COMMUNITY FOREST MANAGEMENT PLAN PREPARED FOR

The Municipality of Princeton, NJ

December 2025

DAVEY
Resource Group

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ACKNOWLEDGEMENTS

This Community Forest Management Plan supports the Municipality of Princeton's vision to promote and enhance community well-being through tree conservation and improved forestry practices. It provides a framework for preserving and expanding the Municipality of Princeton's urban tree canopy so the environmental, economic, and social benefits it provides will continue for generations to come.

MISSION STATEMENT

Princeton strives to proactively preserve, enhance, maintain, and grow a sustainable community forest that provides lasting aesthetic, social, cultural, economic, environmental, and health benefits while ensuring public safety for all who live and work in the community. We are committed to achieving tree equity across the municipality through thoughtful stewardship of our urban tree canopy. Our goal is to balance sustainable growth with the protection of natural ecosystems, fostering environmental resilience for current and future generations.

LIABILITY STATEMENT

Street trees on public easements and rights-of-way, as well as trees on municipal parkland and other municipal properties, are valuable community assets. They are part of Princeton's infrastructure. Although street trees are an asset to the community, it is inevitable that as they mature, they will require care, maintenance, and eventual replacement. Care and maintenance, in addition to planting "the right tree in the right place," can help ensure that community trees not only contribute to the environmental and economic vitality of the area, but also reduce the potential hazards to public safety. However, given the Municipality of Princeton's limited personnel and financial resources, our community may not be able to meet each need of our community forest immediately. Therefore, it is the intent of this plan to focus available resources toward the greatest need in a step-by-step fashion, working towards a healthy forest with commensurate reductions in risk to public safety.

The municipality's core goals are to:

- Maintain, protect, sustain, and enhance the public tree canopy including in parks, natural areas, and rights-of-way.
- Encourage and promote stewardship of the tree canopy on private lands.
- Leverage trees for environmental resilience and public health.
- Strengthen disaster preparedness and recovery capacity.

By implementing the steps outlined in the Management Plan, including training and education, strengthening the community forest ordinance, improving tree resource management, building community capacity, and enhancing disaster preparedness, we will garner public support for plan implementation and demonstrate the long-term benefits to the environment and public safety.

We also want to become more proactive in the management and care of our trees. Through inventories and hazard assessments, Princeton will be in a position to take corrective action prior to structural tree failure and other hazardous tree related conditions. It is acknowledged that not all hazardous conditions will be predicted. Adequate maintenance and care will reduce the probability of tree failure, but unexpected events may still occur.

Following this Management Plan will demonstrate that Princeton is devoting reasonable levels of resources in a planned manner to reduce the number of tree related accidents and thereby reduce its exposure to liabilities and increase public safety.

EXECUTIVE SUMMARY

Princeton's Community Forest Management Plan, prepared by Davey Resource Group, Inc. (DRG) and with review by the Shade Tree Commission, focuses on quantifying the benefits provided by the municipality's urban forest and addressing its ongoing maintenance needs. In 2022, DRG completed an inventory of public right-of-way (ROW) and park trees, evaluating tree structure and condition. A map of the inventoried areas is provided in Appendix B.

Using the i-Tree Eco model, DRG estimated the economic value of environmental benefits provided by the public tree population and developed a prioritized management plan to guide future tree care.

The inventory identified 19,281 trees, stumps, and vacant planting sites within Princeton's ROW and parks. The urban forest includes over 200 species, with red maple (*Acer rubrum*) as the most common street tree and eastern white pine (*Pinus strobus*), comprising 10% of the tree population—as the most common park tree. Approximately 39% of all trees are in the young age class (0–8" DBH).

Despite threats from invasive pests such as the spotted lanternfly, Asian longhorned beetle, and spongy moth, 93% of street trees and 91% of park trees are in Fair condition or better, indicating overall urban forest stability. However, the data reveals a notable decline in condition from the young to established age class, which then remains relatively stable through maturity. This suggests that once trees become established, they have a strong likelihood of reaching full maturity.

RECOMMENDED APPROACH TO TREE MANAGEMENT

An effective approach to tree resource management follows a proactive and systematic program that sets clear and realistic goals, prescribes future action, and periodically measures progress. A robust urban forestry program establishes tree maintenance priorities and utilizes modern tools, such as a tree inventory accompanied by TreeKeeper® or other asset management software.

Princeton partnered with Davey Resource Group (DRG) in 2022 to inventory its public trees and develop this management plan. In 2024, DRG also completed a comprehensive Tree Canopy Assessment for the municipality. Consisting of four sections, this part of the plan deriving from the findings of the inventory considers the diversity, distribution, and condition of the inventoried tree population and provides a prioritized system for managing the municipality's tree resource.

- *Section 1:* Princeton's Background and CFMP Report Summary covers the context and overview of this document's contents and purpose.

- *Section 2:* Structure and Composition of the Public Tree Resource summarizes the inventory data with trends representing the current state of the tree resource.

- *Section 3:* Recommended Management of the Public Tree Resource details a prioritized management program and provides an estimated budget for recommended maintenance activities over a five-year period.

- *Section 4:* Future of the CFMP and Community Involvement lays out a plan for updating the tree inventory data and presents opportunities for the community to participate in urban forestry stewardship as well as other related environmental municipal services.
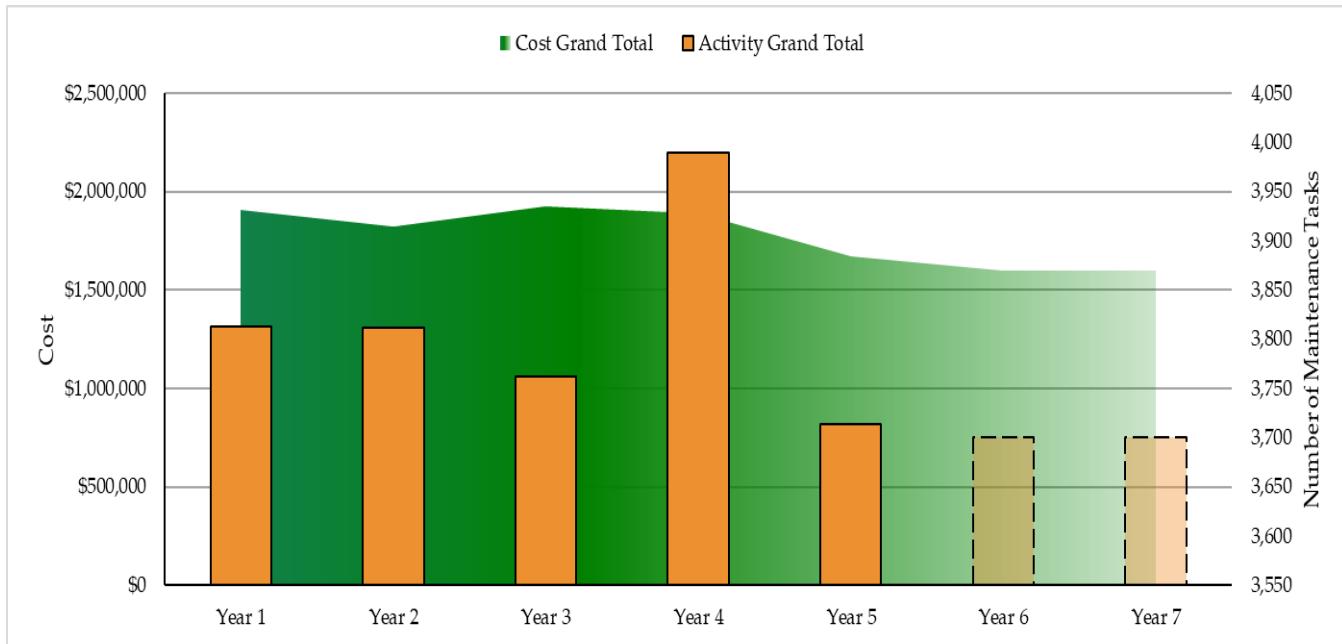
Figure 1. Budget totals for planting and maintenance, including pruning, removals, young tree training, and inspections.

The cost grand total and activity grand total are derived from the five-year budget table on page 37 of this plan. This table outlines estimated costs for core urban forestry activities in Princeton, including tree removals, priority pruning, young tree training, and routine pruning. These activities do not represent an exhaustive list of all urban forestry needs, and the associated costs are based on estimates that may be refined as conditions, priorities, and available resources change.

