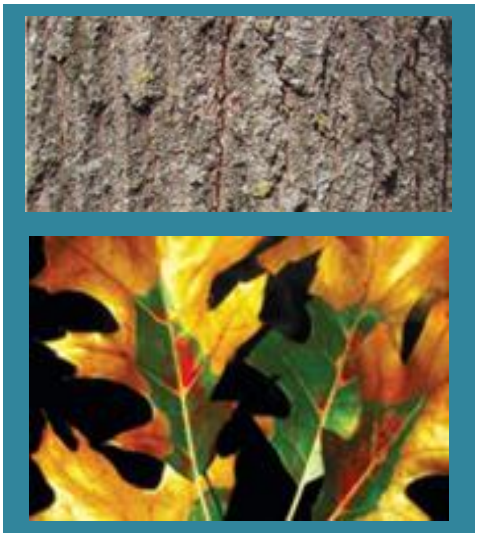


Figure 41. Cracked bark (top) and infected leaves (bottom) caused by oak wilt

Figure 40. Ash tree leaflet (top) and emerald ash borer exit hole (bottom)

- **Oak wilt:** Oak wilt is a primary fungal pathogen that invades the vascular system of oak trees. Oak wilt kills thousands of stressed and even healthy trees each year in forests, woodlots, and urban areas across Wisconsin. The disease is a particularly serious problem for species in the red oak group such as northern red, northern pin oak, and black oaks. Once wilting symptoms are apparent on a red oak, the infected tree will lose most of its leaves and die within approximately one month. Among the white oak group, bur and swamp white oaks demonstrate moderate tolerance to the disease, living several years after symptoms first appear. White oaks experience even slower disease progression and may survive infection (WI DNR, 2023). According to the City's inventory database, there are 478 oaks in the white oak group and 189 oaks in the red oak group. In total, these oaks comprise 4% of the inventoried public tree population. View Appendix 1 for the City's Tree Pest and Disease Plan.

- **Emerald ash borer:** For Wisconsin, the emerald ash borer insect was first confirmed in Ozaukee and Washington Counties in 2008 and later found in La Crosse County in 2011 (UWL, 2023). This insect causes catastrophic loss to all true ash (*Fraxinus*) species. For La Crosse, as of September 2023, there are a total of 264 ash trees in public spaces that are managed by the City. The majority of naturally occurring ash (*Fraxinus pennsylvanica*, F. *americana*) exist in riparian areas and undeveloped areas. View Appendix 1 for the City's Tree Pest and Disease Plan.

Structured around the principles of Integrated Pest Management (IPM), this recommendation for La Crosse emphasizes a sustainable and comprehensive approach to pest control, prioritizing long-term health of the urban canopy while minimizing pesticide use. The IPM framework is predicated on the understanding of pest life cycles, their ecological interactions, and the judicious application of control methods to address pest damage economically and with minimal risk to public health, property, and the environment. IPM in urban forestry integrates a spectrum of techniques, including biological control, habitat manipulation, cultural practice alterations, and the introduction of resistant flora. Chemical treatments are employed conservatively, guided by rigorous monitoring and strict adherence to established environmental guidelines, ensuring interventions are precise and target specific. This dynamic method of pest management necessitates continual surveillance and the flexibility to adapt to shifting pest dynamics and environmental conditions, thus fostering biodiversity, reducing dependency on chemical interventions, and promoting the resilience of the urban forest ecosystem. View Appendix 1 for the City's Tree Pest and Disease Plan.

STORM PREPAREDNESS AND RESPONSE

A wide range of natural disasters contribute to varying levels of impact and risk in La Crosse. According to the Federal Emergency Management Agency's (FEMA) National Risk Index (NRI), La Crosse County is in the 74th percentile for risk nationally, and 86th percentile for the state of Wisconsin. Of the 18 natural hazard types factored into the NRI calculation, La Crosse County is most at risk to cold waves and hail, and moderately at risk to heat waves, flooding, strong winds, and tornados. The County has a low risk for wildfire, ice storms, and droughts (crops only). Specific guidance for public tree storm preparedness and response is provided in Appendix 3.

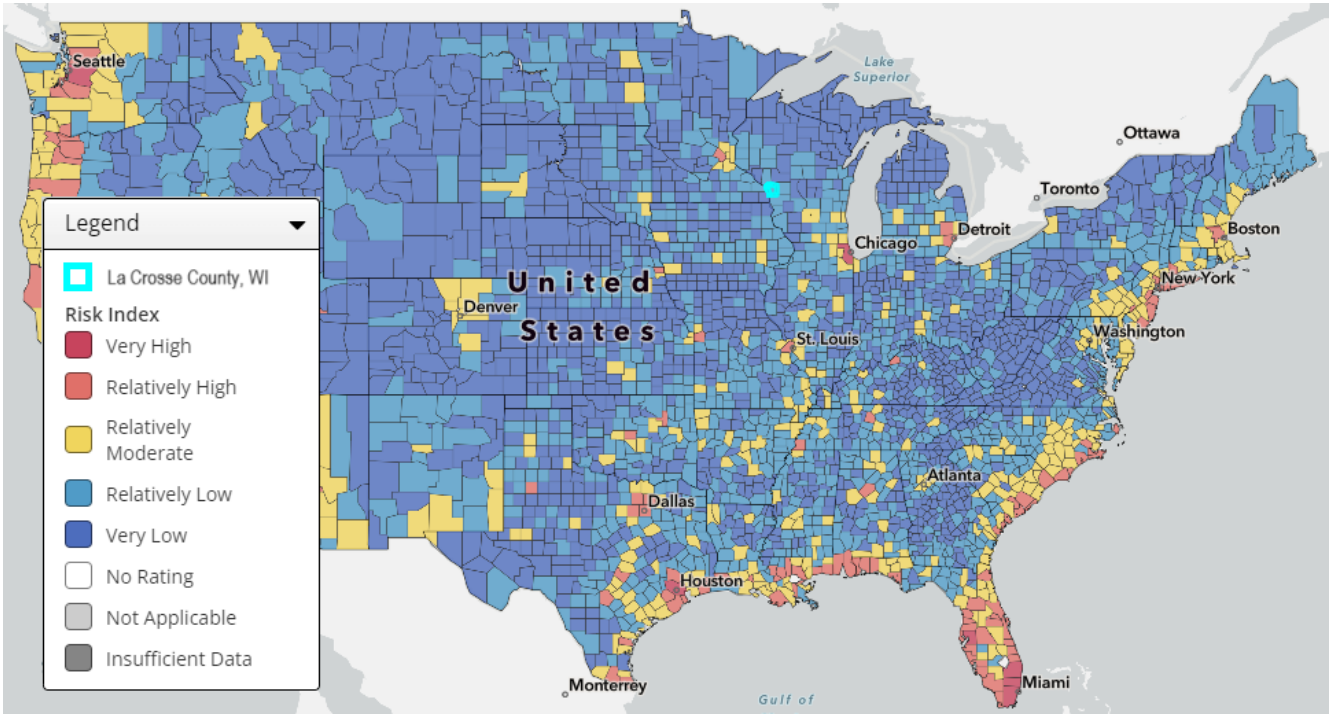


Figure 42. FEMA National Risk Index

3) Administration Implementation and Guidance

Goal: Foster a culture of innovation, collaboration, and adaptability, ensuring the program remains responsive to changing environmental conditions and community needs. The focus is on developing a holistic approach that seamlessly integrates all aspects of the program, from administrative efficiency and balancing priorities to community involvement while maintaining a strong commitment to public safety, environmental stewardship, and urban ecological health.

Goal 3 Strategies

- 3A) Incorporate consideration of climate change impacts into forest management plans and practices to increase climate resilience, retain biodiversity, and ensure continued ecosystem function and services. ✪GS4-1
- 3B) Effectively manage invasive plant species on public property. ✪GS4-4
- 3C) Increase capacity to undertake additional program duties and outreach activities, such as community engagement and additional crews for maintenance.
- 3D) Assess and strategize improved communication and protocols to efficiently manage the urban forest.
- 3E) Strengthen existing and foster new collaborative partnerships to manage the urban forest.

Recommended Priority Actions for Administration

Objective I:

1) *Align related and relevant strategies between the Urban Forest Management Plan and other plans such as the Climate Action Plan.* The analyses from the Urban Forest Management Plan— along with supporting efforts such as the City's Climate Action Plan and canopy assessment (paleBLUEdot LLC, 2022) should be reviewed to ensure implementation of both plans is a coordinated effort. The planting and maintenance programming strategies in the UFMP will allow the City to incorporate climate change impacts into the everyday management of the urban forest. The strategies for planting and maintenance in the previous goals were created in conjunction with reaching the Climate Action Plan goals and utilizing existing inventory and canopy data to make informed decisions about priority planting areas and maintenance areas to reduce the urban heat island and the implementation of other climate change initiatives. In order to ensure this data and the goals are in alignment with these plans, the City will likely need to increase staffing to accomplish these strategies.
2) *Gather research and an understanding of the specific climate impacts on the local forest ecosystem*. These impacts may include changes in temperature, precipitation, and the emergence of new pests. The City of La Crosse can utilize the Climate Action Plan and canopy assessment to aid in this decision-making process.
3) *Promote and implement projects that support biodiversity.* Planting a variety of species with an emphasis on native trees and protecting existing trees supports biodiversity.

4) *Establish budgets for and commitments to staying informed of climate change impacts and strategies.* Continuous monitoring and research are essential to understand the impacts of climate change and the effectiveness of various management strategies. Collaboration with local communities, groups, and other departments is necessary to share knowledge and resources, along with educating the public about the importance of forests in climate resilience. Additionally, managing trees to protect watersheds and maintain water quality is important, especially as climate change often affects water availability. By integrating these strategies, urban forest management can be adapted to increase resilience to climate change, preserve biodiversity, and ensure the continued provision of ecosystem services.
5) *Develop a list of harmful invasive plants (i.e., those known to reduce biodiversity or alter ecosystem processes) commonly used in landscaping and provide native alternatives to each non-native species*. Publicize the list widely and encourage plant nurseries and landscapers to provide the native alternatives.
6) *Utilize local, regional, and national resources and partners to increase capacity and levels of service*. Continue to apply for funding to support innovative and essential tree management projects and utilize the resources and trainings provided by these reputable entities.
7) *Align staffing and roles to manage growing service demands*. By keeping records of service requests, maintenance activities, and other data, the Forestry Division may identify the timing for where and when additional staffing resources are needed.
8) *Establish or strengthen standard operating procedures (SOPs)*. Clarification and documentation of workflows, processes, and procedures is essential for sustainable management and efficient use of resources.

Supporting Details

MANAGING INVASIVE PLANT SPECIES

Identifying harmful invasive species and providing native alternatives involves a methodical approach, and the formation of a specialized group or committee is often necessary to ensure the process is thorough and effective. For the group, consider utilizing an existing group such as the Parks, Recreation & Forestry Board and revisiting the roles, responsibilities, and activities to align with this Urban Forest Management Plan. The group should have members that represent diverse areas of expertise and should meet regularly to implement, monitor, and adjust strategies and actions in this Plan pertaining to invasive plant species.

Once an invasive plant species is removed or eradicated from a project site, the area would ideally be replanted with native alternatives. For each invasive species that threatens the region, the City should identify native plants that serve as good replacements depending on the location, the intended function, the aesthetics, or other end goals. Installation of native species as replacements should ensure the native alternatives are not only environmentally friendly but also well-suited to the local climate and soil conditions. It is recommended that signage be incorporated into these projects that occur on public property. Information could include the impacts of invasives and the

benefits of native species, such as supporting local wildlife, lower maintenance needs, or drought resistance. In addition to signage, educational resources for property owners, especially large landholders, should be updated and made available since the spread of invasive species does not stop at public or private boundaries. Education should also include partnering with local nurseries, garden centers, schools, and community groups for a wider distribution of information. Tree nurseries may also be able to cultivate more native tree species to widen the planting palette. These lists and resources should be updated with new findings and adjustments based on community input and scientific research.

STAFFING AND RESOURCES FOR A GROWING URBAN FOREST AND DEMAND

Adequate staffing and resources for public tree management and broader urban forest impacts within the Forestry Division is essential to sustainability and quality levels of service to the community. Proactive management of the public boulevard and park trees requires trained, qualified, and dedicated staff to balance regular pruning cycles, address planned removals, and maintain new plantings in addition to responding to emergency situations and customer service. Currently,

The City is committed to public health and safety, combatting climate change, and environmental justice. Currently, the Forestry Division is maintaining its service demand, however this demand is increasing as the urban forest matures, parks grow, and combating climate change becomes an immediate need. Adoption of the Climate Action Plan in 2022 and the Urban Forest Management Plan will require additional dedicated resources. Urban forest programs are also growing in demand. The City is managing this demand with current full-time, part-time, permanent, and temporary staff. However, program demand is and will continue to grow comparable to the growth of the urban forest and that growth must be addressed now to maintain the City's urban forest, climate action, and public service needs. If the City aims to achieve tree canopy goals, then this will require additional planting, watering, maintenance, engagement, and administrative resources, particularly for those trees within public spaces.

In La Crosse, the Forestry Division currently has one arborist and two certified arborists for a three-person crew plus the Forestry Coordinator. According to the City, the 2023 annual average wages of a Lead Certified Arborist was $68,340 and a Certified Arborist earned about $58,067. These figures do not include additional costs such as trainings, professional development, overtime pay, severance pay, shift differentials, nonproduction bonuses, employer cost for supplementary benefits, and tuition reimbursements. Also, urban forestry professionals are often required to maintain certifications for safety standards, industry standards, and best management practices. According to the City, the benefit package for full-time employees is generally around 40% of the annual salary.

Going forward, the Forestry Division should closely monitor expected changes to demands and services to effectively request budget and staffing adjustments. The following section provides estimated costs for the City to consider increasing its maintenance capacity to account for a growing public tree population and greater challenges that lie ahead due to climate change.

Table 14. Estimated costs for additional tree maintenance staffing

Recommended Staff	Wage Rate (& hourly)*	# of New Staff	Salary & Benefits Totals**
A) Lead Certified Arborist	$32.73 ($27.12 – $35.58 hourly)	1	$95,676
B) Certified Arborist	$27.81 ($27.12 – $35.58 hourly)	1	$81,294
C) Arborist	$24.96 ($23.69 – $31.09 hourly)	1	$72,963
Subtotal	--	*3*	*$249,934*

* FTE = full-time equivalent. Wage rates were provided by the City of La Crosse in December 2023. Hourly rates are provided as high- and low-end rates in parentheses.

** Benefits are estimated at 40% of annual salary for full-time staff

The Lead Certified Arborist typically manages the crews and maintains ISA Certified Arborist credentials to ensure that the crews are running safely and smoothly in the field. The crews are typically made up of tree trimmers, pruners, and arborists who maintain ISA Certified Arborist credentials or are working toward this certification with on-the-job training and experience.

According to the estimates, a new arborist crew consisting of three staff— a Lead Certified Arborist, one Certified Arborist, and one Arborist would cost $249,934 annually.

The table below provides an estimation of the anticipated equipment costs as the Forestry Division potentially transitions from one arborist crew to two separate crews. This expansion will allow the program to be more efficient, which will lead to better results in tree health, implementation of the five-year pruning cycle, planting and care of new trees, response in emergency situations, customer service, and overall urban forest management and customer service.

Table 15. Estimated upfront and annual equipment costs for an additional in-house arborist crew

Equipment†	Hours	Cost/Unit	# of Units	Total Cost	Annual Cost
F450 Pickup (or similar)	1	$95,000	1	$95,000	--
1 F450 Pickup hours	1,000	$16.94	1,000	--	$16,940
Chipper	1	$40,000	1	$40,000	--
Chipper hours	1,000	$16.94	1,000	--	$16,940
Bucket/Chip Truck	1	$300,000	1	$300,000	--
Bucket/Chip Truck hours	1,000	$16.94	1,000	--	$16,940
Subtotal	*--*	*--*	*--*	*$435,000*	*$50,820*

Gear†	Hours	Cost/Unit	# of Units	Total Cost	Annual Cost***
Personal Protective Equipment (PPE)	--	$350	6	$2,100	$630
Uniforms	--	$250	15	$3,750	$1,125
Arborist Saw	--	$800	2	$1,600	$480
Ground Saw (Large)	--	$800	2	$1,600	$160
Ground Saw (Medium)	--	$500	2	$1,000	$100
Power Pole Saw	--	$800	2	$1,600	$160
Pole Pruner	--	$300	2	$600	$60
Rake	--	$25	3	$75	$23
Shovel	--	$25	3	$75	$23
Brush Bucket	--	$40	2	$80	$24
Cart	--	$50	2	$100	$25
Other (e.g. blower)	--	$500	2	$1,000	$250
Subtotal	*--*	*--*	*43*	*$13,580*	*$3,059*

† Equipment costs are based on 2021 estimates gathered by PlanIT Geo for municipal rates and discounts offered at leading vehicle dealerships. Gear costs are based on 2023 estimates and municipal discounts.

*** Accounts for equipment depreciation and replacement.

Table 16. Summary of estimated costs to increase by one in-house arborist crew

Cost Item	Amount
Annual Staff Cost	$249,934
Vehicle, Equipment, and Gear Purchase	$448,580
Total Upfront Cost	$698,514
Annual Staff Cost	$249,934
Annual Operating Costs (supplies, clothing, equipment, rental, etc.)	$53,879
Annual Training, Certifications, and Membership Costs	$6,000
Total Annual Cost	$309,813

As the tables above show, a new three-person arborist crew may require a pickup truck, chipper, and bucket/chip truck and these upfront costs are estimated at $435,000. Annual estimated maintenance and service costs may amount to $50,820. For gear, it is estimated that the crew needs $13,580 in gear upfront and approximately $3,059 annually for gear and equipment wear, tear, and replacement. When combining the salary and fringe benefits costs with the equipment and gear costs, the City should plan to budget for an upfront cost of $698,514 and an annual cost of $309,813 which includes budgets for trainings and certifications.

IMPROVED COORDINATION

Implementing effective communication and workflow management in urban forest management requires a structured and collaborative approach. The process begins with establishing regular internal meetings. These meetings, set at a frequency that balances continuous communication with productivity, serve as a platform to review ongoing activities, address challenges, and strategize future actions. Within this framework, it is crucial to clearly define the roles and responsibilities of each team member. This clarity not only streamlines communication but also ensures comprehensive coverage of all urban forest management aspects, avoiding overlaps and gaps in responsibilities.

A critical step in this process is the documentation of current workflows. These workflows encompass all processes related to tree planting, maintenance, data collection, stakeholder engagement, and emergency responses. Utilizing visual tools like flowcharts or process maps can greatly enhance the understanding and analysis of these processes. It is also beneficial to develop a centralized information system, possibly a digital platform like a cloud-based system, where all relevant information is stored. This system should be easily accessible to all team members and include essential data like tree inventories, maintenance schedules, and feedback from stakeholders.

Implementing a project management tool can significantly improve task tracking and coordination. Such a tool provides a clear view of tasks, deadlines, and progress, ensuring everyone is aligned and informed. Moreover, fostering an environment of open communication is pivotal. Encouraging team members to freely share ideas, concerns, and feedback leads to early identification of potential issues and collaborative problem-solving.

Annually assessing these workflows is an integral part of the process. This assessment involves analyzing the effectiveness of current processes, considering advancements in urban forestry practices, technological developments, and team feedback. Based on this assessment, workflows should be updated and adapted to reflect best practices and incorporate new technologies or methodologies. It's important that all team members are adequately trained on any new processes or tools.

Additionally, maintaining a record of best practices and lessons learned from various projects can serve as an invaluable resource for training and refining processes. This documentation aids in capturing experiential knowledge and ensures that successful strategies are replicated, and pitfalls are avoided in future projects.

Finally, integrating stakeholder feedback into the internal review process is essential. Regularly considering input from external stakeholders ensures that the workflow remains relevant and effective, aligning with the needs and concerns of the community and other stakeholders. By following these steps, urban forest management can be conducted more efficiently, transparently, and adaptively, leading to a more sustainable and community-aligned approach.

STRENGTHENING AND ESTABLISHING PARTNERSHIPS

Managing an urban forest effectively requires a dedicated, full-time staff member whose primary responsibility is to strengthen and foster both new and existing collaborative partnerships. This role involves actively engaging the local community in urban forest management through volunteer initiatives, educational programs, and regular feedback sessions, thereby fostering a sense of ownership and stewardship among residents. Additionally, the staff member would be responsible for establishing and maintaining partnerships with local businesses, encouraging them to sponsor tree planting events or adopt green spaces, which are crucial for the expansion and maintenance of urban forests.

Collaboration with nonprofits, environmental groups, and government agencies is also a key aspect of this role. These entities can offer expertise, resources, volunteers, and funding opportunities. The staff member(s) would also liaise with educational institutions to facilitate research, educational programs, and student projects, promoting a culture of learning and innovation in urban forestry management.

A significant part of this job involves leveraging technology and social media to coordinate events, disseminate information, and gather community input, making the role highly dynamic and interconnected. Organizing regular meetings and workshops with all stakeholders to discuss progress, challenges, and future plans ensures continuous communication and collaboration. Recognizing the contributions of partners and volunteers through awards and public acknowledgment is also a critical function, as it motivates continued participation and support.

Example Partnership Opportunity

GROW is a non-profit with a mission to connect youth with healthy food and nature. Recently, GROW received $15,000 from the American Rescue Plan Act (ARPA) to support garden education for student's pre-k through elementary at local schools using their gardens and greenhouse. To date, the program has 10 garden partner schools, 122 farm camp participants, 334 open garden visits, 497 greenhouse field trip attendees, and 3,482 students engaged in healthy food and nature.

Source: Growlacrosse.org

Given the diverse responsibilities and the need for a flexible, inclusive approach, this role requires full-time commitment. Regular monitoring and reporting on the health and growth of the urban forest are essential, as it builds trust among stakeholders and demonstrates the tangible impact of these collaborative efforts. Thus, this position is not just a job, but a mission to enhance and protect urban green spaces through sustained community involvement and partnership. For additional information regarding community outreach, education, and engagement, see the Engagement Implementation and Guidance section.

4) Regulation Implementation and Guidance

Goal: Preserve tree canopy cover and the urban forest through sound but fair policies and regulations that align with shared priorities in the City and best practices. Our tree canopy will be enhanced by facilitating the planting of diverse and climate-resilient tree species while implementing more stringent regulations on tree removals to protect and preserve existing green spaces.