Recommended Maintenance Types

Tree Removal
Trees designated for removal have defects that cannot be cost-effectively or practically corrected. Many of the trees in this category have a large percentage of dead crown.

Total = 776 trees

High Priority = 3 trees

Moderate Priority = 139 trees

Low Priority = 634 trees

Priority Pruning
Priority pruning removes defects such as dead and dying parts or broken and/or hanging branches. Pruning the defective part(s) can lower risk associated with the tree while promoting healthy growth.

Total = 207 trees

High Priority = 0 trees

Moderate Priority = 207 trees

Routine Pruning Cycle
Over time, routine pruning of Low Risk trees can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Total = 14,366 trees

New Tree Planting
Planting new trees in areas that have poor canopy continuity or sparse canopy is important to ensure that tree benefits are distributed evenly across the municipality.

Total new tree plantings per year = 350 trees

Young Tree Training Cycle
Younger trees may have branch structure that can lead to potential problems as the tree ages, requiring training to ensure healthy growth. Training is generally completed from the ground with a pole pruner or pruning shear.

Total = 3,000 trees

Number of trees in cycle each year = approximately 400 trees (1-3" DBH)

COMMUNITY FOREST PROGRAM CAPACITY

COMMUNITY FORESTRY ADMINISTRATION

The Municipality of Princeton administers its community forestry program with a commitment to sustainability, equity, and environmental stewardship, in alignment with its 2023 Master Plan. The administration of this program is grounded in proactive urban forest management, interdepartmental coordination, and public engagement to ensure the health, safety, and long-term viability of the urban canopy.

Key Municipality Departments and Entities Involved in Urban Forestry Oversight

The Municipality designates responsibility for its community forest to a combination of municipal departments and advisory bodies, including:

- **Municipal Arborist** – Manages and cares for the urban forest in Princeton. This includes developing and implementing urban forestry programs and tree planting initiatives; planning, organizing, and directing the maintenance and removal of trees on public property performed by Department of Public Works (DPW) tree care personnel and private contractors; acquiring and managing grant funding; interfacing with forestry staff in outside agencies and the public utilities as related to their work in Princeton; preparing tree condition reports for public trees; managing the public tree inventory; and coordinating with the Engineering Department staff for capital improvement and private development projects. The Arborist is the enforcement officer for Princeton Trees and Shrubs ordinance and is responsible to review and approve tree removal and replacement permits for tree work on private property; enforce regulations of the ordinance; and provide technical assistance to property owners. The Arborist is the primary liaison to the public regarding tree-related matters including complaints and provides technical support to the Shade Tree Commission. Maintains Princeton's Tree City USA status and prepares annual reports. Conducts annual community outreach events including Arbor Day at the four elementary schools, Community Night Out, and other similar events.
- **Department of Public Works** – Tree Care Specialists – Executes tree planting, maintenance, and removal operations in support of municipal forestry goals and CFMP priorities. Oversees and implements storm damage response and debris management. Executes the municipal-wide branch and log collection and wood waste composting programs.
- **Deputy Administrator –** Formulates and manages strategic planning for Infrastructure & Operations which includes the Engineering Department, the Department of Public Works, and Open Space. Oversees the operational and capital budgets for Infrastructure & Operations.
- **Engineering Department** - Develops and manages capital improvement projects in the public rights-of-way and public lands. These projects include roadway streetscapes, active recreation parks, and open spaces. Tree planting and removal are a component of these projects. The Engineering Department, through the Land Use Engineer, reviews site plan applications for additions and construction of single- and two-family homes and other property developments subject to land use Board approvals. Implements the municipal separate storm sewer system (MS4) permit issued by the New Jersey Department of Environmental Protection. Liaises with the Flood and Stormwater Commission and the Environmental Commission (on a project basis).

- **Department of Recreation** - Oversees landscape maintenance on select active recreation municipal park lands.
- **Planning Board** - Reviews and approves development plans that include tree planting and removals. Provides recommendations for the Master Plan, including potential ordinance adoption. A landscape architect consultant reviews and issues comments regarding planning board applications.
- **Zoning Board** - Reviews and approves development plans that include tree planting and removals. The Arborist and Land Use Engineer jointly review and issue comments regarding Zoning board applications.
- **Open Space Manager** - Manages passive recreation areas, pursues grant funding, administers small contracts for open space maintenance, and oversees large contracts for reforestation projects.
- **Shade Tree Commission (STC)** – The STC, established under municipal ordinance, advises the Mayor and Council on tree-related matters, recommends amendments to the Tree and Shrub ordinance, promotes proper tree care, monitors threats from pests and diseases, helps maintain Princeton's Tree City USA status, and hears public concerns. The STC is authorized to review tree surveys, removal plans, and planting plans submitted with land development applications and report on its findings to the planning board or zoning board. It also engages the community with support from the municipality through initiatives such as seedling giveaways as well as partnering with other entities such as Sustainable Princeton and the Environmental Commission.
- **Princeton Environmental Commission –** PEC has the authority to study, and make recommendation and provide advice concerning environmental issues and actions that may affect the natural resources and inhabitants of the community. Drafts and amends ordinances. Inventories and advocates for the preservation of open spaces; responds to the public regarding local environmental concerns; reviews and comments on Land Use Board applications; and sponsors research studies.
- **Flood and Stormwater Commission -** Conducts studies and makes recommendations to the Mayor and Council concerning flooding and storm water management issues. Includes one member of the environmental commission and one member from the governing body. Vested interest in preserving trees as part of the municipality's broader flood-water mitigation strategy as stated in Princeton's 2005 Flood Mitigation Plan.

PARTNERSHIPS (NGOS, NONPROFIT ORGANIZATIONS, INTERDEPARTMENTAL)

Sustainable Princeton - Sustainable Princeton (SP) provides services to support the Municipality's efforts to achieve its sustainability-related goals. Their work focuses on education, outreach, and engagement including hosting workshops, events, and volunteer opportunities that connect residents with the knowledge and tools they need to plant, maintain, and protect trees. SP collaborates with landscapers, schools, and community groups to promote native species and sustainable landscaping practices.

Beyond education, SP organizes hands-on projects such as community plantings and garden restorations. These efforts not only improve tree canopy and ecosystem health but also foster stronger connections between neighbors and the environment. SP regularly shares resources, ranging from how-to guides to lending tools, to make sustainable tree care accessible to all. By focusing on community engagement and stewardship, SP helps ensure that residents see themselves as partners in caring for Princeton's trees, building a culture of shared responsibility that strengthens both climate resilience and quality of life.

Friends of Princeton Open Space (FOPOS) - Preserves open space for long-term conservation, protects natural resources, maintains accessibility to trails, and provides environmental education in Princeton. FOPOS also stewards the Billy Johnson Mountain Lakes Preserve, Mountain Lakes North, John Witherspoon Woods, Woodfield Reservation, Stony Brook Trail, and Tusculum; creates and maintains hiking trails, boardwalks, and footbridges; and removes invasive species and replants native varieties. FOPOS also sponsors community programs and activities, such as nature walks and educational workshops, and advocates for governmental actions that protect our water, land, animals, and plant communities. FOPOS holds a conservation easement and an Adopt-a-Park agreement with Princeton for the Billy Johnson Mountain Lakes Preserve.

Friends of Herrontown Woods (FOHW) - Celebrates Herrontown Woods as a preserve where people of all ages enjoy, explore, and learn from nature, inspiring them to serve as its stewards. Promotes native plant landscaping through demonstration and community outreach.

Marquand Foundation - Maintains and promotes the Marquand Park and Arboretum, a 17-acre historic preserve of trees and woodlands that offers a variety of recreational and educational experiences in the center of Princeton. The Marquand Foundation holds an Adopt-a-Park agreement with Princeton for Marquand Park and Arboretum.

Ridgeview Conservancy – Conserves vulnerable forests, wetlands, and cultural-historical sites. Restores connections to nature by educating youth and the public about wild resources. Designs and builds trails. Promotes equitable access to nature for underserved communities.

TRAINING

In 1996, the New Jersey Legislature passed the Shade Tree and Community Forestry Assistance Act to reduce municipal liability related to trees on public property. To qualify for this legal protection, municipalities must maintain an approved Community Forestry Management Plan and ensure that designated volunteers receive ongoing, certified training.

Training is a key requirement of the New Jersey Community Forestry Program and a foundational element of The Municipality of Princeton's urban forestry strategy. The municipality maintains compliance by ensuring that Community Outreach and Resource Education (CORE) volunteers (Shade Tree Commission members) complete the annual Continuing Education Unit (CEU) requirements established by the New Jersey Department of Environmental Protection (NJDEP) Urban and Community Forestry Program.