Goal 4 Strategies

- 4A) Review City ordinances and zoning, including boulevard tree requirements. ✪GS1-1
- 4B) Monitor canopy cover change to inform possible changes to public and private tree regulations ✪GS1-8
- 4C) Update the City's design standards, specifications, and procedures to align with the Plan. ✪GS1-3, GS1-4
- 4D) Establish or update code and standards to support a holistic ecosystem management approach to sustainability. ✪GS1-9
- 4E) Incentivize and award City and private projects that support this Plan's goals and strategies. ✪GS3-6

Recommended Priority Actions for Regulations

1) *Identify impediments to tree planting and opportunities where tree requirements could be strengthened.* In many cities, progressive and innovative approaches to tree regulations have been taking shape. For public trees, a no-net-loss strategy or policy is often a starting point. For cities with a community-wide canopy cover goal, oftentimes a greater proportion of plantings compared to removals is mandated. For example, rather than implementing a 1:1 replacement meaning one tree is planted for each tree removed, cities are adopting policies that require a certain number of trees to be replanted based on the diameter of the tree removed. This helps to offset the substantial loss of canopy cover and associated benefits that occurs from a large tree being removed. The City should perhaps begin by examining tree planting, preservation, protection, and maintenance requirements for Capital Improvement Projects and City-led public tree plantings.

   Similar considerations could be made for private development and redevelopment projects. Many cities are offering innovative incentives to developers who preserve or plant trees beyond the minimum requirements. Emphasis should be placed on growing the trees rather than simply planting trees to meet requirements though. Therefore, warranties and bonds along with monitoring and enforcement by adequately staffed City programs should be implemented to ensure regulations are followed and that the trees planted or protected during the project survive for years past the completion of the project. Changes to tree regulations should also consider limiting the removal of quality soil, ground cover, native shrubs, and other vegetation for City construction and private development projects. Consider design

standards that support tree canopy cover goals and planting strategies that do not impede solar energy projects. For additional considerations regarding public and private tree regulations, see Appendix 4.

2) *Update City design standards with tree species recommendations that meet goals for species diversity, urban forest resiliency, and canopy cover.* To internally update the City's landscape design standards within the "City of La Crosse – Standard Specifications and Procedures (Appendix B)" resource, the City should initiate a comprehensive process that integrates internal expertise with external research. This process begins with reviewing and incorporating climate change research specific to La Crosse. Collaborating with local arborists, tree nurseries, and urban forestry experts, and utilizing the vulnerability study summarized in the Urban Forest Management Plan (here), the City can identify tree species that will thrive under these future conditions, considering factors like resilience to temperature fluctuations, altered precipitation patterns, and potential new pests or diseases.

3) *Update City design standards with tree requirements for parking lot installations and repairs.* For parking lot guidelines, the City can use technologies such as Silva Cells, constructed soils, and advanced tree wells to address adding more trees to these areas. These systems are integral components in urban landscaping, particularly in parking lot designs, for fostering healthy tree growth and effective stormwater management. Silva Cells, which are modular underground systems, support large trees in paved areas like parking lots. These frames and decks, often made of durable materials, can bear the weight of pavement and vehicles, while creating space for roots and soil. This innovative approach not only allows for uninterrupted root growth beneath pavements but also aids in stormwater absorption, thereby reducing runoff and facilitating groundwater recharge.

Figure 43. A consulting arborist demonstrates root growth and impacts of compacted soil, girdling roots, and hardscape conflicts (Source: WXOW News19 and Legacy Trees)

Constructed soils, or engineered blends of soil, organic matter, and other materials, are often employed alongside Silva Cells. These are specifically tailored to offer a nurturing growth medium in urban settings, addressing the challenges of nutrient provision and drainage in compacted soils.

Advanced tree wells are specially designed spaces around trees in parking lots, sometimes featuring aeration systems and water reservoirs, and often incorporate Silva Cells and constructed soils. These wells are crucial for protecting roots from compaction, ensuring better water and nutrient access, and enhancing the overall aesthetic appeal.

4) *Utilize the urban heat and impervious surface study to target tree plantings and incentivize developers to support this effort.* Focusing on incentivizing projects to manage urban forests and reduce heat islands requires a blend of financial, regulatory, and community-driven strategies. The study (paleBLUEdot LLC, 2022) that supported the development of canopy goals in the City's Climate Action Plan includes an assessment of impervious (paved) surfaces and urban heat indices by U.S. Census Tract. As part of the Urban Forest Management Plan, this data and the canopy cover data were cross-examined with the public tree inventory data to identify opportunities where planting and replanting could address urban heat and stormwater runoff due to impervious surfaces. This effort should align with the planting strategy in this Plan.

   In addition to targeting urban heat within public spaces, developers and property owners could be incentivized to support this effort on private property. Incentives may include:

   - *Tax Incentives and Rebates*: Offering tax reductions or rebates to property owners who maintain or enhance green spaces, plant trees, or implement green roofs and walls. This direct financial incentive can significantly motivate landowners to invest in green infrastructure.
   - *Development Incentives:* Providing developers with benefits such as increased floor area or height ratios, expedited permit processing, or density bonuses for incorporating green spaces and sustainable design elements into their projects.
   - *Grants and Funding:* Establishing grant programs that provide funding for projects focused on urban forestry and heat island mitigation. These grants can help cover costs associated with planting trees, creating green spaces, or retrofitting buildings with green technologies.
   - *Technical Assistance and Resources*: Offering free or subsidized consultation, tree planting services, and educational resources to assist property owners in understanding and implementing best practices for urban forest management.
   - *Recognition and Certification Programs*: Creating award or certification programs to recognize and publicize the efforts of businesses and individuals who contribute significantly to urban forest management. This can enhance their public image and encourage others to follow suit.
   - *Public-Private Partnerships*: Encouraging collaborations between the City, private entities, and non-profits to pool resources and expertise for larger-scale urban forestry projects.
   - *Flexible Zoning and Land-Use Policies:* Adjusting zoning regulations to encourage or mandate the inclusion of green spaces in new developments. Policies could include requirements for tree canopy coverage, green roofs, or permeable surfaces.
   - *Utility Savings and Rebates*: Partnering with utility companies to offer rebates or reduced rates for properties that demonstrate reduced energy usage through green initiatives, such as tree planting to provide shade and reduce cooling costs.

5) Engagement Implementation and Guidance

Goal: Foster tree stewardship in our community through equitable and impactful community education and engagement. An engaged and educated community expands our capacity to sustainably manage the urban forest and offers opportunities for access to our natural environment.

Goal 5 Strategies

- 5A) Use education programs and incentives to promote the use of native plants and trees on public and private property. ✪GS4-3
- 5B) Develop and provide educational materials on tree planting and maintenance for a wide variety of residents.
- 5C) Increase opportunities for residents to participate in informational sessions about tree maintenance and care.
- 5D) Create alternative engagement approaches, such as events around the care and planting of trees.

Recommended Priority Actions for Engagement

1) *Update messaging and materials.* Begin with updating the City's website and supporting materials and resources with information from the Plan.
2) *Maintain Tree City USA accreditation.* Continue to pursue Growth Awards and other recognition for urban forest management efforts such as the award offered by the American Public Works Association.
3) *Finalize a robust community outreach strategy and communications plan.* The objectives should include an effort to garner more support, spur behavior change where needed, and increase participation from the community.
4) *Continue to gather input and feedback from the community members of La Crosse.* Consider a biannual public survey, reviews of service requests, and by other means to measure change in perceptions, opinions, and priorities.
5) *Conduct effective outreach and education to all neighborhoods and demographics.* Prioritize efforts in communities that are within priority planting areas such as those in U.S. Census Tract 11.01 and 11.02.
6) *Provide frequent updates to the community on Plan implementation progress.* Utilize the "How are we doing?" section for measuring and reporting progress.
7) *Strengthen partnerships and leverage resources to achieve common goals.* Utilize the findings from the Plan to establish a mutually beneficial relationship and align priorities. Consider the conventional and non-conventional partnerships, along with corporate sponsorships.
8) *Create or expand the network of trained and engaged community tree stewards.* Expand existing efforts and programs as resources allow and consider staffing adjustments for more robust volunteer and event coordination pertaining to the urban forest and the community members.

Supporting Details

The City of La Crosse and its Forestry Division actively engage with the community through website content, social media messaging, press releases and news articles, and by extending outreach through community partners' networks. The following strategy is provided for the Forestry Division to review and adapt community engagement efforts to support the implementation of the Urban Forest Management Plan.

There are multiple ways to engage the public to improve the care of and expanse of local tree canopy. First, topics or messages must be defined, prioritized, and limited in number. More effective communication occurs through choosing a few strong messages and repeating them over and over. After messages are chosen, avenues of targeted communication to deliver those messages can be determined and implemented. Important topics and messages that should be considered for La Crosse are as follows:

MESSAGING

- Current Canopy Extent and Value of La Crosse's Trees. The message should present the current canopy level and benefits the canopy (and public trees) provides. This is typically the first message to send out to the public, as all other messages should connect back to this one. This can also be a way to "roll out" the Urban Forest Management Plan to the public. Include information such as why La Crosse needs tree canopy, what the current canopy level is, and the plans to improve the management of the trees that comprise the canopy. Educating local business owners on the impact that a shady commercial district can have on sales and educating property owners about the impact that trees have on property values are other useful methods for boosting the desire for increased canopy along main thoroughfares and neighborhood streets while also engaging the public. The important value of mature trees could be also highlighted, as people often do not realize that the large tree they have adds value to their property, the community, wildlife, and the environment.
- How You Can Get Involved. What are the next steps you want people to take? The City should decide the answer and insert this "ask" in every outreach piece or effort. The City should continue offering memorial trees and offering tree giveaways (such as seedlings or saplings) at Arbor Day and related events for people to plant on private property. Another opportunity for getting the community involved is to increase awareness of the City's Champion Tree on Cottonwood Trail and the boulevard tree permitting program. Lastly, citizens can donate funds or volunteer at a tree planting event.
- Tree Threats. Public and private trees can die, decline, or become safety risks as a result of insect and disease infestation as well as inadequate maintenance. With education, the residents of La Crosse can become aware of the common threats to the tree canopy and what they can do to help. The City should provide education on existing tree pest and disease concerns and what the City is doing about these threats on public land, and options for management on their own land. Since the majority of the trees that comprise the City's urban tree canopy are on private property, it is vital for the City to educate the public on how to detect insect and disease threats, provide information about management and treatment options, and relay the importance of reforestation in the event trees are removed. Informing

residents about tree removals and other significant tree work is essential for maintaining the City's relationship with the community. When an established public tree has to be removed, the City should continue its current practice of notifying abutting or adjacent property owners of the necessary removal. Consistent and transparent messaging around the cause(s) and reason(s) for removing a public tree— and that the removal is part of a larger, long-term planting strategy in support of the City's canopy cover goal— will build trust and support while reducing staff time in addressing concerns.

- **General Tree Care Education for Property Owners.** There are several actions people take that are detrimental to trees at all stages of life, including improper mulching and pruning. Easy tips and tidbits of information to share with residents for trees on their own properties can help improve tree maintenance and increase tree health and survival rates. Some examples include:
  - Demonstrate how to properly mulch a tree. Too often mulch is placed around tree trunks in a "mulch volcano", which is extremely detrimental to the tree. A simple message of how to mulch properly can improve tree health and longevity.
  - Provide guidance on how and when to prune trees. Incorrect pruning can lead to poor tree structure or wounds that may never seal.
  - Explain proper tree planting and tree care techniques. This could be especially helpful for homeowners who are considering planting a tree in their yard but are unsure where to start.
  - Encourage recycling or composting leaves on-site.

USE MULTIPLE AVENUES OF COMMUNICATION

There are numerous avenues to convey urban forestry messages and accomplishments of the program to the residents, such as:

- **Social Media.** Social media sites such as Facebook, Instagram, and Twitter ("X") can create buzz and promote involvement in the current urban forestry activities occurring locally. To reach even more people, the City should consider coordinating with allied community gardens, non-profits, educational institutions, and business to get messages posted on their social media sites as well.
- **Website.** The City of La Crosse's Forestry webpage contains important information about the program, including details about tree planting, permitting, watering, emerald ash borer management, programs and upcoming events, urban forestry best practices, tree regulations, among other things. The website should be maintained regularly to make sure information is up to date.
- **Presentations to City leadership and local business and neighborhood groups.** Identify key audiences, partners, and potential champions for the urban forestry program. Making short presentations at regular or special meetings where they are relieves individuals from having to go to yet another meeting in the evenings. Initial outreach could be based on letting the audience know about La Crosse's urban forest and the work called for in this Plan. Be sure to have an "ask" at the end of the presentation. What do you want them to do next? This work often unearths new partners and funding sources that can otherwise go untapped.

- **Do a survey.** Once every other year, create a short online survey to identify what urban forestry issues people in La Crosse are concerned about or care about. The survey can also be used to gauge people's reactions to new urban forest management procedures and regulations, and their willingness to participate in volunteer work or to donate funds or other resources. Questions about public trees, maintenance responsibility, and tree canopy can be part of the public survey.
- **Cultivate partnerships for communication.** Partnerships can be initiated with organizations that can help promote, enhance, and preserve La Crosse's urban forest. Organizations can include local businesses, local utilities, regional non-profits, homeowner associations, neighborhood associations, and schools and other educational institutions. Other audiences to engage can include youth groups, landscape architect firms, faith-based groups, and nurseries and landscape contractors. Actions that can be taken by each partner should be defined before approaching them for support.
- **Encourage local campuses to achieve or continue achieving Tree Campus USA status.** This distinction and legacy supports La Crosse's urban forest. One standard a campus needs to achieve annually is for students to participate in one or more Service Learning Projects. Utilize Western Technical College's Tree Campus USA achievement as an example or model. These Service Learning Projects are intended to provide an opportunity to engage the student population with trees. College students could help the City's Forestry Division perform many tasks, such as tree planting, tree care, and public outreach. Similarly, consider the Arbor Day Foundation's Tree Campus Healthcare recognition program for private healthcare facilities and properties.
- **Continue to create and publish the Annual Urban Forestry Report and Work Plan.** This annual report or state of the urban forest should provide highlights from the previous year and the Work Plan should provide goals and actions for the upcoming year. These actions should reflect the goals and strategies in the Urban Forest Management Plan and the "How are we doing?" section can be utilized to support the reporting and work plans. The reports should include updated tree inventory data, tree planting statistics, key performance indicators and metrics, status of achieving canopy goals and actions in the Plan, and other program information. It should provide information on the number and condition of public trees, as well as maintenance, planting, and management accomplishments. It should also present a summary of the current year's annual work plan and identify emerging issues and budget or resource needs.
- **Add signage to the landscape.** Signs placed in high traffic areas can spark interest in trees and the urban forest. Something as simple as species name or a notable fact about a tree can encourage people to learn more and to get more involved.
- **Create Story Maps.** The story about La Crosse's urban forest, the programs that manage it, and the community that shapes and benefits from it can be told through maps that illuminate and contextualize the story. Maps are the visual representation of where events happen. As such, maps and stories complement each other, and story maps serve as an integrated presentation. Story maps use geography as a means of organizing and presenting information. They tell the story

of a place, event, issue, trend, or pattern in a geographic context. They combine interactive maps with other rich content—text, photos, illustrations, video, and audio—within intuitive user experiences. Content may include the canopy cover and urban heat study (paleBLUEdot LLC, 2022), the tree inventory, programs and events, and content from the Urban Forest Management Plan such as tree canopy goals, ecosystem benefits, and the urban forest vision, goals, strategies, and priority actions.

NEIGHBORHOOD TREE STEWARDS

The City should formally establish a community or neighborhood tree stewards program that provides free education from local arboriculture experts on tree identification, tree biology, proper tree care, City tree regulations, tree planting, natural area restoration, nursery tree production, and the benefits of trees. After the training, the "Tree Stewards" would be equipped to take on the task of spreading accurate information about trees to their own neighborhoods. Tree Stewards could volunteer to conduct a tree planting or tree-related education project in exchange for the training and education they receive. The City's Forestry staff could offer guidance and assistance throughout a project. A Tree Stewards program should establish local partnerships such as community-based organizations, green industry experts, youth programs, among others.

The program should serve as a volunteer opportunity for community residents to assist with new tree planting and new tree care such as watering, mulching, and pruning. The young tree care volunteers could be specially trained to care for young trees and to serve as advocates and educators within their networks. This would increase capacity as the City aims to increase tree canopy cover. As such, this type of program involves initial and continuing training, frequent mentoring, and overall coordination of the process and volunteers. It also provides yet another engagement opportunity and encourages partnership opportunities with a variety of groups, such as neighborhood associations, master gardeners, scout troops, church affiliated groups, youth groups, high school community service programs, and others to accomplish new and young tree care tasks.

The City should explore ways in which the program could provide the essential care that newly planted trees need. Trees to include in a "Young Tree Care" program are generally less than six inches in diameter. These younger trees sometimes have branch structures that can lead to potential problems as the tree ages, such as codominant leaders, multiple limbs attaching at the same point on the trunk or crossing/interfering limbs. If these problems are not corrected, they may worsen as the tree grows, which increases risk and creates potential liability. With direction from City staff, young tree care volunteers could be trained to carry out the young tree training program. Beyond pruning, young trees need watering and mulching to become established, and may require fertilization and other Plant Health Care (PHC) treatments until they reach maturity.

The tree stewards could also be used to support the urban forest management program in other ways. Volunteers could develop and/or staff Arbor Day and Earth Day events, post and manage tree messages on social media, help update the inventory, and/or locate planting sites in neighborhoods.

EXPLORE PARTNERSHIPS

Establish partnerships to fund and accomplish the young tree training program and some mature tree care activities. For instance, the utility companies may support tree growth regulator applications for trees under their lines; businesses or developers may pay into a fund to "adopt" or maintain trees in parks, commercial areas, and newly built streets; residents may help water mature street trees during times of drought.

The City should continue to maintain and strengthen partnerships with agencies and organizations that provide technical service and grant opportunities. For example, the WI Department of Natural Resources provides urban forestry grants and the University of Wisconsin offers technical support. These partners among many other local, regional, and national partners can support La Crosse in implementing the Urban Forest Management Plan.

PUBLIC EDUCATION

Public education is one of the true keys to reaching the goals of an urban forestry program. Only by educating the public, City officials, developers, and contractors working within city limits will the City be able to achieve urban forest protection and planting goals. Ordinances and guidelines alone will not guarantee success since builders, contractors, and others often have their own priorities and agendas, and trees and ordinances are sometimes viewed as a nuisance with no incentives for tree planting, protection, and preservation.

Cooperation from all concerned parties can be improved by requesting various community stakeholders, such as City Council members and neighborhood groups, to attend educational sessions to learn about the current state of La Crosse's urban forest, plans for urban forest management and planting, and the importance to the future of the community.

To gain support for La Crosse's Forestry Program, various public outreach campaigns aimed at educating the residents of La Crosse should be established. Where there is understanding and acceptance of the Forestry Program as a whole, there will be increased support for the planting portion of the program. Based on examples of public relations efforts by urban foresters in other communities, the following types of activities are suggested for the City to undertake, adopt, or adapt current efforts:

- Hold a seminar or public meeting to discuss the tree inventory project, its results, and its importance for the City.
- Develop monthly evening or weekend seminars related to tree care and landscaping; bring in guest experts from various disciplines in the green industry.
- Write a monthly "Tree Talk" article for local newspapers or social media.
- Develop a Tree Care door hanger brochure to go to each residence where new trees are planted; educating residents about proper tree care could help eliminate trunk damage and improper mulching and pruning of new trees.
- The City should consider giving away tree seedlings to interested community members. This is a great offer and a way to spread the word about trees, especially around Arbor Day. La Crosse could capitalize on the idea and attach the same Tree Care door hanger brochure or a different informational brochure to each of these trees.

- Co-host tree planting programs with the local garden club, local non-profits, or groups.
- Map the locations of fruit-bearing trees in the City and coordinate with groups that harvest the fruit for homeless and food insecure organizations.
- Embrace story telling within the urban treescape. Connect the trees to the history of the area through complementary art, placards, or signage. Consider establishing tree walks that highlight some of La Crosse's greatest tree specimens and provide tree identification training. Regularly update the memorial tree records, maps, and information.
- Encourage citizen science activities that involve the urban forest. For example, the Nature Conservancy's "Healthy Trees Healthy Cities" app can be used to monitor tree health and check trees for pests. Local professors and non-profit groups that work with citizen science may be able to help plan projects and recruit citizen scientists.
- Expand the annual Arbor Day celebration to help it become an even greater community tradition. The Arbor Day celebration could be further developed as an all-day Saturday event, preferably held in a popular park/public space setting in the city. Expanding programs about planting and pruning trees and including children's programs about trees can help increase public interest in the City's tree programs. Additionally, the City could invite contractors to conduct demonstrations on tree planting, trimming, landscaping, and species selection. Organizers could also set up booths with tree information. Refer to the National Arbor Day Foundation (ArborDay.org) for publications that provide great Arbor Day ideas to assist in planning of this event.

Figure 44. La Crosse's annual Riverfest event offers opportunities to engage the public with the urban forest (Source: Explore La Crosse)

SUPPORTING THE PARKS, RECREATION & FORESTRY BOARD

In addition to its regular duties, the Forestry Program can support the La Crosse Parks, Recreation & Forestry Board by providing updates on the progress of implementing the Urban Forest Management Plan. Key findings and information from the Plan can be shared with the Board to support their coordination of community outreach activities. In addition, the Plan's monitoring section provides key strategies and metrics that can be incorporated into Urban Forestry Annual Reports and Urban Forestry Work Plans.

It is recommended that the Board's roles and responsibilities be revisited to ensure they align with the goals of the Urban Forest Management Plan as applicable. In addition, for those Board members interested, the Forestry Program may offer training assistance by sharing the Tree Board University (treeboardu.org) portal and other resources regarding urban forest management.

ENVIRONMENTAL JUSTICE

The equitable distribution of resources is a key driver of environmental justice. This Urban Forest Management Plan aims to grow the urban forest with a focus on public spaces. The Plan addresses the fact that existing canopy resources and associated benefits are unequally distributed. Urban tree canopy expansion and maintenance requires a financial investment on the part of the City, primarily from tax dollars. As a result, tree canopy coverage tends to be larger and more established in wealthier neighborhoods, and tree canopies are often less than ideal in communities that are economically disadvantaged. Along with funding, community support for the urban forest and this Plan are necessary to succeed. Communication should begin months before a tree planting starts and should build trust between the entity spearheading the tree plantings and the community the tree planting is taking place in. Connecting with trusted community leaders to introduce the idea of an expanded tree canopy, holding outreach events at an earlier stage in the plan, and taking local opinion into account when it comes to tree species selection can develop a partnership, rooted in trust, with the area's residents. But a big part of keeping that trust is staying consistent through action. Following up with these communities to hear and address any concerns while consistently maintaining the new plantings will help ensure a fully developed urban forest. The framework of the Urban Forest Management Plan guarantees the presence of environmental justice principles in La Crosse's Forestry Program.

The Tree Planting Initiative and Citywide tree canopy cover goals will support La Crosse's efforts in addressing community equity and environmental justice. These planting and canopy efforts could identify areas in most need of tree canopy cover, tree plantings, and urban forestry services such as a program to assist low income property owners with management of hazardous or invasive trees. And, as the City expands its network of partners, all populations within a neighborhood will be better represented.