Completed and Ongoing Trainings

- The Municipality of Princeton has maintained compliance with the New Jersey Shade Tree and Community Forestry Assistance Act (P.L. 1996, Chapter 135) by ensuring that all members of the Shade Tree Commission are CORE-certified. New commissioners are encouraged to complete CORE training within their first year of service to support Princeton's ongoing commitment to professional standards in community forestry management.

- The Arborist and members of the Shade Tree Commission have demonstrated strong commitment by consistently attaining the required 8 Continuing Education Units (CEUs) per year, reflecting active participation in forestry-related education and training opportunities.

    ○   The Municipality of Princeton has successfully pursued CEU-accredited training through sources such as:
- The New Jersey Shade Tree Federation
- The International Society of Arboriculture (ISA)
- Rutgers Cooperative Extension courses and webinars
- Support from a Consulting Forester

Recommended Training for the 2025–2029 CFMP Cycle

To enhance the technical capacity and effectiveness of the Shade Tree Commission and Public Works personnel, the following trainings are recommended:

- **Re-certification of CORE Training**: Recommended every 5 years for existing members and required for new appointees.
- **Rutgers Municipal Shade Tree Management and Tree Inventory Courses**: In-person offerings focused on species identification, proper pruning, site selection, and tree health diagnostics.
- **Rutgers Hazardous Tree Identification Courses:** In-person offerings focused on helping participants understand hazard identification, prioritization, and documentation.
- **i-Tree Open Academy:** (USDA Forest Service): Virtual learning series to explore the latest in tree benefits through the i-Tree tools.
- **The Committee for the Advancement of Arboriculture (CAA)**: Five-week climbing course.

Implementation and Oversight

The STC will continue to track CEUs and maintain training records. Priority will be given to cost-effective or grant-funded programs that provide NJUCF-approved CEUs. Training will also be extended to DPW staff and contractors involved in municipal tree maintenance to ensure consistent and ANSI A300-compliant practices across all operations.

COMMUNITY OVERVIEW

The Municipality of Princeton is a historic and culturally vibrant community in central New Jersey, encompassing approximately 18 square miles of diverse land uses, including a walkable downtown, residential neighborhoods, institutional campuses, parks, and natural areas. Princeton's tree resource is a defining feature of its landscape, contributing to the municipality's identity, environmental health, and quality of life.

Geographically, Princeton includes both densely developed urban areas and suburban landscapes, as well as preserved open space and forested lands. The presence of institutions such as Princeton University, alongside historic districts and a strong commitment to sustainability, shapes the municipality's approach to urban forestry. Varying soil conditions, aging infrastructure, and development pressure influence tree survival and require coordinated, adaptive management strategies.

Trees are highly valued by residents for their aesthetic, ecological, and health benefits. Community engagement with the urban forest is robust and supported by municipal leadership. The Shade Tree Commission, in collaboration with the Department of Public Works, municipal staff, and local volunteers, fosters stewardship through public education, planting initiatives, and regular outreach. The community has expressed strong support for expanding the urban canopy, increasing tree equity, and integrating trees into resilience and climate adaptation planning—all of which are core themes of Princeton's Master Plan.

PRINCETON'S ACCOMPLISHMENTS

1. **COMPLETED URBAN TREE CANOPY ASSESSMENT (2024)**
   In 2024, Princeton conducted a comprehensive Urban Tree Canopy (UTC) Assessment to evaluate existing canopy cover, identify planting opportunities, and support climate resilience planning. The findings now guide strategic decision-making, with an emphasis on equitable canopy distribution and green infrastructure integration.

2. **ENHANCED TREE RISK MANAGEMENT THROUGH GIS-BASED INVENTORY**
   The Municipality updated its tree inventory to include condition ratings, species diversity metrics, and risk classifications through 2022 tree inventory. This enables the Municipal Arborist, Department of Public Works and Shade Tree Commission to proactively maintain Princeton's urban forest and allocate resources efficiently.

3. **ENHANCED TREE REPLACEMENT ORDINANCE**
   In August 2020, Princeton adopted Ordinance 2020-26, which enhanced protections through updated tree-protection zones, higher tree replacement fees, and contractor registration requirements—surpassing baseline state standards.

4. **ASH TREE MANAGEMENT**
   Princeton crafted a comprehensive emerald ash borer (EAB) management plan for approximately 1,800 ash street trees, combining strategic removals and selective treatments to mitigate infestation risks.

5. **MICROFOREST GRANT AT QUARRY PARK**
   Princeton received a $10,000 Sustainable Jersey grant to help fund a new microforest at Quarry Park. This initiative is transforming 6,000 sq. ft. of turf into a dense ecosystem of approximately 1,300 native trees and shrubs, built using the Miyawaki Method, and equipped with walking paths and benches to enhance biodiversity, stormwater control, and climate resilience.

6. **REFORESTATION OF COMMUNITY PARK NORTH (RGGI GRANT)**
   The municipality, in partnership with Friends of Princeton Open Space, secured a $552,000 Natural Climate Solutions grant to restore 40 acres of forest in Community Park North. The project includes invasive species removal and the planting of over 2,500 native trees and shrubs.

7. **TREES FOR SCHOOLS GRANT**
   Princeton Public Schools was awarded a $92,125 grant through the Trees for Schools program—jointly administered by NJDEP, Sustainable Jersey, and TCNJ—to support tree plantings across school campuses.

PRINCETON'S BARRIERS TO SUCCESS

1. **AGING INFRASTRUCTURE AND LIMITED GROWING SPACE**

   Many of Princeton's older streetscapes and compact urban areas lack sufficient planting strips or soil volume to support healthy tree growth. Conflicts with utilities, sidewalks, and underground infrastructure make tree establishment and long-term survival more challenging.

2. **EQUITY GAPS IN TREE CANOPY DISTRIBUTION**

   While Princeton has a well-established tree canopy in many areas, certain neighborhoods—particularly those with higher-density housing—experience lower canopy coverage. Overcoming historical disparities in planting and maintenance requires sustained investment and community engagement.

3. **CLIMATE STRESSORS AND PEST PRESSURE**

   Princeton's trees face increasing stress from climate change impacts, including extreme heat, storms, and prolonged droughts, as well as threats from invasive pests and diseases, such as Emerald Ash Borer (EAB), Bacterial Leaf Scorch (BLS), Beech Leaf Disease (BLD), and Spotted Lanternfly (SLF). These challenges demand more adaptive and resilient species selection and increased maintenance capacity.

4. **STAFFING AND RESOURCE CONSTRAINTS**

   While Princeton has a dedicated Municipal Arborist, limited Public Works Tree Care Specialist personnel and budget capacity can delay routine maintenance, risk mitigation, and proactive planting, particularly as the urban forest expands and expectations increase.

5. **UTILITY WIRES & CLEARANCE PRUNING**

   Trees planted near electrical lines receive frequent pruning to ensure public safety and compliance. These clearance requirements can deform the tree canopy, limit planting options near roads and constrain species choice, often prioritizing low-growing, smaller trees.

6. **CANOPY LOSS FROM DEVELOPMENT**

   Private property building additions and replacements, and outdoor amenities such as pools, continue to reduce the urban tree canopy. Mature tree loss often outweighs gains made through tree replacements, resulting negatively on shade cover, habitat, and aesthetics. A more detailed description of Princeton's Canopy can be found in the 2024 Urban Tree Canopy Report.

7. **NEIGHBORHOOD RESISTANCE TO TREE PLANTING**

   Princeton's efforts to replace lost street tree canopy has relied on the informal adoption of tree by the adjacent residents. This policy has resulted in a deficit of planting in areas where residents have limited or no ability to care for trees such as higher density, predominantly tenant occupied areas, or where residents are aging in place.

Despite these obstacles, Princeton continues to take proactive steps to maintain and protect its tree canopy through planting initiatives, ordinance improvements, and targeted pest management. However, true restoration of lost canopy will require a sustained, long-term commitment—integrating resilient species selection, increased maintenance capacity, and community engagement.

OVERALL PROGRAM GOALS

Princeton is committed to stemming the canopy loss and enhancing the urban tree canopy through proactive, community-supported urban forestry practices. The following goals reflect the municipality's priorities for environmental stewardship, public safety, and community engagement, and will guide implementation of this Community Forestry Management Plan over the next five years:

1. **MAINTAIN, PROTECT, SUSTAIN, AND ENHANCE THE PUBLIC TREE CANOPY INCLUDING IN PARKS, NATURAL AREAS AND RIGHTS-OF-WAY**
Preserve and proactively manage the trees on Princeton's public lands—including parks, natural areas, and rights-of-way—to maintain a healthy, safe, and diverse urban forest that reflects the community's values. Prioritize tree planting and maintenance in neighborhoods with historically low canopy cover to ensure all residents, regardless of income or location, can access the health, environmental, and economic benefits of trees.

2. **ENCOURAGE AND PROMOTE STEWARDSHIP OF THE TREE CANOPY ON PRIVATE LANDS**
Encourage, support, and incentivize property owners to protect and expand tree canopy on private property, fostering shared responsibility for the benefits and resilience of Princeton's urban forest.

3. **STRENGTHEN COMMUNITY ENGAGEMENT AND STEWARDSHIP**
Foster a culture of urban forest stewardship through public education, volunteer planting initiatives, and collaboration with residents, schools, and local organizations.

4. **LEVERAGE TREES FOR ENVIRONMENTAL RESILIENCE AND PUBLIC HEALTH**
Integrate trees and shrubs into municipal strategies to address pressing environmental and health challenges, including stormwater management, flood mitigation, heat island reduction, air quality improvement, climate adaptation, and mental health.

5. **STRENGTHEN DISASTER PREPAREDNESS AND RECOVERY CAPACITY**
Develop and maintain plans for disaster readiness, rapid response, and long-term recovery from severe weather events, pest outbreaks, and other threats to the urban forest, ensuring swift action to protect public safety and canopy health.
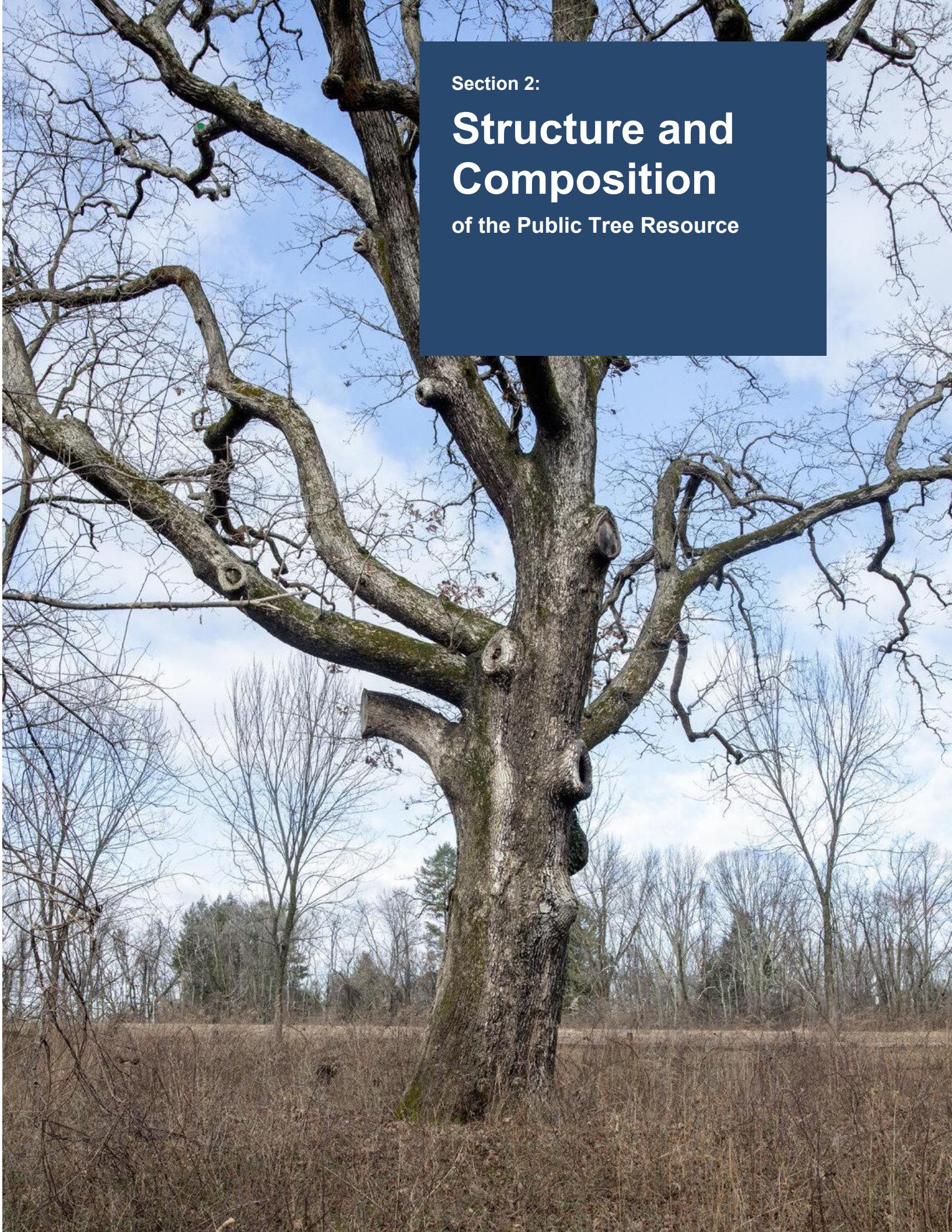
OVERVIEW

In January 2022, DRG arborists collected site data on trees, stumps, and planting sites within the Municipality of Princeton. A total of 19,283 sites were inventoried along the street right-of-way. Appendix C contains an illustrated map showcasing the inventoried sites, and Figure 2 provides a breakdown of the total sites by type. See Appendix A for details about DRG's methodology for collecting site data. Since the completion of the initial inventory, the Municipal Arborist has actively maintained and updated the dataset to ensure it remains accurate and reflective of current conditions.
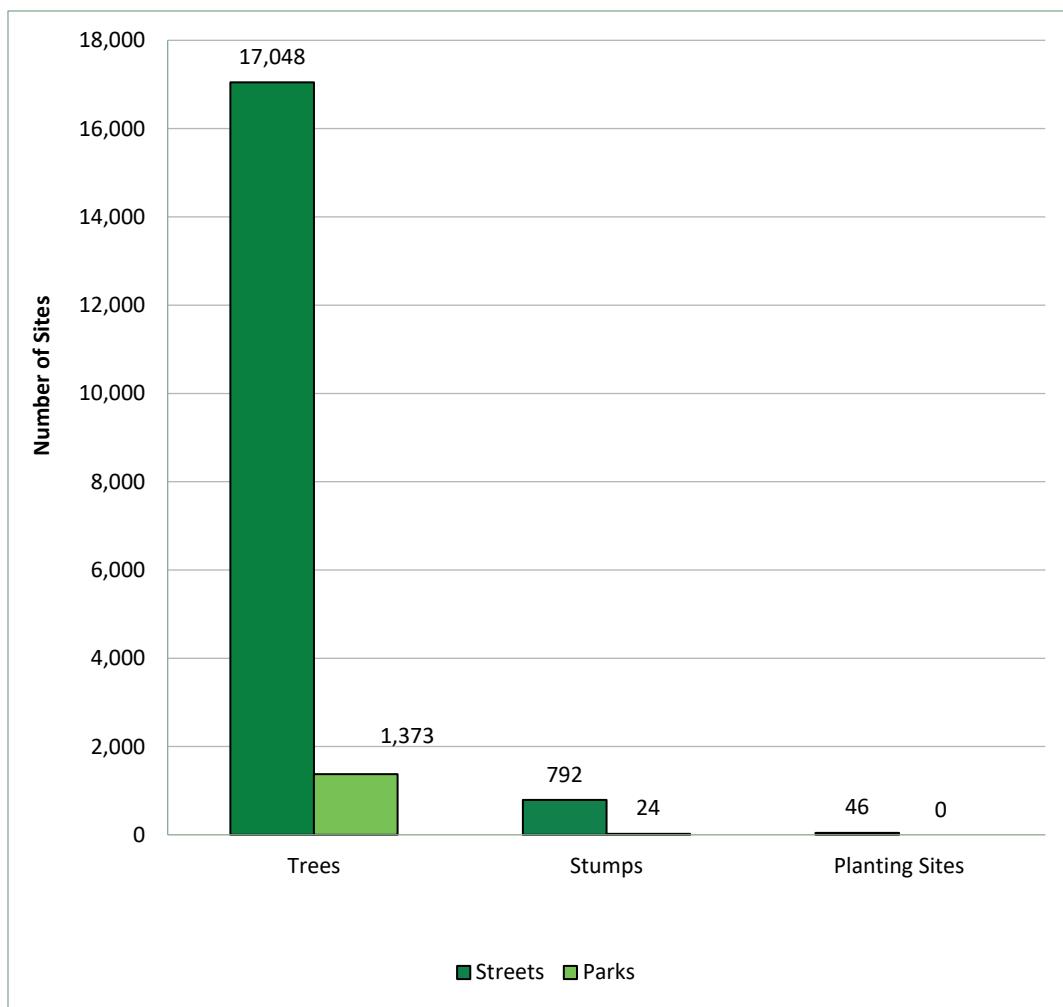

Figure 2. Number of inventoried sites by type.