COMMUNITY ENGAGEMENT RECOMMENDATIONS SUMMARY

Community outreach and engagement about the Plan begins with clear messaging and information gathered from the Urban Forest Management Plan. To make a greater impact and to fully recognize all communities in La Crosse, it is recommended the City continue partnering with local non-profit community organizations with a mission that supports the urban forest. In addition to community partners, the Parks, Recreation & Advisory Board could add capacity and create more advocates for the Forestry Program. Lastly, an expanding community of tree stewards that are trained in tree planting and post-planting care will increase the Forestry Program's capacity, support the Citywide canopy cover goals and Climate Action Plan, and build support for long-lasting impacts.

Source: Explore La Crosse

HOW ARE WE DOING?

Assessing Progress

The framework of the goals and actions in the Urban Forest Management Plan provides the City of La Crosse with the means to measure progress and adapt to an everchanging environment and availability of resources. Each of the goals align with industry standards, best practices, and stakeholder priorities. The actions are intended to guide the City towards improvements in public tree management and sustainability for the Citywide urban forest. As actions are implemented, various metrics should be evaluated to gauge success, measure progress, and adjust accordingly. View the Evaluate and Monitor section of the Monitoring Plan for more information.

It is recommended the City utilize the expertise of the Forestry Division and the Parks, Recreation & Forestry Board or establish an urban forestry working group to manage Plan implementation and monitoring. This team should coordinate the implementation of actions with the respective partners or collaborators.

Based on the assessment of La Crosse's public trees and the Citywide urban forest resource, along with an evaluation of the programs that manage trees, and a cross-examination of community priorities and best practices, the following implementation schedule is recommended. Implementing the Plan in this manner will effectively and efficiently address the City's shared challenges and priorities using available resources. As the Plan progresses, more resources will become available to implement the longer-term actions.

Table 17. The framework for implementing and monitoring Plan progress

Theme: Tree Planting

Goal: Increase the tree canopy coverage citywide, thereby contributing to environmental sustainability, enhancing local biodiversity. This goal will focus on planting a diverse range of tree species, suitable for the region's climate and soil conditions, to create a sustainable urban forest.

Strategies	Actions
1A) Increase community-wide tree cover from 30% to 32.5% by 2030 and 35% by 2040 (350 acres added by 2030, 700 acres added by 2040). ✪GS1	1) Support the community-wide canopy goal by reviewing and committing to a tree canopy goal for public spaces.
1B) Plant shade trees around municipal buildings to reduce indoor cooling needs, and around parks, playgrounds, and other outdoor spaces to reduce outdoor temperatures. ✪GS1-2	2) Formalize a tree planting initiative for public spaces.
1C) Increase street tree planting along bicycle routes to provide comfortable, shaded travel, especially in low-income and minority neighborhoods. ✪GS1-5	3) Conduct a high-resolution tree canopy assessment as an update and periodically reassess canopy cover to monitor changes and trends.
1D) Identify public property that could be converted to forest instead of lawns. ✪GS1-6	
1E) Set a percentage maximum of each City-planted tree species to improve diversity, with an emphasis on species that are well-suited to future climate conditions. ✪GS2-6	**KEY:** "✪GS1-6" = indicates alignment to the City's Climate Action Plan (CAP) and the respective strategy in the CAP "UFMP" = Urban Forest Management Plan
1F) Develop neighborhood tree goals and create guidance and training to increase community stewardship of trees (e.g., opportunities for residents to learn about and take care of their neighborhood trees). ✪GS1-7	

Theme: Tree Maintenance

Goal: Strengthen the comprehensive public tree maintenance program to support public safety, long-term sustainability, and health of our urban forest. This will be achieved by conducting regular and thorough tree health assessments, preserving and rejuvenating public tree condition, and implementing proactive measures against potential threats. Achieving these outcomes requires systematic pruning of boulevard trees and trees in maintained areas of public parks.

Strategies	Actions
2A) Incorporate consideration of climate change impacts into forest management plans and practices to increase climate resilience, retain biodiversity, and ensure continued ecosystem function and services. ✪GS24-1	1) Formalize a five-year Public Tree Management Program.
2B) Implement and strategize improved pruning and maintenance cycles on the City-managed public trees.	2) Design the Public Tree Management Program to reduce tree risk and address tree removals.
2C) Develop a young tree pruning and watering program.	3) Increase public tree maintenance and management capacity.
2D) Continue to request and secure funding for necessary tree equipment and technology.	4) Update and maintain the public tree inventory.

Theme: Administration

Goal: Foster a culture of innovation, collaboration, and adaptability, ensuring the program remains responsive to changing environmental conditions and community needs. The focus is on developing a holistic approach that seamlessly integrates all aspects of the program, from administrative efficiency and balancing priorities to community involvement while maintaining a strong commitment to public safety, environmental stewardship, and urban ecological health.

Strategies	Actions
3A) Incorporate consideration of climate change impacts into forest management plans and practices to increase climate resilience, retain biodiversity, and ensure continued ecosystem function and services. ✪GS4-1	1) Align related and relevant strategies between the Urban Forest Management Plan and other plans such as the Climate Action Plan.
3B) Effectively manage invasive plant species on public property. ✪GS4-4	2) Gather research and an understanding of the specific climate impacts on the local forest ecosystem.
3C) Increase capacity to undertake additional program duties and outreach activities, such as community engagement and additional crews for maintenance.	3) Promote and implement projects that support biodiversity.
3D) Assess and strategize improved communication and protocols to efficiently manage the urban forest.	4) Establish budgets for and commitments to staying informed of climate change impacts and strategies.
3E) Strengthen existing and foster new collaborative partnerships to manage the urban forest.	5) Develop a list of harmful invasive plants (i.e., those known to reduce biodiversity or alter ecosystem processes) commonly used in landscaping and provide native alternatives to each non-native species.
	6) Utilize local, regional, and national resources and partners to increase capacity and levels of service.
	7) Align staffing and roles to manage growing service demands.
	8) Establish or strengthen standard operating procedures (SOPs).

Theme: Regulation

Goal: Preserve tree canopy cover and the urban forest through sound but fair policies and regulations that align with shared priorities in the City and best practices. Our tree canopy will be enhanced by facilitating the planting of diverse and climate-resilient tree species while implementing more stringent regulations on tree removals to protect and preserve existing green spaces.

Strategies	Actions
4A) Review City ordinances and zoning, including boulevard tree requirements. ✪GS1-1	1) Identify impediments to tree planting and opportunities where tree requirements could be strengthened.
4B) Monitor canopy cover change to inform possible changes to public and private tree regulations ✪GS1-8	2) Update City design standards with tree species recommendations that meet goals for species diversity, urban forest resiliency, and canopy cover.
4C) Update the City's design standards, specifications, and procedures to align with the Plan. ✪GS1-3, GS1-4	3) Update City design standards with tree requirements for parking lot installations and repairs.
4D) Establish or update code and standards to support a holistic ecosystem management approach to sustainability. ✪GS1-9	4) Utilize the urban heat and impervious surface study to target tree plantings and incentivize developers to support this effort.
4E) Incentivize and award City and private projects that support this Plan's goals and strategies. ✪GS3-6	

Theme: Engagement

Goal: Foster tree stewardship in our community through equitable and impactful community education and engagement. An engaged and educated community expands our capacity to sustainably manage the urban forest and offers opportunities for access to our natural environment.

Strategies	Actions
5A) Use education programs and incentives to promote the use of native plants and trees on public and private property. ✪GS4-3	1) Update messaging and materials.
5B) Develop and provide educational materials on tree planting and maintenance for a wide variety of residents.	2) Maintain Tree City USA accreditation.
5C) Increase opportunities for residents to participate in informational sessions about tree maintenance and care.	3) Finalize a robust community outreach strategy and communications plan.
5D) Create alternative engagement approaches, such as events around the care and planting of trees.	4) Continue to gather input and feedback from the community members of La Crosse.
	5) Conduct effective outreach and education to all neighborhoods and demographics.
	6) Provide frequent updates to the community on Plan implementation progress.
	7) Strengthen partnerships and leverage resources to achieve common goals.
	8) Create or expand the network of trained and engaged community tree stewards.

Monitoring Plan

This Urban Forest Management Plan will be updated and revised periodically (i.e., every 10 years) to reflect changes in structure and function of public trees and the Citywide urban forest, to incorporate changes in industry standards, to consider community response, and to measure the progress of the urban forest partners in implementing the recommendations and reaching the established goals. This process should be overseen by an urban forestry working group consisting of members from the community with an array of skill sets and background. Examples include the City's Forestry Division, the Parks, Recreation & Forestry Board members, other City staff, and stakeholders. Monitoring of the Plan should follow the Evaluate, Monitor, Report, and Revise methodology.

Knowing how the City and its partners are doing will require a continual process of evaluation. This section presents examples of how to monitor, analyze, and revise the Plan, which will keep stakeholders informed of the status of the Forestry Division's programs. To monitor progress toward implementing the Plan recommendations, an evaluation of key performance metrics similar to those utilize in developing the draft Plan should be completed. This evaluation will identify progress and shortfalls compared to the baseline evaluation.

In addition, a report card could be created based on outcomes of the audit and distributed to the public periodically. This will measure the progress toward implementing the Plan's actions. Included in this section is a suggested structure to measure and report success toward accomplishing each goal. Other indicators to measure progress may need to be developed to ensure a thorough and accurate evaluation.

Figure 45. Summary of the Plan implementation and monitoring process.

Evaluate, Monitor, Report, and Revise

Measuring accomplishment of the actions will require ongoing analysis. Benchmark values and key performance indicators resulting from implementing actions should be tracked, and a state of the urban forest report should be prepared and distributed to the public every 2 to 5 years. Evaluations and monitoring may include an updated public tree inventory, i-Tree benefits analyses, or urban tree canopy assessments. The state of the urban forest report should include the benchmark values as reported in the Plan so that the City can measure and compare changes to the urban forest. The report should reflect changes to the audit system that are measured.

The following table provides a summary of the benchmark values that can be used to evaluate, monitor, and report on Plan progress. In turn, the results will inform any necessary changes to the Urban Forest Management Plan's strategies or priority actions.

TRACKING BENCHMARKS AND KEY PERFORMANCE INDICATORS

Table 18. La Crosse's primary urban forest benchmarks and key performance indicators to measure Plan progress

URBAN TREE CANOPY (UTC) COVER	
Tree Equity Score (2023)	80 out of 100 (TreeEquityScort.org)
Citywide UTC (2022)	30% average (paleBLUEdot LLC, 2022)
Urban Forest Carbon Sequestration (2022)	16.7 million pounds (4,198 acres of canopy)
Short-term Citywide Canopy Cover Goal	32.5% by 2030
Long-term Citywide Canopy Cover Goal	35% by 2040
Proposed Canopy Goal for Public Trees	1:1 replacement up to 5:1 replacement
Public Tree Plantings to Reach Goal	35 trees per year up to 174 trees per year
PUBLIC TREE COUNTS (SEPTEMBER 2023)	
Total Public Trees Inventoried (alive or dead)	18,389 boulevard or Pettibone Park trees
Total Public Boulevard Trees	17,809
Total Pettibone Park Trees Maintained	580
Total Public Park Trees Maintained	TBD
Total Public Boulevard Planting Sites	TBD
Total Public Open Space Trees	Unknown
Public Tree Species Exceeding 10%	Norway maple (23%) | Hackberry (14%)
TREE BENEFITS (2023 ESTIMATES)	
Citywide (UTC Assessment)	2022: $4.8 million (total)
Ecosystem Benefits of Public Trees	2023: $111,237 (annual estimate)
Asset Value of Public Trees	TBD
TREE AND BUDGET DISTRIBUTION (2023)	
Public Trees (street and park) per Capita	0.35 (2021 population)
Budget per Capita	TBD
Budget per Public Tree (inventoried)	TBD
Forestry Full-time Equivalents (FTE)	5.00 (2023)
Total Public Trees (inventoried) per Staff	3,700 trees for every 1.0 FTE
MANAGEMENT ACTIVITIES (2023)	
Public Trees Pruned	~3,500 average
Public Trees Removed	TBD
Public Trees Planted	~421 trees (5-year average)
Number of Volunteers and/or Hours	TBD
Number of Permits	TBD (approved, denied)
INDICATORS OF SUSTAINABLE URBAN FORESTS (2023)	
Canopy Cover Change	TBD
Public Tree Size Class (majority)	28% 0-6-inch diameter
% of Public Trees in Good Condition	62%
Public Ash (*Fraxinus*) Trees Remaining	264 (2023)
% of Public Trees at Risk to Climate Change	11% (Climate Tree Atlas)
% of Public Tree Inventory Completed	TBD
# of Public Trees Assessed for Risk	TBD
# of UFMP Actions Completed	TBD (## out of 27 actions)
# of Urban Forest-related Events or Trainings	TBD
PUBLIC PERCEPTION	
Tree-related priorities	TBD
Preference for improving public tree health	TBD
Where to prioritize future investments	TBD

SAMPLE MONITORING SHEET

Table 19. Example worksheet for monitoring Plan implementation and changes to the Forestry Program

	Actual 2024	Goal 2025	Actual 2025
Outcome: The Public is Involved in Environmental Stewardship			
Calls for assistance & information			
Site inspections			
Average response time (site inspections)			
Customer satisfaction as rated by program participants (new)			
Presentations and educational events			
Forestry Administers a Viable Volunteer Program			
Volunteers trained (unique)			
Volunteers participating (adults)			
Volunteers participating (youth)			
Outcome: The Public Trees Management Program is Effective			
Acres of total tree canopy based on latest GIS report			
Technical reviews of projects completed on time			
Young Tree Survival is Improving			
Trees monitored (all projects in 5-year cycle)			
Survival rate of new trees			
Trees pruned to improve health			
Estimated acres of added canopy from monitored trees at maturity			
New Trees are Added to the Existing Canopy			
Restoration projects (contractor, volunteer, youth)			
Trees planted			
Tree seedlings and shrubs planted			
Other plants distributed or planted			
Native species composition of new plants			
Estimated increase in tree canopy this year, in square feet			
Outcome: Urban Forestry is a Good Investment			
Value of grants, donations, sponsorships, and reductions			
Benefits of newly planted trees over 40-year period			
Value of program per tree cost (planted and maintained for 5 yrs.)			

REPORTING AND REVISING

The findings from monitoring and evaluating Plan progress as demonstrated in the previous section should be incorporated into an internal and external report(s). Many cities across the country that have an urban forest management plan have been moving toward a direction of online reporting where results of the plan implementation monitoring protocols are made available on an interactive platform on a city's website. In addition, the board or committee overseeing the Plan's implementation in coordination with the urban forestry program often prepares an annual report and work plan that is communicated to other city boards, committees, and city council. In addition, other departments are made aware of the report and work plan and are informed of how the work plan aligns with other city priorities and projects.

Monitoring, evaluating, and reporting on Plan progress will inform any necessary changes to the Plan's strategies or actions and should be addressed in a timely manner where appropriate. Completion of this 10-year Plan with a five-year Public Tree Management Program is a critical step towards meeting the vision for La Crosse's urban forest.

Continual monitoring, analysis, and reporting will help to keep urban forest partners involved and focused on accomplishing the actions. Plans are typically revised every 5 to 10 years; hence, the Plan will need formal revision to respond and adapt to changes as they develop. Formal revision of the Plan should coincide with the update of the City's Comprehensive Plan, Climate Action Plan, and other relevant planning efforts. Recommendations and goals of each should be compared. Revisions to the Plan should occur with major events, such as newly discovered pests or diseases, changes in program budget and resources, or significant changes to industry standards or legal codes.

ACT AND REPORT	EVALUATE AND REVISE	ACT AND REPORT	EVALUATE AND REVISE
Years 1-5	*Year 5*	*Years 6-10*	*Year 10*
Annual Action Plans and Reports	Urban Forest Audit and Plan Amendments	Annual Action Plans and Reports	Urban Forest Audit and Plan Update
Monthly Activities and Annual Report	Updated Benchmarks and Plan Actions	Monthly Activities and Annual Report	Updated Benchmarks and Plan Actions

Figure 46. Example of the plan implementation, evaluation, and revision process.

CONCLUSION

Trees are an integral part of the community and the ecological systems in which they exist. They provide significant economic, social, and ecological benefits, such as carbon sequestration, reduction of urban heat islands, energy savings, reduction of stormwater runoff, improvement of water quality, enhancement of human health and wellness, and increase the value of properties. Planting and maintaining trees help La Crosse become more sustainable and reduce the negative impacts on the ecosystem from urban development. Trees are as necessary as water, infrastructure, and energy to sustain healthy communities. The health of the urban forest is directly linked to the health of the region.

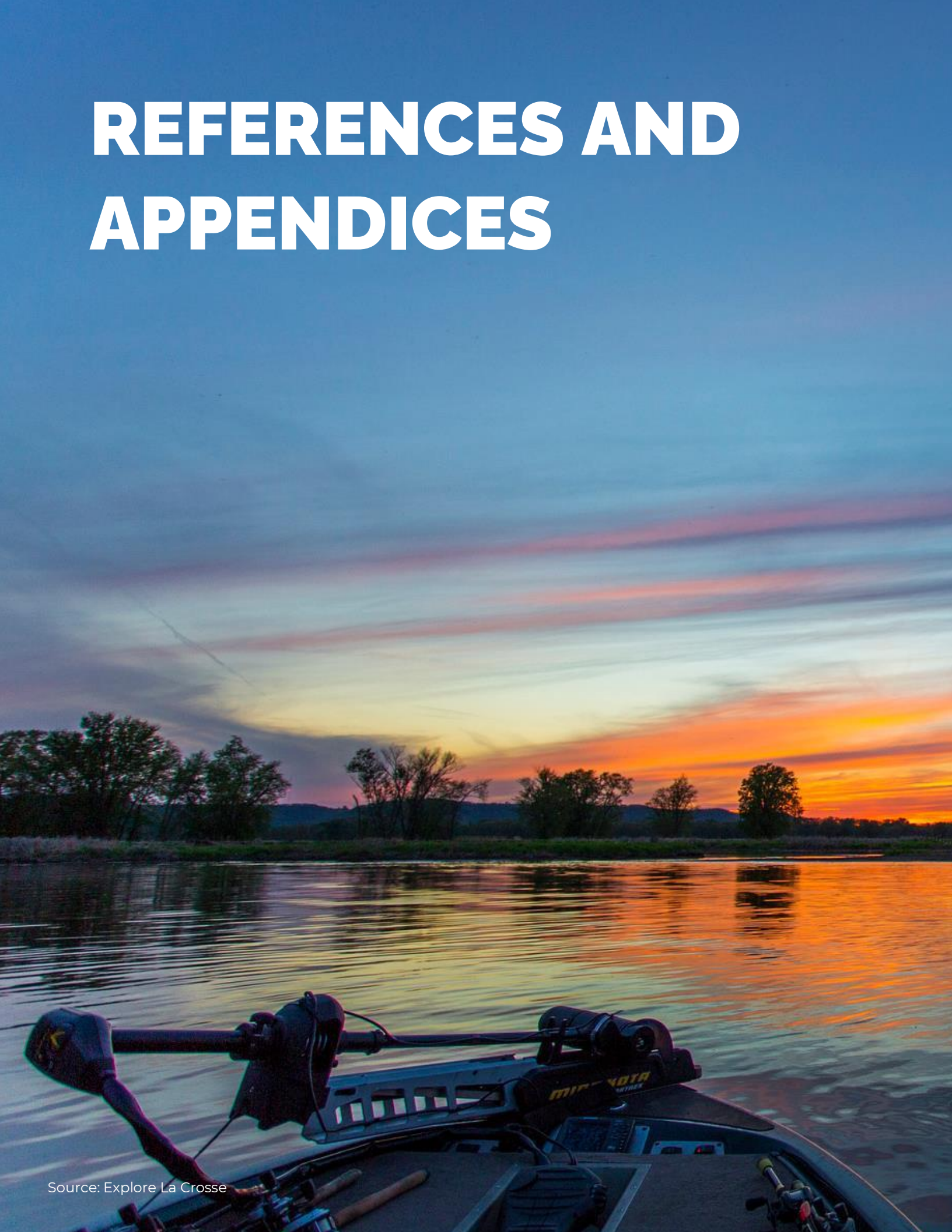
The Urban Forest Management Plan is a roadmap for a strategic approach to manage La Crosse's urban forest with an emphasis on public trees. The Plan contains goals, strategies, and supporting actions that are critical to the long-term vitality of the urban forest. However, in order for the Plan to actually have an impact on the forest resource, it requires stewardship and financial resources to begin implementation. Further, it needs to be institutionalized as a document requiring implementation with a sense of urgency to get things started. Completion of the Urban Forest Management Plan clearly demonstrates that City leadership understands that a healthy urban forest is critical to guaranteeing the long-term health and vitality of the community, and that it is not a luxury but an absolute necessity.

In order to accomplish the goals, the City should consider the following commitments:

- Recognize that the trees of the urban forest are more than aesthetic enhancements and are the backbone of the urban ecosystem.
- Promote and manage the health and growth of the urban forest by managing it as an essential part of the City's green infrastructure and by following scientifically established best management practices for tree selection, planting, watering, and pruning.
- Promote a robust urban forest through policies and practices that reduce its vulnerability to known diseases or pest infestations, and future threats, including the anticipated effects of climate change.
- Promote public appreciation of the urban forest through educational outreach programs. Support local businesses, institutions, organizations, and individuals in their efforts to grow and maintain the urban forest through community education.
- Engage in a continuous process of long-range planning for the growth and maintenance of the urban forest and proceed in an inclusive and transparent manner.

Successful implementation of actions in this Plan will bring La Crosse to a higher level of service that is more equitably distributed across the City resulting in a sustainable and thriving urban forest that benefits all residents and future generations.

REFERENCES AND APPENDICES



Source: Explore La Crosse

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APPENDICES

Appendix 1: Tree Pest and Disease Management

Goals

The objectives of the La Crosse's Tree Pest and Disease Management Plan include:

- **Preservation of Public Trees**: Safeguarding the city's trees from the debilitating effects of pests and diseases.
- **Minimization of Pesticide Utilization**: Curtailing reliance on chemical treatments through the prioritization of alternative pest control methods.
- **Sustainable Pest Management**: Advancing sustainable pest control practices that ensure long-term ecological balance and tree health.
- **Public Awareness and Education**: Informing residents about the tree pests and diseases prevalent in the region, their impacts, and prevention strategies.

Objectives

To actualize these goals, the city will implement the following measures:

- **Arboricultural Monitoring**: Systematic surveillance of public trees to identify and diagnose the presence of pests and diseases.
- **Preventive Measures**: Enforcement of rigorous tree care and sanitation protocols to diminish the probability of pest and disease outbreaks.
- **Pesticide Application**: Reserved use of pesticides, adhering to safety and responsibility standards, and only as necessitated by situational urgency.
- **Continuous Evaluation**: Ongoing assessment of pest control operations, refining tactics in response to their efficacy and environmental interactions.
- **Community Education**: Active dissemination of knowledge regarding tree health, pests, and diseases to the public, fostering community participation in preventative care.

Implementation

The City of La Crosse will operationalize this pest and disease management plan through concerted actions:

- Professional Inspections: Engage certified arborists for regular and comprehensive evaluations of the urban tree population.
- Tree Care Program Development: Formulate an extensive tree care agenda encompassing appropriate irrigation, nutrition, and pruning practices.
- Removal and Disposal: Methodically remove and appropriately dispose of trees that are diseased or pest-ridden to prevent further infestation.
- Pesticide Oversight: Apply pesticides judiciously, ensuring application safety and environmental responsibility.
- Effectiveness Monitoring: Vigilant monitoring of pest control strategies, adjusting methodologies in alignment with observed outcomes.
- Public Education Initiatives: Roll out educational programs aimed at equipping residents with knowledge on tree health maintenance and disease prevention.

Evaluation

The effectiveness of the Tree Pest and Disease Management Plan will be assessed annually, with evaluations focusing on:

- **Disease and Pest Incidence**: Quantitative measurement of the prevalence and impact of pests and diseases on public trees.

- **Cost Analysis**: Financial evaluation of pest control measures and their effectiveness.
- **Public Knowledge**: Assessment of awareness regarding tree pests and diseases.
- **Community Feedback**: Gauging resident satisfaction with the city's pest and disease management initiatives.
- **Adaptation of Strategies**: Utilization of evaluation outcomes to inform and refine the plan's strategies and actions.

Building on the foundational strategies outlined, a detailed examination of specific pests is imperative. The following section provides an in-depth analysis and tailored management protocols for each primary arboricultural threat: the emerald ash borer, oak wilt disease, and spongy moth ensuring targeted and effective mitigation efforts.

La Crosse's Tree Pests and Diseases

EMERALD ASH BORER

Emerald ash borer (EAB) is an extremely destructive insect of ash trees (*Fraxinus* spp). The emerald ash borer (*Agrilus plannipennis*) is a wood boring beetle of Asian origin that has become established in many parts of the United States and Canada where native and urban ash are found. Ash tree species such as green and white ash are very common in Colorado landscape settings. It is far more damaging to urban trees than any other insect that has previously been found in the state. As populations of this insect increase in the infested areas, all untreated ash trees will die as a direct result of EAB.

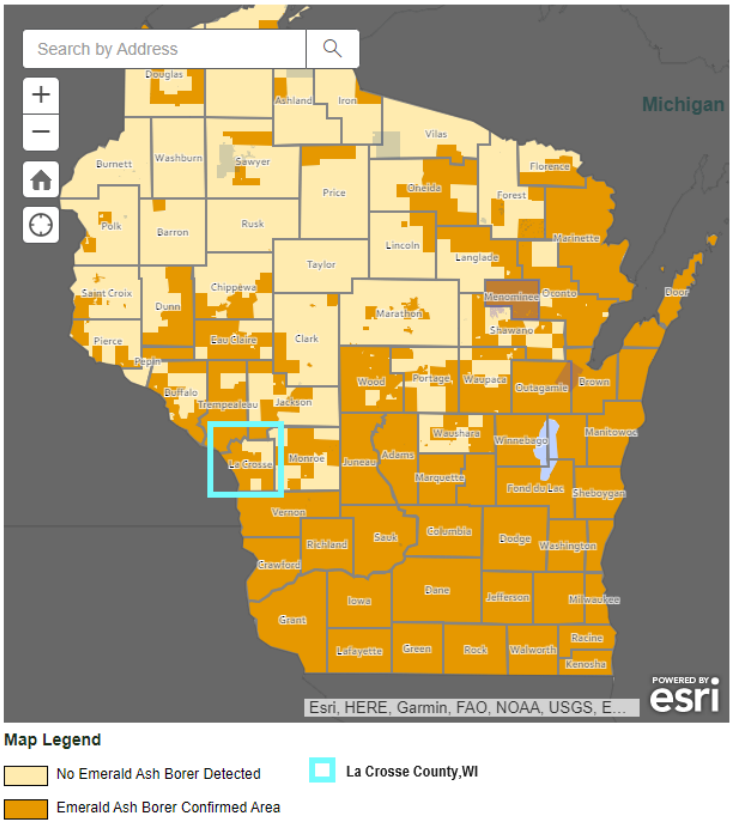


Figure 47. Map displaying the status of detection for emerald ash borer by Wisconsin counties

This pest is not very damaging in its native land due to naturally occurring biological control organisms and the natural development of EAB resistance within the native ash populations. Unfortunately, native ash trees in the U.S. have zero resistance to EAB with the small exception of blue ash in the southeast states. In the Midwest and eastern areas of North America, where this insect has been present for several years, EAB has already killed many millions of ash trees resulting in losses of over $4 billion worth of resources. In Wisconsin it is estimated there are over 770 million ash trees, nearly 7 percent of Wisconsin's trees. In urban areas, ash trees make up to 20 percent of the urban forest, and many of these trees are on private property (University of Wisconsin, 2023). If preventative treatments are not implemented within a community, it has the capacity to kill every ash tree within a given community inside ten years.

EAB AND TARGET TREE IDENTIFICATION

Early EAB detection protocols are critical to management strategies and budgetary planning. City Forestry's limited resources and staff make this effort difficult, but Forestry should explore options for early detection.

Figure 48. Ash (Fraxinus) trees have opposite buds, diamond-shaped ridged bark, five to nine leaflets on each stalk, and paddle-shaped seeds. Adult beetles are approximately one-half inch long and have an emerald-green head and back, a coppery reddish-purple abdomen, create D-shaped exit holes, and S-shaped galleries when entering the tree in the larval stage (Source: Colorado State Forest Service)

Signs of EAB infestation include:

- Sparse leaves or branches in the upper part of the tree
- D-shaped exit holes approximately one-eighth-inch wide
- New sprouts on the lower trunk or lower branches
- Vertical splits in the bark
- Winding, S-shaped tunnels under the bark
- Increased woodpecker activity

EAB has a life cycle that normally takes one year. During winter, the life stage present is a full-grown larva that lives within a chamber cut into the outer sapwood of a host tree. In the spring it will transform to a pre-pupal phase and then continue into the pupal stage. It will transition from a pupa into the adult beetle form which will then emerge from the ash. During low population levels, this life cycle may take two years to complete.

Adults emerge from the tree by cutting through the bark, producing a D-shaped exit hole. In Wisconsin, EAB will normally begin to emerge in mid- to late-May, with peak emergence in June. However, some beetle emergence could extend into midsummer.

After emergence, adults move to the crown of an ash tree (flight season) where they feed on leaves. After about a week of feeding, the now mature adults will begin to mate. A few days after mating the females will begin to lay eggs on the surface of the bark. Females typically live for about a month and during this time will lay several dozen eggs.

Eggs hatch in about a week and the tiny, newly hatched larvae burrow through the bark to feed on the tissues underneath which includes the phloem, cambium, and outer sapwood. This is the primary cause of death to ash trees.

EMERALD ASH BORER MANAGEMENT

The following provides an overview of the EAB monitoring and management strategy.

EAB Monitoring and Detection
Create and maintain an inventory of public trees with active monitoring.
Coordinate with partners to provide public information and trainings regarding EAB detection.
Estimate the EAB management costs and prepare budget requests.
Keep current with local and regional research, resources, and quarantines.
Identify ash trees for preventative treatments such as high value trees in good condition.
Identify trap trees for EAB.
Identify and remove dead or dying ash trees as needed and feasible.
Develop incentives and programs to support private ash tree management.
Consider updating City Code to allow flexibility in ash removals for development projects, removal of diseased trees, emergency removals, and City authority for ash tree treatments and removals.
Determine the approach for treatments (methods, in-house vs. contracted).
Establish a wood utilization program and/or identify local woodworkers for wood reuse.
Identify hazard trees in detection / infested areas.
Remove dead or dying ash trees and public areas promptly.
Detect spread of infestation into new neighborhoods as early as possible and suppress the pest pressure.
Maintain the inventory of public trees based on the planned and completed management.
Continue to educate and support EAB management on private land.
Replant using non-host tree species at locations where ash trees were removed.
Plant two trees for each ash removed and replant within one year of removal.
Consider incentives and programs for private landowners to replant.
Align plantings with tree canopy cover goals and priority planting areas.

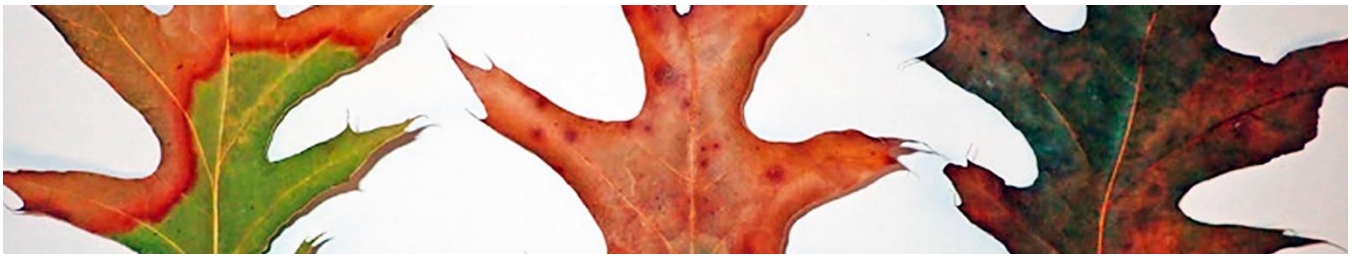
The City of La Crosse should develop a formal strategy which includes a combination of tree removal, replacement, inspection, monitoring, and treatment. The objective of the strategy should be to protect the city's ash trees and minimize the costs associated with EAB management. An essential component to this strategy is the education and outreach to residents and large.

Tree removals should be determined and prioritized based on the size of the tree, location, condition, among other factors. If an ash tree is the prominent feature on a site, treatment options may be considered. The removals should align with the risk reduction removal strategies and can be conducted by City Work District or by Citywide designated priority. Tree replacements should be planted after removal of the ash tree and align with the Urban Forest Management Plan's planting strategies.

The cost of treating ash trees for EAB will vary depending on the treatment method used, but generally, soil or trunk injection treatments of an insecticide. Caution be made when considering insecticides as some can affect pollinator species. Imadacloprid, typically applied to the soil, and emamectin benzoate, applied as a trunk injection, are both effective in controlling EAB for two years but can be harmful to pollinators. Azadirachtin is a natural-sourced insecticide that is applied as a trunk injection and there are conflicting studies and research on the impacts of pollinators, but it is also effective for two years in treating EAB. The City should identify ash trees to treat in perpetuity based on their significance and ash trees to treat in the interim while removals are conducted to spread out the costs over time.

Property owners and residents should be aware of the EAB management program and trained to identify new locations of ash trees and possible EAB spotting. Property owners should understand the resources, best practices, and other information regarding EAB management on their property to prevent further spread of the pest.

Oak Wilt



Oak wilt, caused by the fungus *Bretziella fagacearum*, is a significant concern in Wisconsin, where it affects both the red and white oak groups. Oak wilt was first detected in Wisconsin in 1944 and is now confirmed in most of Wisconsin's counties. Its distribution within the state has been notably observed in urban areas and fragmented forests, often exacerbated by human activities that facilitate the spread. The disease is not uniformly spread across the state but tends to cluster in pockets where conditions are conducive to the fungus's growth and spread, while being widespread in central and southern Wisconsin it is still a new and uncommon disease in northern Wisconsin.

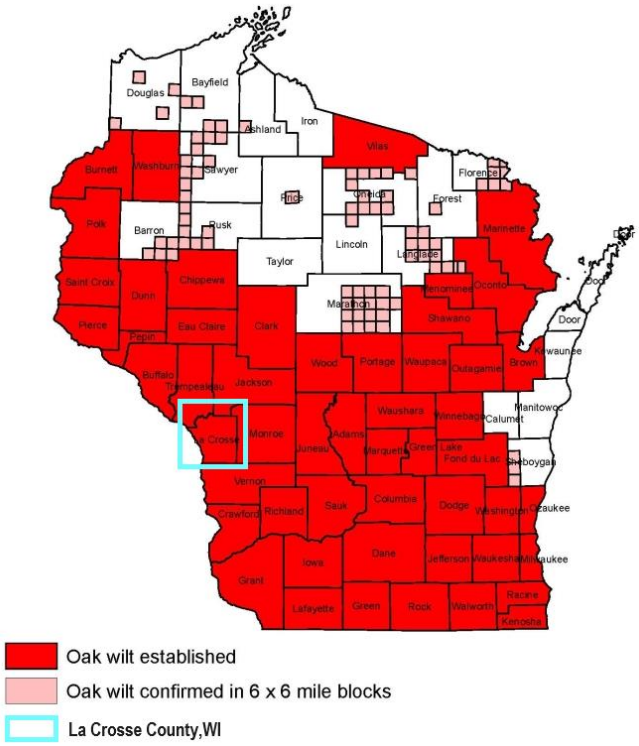


Figure 49. Oak wilt detections in Wisconsin by county (Source: WI DNR, 2023)

The impact of Oak wilt on Wisconsin's landscapes is profound and multifaceted. Ecologically, the disease has the potential to dramatically alter forest composition by selectively killing oak species, which are keystone species in many Wisconsin forests. This loss can lead to decreased biodiversity, as oaks provide critical habitat and food sources for a variety of wildlife, including insects, birds, and mammals. Oaks are valuable not only for timber but also for their contribution to the aesthetic and recreational appeal of Wisconsin's landscapes. In urban and suburban settings, the loss of mature oaks to Oak Wilt can reduce property values, increase municipal costs associated with tree removal and replacement, and necessitate increased expenditures for pest management. Additionally, the social and cultural loss is considerable. Oaks hold a celebrated place in Wisconsin's natural heritage and are often considered community landmarks. The presence of oaks is intertwined with regional identity and the cultural value placed on natural spaces for recreation and comfort.

From an urban forestry management perspective, the impact of Oak Wilt necessitates ongoing vigilance, resource allocation for management practices, and the development of long-term strategies for resilience and recovery. As such, the disease's presence in Wisconsin underscores the need for proactive management to sustain the health of both natural and urban forests.

OAK WILT AND TARGET TREE IDENTIFICATION

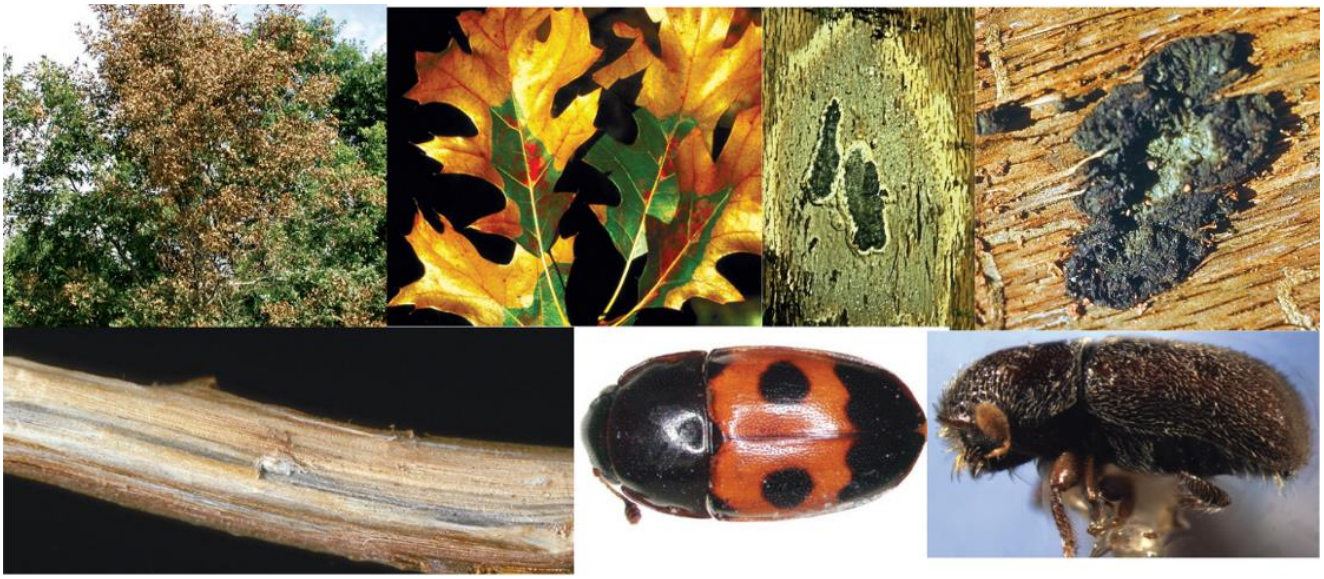


Figure 50. Images to support identifying the oak wilt disease complex from top left to bottom right: typical crown symptoms of oak wilt on red oak, oak wilt symptoms on red oak leaves, fungal mat of oak wilt disease, older fungal mat with bark beetle galleries, black streaks in the new sapwood caused by oak wilt disease, adult nitidulidae beetle, and adult oak bark beetle (Source: USDA Forest Service)

Early oak wilt detection protocols are critical to management strategies and budgetary planning. City Forestry's limited resources and staff make this effort difficult, but Forestry should explore options for early detection.

Signs of oak wilt include:

- Early spring leaves turn dull green or bronze and looked water soaked
- Symptoms start from the tip and outer edge of leaves, moving toward the midrib and base
- Rapid defoliation, starting in the upper canopy
- Leaves that drop to the ground are still partially green
- Black and gray fungal mat development under the bark of dying oaks
- Fungal mats can raise and crack the bark of infected trees
- Brown or lack discoloration in new sapwood is common in white oaks
- Red oaks die quickly, white oaks may recover or die in 1 to 2 years

The biology of oak wilt revolves around its transmission and the lifecycle of the pathogen. This disease is a vascular wilt. The fungus invades the water-conducting vessels of oaks, producing fungal mats that disrupt water flow, causing wilting and eventual death. Trees respond to infection by forming tyloses (where living parenchyma cells balloon into vessels as a defense response) that restrict water flow in the vessels.

Transmission occurs via root grafts between adjacent oaks or through sap-feeding beetles that carry spores from infected to healthy trees. The beetles form breeding galleries in recently dead or dying oaks. The adults carry spores on their bodies when they emerge the following spring and infect healthy trees as they feed in the spring and early summer. The fungus overwinters as mycelium in infested trees and as fungal mats on dead trees.

The red oak group, which includes species like northern red oak and pin oak, is particularly susceptible, often dying within a single growing season after infection. White oaks, such as bur oak and white oak, show more resistance and may survive for several years with the disease, exhibiting a slower decline.

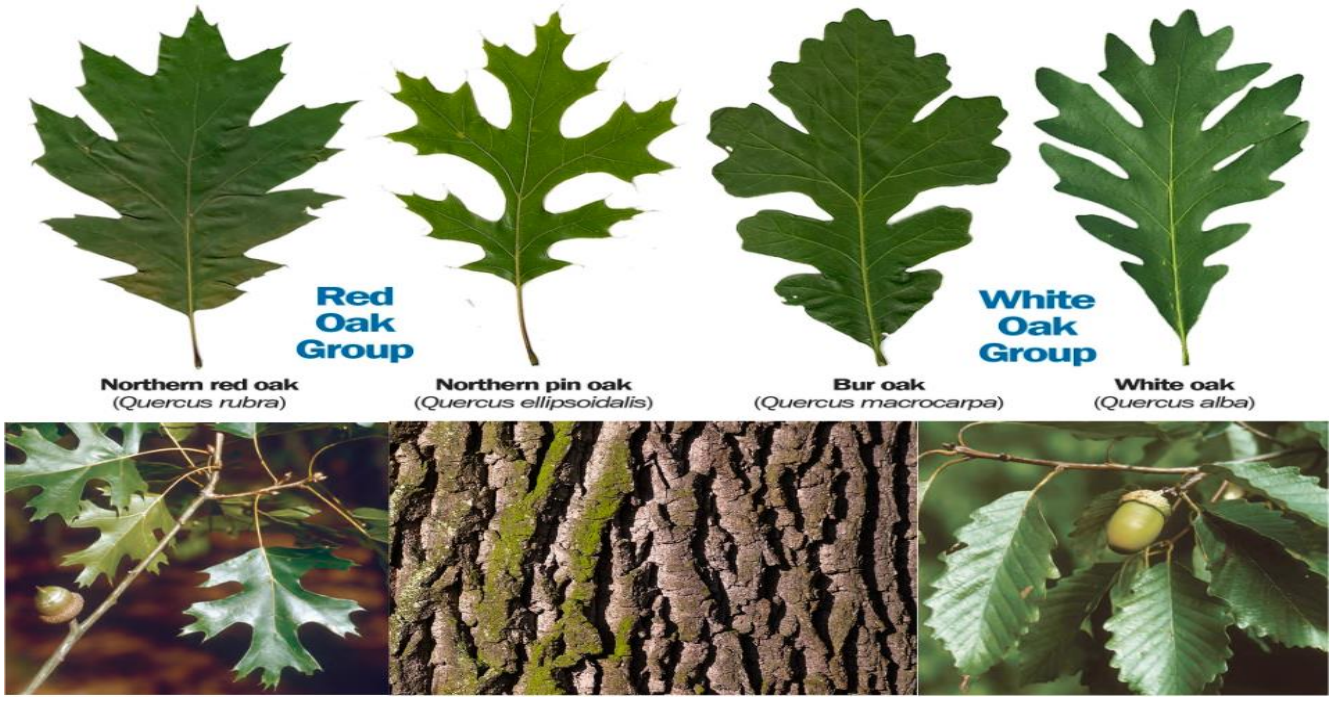


Figure 51. Oaks are divided into two major groups: red and white oaks. Both have alternate branching patterns, produce acorns, and have very rough, thick bark with deep fissures running vertically along the trunk. Oak bark can range from gray- brown in color to brown-red. Red oak leaves have bristles at the tips of the lobes and leaf apex, while white oak leaves do not. Red oak acorns require two growing seasons and have thin flat cup scales with velvety hairs on the inner surface, while white oak acorns require one growing season and have thick cup scales with a keel and callus growth at the base (Source: PlanIT Geo, Inc. photo stock)

OAK WILT MANAGEMENT

Management of Oak Wilt in Wisconsin is multifaceted, combining preventative measures, cultural controls, and direct interventions or mechanical controls.

Prevention of this disease is the best approach as it is difficult to control once it exists in an area or stand. Preventative measures include avoiding pruning oaks during the growing season when sap-feeding beetles are active.

Cultural controls involve the proper disposal of infected wood to prevent it from serving as a source for beetle attraction and spore dispersal. Trees that have died of oak wilt will harbor spores for up to one year after death. If the fungal mats or beetle galleries are present, trees should be cut, and the wood should be burned, buried, or chipped. Sanitation of all tools with a bleach water dilution between pruning will help prevent human caused spread of spores.