SPECIES, GENUS, AND FAMILY DISTRIBUTION

The 10-20-30 rule is a common standard for tree population distribution, in which a single species should compose no more than 10% of the tree population, a single genus no more than 20%, and a single family no more than 30% (Santamour 1990). This standard was developed partially in response to tragedies such as the demise of vast swaths of American elm (*Ulmus americana*) after the introduction of Dutch elm disease to the United States (see side panel, "Resilience Through Diversity"). It provides valuable guidelines to help protect urban forests from both pests and diseases as well as from the effects of extreme weather events and climate change.

Figures 3a-b show The Municipality of Princeton's distribution of the most abundant tree species inventoried along the street ROW and parks compared to the 10% threshold. Red maple (*Acer rubrum*) is the most abundant tree species inventoried in the ROW, comprising 9% of the inventoried ROW trees (Figure 3a), followed by London planetree (*Platanus × acerifolia)* at 6%, and white pine (*Pinus strobus)* at 5%. Among the park tree population, white pine comprise 10% of the population (Figure 3b), followed by red maple at 8%, and Norway spruce (*Picea abies*) at 7%.
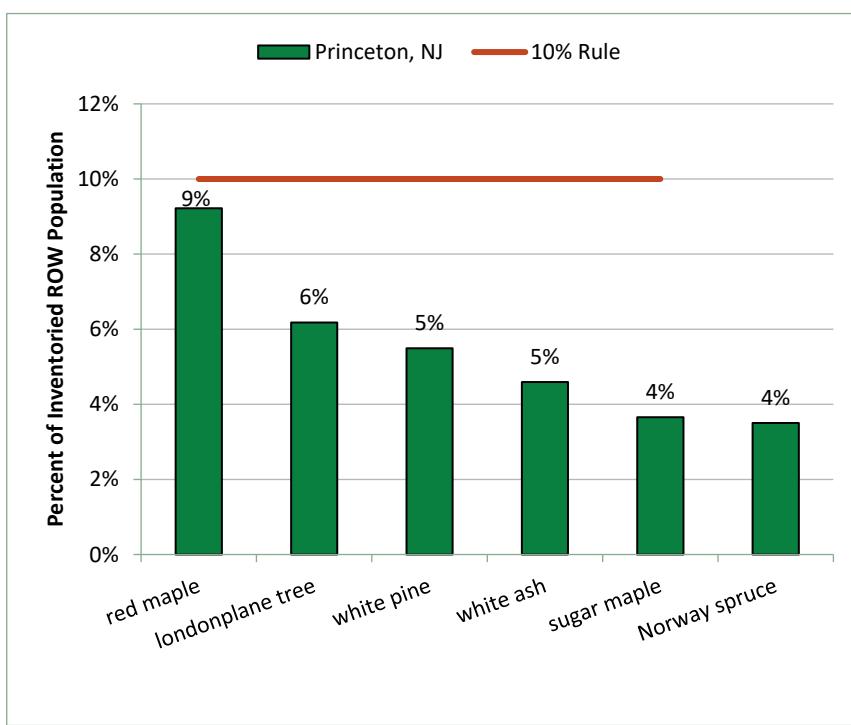
Figure 3a. Species distribution of inventoried ROW trees.

RESILIENCE THROUGH DIVERSITY

The Dutch elm disease epidemic of the 1930s provides a key historical lesson on the importance of diversity (Karnosky 1979). The disease killed millions of American elm trees, leaving behind enormous gaps in the urban canopy of many Midwestern and Northeastern communities. In the aftermath, ash trees became popular replacements and were heavily planted along city streets. History repeated itself in 2002 with the introduction of the emerald ash borer into America. This invasive beetle devastated ash tree populations across the Midwest. Other invasive pests spreading across the country threaten urban forests, so it's vital that we learn from history and plant a wider variety of tree genera to develop a resilient

Ash trees in an urban forest killed by emerald ash borer.
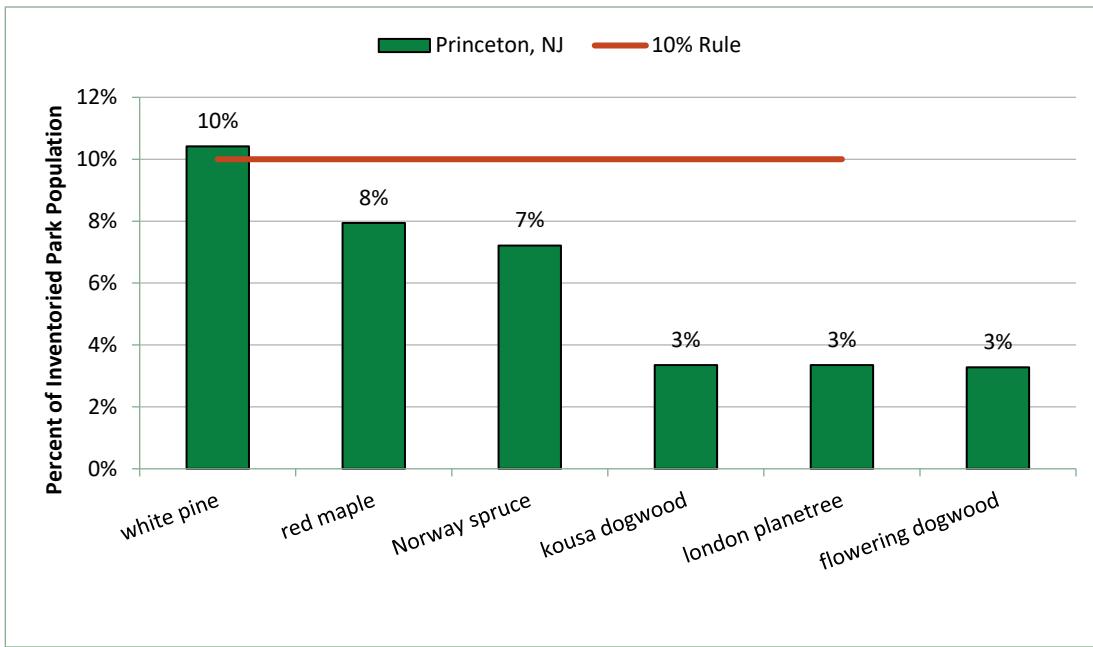
Figure 3b. Species distribution of inventoried park trees.