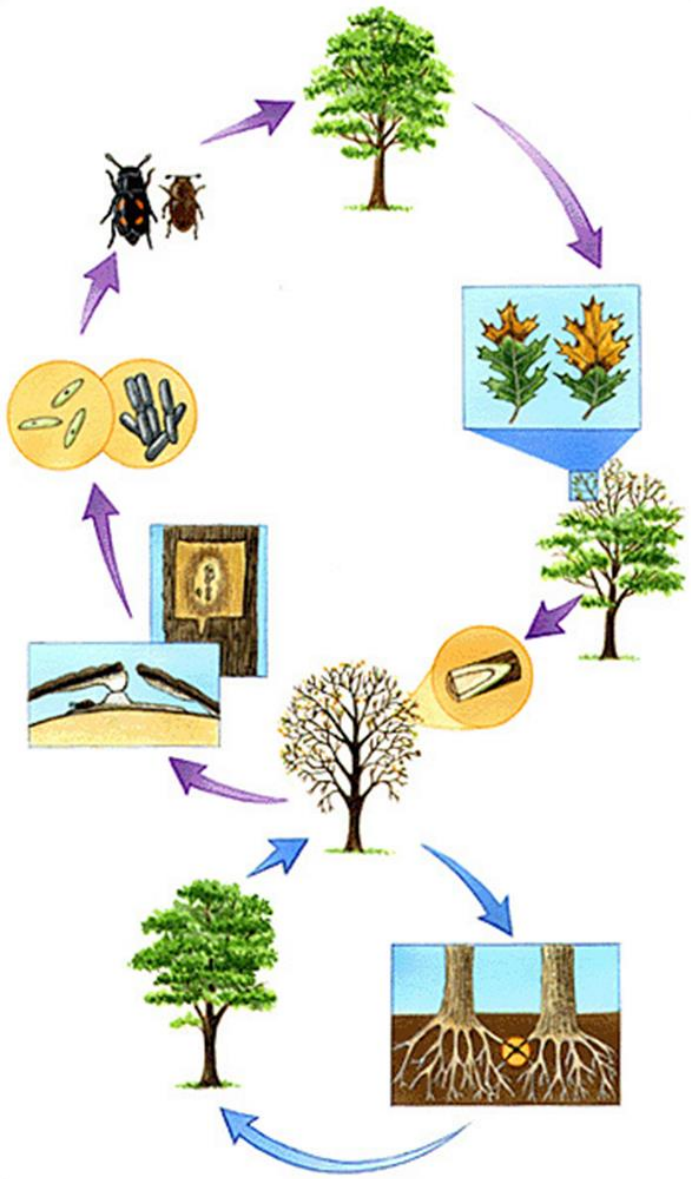


Figure 52. The oak wilt disease cycle (Source: North Country Public Radio)

Direct interventions may include the use of fungicides and the disruption of root grafts between infected and uninfected trees to halt the below ground spread. Mechanical and chemical barriers and severing root grafts between diseased and healthy trees are effective ways to prevent the spread of oak wilt through root grafts. New root grafts will not form between dead/dying trees and healthy trees. Physical severing of the root system using a vibratory plow or trencher has proven to be effective if plow lines are placed correctly. Recently, field trials have shown some promising results to contain the below-ground spread of oak wilt by using herbicides on healthy oaks, or uprooting the entire root mass of healthy oaks that border the infected pocket. Although management to control the below ground spread of oak wilt can be complicated and costly, it can be very successful (Wisconsin DNR, 2023).

Public education campaigns are also critical, informing the community about early detection and proper management techniques to prevent the establishment and spread of oak wilt.

Spongy Moth

The spongy moth (*Lymantria dispar*), formerly known as the gypsy moth, has a well-documented history of infestation in the eastern United States, including Wisconsin. In La Crosse, the distribution of the spongy moth is actively monitored due to its status as an invasive species, prompting management efforts to curb its spread. The pest is native to Europe and was first introduced to North America in the late 19th century to Massachusetts by an amateur entomologist hoping to start a silk industry in the United States by crossbreeding the species with native moths found in New England. The spongy moth has since expanded its range, primarily through human-assisted movement and wind, defoliating millions of acres of trees in forests and urban areas in 20 states and the Washington D.C. area.

Figure 53. Spongy moth caterpillar feeding on a leaf.

Spongy moths were first found in the eastern part of Wisconsin in 1960, becoming fully established in the state by 1989. Moths have since been found in every county, with 53 of Wisconsin's 72 counties now enacting quarantines. In unquarantined counties, such as La Crosse, the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) monitors for the pest using traps and conducts aerial spray treatments on any isolated populations it finds.

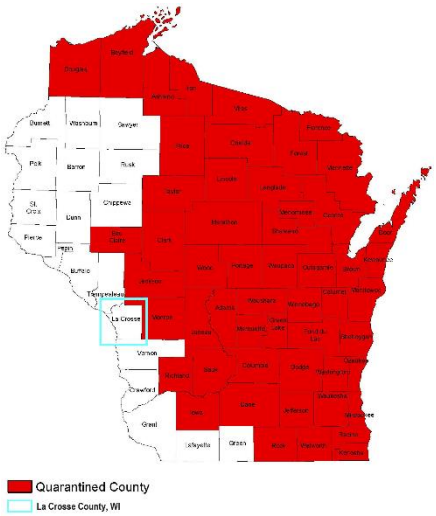


Figure 54. Map of Wisconsin counties with spongy moth quarantines (Source WI DNR)

The impact of the spongy moth on ecosystems is considerable. Severe and repeated infestations can lead to the decline and death of trees, especially if the trees are already stressed by other environmental factors. The loss of trees affects biodiversity, public enjoyment, and property values. It also impacts the area's carbon sequestration capabilities and can increase the vulnerability of forests to erosion and other invasive species. High caterpillar numbers can be a tremendous nuisance. In addition, the caterpillar hairs can cause skin rashes and other reactions in some people.

SPONGY MOTH AND TARGET TREE IDENTIFICATION

Early oak wilt detection protocols are critical to management strategies and budgetary planning. City Forestry's limited resources and staff make this effort difficult, but Forestry should explore options for early detection.

Figure 55. Images to help with identifying spongy moth from top left to bottom right: spongy egg mass laid on tree bark, spongy moth caterpillar, spongy moth pupae (cocoon), male spongy moth, male spongy moth (brown) and female spongy moth (white), and a defoliated tree canopy caused by caterpillar feeding (Source: USDA Forest Service)

Identifying characteristics of spongy moth and signs of infection:

- Tan colored egg masses on bark covered with hair, giving a furry appearance.
- Egg masses are 1 to 1.5 inches long and about 0.75 inches wide.
- Newly hatched caterpillars are black and hairy.
- Mature caterpillars are 1.5 to 2 inches in size, a mottled yellow to gray color.
- Mature caterpillars have a distinctive five pairs of blue dots followed by six pairs of red dots along their backs.
- Female moths are white with dark saw-toothed patterns on their wings and a 2-inch wingspan.
- Male moths are brown with a darker brown pattern on their wings and a 1 to 1.5 inch wingspan.
- Trees affected by spongy moth will be mostly stripped of leaves or have a few leaves that show signs of feeding.

The spongy moth is a defoliating insect whose larvae (caterpillars) feed voraciously on the leaves of hundreds of species of plants, predominantly hardwood trees. Spongy moth caterpillars feed on more than 300 species of deciduous and evergreen trees but prefer approximately 150 species as primary hosts. Some of these preferred hosts include aspen, birch, cedar, cottonwood, fruit trees, larch, oak, poplar, and willow. Oak trees growing on lawns are particularly susceptible to heavy defoliation. Research shows that the following species are by avoided by the spongy moth: ash, red and white cedar, locusts, balsam fir, dogwoods, mountain maple, and scotch pine.

The biology of the spongy moth is characterized by four life stages: egg, larva (caterpillar), pupa, and adult. Populations periodically become high very high when weather conditions are favorable for the insect. These outbreaks are observed in areas about every ten years. Females lay egg masses in July and August that overwinter. During an outbreak, it is common to see large variations in egg mass numbers from one year to the next. The egg masses, laid on trees, buildings, and outdoor furniture hatch in between mid-April and mid-May, releasing caterpillars that feed on foliage. During an outbreak they can strip trees, seemingly overnight.

As the caterpillars grow, the distinctive pairs of blue and reds spots appear down their backs. Spongy moths do not make a silk web or tent in trees. Feeding occurs throughout June and July, with the caterpillars maturing to pupae from late June to August. Adult moths emerge from the pupae and only live long enough to reproduce. Female moths are unable to fly while the males fly erratically.

There are several hairy, bristly, or tufted caterpillars that are often mistaken for spongy moth. It is therefore essential to make a proper identification before taking necessary control or management measures.

SPONGY MOTH MANAGEMENT

Effective management of the spongy moth in La Crosse requires a comprehensive and integrated approach. The focus is on minimizing the impact of the pest while maintaining ecological balance. Regular monitoring of spongy moth populations and the health of forested areas is vital for early detection and timely intervention. This includes setting up pheromone traps to monitor adult moth activity and aerial surveys to assess defoliation levels. As mentioned, the Wisconsin DATCP and DNR regularly perform monitoring through these methods in unquarantined Wisconsin counties. Strict enforcement of quarantine regulations helps to contain the infestation within manageable limits. Regulations regarding the movement of firewood and other potential means of pest transport are crucial in slowing the spread of the spongy moth.

Biological controls of spongy moth are difficult though natural enemies do exist, such as certain species of wasps, birds, and small mammals like mice and shrews. Unfortunately, due to many of these species also being considered pests or undesirable and the presence of domesticated cats, their ability to control populations of spongy moths is limited.

Mechanical and physical control methods include scraping off and destroying egg masses found on tree trunks, outdoor furniture, and other surfaces. Oiling or scraping egg masses into buckets of soapy water and allowing them to soak for a few days is the most effective method. Egg masses are often found in hidden spots, such as behind signs, inside birdhouses, and beneath loose bark. Only remove new masses that are safely within reach. Barrier bands and collection bands are an effective means of trapping or deterring caterpillars as they crawl up into trees. Barrier bands

Figure 56. Scraping egg masses into soapy water (Source: USDA Forest Service)

should be prepared before eggs begin hatching, while collection bands are used to collect larger caterpillars later in the season. Barrier bands consist of a sticky wrap, like duct tape, wrapped around the tree that traps the caterpillars. A collection band typically is made of burlap wrapped around the tree. In the late season, caterpillars will crawl down the trunk to hide from predators. The caterpillars will hide under the burlap and can be easily destroyed by scraping them into buckets of soapy water. Bands should be checked daily while caterpillars are present. Pupae and female moths can be brushed into soapy water or crushed. Avoid touching any stage of the spongy moth as they can cause skin irritations.

Figure 57. Scraping caterpillars into soapy water from a burlap collection band (Source: USDA Forest Service)

Figure 58. Caterpillars clustering beneath a sticky barrier band (Source: USDA Forest Service)

Chemical controls, while less preferred, may be suitable for protecting high-value trees. Insecticides should be used judiciously and as part of a broader Integrated Pest Management (IPM) approach. The timing of applications is critical to maximize effectiveness and minimize environmental impact. These are applied as a spray, soil treatment or injection. There is an unknown risk of introducing “oak wilt” through unsealed trunk injection sites on oak trees. An aerial spray is an option for larger areas of high-value trees found in residential areas, campgrounds and parks.

Raising public awareness about the spongy moth, its life cycle, and management is essential. Homeowners are encouraged to inspect their trees and property for signs of the moth and to participate in control efforts like egg mass removal. Educational outreach programs and materials help in spreading awareness and guiding residents on responsible management practices.

Collaboration with state and federal agencies, universities, and research institutions is key to staying informed about the latest control technologies and strategies. Ongoing research helps in developing new and more effective ways to manage the spongy moth population.

Healthy trees should withstand one or two years of heavy defoliation and produce a new set of leaves within a few weeks. Multiple forms of tree stress simultaneously (e.g., heavy defoliation, drought or physical damage) will often kill a tree. Watering yard trees once a week during dry periods will reduce tree stress and aid recovery from heavy defoliation.

Appendix 2: Tree Benefits Descriptions

The Publicly Managed Urban Forest Benefits

Benefits of the Urban Forest

Sustainability and urban forests are intimately intertwined, each playing a crucial role in enhancing the other. Urban forests, essentially comprising all trees and vegetation in urban areas, contribute significantly to sustainable urban development, offering a myriad of benefits that encompass environmental, social, and economic dimensions.

From an environmental perspective, urban forests are vital in mitigating the urban heat island effect, a common issue in cities where concrete and asphalt absorb and re-radiate heat more than natural landscapes. Trees and plants in urban forests lower surface and air temperatures through shading and evapotranspiration, creating a cooler and more pleasant urban environment. This cooling effect is not only essential for comfort but also reduces the energy demand for air conditioning, leading to lower greenhouse gas emissions and energy costs. Moreover, urban forests play a key role in air quality improvement. Trees absorb pollutants like nitrogen oxides, ammonia, sulfur dioxide, and particulate matter, making the air healthier to breathe. They also sequester carbon dioxide, a primary greenhouse gas, thus contributing to climate change mitigation.

In terms of water management, urban forests enhance the city's resilience to flooding. Trees and undergrowth increase soil permeability, allowing for better rainwater absorption and reducing surface runoff. This natural water management system diminishes the strain on urban sewage systems during heavy rains and mitigates flood risks. Additionally, this process helps in purifying water, as the soil acts as a natural filter, removing pollutants and improving the overall water quality in urban areas.

The benefits of urban forests extend beyond environmental sustainability to encompass social and economic aspects. Socially, these green spaces are essential for the mental and physical well-being of urban residents. Urban forests provide tranquil spaces for relaxation and recreation, which is crucial in the often-stressful urban environment. Studies have shown that access to green spaces significantly reduces stress, anxiety, and depression, and improves overall mental health. Moreover, urban forests offer opportunities for physical activities like walking, jogging, and cycling, contributing to public health, and reducing healthcare costs.

Culturally, urban forests often become landmarks and symbols of local identity. They can reflect the historical and cultural heritage of a place, with certain trees or parks holding historical significance and being integral to local traditions and narratives. For instance, a centuries-old tree might be a living witness to the city's history and evolution, thus becoming a cultural icon.

In a broader sense, the urban forest is a manifestation of a city's relationship with the natural environment. It shows how urban planning and development can harmonize with nature, rather than dominate it. This balance is increasingly recognized as crucial for sustainable and livable cities, making urban forests a vital component of urban ecosystems.

Urban forests also enhance the aesthetic appeal of cities, making them more attractive places to live, work, and visit. This increased attractiveness can lead to economic benefits. For instance, properties near well-maintained green spaces often have higher values. Businesses in greener areas tend to attract more customers, and employees report higher levels of job satisfaction. Urban forests also create job opportunities in sectors such as landscaping, park management, and environmental conservation.

Educationally, urban forests serve as outdoor classrooms where people can learn about nature, ecology, and environmental stewardship. This educational aspect is particularly important in urban settings, where people, especially children, might otherwise have limited opportunities to connect with nature.

Urban forests also contribute to urban biodiversity by providing habitats for various wildlife species, including birds, insects, and small mammals. This biodiversity is not only valuable but also contributes to the ecological functioning of urban areas, such as pollination of plants and pest control.

However, the sustainability of urban forests themselves is a critical consideration. The planning, planting, and maintenance of urban forests need to be done thoughtfully to ensure that they are resilient to urban stressors such as pollution, limited soil space, and human interference. Species selection is crucial; native and drought-resistant species are often preferred for their ability to thrive in specific urban conditions and their minimal requirement for maintenance.

Furthermore, urban forests must be inclusively and equitably distributed across the city. All residents, regardless of their economic status or neighborhood, should have access to the benefits provided by urban green spaces. This equitable distribution also plays a role in mitigating environmental injustices, where underprivileged communities often face higher levels of pollution and fewer green spaces.

In conclusion, urban forests are a cornerstone of sustainable urban development. They provide a wide range of environmental, social, and economic benefits that are essential for the health and well-being of urban populations and the environment. Sustainable management and equitable distribution of urban forests are crucial in building resilient, livable, and vibrant cities for current and future generations. As urban areas continue to grow, the importance of urban forests in sustaining the health and vitality of urban life cannot be overstated.

The City of La Crosse utilizes the platform TreePlotter to maintain, record and manage the urban forest resource. By utilizing this tool, the City can estimate the ecological value of the trees and urban forest and understand the ecological and economical investment and return of this resource.

Carbon Sequestration and Storage

Both CO_2 and carbon storage primarily occur through the natural process of photosynthesis and biomass accumulation. CO_2 storage refers more to the dynamic process of trees absorbing CO_2 and releasing oxygen, thus immediately impacting air quality and CO_2 levels. Carbon storage, on the other hand, encompasses the longer-term accumulation of carbon in the biomass and soil of the urban forest, contributing to a reduction in the overall atmospheric carbon over time.

The effectiveness of these processes in urban forests depends on various factors such as the density of tree planting, species selection, tree health and maintenance, and integration with urban infrastructure and planning.

CO_2 Storage in Urban Forests

1. Mechanism:
    - Photosynthesis: Urban trees and vegetation absorb CO_2 from the atmosphere through photosynthesis. During this process, carbon dioxide is converted into glucose, which the plants use for growth, and oxygen is released.
    - Carbon Sequestration: The carbon portion of the absorbed CO_2 is incorporated into the biomass of the trees and soil. This includes the tree's trunk, branches, leaves, and roots, as well as the organic matter in the soil.
2. Role in Urban Forests:
    - Reducing Atmospheric CO_2: By absorbing CO_2, urban forests help mitigate urban air pollution and contribute to reducing greenhouse gas concentrations.
    - Microclimate Regulation: Trees in urban forests can improve the microclimate, reducing the urban heat island effect through shading and evapotranspiration.

Carbon Storage in Urban Forests

1. Mechanism:
    - Biomass Accumulation: Apart from absorbing CO2, urban trees store carbon in their biomass over their lifetime. This includes all parts of the tree, from leaves to roots.
    - Soil Carbon Storage: Urban forests also contribute to carbon storage in the soil through fallen leaves and branches, which decompose and enrich the soil with organic carbon.
2. Role in Urban Forests:
    - Long-term Carbon Sink: Urban forests act as carbon sinks, storing carbon for decades or even centuries, depending on the lifespan of the trees.
    - Biodiversity and Ecosystem Services: They support biodiversity and provide ecosystem services such as habitat provision, water regulation, and recreational spaces.

Stormwater Mitigation

Urban forests and trees are crucial in mitigating stormwater in urban environments, performing several key functions that collectively contribute to a healthier and more sustainable urban ecosystem.

Interception is one of the primary ways trees manage stormwater. Trees act like natural umbrellas over the urban landscape, with their leaves, branches, and trunks capturing a portion of the rainfall. This intercepted water can then evaporate back into the atmosphere or drip slowly to the ground. This process significantly reduces the volume and intensity of stormwater that reaches the ground, thereby easing the pressure on drainage systems. The canopy of a single large tree can intercept thousands of liters of water annually, making this a significant factor in urban stormwater management.

Infiltration and Soil Improvement are other vital functions of urban trees. The roots of trees create spaces and channels in the soil, enhancing its ability to absorb and hold water. This process reduces surface runoff, as more water seeps into the ground rather than flowing over it. Furthermore, the decomposition of leaves and other plant materials enriches the soil with organic matter, improving its structure and water-holding capacity. Well-structured soil with high organic content can absorb and retain a large amount of water, reducing the burden on stormwater systems during heavy rains.

Reduction of Surface Runoff is a direct consequence of increased infiltration and improved soil structure. By slowing down the flow of rainwater over the surface, trees significantly reduce the volume and velocity of stormwater runoff. This not only prevents urban flooding but also minimizes erosion, protecting urban landscapes and infrastructures.

Water Quality Improvement is another critical aspect of stormwater management where urban trees play a role. As stormwater infiltrates through the soil, it gets naturally filtered. Trees and the surrounding soil act as biofilters, removing pollutants like heavy metals, nitrogen, phosphorus, and sediment from the water. This natural filtration process significantly improves the quality of water that eventually reaches rivers, lakes, or aquifers.

Stabilizing Riverbanks and Slopes: Tree roots bind the soil on riverbanks and slopes, preventing erosion and the subsequent sedimentation in water bodies. This function is particularly important in urban areas where concrete and asphalt surfaces can increase the speed and volume of runoff, leading to severe erosion during heavy rains.

Creation of Microclimates and Reduction of Heat Islands: Trees and urban forests not only manage stormwater but also create cooler microclimates in cities. They provide shade and release moisture into the air through transpiration, reducing the overall temperature. This is beneficial for stormwater management as higher temperatures can increase the rate of evaporation, potentially exacerbating stormwater runoff issues.

Supporting Biodiversity: Urban forests provide a habitat for a diverse range of wildlife. This biodiversity contributes to the overall health of the urban ecosystem, influencing factors such as soil health and local climate regulation, which indirectly affect stormwater management.

In summary, urban forests and trees are integral to managing stormwater in cities. They not only reduce the volume and improve the quality of runoff but also help control

flooding, erosion, and contribute to the overall environmental health and sustainability of urban areas. Their multifunctional role underscores the importance of integrating green infrastructure into urban planning and development strategies.

With increased planting and maintenance of the urban forest these values will increase with time. As young trees reach their mature sizes and are maintained their ability to reduce stormwater runoff and intercept more rain will assist La Crosse greatly.

Pollutants

One of the key functions of trees is their ability to absorb harmful pollutants. They take in gases such as nitrogen oxides, ammonia, sulfur dioxide, and ozone through their leaves and bark. This process is crucial in urban areas where these pollutants are often present in high concentrations due to vehicle emissions and industrial activities. By absorbing these gases, trees help in reducing the overall concentration of air pollutants, which can have direct health benefits for urban residents.

Trees capture gaseous pollutants through a sophisticated and essential process, largely centered around their leaves. The key mechanism involves the stomata, tiny openings usually found on the underside of leaves. These stomata are crucial for gas exchange, a process integral to photosynthesis and transpiration. As they open, they also allow surrounding air to enter, bringing with it various pollutants like nitrogen oxides, sulfur dioxide, ammonia, and ozone. Once these gases enter the leaf, they are either used in the tree's metabolic processes, transformed chemically, or stored within the plant tissues.

The leaf surfaces, particularly those with rough or hairy textures, also contribute to capturing pollutants. This occurs through a physical process where the gaseous pollutants adhere to the leaf's surface. However, this method is generally less significant compared to the absorption through stomata.

Inside the leaf, some gases undergo chemical transformations. For instance, sulfur dioxide can be converted into sulfate ions, which the tree might use as nutrients. Nitrogen oxides can similarly be transformed into usable forms of nitrogen, beneficial for the tree’s growth.

Trees store some of these absorbed gases in their various parts, effectively removing them from the atmosphere. Carbon dioxide, for example, is utilized in photosynthesis, aiding the tree's growth while also producing oxygen.

In addition to gaseous pollutants, trees are also effective in capturing particulate matter. These tiny particles, which include dust, dirt, soot, and smoke, can be harmful when inhaled and are linked to respiratory and cardiovascular diseases. The leaves and bark of trees are the primary interfaces for this interaction. The surfaces of leaves, especially those with rough, hairy, or sticky textures, are particularly adept at trapping these particles. As air passes through the branches and leaves of a tree, particulate matter is intercepted and adheres to the leaf surfaces. This physical process of trapping and holding onto particles is significantly effective, especially in dense, leafy trees.

Furthermore, the complex structure of a tree, with its numerous branches and leaves, creates a natural barrier that disrupts air flow. This disruption causes air pollutants, including particulate matter, to settle on leaves and branches instead of remaining

airborne. In addition to the physical trapping on the leaves, some particulate matter also settles on the bark of trees.

Another significant aspect of trees in urban environments is their role in carbon sequestration. Trees absorb carbon dioxide, a major contributor to global warming, and store carbon in their trunks, branches, and leaves. By doing so, they help mitigate climate change, which has indirect but substantial impacts on human health. Climate change is associated with a range of health risks, including heat-related illnesses and the spread of infectious diseases.

Moreover, trees contribute to reducing the urban heat island effect. This phenomenon, where urban areas are significantly warmer than their rural surroundings, is exacerbated by concrete and asphalt, which absorb and re-radiate heat. Trees provide shade and release water vapor through transpiration, cooling the surrounding air. This reduction in temperature can be crucial in preventing heat-related health issues in cities, especially during summer months.

The presence of trees in urban areas plays a vital role in filtering air pollutants, absorbing carbon dioxide, and mitigating the urban heat island effect. These functions directly impact human health by reducing the risk of pollution-related diseases and the adverse effects of urban heat. The integration of trees and green spaces into urban planning is therefore essential for creating healthier urban environments.

Tree Equity

Tree equity is a concept that focuses on the equitable distribution of trees in urban environments. It's built on the understanding that trees are not just aesthetic elements, but crucial components of urban ecosystems that provide a wide range of benefits to city dwellers. These benefits include improving air quality, reducing heat islands, enhancing mental and physical health, supporting biodiversity, and mitigating the impacts of climate change.

However, tree coverage in cities is often unevenly distributed, leading to disparities in who enjoys these benefits. Historically, wealthier neighborhoods tend to have more trees and green spaces, while poorer areas, often home to communities of color, have fewer trees. This disparity can exacerbate social inequalities, as residents in tree-poor areas are deprived of the health, environmental, and economic benefits that trees provide.

Tree equity is important for an urban forest because it aims to correct these imbalances. By ensuring that all areas of a city, regardless of their socioeconomic status, have adequate tree coverage, urban planners and policymakers can create healthier, more sustainable, and more equitable urban environments. This approach not only addresses environmental justice issues but also contributes to the overall resilience of cities against the effects of climate change.

In essence, tree equity is about recognizing trees as vital urban infrastructure that should be distributed fairly to ensure that all city residents, regardless of where they live or their economic status, can enjoy the benefits they offer. This concept is increasingly important in urban planning and environmental policy, as cities around the world grapple with the challenges of climate change, urban heat islands, and social inequities.

The impacts of an inequitable urban forest are significant, encompassing environmental, social, and economic aspects, but there are positive steps that can be taken to address these challenges. Environmentally, areas with fewer trees suffer from poorer air quality and higher temperatures due to the urban heat island effect. To combat this, cities can implement targeted tree-planting initiatives in these underserved areas. This not only improves air quality but also helps in cooling the urban environment, making it more comfortable and reducing the reliance on energy-intensive air conditioning.

On a social level, inequitable tree distribution often mirrors socio-economic disparities, with lower-income neighborhoods having fewer trees and thus missing out on the health and recreational benefits of a robust urban forest. Community engagement programs that focus on tree planting and maintenance can foster a sense of ownership and pride among residents, while also providing educational opportunities about the importance of urban green spaces.

Economically, areas with sparse tree coverage can experience reduced property values and miss out on the economic benefits of attractive, green urban landscapes. Investment in urban forestry can be a catalyst for economic development, increasing property values, and enhancing the overall appeal of neighborhoods.

Moreover, implementing green infrastructure, such as rain gardens and green roofs, along with tree planting, can improve biodiversity and ecological resilience. These measures not only address the loss of urban wildlife habitats but also contribute to sustainable urban drainage systems, reducing the risk of flooding.

While the impacts of an inequitable urban forest are profound, they are not insurmountable. Through strategic planning, community involvement, and investment in green infrastructure, cities can turn the challenge of tree inequity into an opportunity for creating more sustainable, healthy, and equitable urban environments. This is why it is crucial to examine the urban forest as a whole and in smaller scale scenarios such as parks or neighborhoods.

Appendix 3: Public Tree Emergency Preparedness and Response

An emergency preparedness plan is essential to shaping a proactive urban forestry program for the City of La Crosse. In this *Urban Forest Emergency Preparedness Plan*, four primary objectives are identified to promote active tree management year-round:

1. Assess and Prioritize
2. Organize and Prepare
3. Response
4. Recover and Regrow

Assess and Prioritize

Maintaining an active tree inventory ensures that the urban forest is prepared for drastic weather events through risk reduction and limitation of unnecessary tree failures. A healthy, diverse, and well managed urban forest is more sustainable and resilient during the stresses associated with disaster. The City of La Crosse's Forestry Division is responsible for the management of public boulevard and park trees; hence, this strategy focuses on public trees but has broader implications for the Citywide urban forest.

MAINTAINING THE INVENTORY

To reduce the risk associated with storm-related tree damage, the City should inspect emergency travel corridors and evacuation routes with trees that are cabled, braced, or otherwise indicated as a high risk annually and before predicted severe weather events. The inspection of these trees is critical to reducing roadway closures during severe weather situations and keeping it clear for emergency response units. High-risk trees should be either removed or maintained to minimize failures as the budget allows.

High risk trees can be identified using the International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ), which quantifies the likelihood of failure, the impact of the failure and provides a scale to rank these trees. For more information on TRAQ visit the Wisconsin Arborist Association at www.waa-isa.org.

PROACTIVE MANAGEMENT

Other crucial preparedness maintenance for these severe storm events should include annual pruning, inspections, updating inventory information and addressing priority tree risks as designated by a certified arborist. Annual maintenance will reduce the overall failures and risk associated with the urban forest overtime as a regimented maintenance plan will better position La Crosse for a more robust proactive maintenance program. Proactive management supports a resilient urban forest over time and aims to reduce tree failures during storm events.

Organize and Prepare

DEBRIS MANAGEMENT

The City's assigned staff to manage or oversee tree-related storm debris should coordinate with the Forestry Division by identifying areas to store and recycle tree debris during weather events. Identifying storage areas within the various sections of the City to deposit trees separate from other debris to provide access to emergency corridors and a more timely clean up. Having separate debris deposit locations for trees and other materials will allow emergency corridors to be opened more quickly and a more timely clean up when emergency arborist crews arrive at the scene. Having designated areas and tree specific debris areas will allow these emergency crews to dispose of materials in a timely fashion and effectively move throughout the city to assist in the recovery efforts after the storm events.

The tree debris needs to be separated from the other debris as chippers and other specialized equipment to properly recycle the tree debris cannot dispose of any metal, plastic, or other materials not entirely of wood. The tree debris can be recycled for mulch or firewood if kept separated. This can be utilized in the City for plantings if mulched and the firewood could be sold if there is a site to store the lumber.

PUBLIC UTILITIES

The City of La Crosse should continue to strengthen its relationship with Xcel Energy and utility vegetation management company under contract to solidify standards, protocols, and specifications for tree maintenance around utility structures and the response strategy post-storm event. This partnership should also focus on planting appropriate trees around utilities and maintenance that promotes reduction of tree failures that will impact utility infrastructure. The City should identify or confirm the liaison who would communicate with all parties on priority maintenance needs and planting specifications to grow a resilient urban forest. The liaison would help develop planting lists and recommendations to maintaining the urban forest proactively to reduce utility conflicts and meet best management practices. The partnership should entail an annual inspection of utility infrastructure and the trees that are adjacent to these structures. The annual inspection would identify tree conflicts with utilities, any major corridors for utilities and roadway access to maintain these structures to reduce closures after severe weather. These priority corridors should be ranked for priority response protocols and debris removal and identify section leaders to manage these corridors.

URBAN FOREST STRIKE TEAM

The City should designate several individuals to attend the Urban Forest Strike Team training course and/or retrain and maintain informed about the program and its resources. This course is a specialized training in the protocols and evaluation of trees after natural disasters and storm events. Identifying staff members who are critical to the recovery of the urban forest and providing them with training in emergency response will allow for a timelier recovery after storms. The staff members who attend this training will become section leads and provide vital data to the command center after storm events to prioritize the cleanup efforts. These trained individuals will be responsible for ensuring the emergency corridors and major roadways are prioritized and cleared to allow emergency

services access and provide updates in live time as they evaluate the aftermath of the storm event.

Once the City has identified critical individuals and areas for storm response, these individuals should participate in an annual drill to practice response and recovery scenarios in preparation for summer and winter storm seasons. Notification to residents that an annual storm preparedness drill is taking place should be done when undertaking this drill. The drill will provide practice to those involved with emergency responsibilities and serve as a refresher on materials and protocols for their individual responsibilities. These annual practices allow individuals to practice in a less stressful situation to help identify areas for improvement and allows them to get comfortable with their duties. These drills will be a time of reflection and provide a time annually to update and change response protocols prior to storm season. The continuous drills will improve recovery and will benefit the City overtime as response and recovery times and procedures will be more effective.

ADDITIONAL PARTNERS

- Wisconsin Department of Natural Resources www.dnr.wisconsin.gov
- Wisconsin Urban Forestry Council www.dnr.wisconsin.gov/topic/urbanforests/members
- Wisconsin Arborist Association www.waa-isa.org
- Extension La Crosse County www.lacrosse.extension.wisc.edu
- Wisconsin Emergency Management www.wem.wi.gov
- USDA Forest Service Community Forest Storm Mitigation Planning template https://gicinc.org/wp-content/uploads/Comm-Forest-Storm-Mit-Plan-Template.pdf
- USDA Forest Service and Green Infrastructure Center's Community Forest Storm Mitigation Planning 4-book series https://gicinc.org/projects/resiliency/storm-mitigation-planning

Response

The City of La Crosse should utilize the Urban Forest Strike Team and their protocols to respond to severe weather events. The first step should be identifying a command center. The command center would serve as the main hub for reporting and deployment of arborist crews to address storm debris. Ideally the center would have a generator for backup power, reliable internet, and the ability to communicate to essential personnel without interference. Individuals who have attended the Urban Forest Strike Team Training should be appointed as incident leaders. The incident leaders should have priority maps for their sections and verify that all major corridors for emergency services are clear or notify the command center of debris that may be blocking these roadways. Within the sections the leaders should identify downed and larger limb failures across roadways, utility infrastructure damage and major tree failures impacting emergency services. These failures should be noted and reported to the command center for evaluation and ranking of priority. The command center will deploy arborist teams and equipment as needs based off the live updates coming from the field.

Command center will provide emergency arborist crews with maps that identify priority corridors, debris deposit sites and contact information with the designated section leader. The section leaders will set up emergency arborists at priority areas and provide oversight as needed to the crews as recovery efforts begin. Section leaders will be expected to provide updates to the command center as emergency crews make their way through sections and finish designated cleanup efforts. Section leads should provide the command center hourly updates on recovery efforts regarding evaluations and progress of emergency crews.

Once the initial evaluation of the section has been complete the section leaders should utilize tablets in the field to update the inventory for any removals or tree related losses suffered during the storm event. The emergency crew arborists should provide the section leader with details on what trees are being removed, so the section leaders can in real time update inventory data and keep these records up to date. Maintaining records of the lost trees during storm events is critical in post recovery evaluations and FEMA reporting for losses. Utilizing the existing inventory data and reporting canopy loss will assist in post storm plantings and financial recovery from FEMA.

Recover and Regrow

Post storm events, the City will need to begin recovery efforts and evaluate storm response protocols. An important part of emergency preparedness is to perform after-action evaluations and improve upon the current protocols. This evaluation will identify priority planting areas, improvements to response and prepare La Crosse to establish a sustainable and resilience urban forest.

AFTER-ACTION REPORT

Post storm recovery, an after-action (AA) report and meeting should be held with section leaders and command center staff. The meeting should review the in the field operations and recovery efforts, any adjustments to protocols, the canopy loss and improvement suggestions for the next storm. A designated individual(s) should write up a report on the overall incident and provide an overview of the canopy loss based off the inventory data. The report and canopy loss data should be reported to FEMA for financial recovery and to the urban forestry program. The urban forestry program should utilize the inventory data and report to plan for planting efforts to replace lost trees and develop a maintenance response plan for post storm recovery. Both the AA report and maintenance response plans are recommended to be shared with residents, to show the canopy loss post incident and provide them with current information on how the City is handling the post storm cleanup and recovery.

RIGHT TREE, RIGHT PLACE

Utilizing Right Tree, Right Place, especially near utility structures will prepare the overall urban forest for severe storm events. Planting trees properly and matching them to the site will reduce utility conflicts with canopy and improper pruning cuts to meet utility regulations. Proper tree establishment on a site will ensure a resilient urban forest during severe storm events. The planning and establishment of trees in the urban forest is critical to reducing the failures during high wind events. Trees that are planted properly and receive the proper establishment care will adapt to their surroundings and grow accordingly providing proper anchoring roots and branch attachments. It is recommended to follow the best management practices for tree planting to provide adequate soil, space, and planting care for tree establishment.

PLANTING FOR RESILIENCE

The City of La Crosse will need to prepare the urban forest to transition to a more climate resilient forest as severe weather and temperature extremes become more regular in the region. To prepare the urban forest, understanding the current inventory as it relates to the composition of species and genera is required. Using the 10/20/30 rule, which states no more than 10% of a particular species, 20% of one genus and 30% of any single family should be planted in the urban forest. Following this guidance for planting will increase diversity and minimize losses of trees in the event of a severe weather change, which may impact a species or genus of trees. While striving to meet the 10/20/30 rule and becoming more diverse, tree selections should consider the future climate of the region. Selection of heat and drought resist trees should be prioritized or those cultivars that have these traits to be selected from nursery stock. Time spent researching the various attributes of the tree's resiliency should be spent to ensure the longevity of each planting. The City should seek out trees that help build diversity but also provide resiliency to heat, drought,

ice/snow events, wildfire, and other storm events that may become more regular to the region. A few attributes to consider for these types of trees may be the following, but are not limited to:

- Thicker leaves for drought resistance
- Thicker bark for wildfire protection
- Disease and pest resistance
- Tolerance to excessive heat
- Stronger branch attachments for snow or ice

UPDATING THE INVENTORY

Part of essential upkeep of the urban forest is to maintain and update the City's public tree inventory, especially post storm events. In addition, periodic (e.g., every five years) high-resolution tree canopy assessments provide data to measure broader changes in canopy cover on both public and private property. In conjunction with the Urban Forest Strike Team, the City's Forestry Division should update the inventory to reflect the current tree loss and maintenance records. Updating the tree removals and loss from the inventory is critical to help identify planting areas and track current canopy cover in La Crosse. Canopy cover after storm events may shift priority areas for recovery and establishment. The City should evaluate the tree canopy post storm events and assess the new priority planting areas. Utilizing the tree planting strategy provided in La Crosse's 2024 Urban Forest Management Plan, the City should create a report identifying the priority planting areas and potential species to plant for future planting initiatives.

Additional Resources

Part of being prepared for an emergency is having the knowledge and/or resources to prepare and respond to these emergency situations. Below are some additional resources to gain knowledge about emergency preparedness and data to support local efforts.

- WI DNR Tree Planting Resources
  www.dnr.wisconsin.gov/topic/urbanforests/treeplantingresources
- Arbor Day Foundation-Right Tree, Right Place
  https://www.arborday.org/trees/righttreeandplace/
- FEMA National Risk Index https://hazards.fema.gov/nri/
- Xcel Energy "Keeping Your Power On. Tree Maintenance Near Power Lines. General Policies & Procedures"
  https://www.xcelenergy.com/staticfiles/xe/Corporate/Corporate%20PDFs/Distribution_Brochure.pdf

Appendix 4: Considerations for Changes to Tree Regulations

In support of Goal 4 Regulations in La Crosse's Urban Forest Management Plan, the following considerations are provided:

1. Identify the Need for an Update: The first step in updating or creating an ordinance involves a comprehensive process of identifying the need for change. This critical phase is informed by several key factors. Regular monitoring of state and federal legal changes is essential, as updates in higher-level laws may necessitate revisions in local ordinances to ensure compliance. Community input is another vital aspect; feedback gathered from public meetings, forums, surveys, and direct communications with residents provides valuable insights into the community's evolving needs and standards. Additionally, technological advancements and shifts in social norms can make existing regulations obsolete, prompting a review. The city should also use data and research, conducting studies to assess the effectiveness of current ordinances and identify areas needing improvement. Stakeholder perspectives from businesses and civic groups are also considered for their unique insights.

2. Initial Drafting: Once the need is established, the initial drafting of the updated ordinance is undertaken. This task is generally assigned to the city attorney's office or is first drafted by a consultant. These individuals should possess the requisite expertise in municipal law and the intricacies of local governance. A task force group of City employees may undertake this responsibility with the City attorney advising reviewing the drafting process.

   This step involves a meticulous process of ensuring that the new wording not only addresses the identified need but also aligns seamlessly with existing laws and regulations. The drafting process is thorough and often iterative, requiring careful consideration of legal terminology and the potential implications of each clause and provision. During this phase, the task force/attorney might consult with various city departments, stakeholders, and experts to gather insights and feedback, ensuring that the draft ordinance is comprehensive, enforceable, and reflects the community's best interests. The aim is to create a draft that is legally sound, clear in its strategies, and capable of effectively addressing the issues identified in the initial assessment phase. This draft then serves as the foundation for further review and discussion by the city council and the community at large, setting the stage for subsequent steps in the ordinance updating process.

3. Departmental Review: The draft ordinance is circulated among various city departments for review. This step ensures that the proposed changes are practical, enforceable, and in line with other city policies and regulations. This stage is crucial for ensuring that the proposed changes are not only legally sound but also practical and enforceable from an operational standpoint. The Parks, Recreation & Forestry Department and the Planning, Development & Assessment Department should be involved in the drafting and reviews. Their objective is to assess the potential impact of the proposed changes on their daily operations, resources, and service delivery to the community.

This review process also involves checking the draft for consistency with existing city policies and regulations and other departments. Each department brings a unique perspective, highlighting any unintended consequences or operational challenges that might arise from the new ordinance. For instance, the Street or Utilities Departments might evaluate the ordinance for its feasibility in terms of infrastructure and maintenance, while the Planning, Development & Assessment Department might focus on its alignment with the city's development goals.

This interdepartmental collaboration often leads to valuable feedback and suggestions for improvement, ensuring a well-rounded and thoroughly vetted ordinance. Departments might propose amendments or raise concerns, which are then addressed by the legal team or the drafting committee. This collaborative and cross-functional review process is instrumental in refining the ordinance, ensuring it not only addresses the initial need but also fits cohesively into the broader framework of the city's governance and administrative functions. The outcome of this departmental review is a more polished and viable draft, ready for presentation to the city council and the public for further deliberation and input.

4. City Council Involvement: The draft ordinance is then submitted to the city council. Council members review the proposal and may suggest amendments or seek additional information. At this point, the refined draft ordinance is submitted to the council members, who play a pivotal role in its legislative journey. The council, composed of elected representatives responsible for making legislative decisions for the city, undertakes a thorough examination of the proposal. Their review is critical, as they consider the ordinance from a policy and community impact perspective, ensuring that it aligns with the broader interests and welfare of the city’s residents.

5. Public Hearing and Input: One of the crucial steps in this process is holding a public hearing. This allows residents and stakeholders to voice their opinions, concerns, or support for the proposed ordinance. Once the city council has reviewed the draft ordinance, a public hearing is scheduled, providing a formal opportunity for residents and stakeholders to participate directly in the legislative process. The importance of this stage lies in its role in fostering transparency and ensuring that the voices of those who will be impacted by the ordinance are heard and considered.

6. Finalization and Approval: This stage is where the city council, having assimilated the feedback from residents, stakeholders, and city departments, revisits the proposed ordinance for one last comprehensive review. The council members engage in detailed deliberations, weighing the public input against the objectives of the ordinance and the broader interests of the city. It is during this period that the council may make further modifications to the draft ordinance, integrating suggestions received during the public hearing or refining aspects of the legislation based on new insights or considerations.

7. Enactment: If the city council approves the ordinance, it is then enacted into law. This phase marks the culmination of a series of meticulous steps ranging from initial drafting to public hearings and council voting. The enactment is more than a mere formality; it represents the official incorporation of the ordinance into the

city's legal framework, making it a binding rule that governs the relevant aspects of city life.

8. Implementation and Enforcement: Finally, city departments responsible for the enforcement of the ordinance are briefed on the changes. They ensure that the updated ordinance is enforced effectively and in accordance with its provisions.

This outline is a general guide and may vary slightly based on specific circumstances or procedural requirements of the City of La Crosse. It's always advisable to consult with city officials or legal advisors for the most current and detailed procedure. Furthermore, some cities adopt a regular review schedule to periodically scrutinize ordinances, ensuring they remain relevant and effective. Finally, legal challenges or litigation can also highlight deficiencies or areas for improvement in existing ordinances. Through this multifaceted approach, the City of La Crosse ensures that its ordinances are continually updated to reflect legal requirements, technological advancements, and the needs of its residents.

Appendix 5: Tree Data Summaries for Pettibone, Myrick, and Riverside Parks

- Pettibone Park trees
- Myrick Park trees
- Riverside Park trees

Figure 59. Map of La Crosse, WI showing Pettibone Park (west, bottom left), Myrick Park (east, top right), and Riverside Park (west, bottom right)

Pettibone Park Inventory Composition and Structure

Pettibone Park Counts

Number of Alive Trees:	572
Number of Dead Trees:	8
Total Data Points:	580

Table 20. The status and count of Pettibone Park trees in the inventory database (Note: all subsequent data summaries are based on 580 trees unless otherwise specified)

Based on the data collected for Pettibone Park the number of trees in this park make up only 3.2% of the overall City-managed public trees. A total of 580 trees were inventoried in Pettibone Park in 2023 and of those trees, only 8 trees were noted as dead. The following summaries are based on the 580 trees in Pettibone Park.

Tree Composition in Pettibone Park: Genera

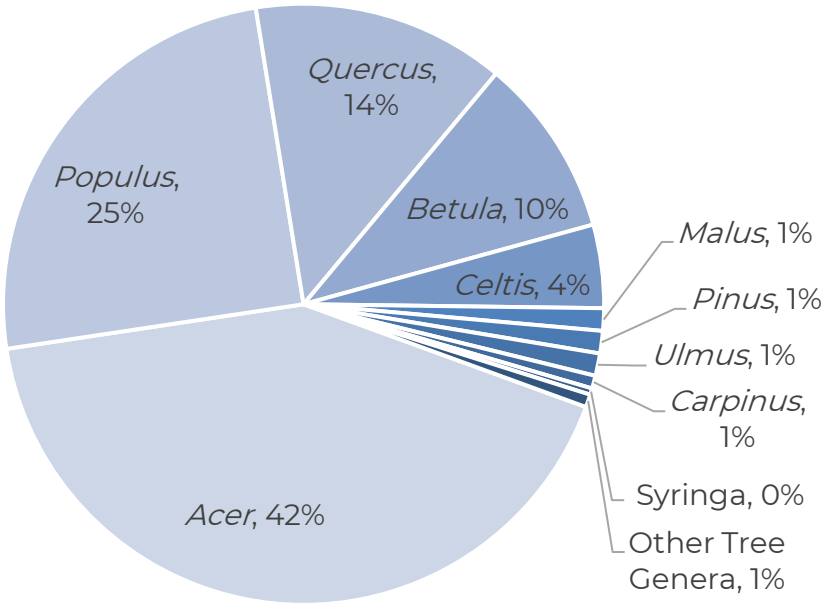


Figure 60. Most common tree genera in Pettibone Park (top 10)

Most trees in Pettibone Park are maples (*Acer*) with 42%, poplars (*Populus*) with 25%, and oaks (*Quercus*) with 14%. The top ten most common tree genera comprise 99% of Pettibone Park and there are 14 unique tree genera in the park compared to 52 unique public tree genera across streetscapes. Maples and poplars currently exceed the 20% diversity limit for tree genera in Pettibone Park.