Figures 4a-b show the Municipality of Princeton's distribution of the most abundant tree genera inventoried along the street ROW and parks. The most abundant genera for both ROW trees and in Princeton are maple (*Acer*), comprising 18% of the ROW tree population and 15% of the park tree population. All other genera fall below the 20% threshold.
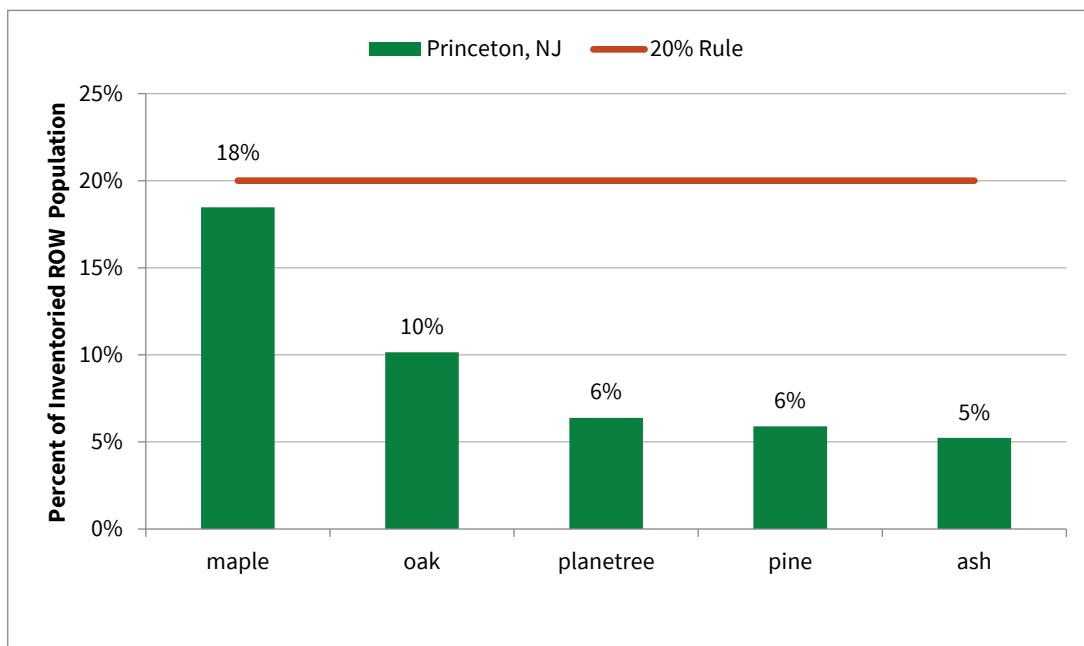
Figure 4a. Genus distribution of inventoried ROW trees.
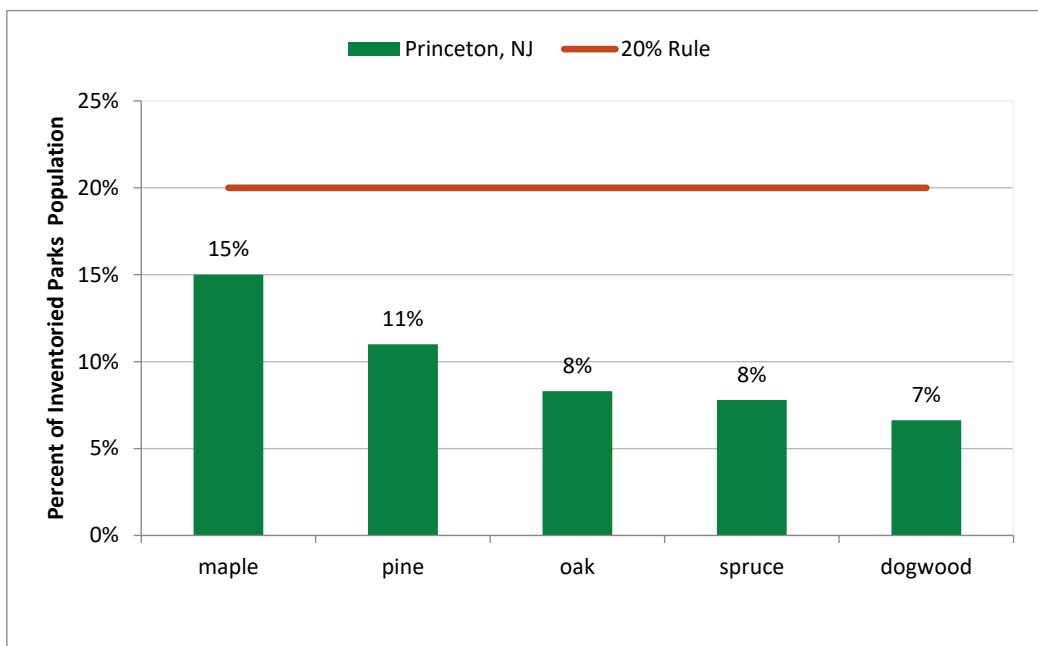
Figure 4b. Genus distribution of inventoried park trees.

Figures 5a-b show The Municipality of Princeton's distribution of the most abundant tree families inventoried compared to the 30% threshold. The most abundant family present among ROW trees is *Sapindaceae,* comprising 19% of all trees. Pinaceae takes the lead for tree families present in parks at 22%.
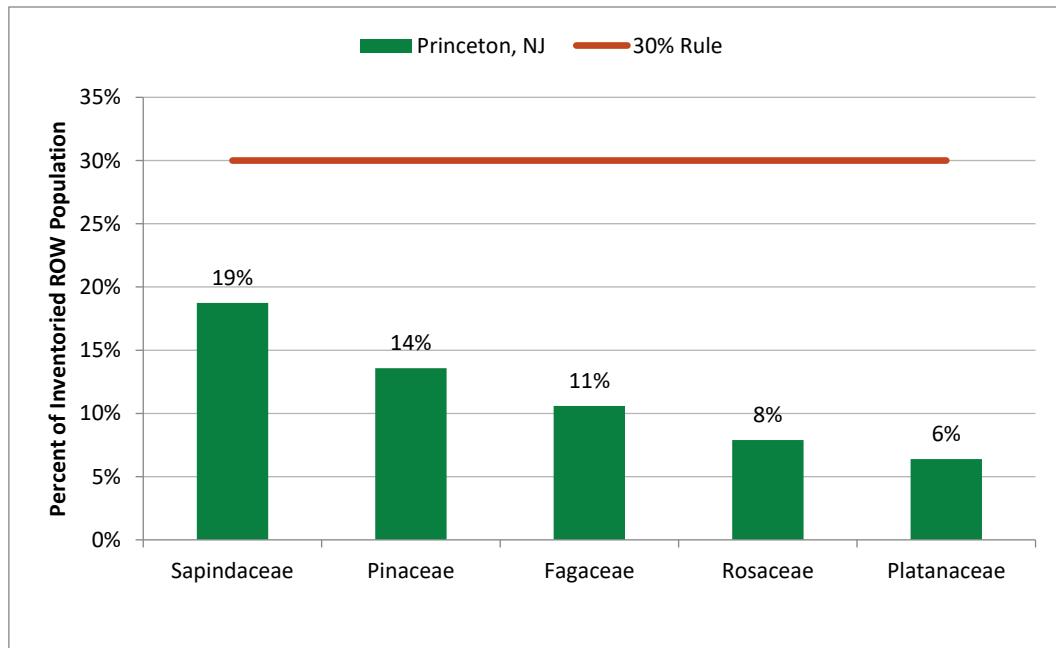

Figure 5a. Family distribution of inventoried ROW trees.
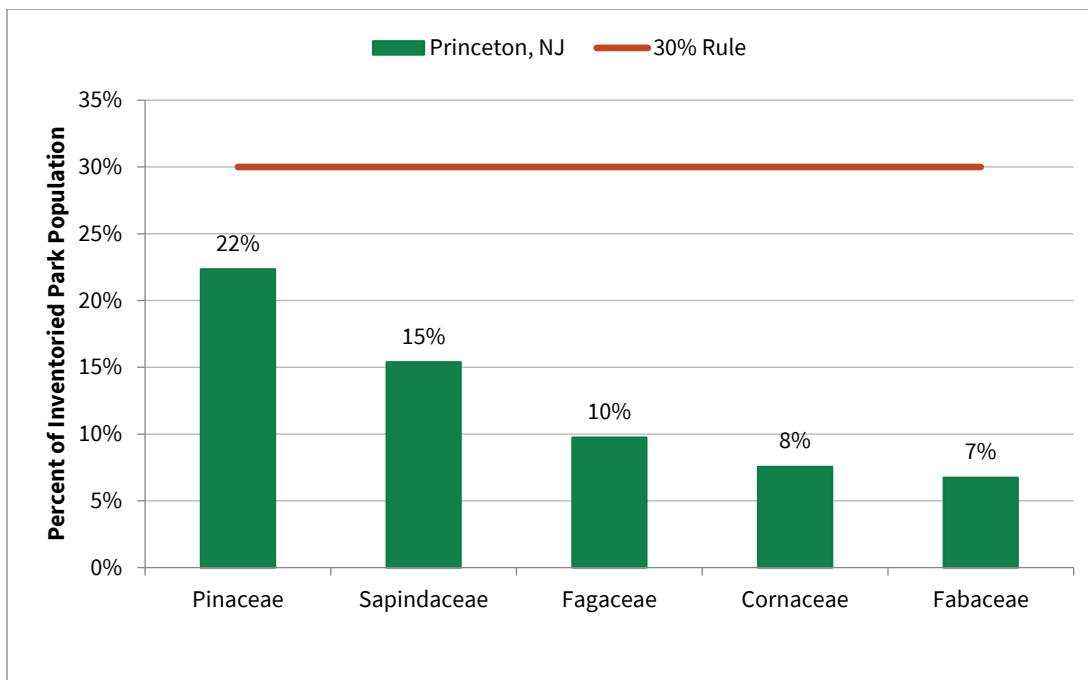
Figure 5b. Family distribution of inventoried park trees.