Tree Composition in Pettibone Park: Species

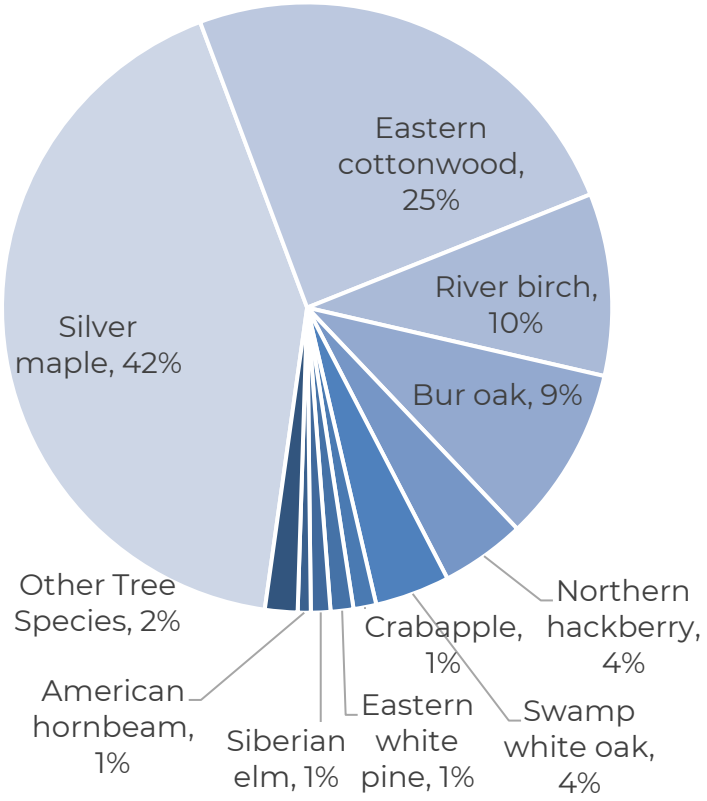


Figure 61. Most common tree species in Pettibone Park (top 10)

Most of Pettibone Park's trees are silver maples (42%), eastern cottonwood (25%), or river birch (10%). There are 19 unique tree species compared to 137 in streetscapes.

One concern is the abundance of these trees as they are each at or above the diversity limit of 10% for any one tree species. Based on these analyses, the Plan's planting strategy aims to diversify park trees. For Pettibone Park, it is also recommended to increase the unique tree species that thrive in parks and are able to withstand prolonged periods of drought or flooding.

Distribution of Tree Size and Relative Age Classes in Pettibone Park

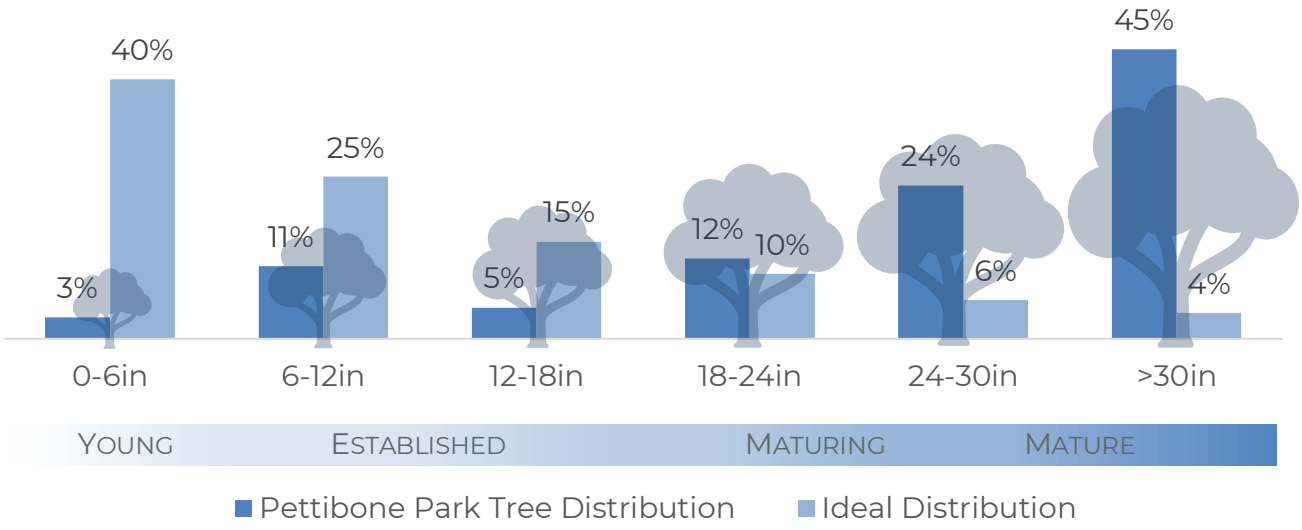


Figure 62. Comparison of La Crosse's Pettibone Park tree size classes (left) to the Ideal Distribution (right, Richards, 1993)

The average Diameter at Standard Height (DSH, measured at 4.5-feet above natural grade) in Pettibone Park is 28 inches, which indicates larger-sized and older trees are growing in the park. As shown in the figure above, 45% of the 580 trees in Pettibone Park are greater than 30 inches in diameter. Alternatively, only 3% of trees in the park are 0-6 inches in diameter.

The larger trees are most likely the silver maples and eastern cottonwood species, as they naturally grow to larger diameters and stature. Park trees also generally have more growing space and less competition or conflicts for space resulting in larger statured trees. While the Ideal Distribution (Richards, 1993) was developed for public street trees, the ranges can also be used for park trees for comparison and cross-examination. The distribution of large trees compared to smaller trees indicates a need to target plantings in Pettibone Park to ensure the benefits and function of these park trees are sustained for the long-term.

If the larger trees are not properly maintained, the loss of these trees will also lead to a dramatic reduction in canopy cover in the park over time, therefore a maintenance and planting strategy should be developed for Pettibone Park and for other public parks as more park tree inventory work continues. Substantial planting efforts in Pettibone Park should be implemented to offset the loss of canopy from the declining mature trees.

Pettibone Park Tree Condition

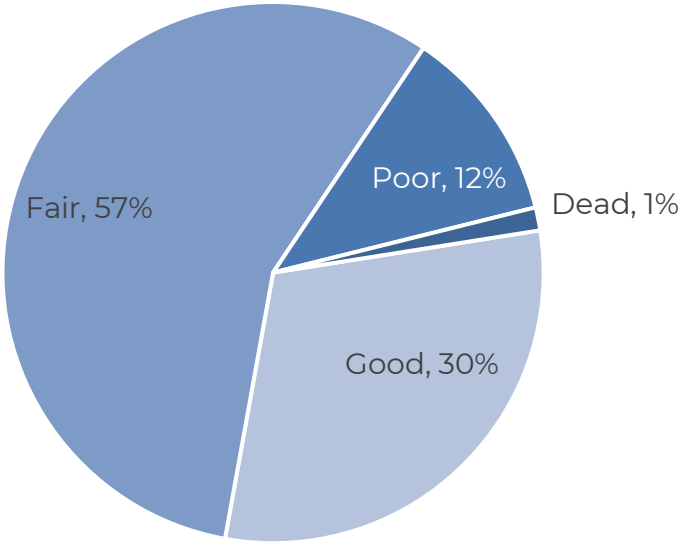


Figure 63. Condition of Pettibone Park trees

Figure 64. Enjoying the shade of trees at Pettibone Park. Assessing tree condition in parks supports tree health and public safety (Source: Explore La Crosse)

The majority of the inventoried trees in Pettibone Park are in fair condition with 57%, compared to 62% of street and boulevard trees in good condition. Knowing that the majority of Pettibone Park's trees are in fair condition and that the average DSH is 28 inches, the costs for when these trees are required to be removed may be greater costs in terms of in-house hours or contracted services.

Individual trees in the fair category will need to be assessed on additional criteria such as species, condition, and risk factor to make management decisions on overall care for the park.

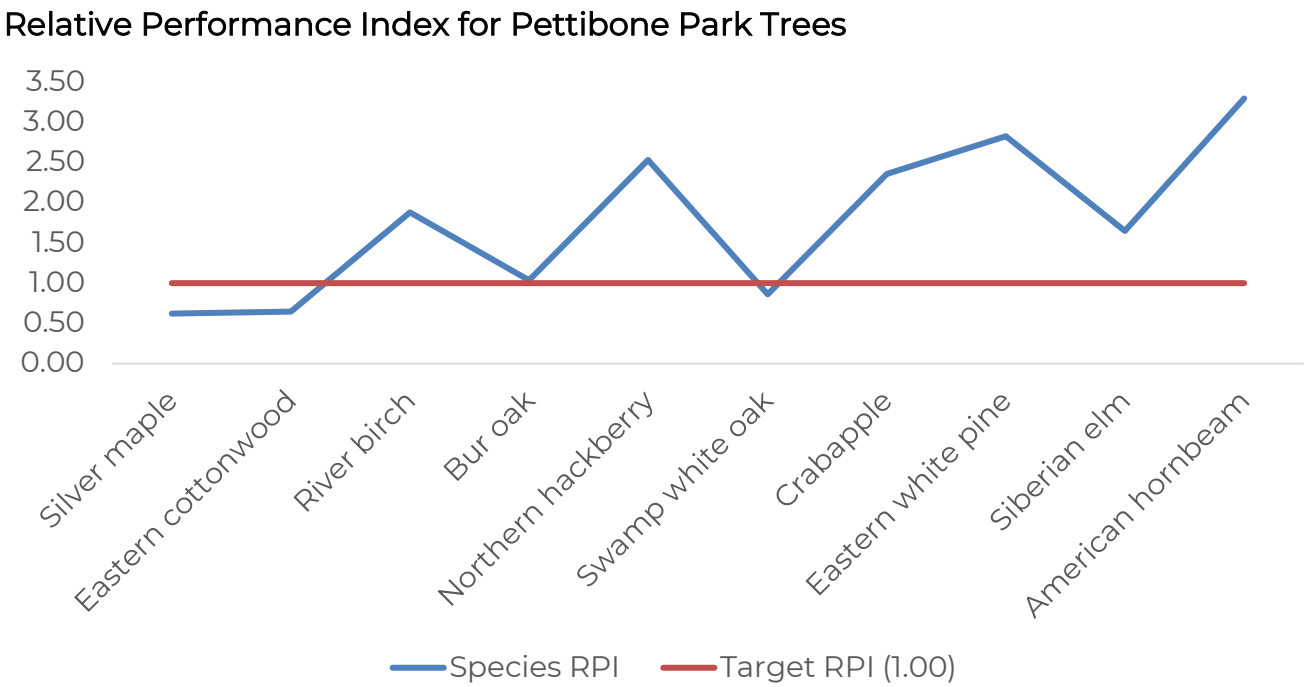


Figure 65. Relative Performance Index (RPI) of the most common trees in Pettibone Park

As described in the RPI section for the Citywide public tree population, Relative Performance Index or RPI answers the question of how well a species is performing in terms of health compared to the entire inventoried population. For the trees in Pettibone Park, river birch, northern hackberry, crabapple, eastern white pine, Siberian elm, and American hornbeam are performing better than the overall public tree population. Bur oaks are performing similar to the overall population of trees in Pettibone Park, but silver maples, eastern cottonwood, and swamp white oaks are underperforming. The results are in line with the research and evidence of tree species condition and performance for the region. One outlier is the poor performance of swamp white oaks in Pettibone Park. Swamp white oaks tend to survive and thrive in a variety of growing conditions so it is recommended that the condition of swamp white oaks be examined more closely to determine if corrections can be made going forward.

These metrics are useful in identifying concentrations of maintenance demand and determining the appropriate tree species to plant in the future. Comparing the RPI values to the observations and defects recorded may also provide management insights.

Pettibone Park Tree Observations

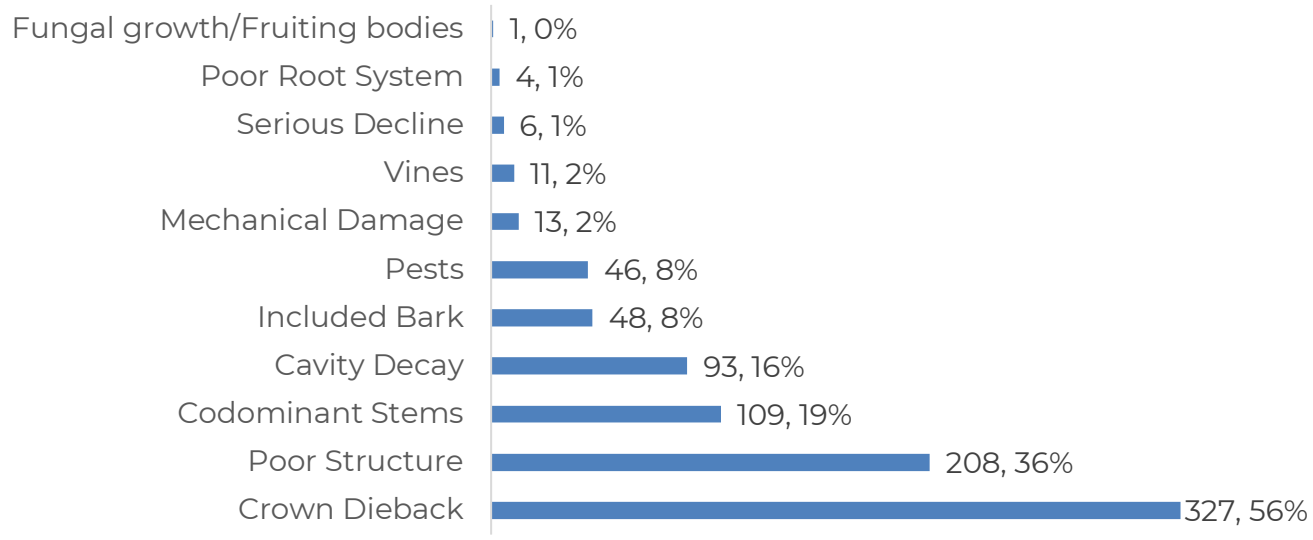


Figure 66. Count and percentage of Pettibone Park trees with an observation or defect recorded

A total of 20 options to record observations or defects were made available for the 2023 inventory in Pettibone Park. Of these options, 11 were utilized during the inventory and a total of 866 observations or defects were recorded for 427 of the 580 (74%) trees in Pettibone Park.

Most trees in the park (56%) were noted as having crown dieback and 36% have a poor structure. 19% of Pettibone Park trees have codominant stems. Of the 866 observations recorded, 51% are likely human-caused and could be remediated or it is a preventable issue in the future. For example, young tree pruning could have likely addressed many of the trees noted as having poor structure, mechanical damage prevented with appropriate mulch rings and/or tree protection, and poor root system could perhaps have been prevented by choosing quality stock at the tree nursery, providing healthy ample soil space, and/or limiting the use of turf irrigation for watering trees in parks (creates shallow roots).

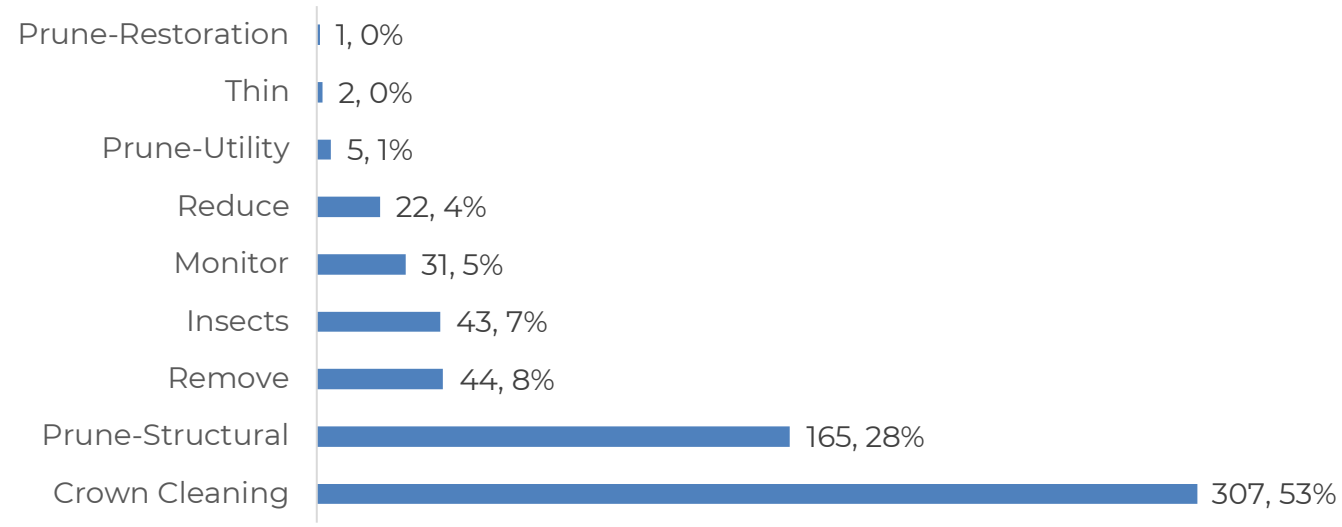


Figure 67. Count and percentage of Pettibone Park trees with a tree work recommendation(s)

Of the 580 trees in Pettibone Park, 408 (70%) were assigned a recommended tree work category. 17 tree work categories were available during the inventory and nine were used. A total 620 observations or defects were recorded for 408 trees in Pettibone Park.

Crown cleaning was the primary recommendation in Pettibone Park with 53% or 307 trees. Structural pruning accounts for 28% or 165 trees in the park followed by 8% or 44 trees recommended for removal.

The maintenance and management strategies in this Plan address these recommendations by prioritizing the maintenance and detailing the approaches to proactive management to address pruning needs and plant health care to address tree pest and disease concerns.

Myrick Park

Count of Myrick Park Trees

447 alive or dead trees

Composition of Myrick Park Trees

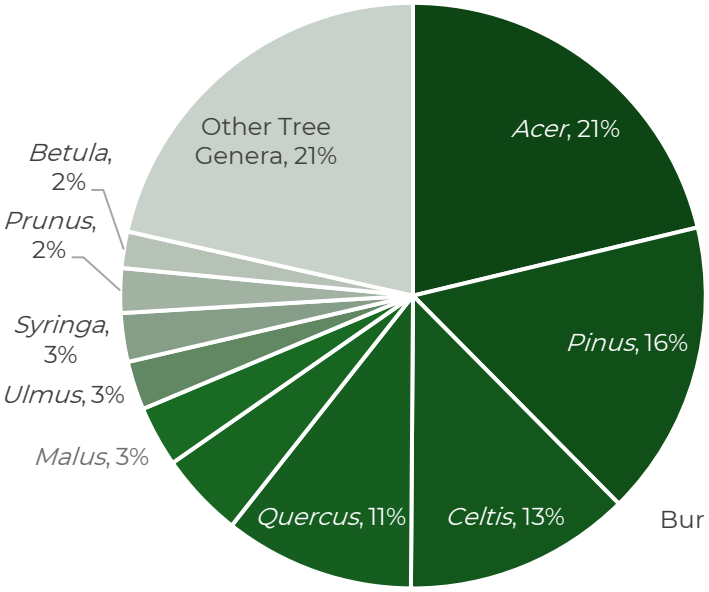


Figure 69. Most common tree genera in Myrick Park

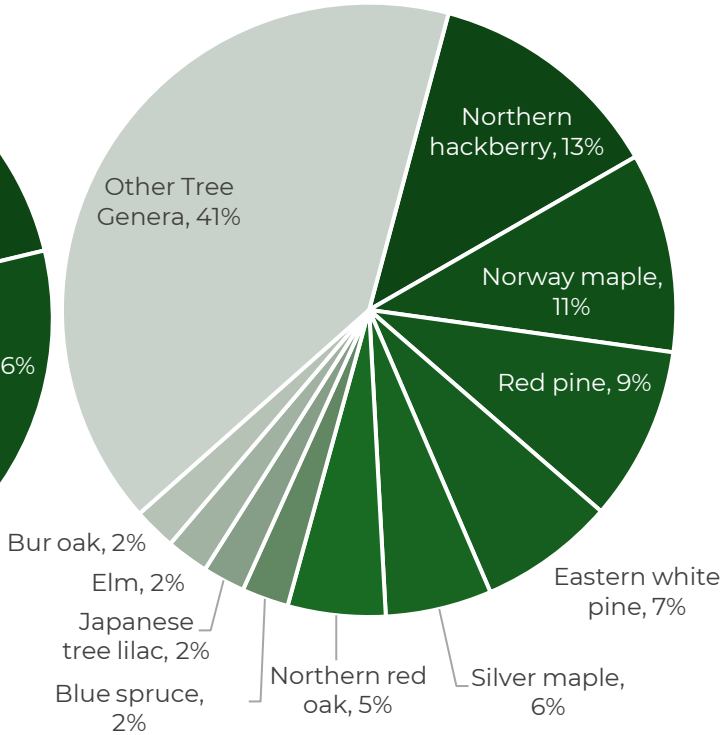


Figure 68. Most common tree species in Myrick Park

The most common tree genera comprise 79% of the 447 trees in Myrick Park and the most common tree species comprise 49% of the trees in the park. The genus *Acer* or maples exceed the recommended limit of 20% for any given tree genera with 21%. The recommended limit for tree species is 10% and northern hackberry and Norway maples exceed the limit with 13% and 11%, respectively.