SPECIES, GENUS, AND FAMILY DISTRIBUTION RECOMMENDATIONS

The composition of species, genera, and families within an urban forest is a key indicator of resilience. A diverse canopy is better able to withstand and recover from disturbances caused by pests, diseases, extreme weather, and climate change (Ordóñez & Duinker, 2014). When diversity is low—particularly when one species or genus is overrepresented—the entire canopy becomes more vulnerable to large-scale damage.

Princeton's experience with the emerald ash borer (EAB, *Agrilus planipennis*) illustrates this risk. With approximately 1,800 ash street trees (*Fraxinus* spp.), the community faced significant removals and costs once EAB became established. Because EAB exclusively targets the ash genus, neighborhoods with high ash concentrations experienced canopy loss more acutely. Other threats, such as fire blight (*Erwinia amylovora*) in the Rosaceae family or beech leaf disease (BLD) in *Fagus*, also demonstrate the dangers of taxonomic concentration.

Currently, no single species, genus, or family dominates Princeton's right-of-way or park tree canopy, which is a strength. The municipality's inventory shows over 200 species across 60 genera, including *Acer* (maple), *Quercus* (oak), *Carya* (hickory), *Ulmus* (elm), and *Pinus* (pine). This diversity buffers Princeton against pests and diseases that target specific taxa.

To maintain and strengthen this resilience, Princeton should:

- **Adhere to the "10-20-30 guideline"**: No more than 10% of the canopy from a single species, 20% from a single genus, and 30% from a single family.

- **Avoid over-planting common but vulnerable species**, such as maple (*Acer* spp.), which are already widely represented and susceptible to multiple pests and stressors.

- **Prioritize adaptive and climate-resilient species** suited for Princeton's soils, infrastructure constraints, and projected climate shifts.

- **Continue diversifying at the family level**, ensuring that no single plant family (e.g., Rosaceae, Fagaceae) dominates.

By applying these principles, Princeton can reduce the risk of repeating the canopy loss experienced during the EAB outbreak and build an urban forest that is healthier, more balanced, and more resilient for future generations.

CONDITION

Several factors affecting condition were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition of each inventoried tree was rated by an arborist as Excellent, Good, Fair, Poor, or Dead. The general health of the inventoried tree population was characterized by the most prevalent condition assigned during the inventory.

In Figure 6, it is evident that a significant majority of the surveyed trees demonstrated either Good or Fair conditions, encompassing a total of 91% and 93% of the inventoried ROW and park trees, respectively. Approximately 7% and 5% of the ROW and park trees surveyed were classified as Poor, respectively, and 2% of the inventory of both ROW and park was reported as Dead.

Condition Recommendations

The condition of individual trees plays a pivotal role in determining the overall health of an urban forest. Healthy trees are better equipped to resist pests, diseases, and environmental stresses, thus reducing the potential for widespread outbreaks or die-offs. They contribute to the structural integrity of the forest canopy, providing crucial habitat and forage opportunities for local wildlife. Additionally, healthy trees actively participate in critical ecosystem functions such as photosynthesis and carbon sequestration, which are essential for maintaining overall forest vitality. Conversely, the presence of diseased or stressed trees can weaken the forest's resilience, making it more susceptible to disturbances, diminishing its biodiversity and compromising its ability to provide ecological services, such as air and water purification. The condition of individual trees directly influences the health, diversity, and ecological functioning of the entire forest ecosystem.

Figure 6. Condition of ROW and park trees.

Trees identified as being in poor condition or worse indicate that the tree's state is irreparable, rendering it impervious to any treatment or maintenance efforts. Conversely, trees in Fair condition imply that maintenance interventions can be undertaken to enhance and sustain their current state or further improve their condition. Hence, to ensure that the majority of Princeton's trees remain in Fair condition or better, it is advisable for the municipality to implement a proactive maintenance program.

While the assessment of tree condition is a valuable component in managing urban forests, it should not serve as the sole determinant for prioritizing maintenance efforts. Rather, a more comprehensive approach is recommended. In particular, the utilization of tools like TreeKeeper® can effectively guide the prioritization of actions, focusing on trees rated as having Poor condition or being in a Dead state, especially when these trees are associated with an Extreme, High, or Moderate Risk classification. Younger trees exhibiting a Fair or Poor condition rating could substantially benefit from structural pruning, aligning with the guidelines established by ANSI A300 (Part 1). This approach aims to bolster their long-term health and vitality.

For mature trees that have garnered Poor condition ratings, their compromised state is often linked to visible indicators of decline and stress, which may manifest as decay, dead limbs, sparse branching, or structural deficiencies. In these cases, addressing their condition necessitates corrective pruning and intensive plant health care to rejuvenate their vigor. Continuous monitoring should be employed to track potential deterioration in their condition. As for trees falling into the Fair condition category, targeted pruning to eliminate dead or faulty limbs can foster improvement over time, ultimately elevating their overall condition with the proper care and attention.

RELATIVE AGE DISTRIBUTION

Analysis of a tree population's relative age distribution is performed by assigning age classes to the size classes of inventoried trees. Size is used as a proxy for age because of the difficulty of accurately and rapidly measuring tree age in the field. Since tree species have different lifespans and mature at different diameters, actual tree age cannot be determined from diameter size class alone, but size classifications can be extrapolated into relative age classes which can offer insight into the maintenance needs of The Municipality of Princeton's tree resource. The inventoried trees are grouped into the following relative age classes:

- Young trees (0–8 inches diameter at breast height (DBH)).
- Established trees (9–17 inches DBH).
- Maturing trees (18–24 inches DBH).
- Mature trees (greater than 24 inches DBH).

These size classes were chosen so that the inventoried tree resource can be compared to the ideal relative age distribution, which holds that the largest proportion of the inventoried tree population (approximately 40%) should be young trees, while the smallest proportion (approximately 10%) should be mature trees (Richards 1983). Although mature trees provide the highest ecological benefits, they are also more vulnerable to decline, storm damage, and pests. Keeping them as a smaller portion of the population ensures a balanced age structure, reduces risk, and supports long-term canopy continuity as younger trees grow into future canopy contributors.
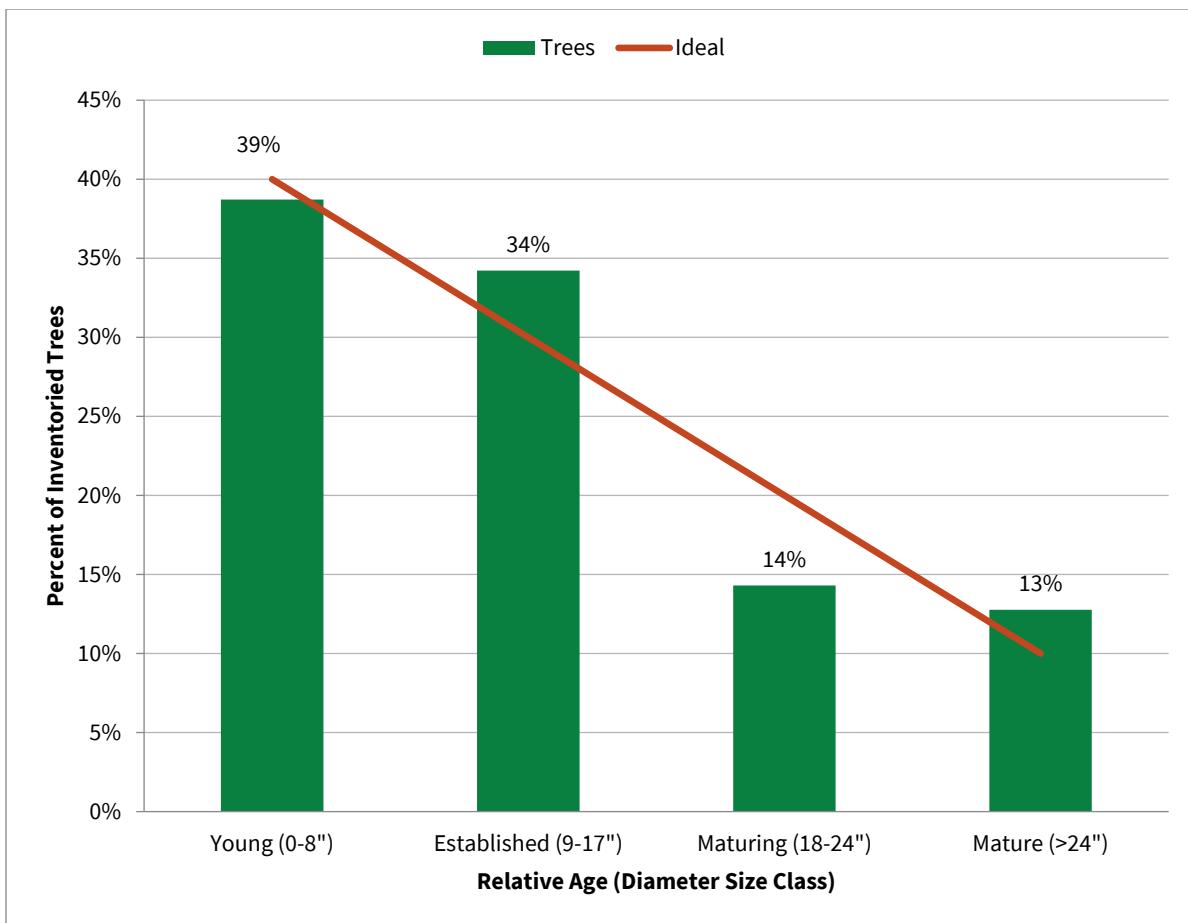
Figure 7. Relative age distribution of all inventoried trees.