Structure of Myrick Park Trees

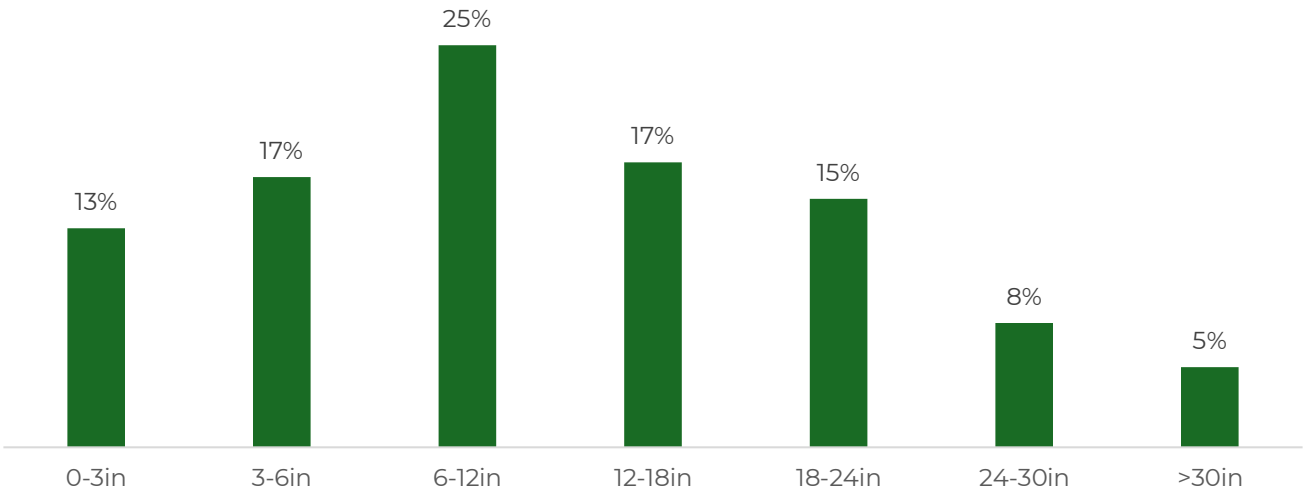


Figure 70. Diameter ranges of Myrick Park trees

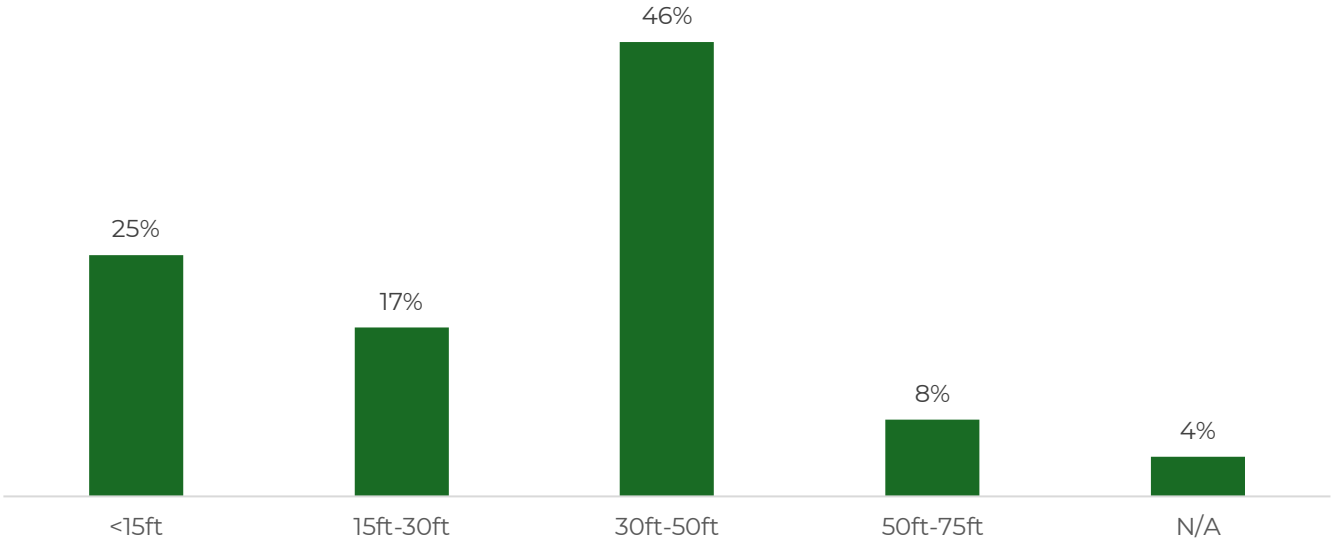


Figure 71. Height ranges for trees in Myrick Park

Most trees in Myrick Park are between 6-12 inches in diameter measured at standard height (DSH) or 4.5-feet above natural grade. Generally, it is recommended that a higher proportion of trees be in the 0-6-inch size class to compensate for the loss of older, mature trees as they reach senescence and are removed.

Most trees in Myrick Park are in the 30-50-foot height range which may correlate with the most common tree species and size classes although growing conditions and space can have an impact on heights.

Maintenance Needs of Myrick Park Trees

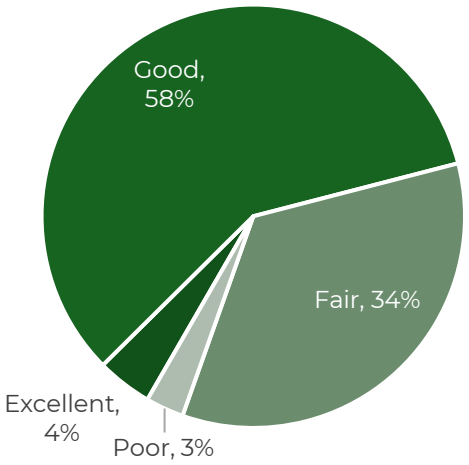


Figure 72. Condition of Myrick Park trees

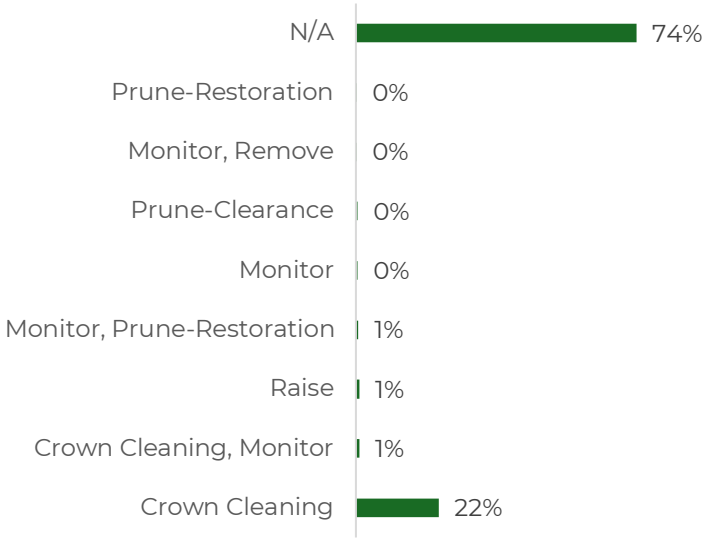


Figure 73. Recommended maintenance for Myrick Park trees

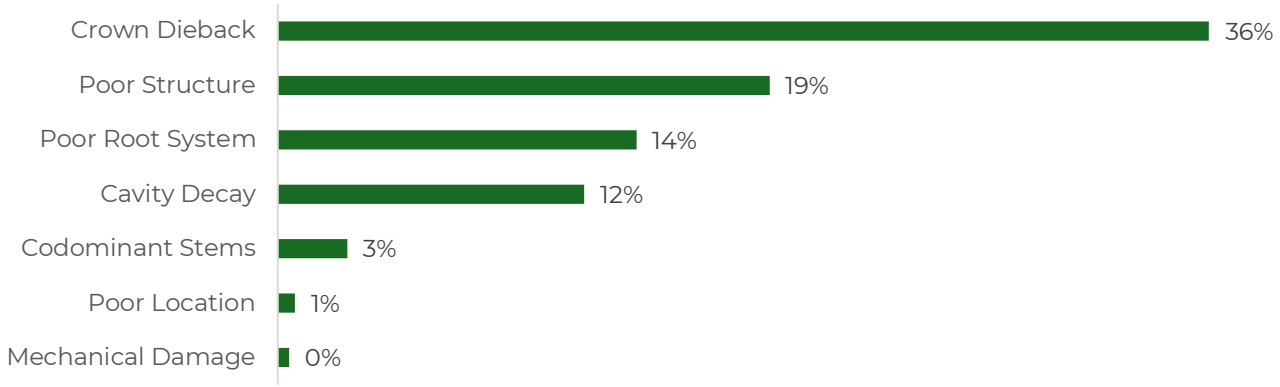


Figure 74.Observations recorded for Myrick Park trees

Of the 447 trees in Myrick Park, most are in good (58%) or fair (34%) condition, only 3% are in poor condition and no trees were recorded as dead. Uniquely, 4% or 19 trees were recorded with a condition of excellent.

Most trees only require crown cleaning maintenance (22%) by removing dead, dying, diseased, decayed, or damaged limbs and to remove limbs that are overlapping or are sucker sprouts. The pruning and amount of pruning should follow ANSI A300 standards.

Observations recorded primarily consisted of crown dieback (36%), poor structure (19%), or poor root system (19%). Of the 447 trees, 247 had an observation recorded (55%) and a total of 378 observations were recorded across the 247 trees. Of the 20 observation categories available, seven categories were utilized. 86% of the observations recorded could likely be remediated with a proactive pruning program or formative pruning in the early stages of the tree's development. For example, poor structure, poor root systems, poor location, and codominant stems could have likely been addressed with proper tree and site selection and structural pruning according to industry standards.

Riverside Park

Count of Riverside Park Trees

372 alive or dead trees

Composition of Riverside Park Trees

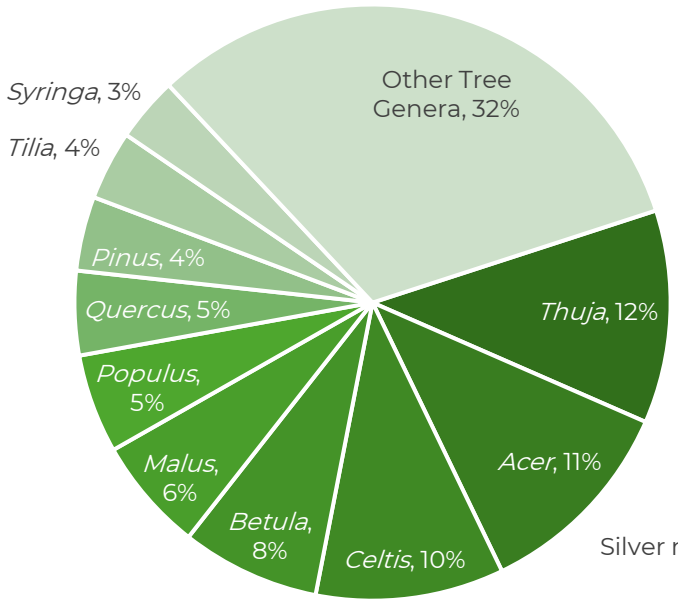


Figure 75. Most common tree genera in Riverside Park

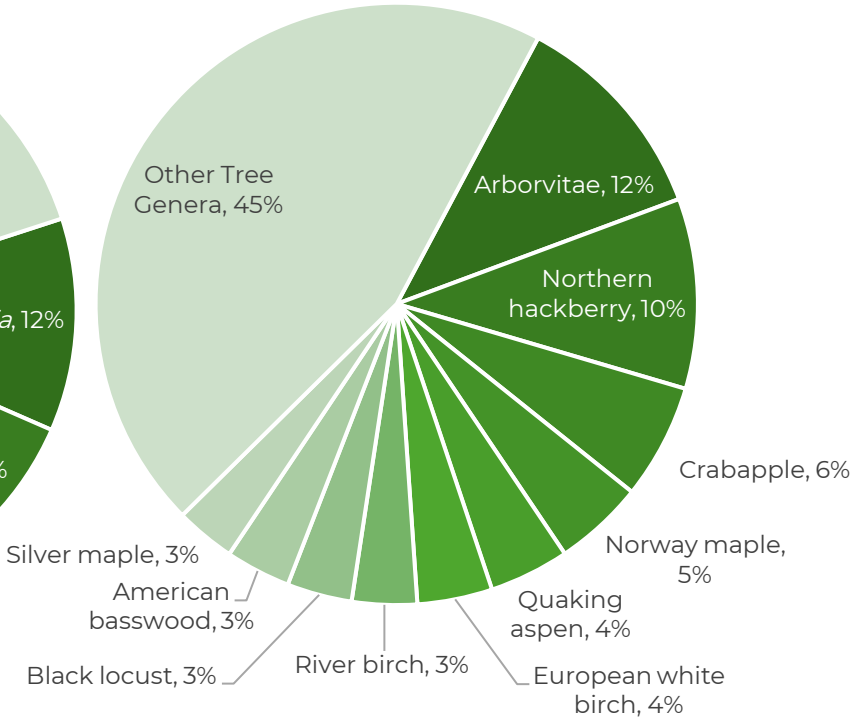


Figure 76. Most common tree species in Riverside Park

The most common tree genera comprise 68% of the 372 trees in Riverside Park and the most common tree species comprise 55% of the trees in the park. No tree genus in the park exceeds the recommended limit of 20% for any given tree genera. The recommended limit for tree species is 10% and arborvitae and northern hackberry exceed or are at the limit with 12% and 10%, respectively.

Structure of Riverside Park Trees

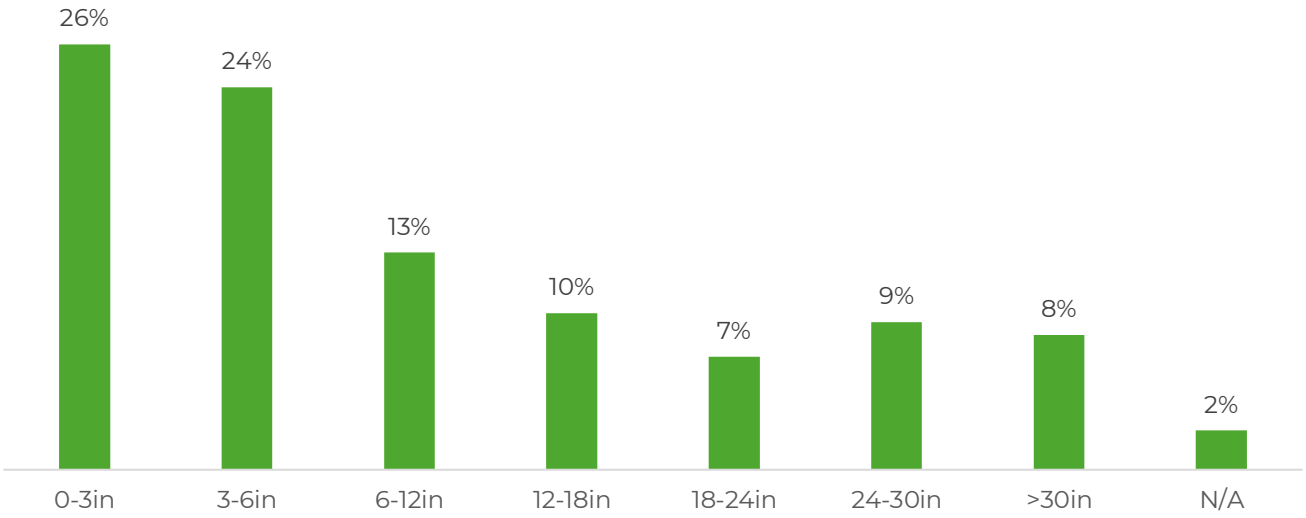


Figure 77. Diameter ranges of Riverside Park trees

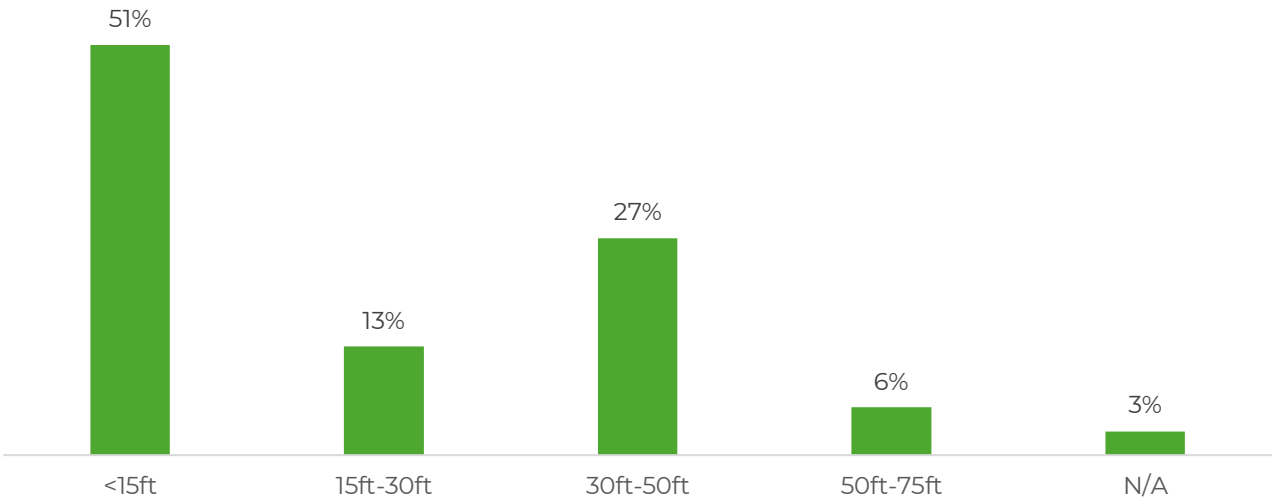


Figure 78. Height ranges for trees in Riverside Park

Most trees in Riverside Park are between 0-6 inches in diameter measured at standard height (DSH) or 4.5-feet above natural grade. Generally, it is recommended that a higher proportion of trees be in the 0-6-inch size class to compensate for the loss of older, mature trees as they reach senescence and are removed. With a combined 50% for trees 0-6 inches DSH, Riverside Park has a good structure for continual canopy cover and associated benefits.

Most trees in Riverside Park are in the less than 15-foot height range which may correlate with the majority of trees in the 0-6-inch DSH size class, although growing conditions, species of trees, and space can have an impact on heights.

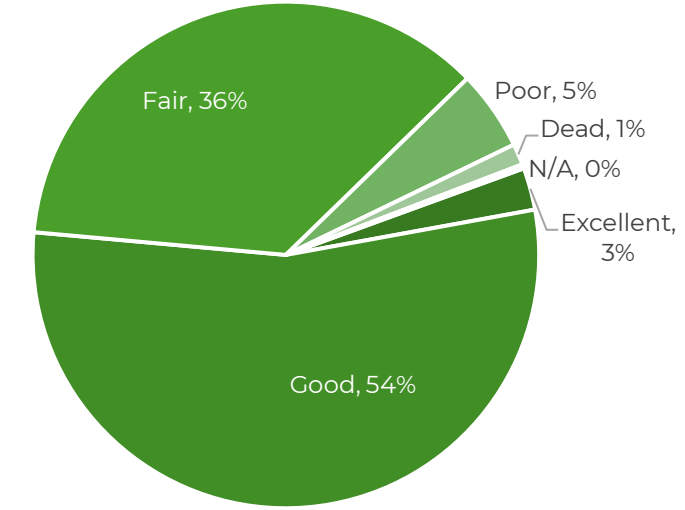


Figure 80. Condition of Riverside Park trees

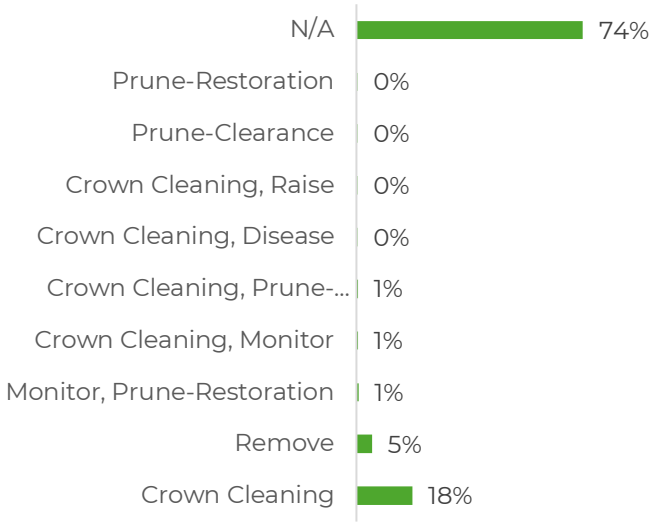


Figure 79. Recommended maintenance for Riverside Park trees

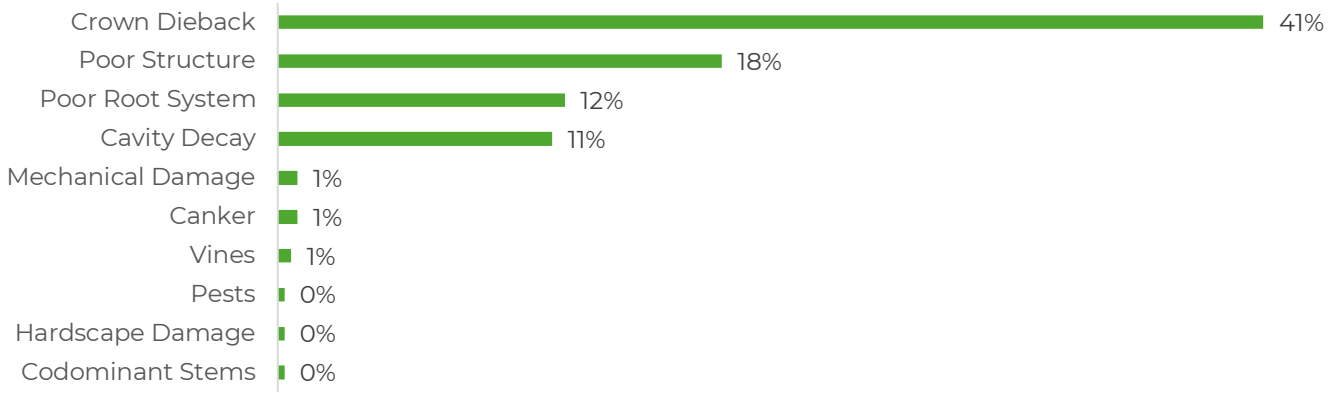


Figure 81.Observations recorded for Riverside Park trees

Of the 372 trees in Riverside Park, most are in good (54%) or fair (36%) condition, only 5% are in poor condition and only five trees were recorded as dead (1%). Uniquely, 3% or 10 trees were recorded with a condition of excellent.

Most trees only require crown cleaning maintenance (18%) by removing dead, dying, diseased, decayed, or damaged limbs and to remove limbs that are overlapping or are sucker sprouts. The pruning and amount of pruning should follow ANSI A300 standards.

Observations recorded primarily consisted of crown dieback (41%), poor structure (18%), or poor root system (12%). Of the 372 trees, 195 had an observation recorded (52%) and a total of 316 observations were recorded across the 195 trees. Of the 20 observation categories available, 10 categories were utilized. 85% of the observations recorded could likely be remediated with a proactive pruning program or formative pruning in the early stages of the tree's development. For example, poor structure, poor root systems, poor location, and codominant stems could have likely been addressed with proper tree and site selection and structural pruning according to industry standards. In addition, vines can be addressed during pruning and mechanical damage could have likely been avoided with proper mulch rings. Poor root systems may also be reduced if trees are watered properly instead of using turf irrigation.

City of La Crosse, WI

URBAN FOREST MANAGEMENT PLAN

February 2024

PlanIT Geo™
developers of TreePlotter