Figure 7 compares the Municipality of Princeton's relative age distribution of its inventoried tree population to the recommended "ideal." While the "ideal" age curve is a general guideline that can be adjusted to reflect local goals and site conditions, a balanced age structure is a critical indicator of long-term canopy stability, ecological resilience, and sustainable maintenance.

Princeton's inventory shows that 39% of trees are young (0–8" DBH), while 34% are established (9–17" DBH). Together, these groups make up nearly three-quarters of the urban forest, a positive indicator of canopy succession. This strong base of younger and mid-sized trees will grow into Princeton's next generation of large shade trees—those that provide the highest ecosystem benefits, including cooling shade, carbon sequestration, pollutant uptake, and stormwater interception.

By comparison, only 14% of trees are maturing (18–24" DBH) and 13% are mature (>24" DBH). While this reflects a natural decline as trees age, it highlights the need to ensure that young trees are successfully maintained and transitioned into the mature size classes. Large, healthy canopy trees deliver exponentially greater benefits than smaller ones, and replacing their functions takes decades.

For Princeton, maintaining an uneven age distribution is advantageous: it helps spread out annual maintenance and removal costs across time, reduces the risk of catastrophic canopy loss from age-related decline or storm damage, and ensures continuous canopy coverage as older cohorts are gradually replaced. However, Princeton's history with emerald ash borer (EAB) demonstrates how pests can accelerate loss in specific cohorts—many of the community's ~1,800 ash street trees were in the mid-size age classes when EAB hit, resulting in removals that disrupted canopy balance and forced rapid replacement.
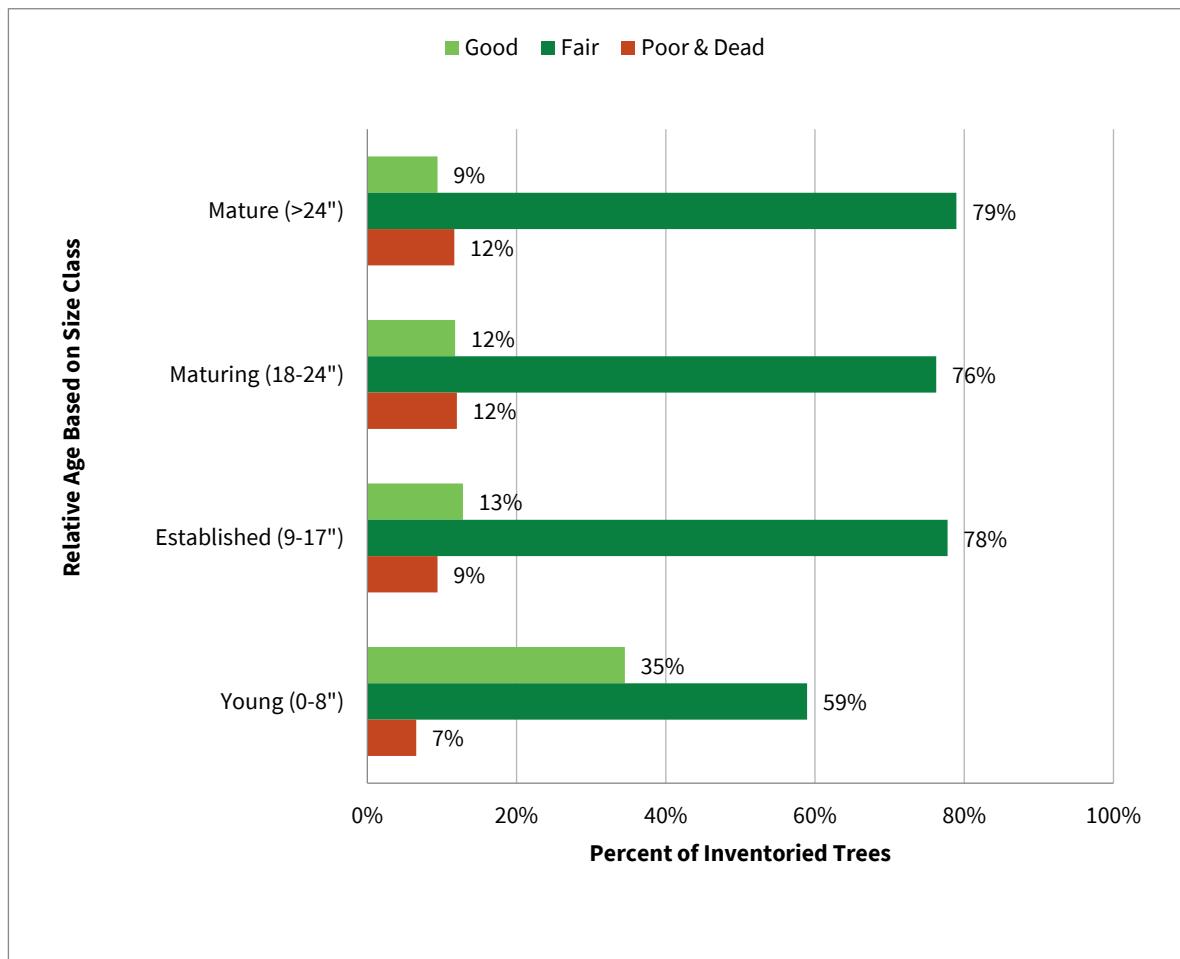
Figure 8. Condition of all inventoried trees by relative age class.

Figure 8 presents a detailed analysis of Princeton's inventoried tree population based on age distribution, offering key insights into the stability of the urban forest.

A substantial portion of Princeton's Young and Established trees currently boast a Fair condition rating or better, signifying their potential to reach full maturity if they receive consistent care and maintenance. Equally significant is the observation that, as trees progress through their maturation cycle, the proportion in Good condition diminishes. This trend reflects the natural aging process as well as stresses from pests, diseases, weather events, and urban growing conditions.

Given the significant investment involved in planting new trees, consistent aftercare—including watering, mulching, pruning, and monitoring—will ensure that the municipality receives a strong return on this investment. Proactive measures taken now can reduce future tree care expenses, minimize removals, and build a healthier and more resilient canopy.

Moreover, Princeton should prioritize preservation and proactive care strategies for its mature and maturing trees. Protecting these large canopy contributors from unnecessary removals and treatable defects will help maintain their ecosystem benefits—shade, carbon sequestration, and stormwater mitigation—that cannot be immediately replaced through new plantings.

By emphasizing both tree preservation and ongoing planting initiatives, Princeton can gradually shift its relative age and condition distribution closer to the "ideal," promoting a balanced, sustainable, and climate-resilient urban forest. This holistic approach will extend the life span of individual trees while strengthening the long-term stability and resilience of the municipal canopy.

Relative Age Recommendations

Princeton's urban forest is a valuable community asset that provides shade, stormwater management, air quality improvement, carbon sequestration, and cultural benefits. To sustain and enhance these services, the municipality should pursue a balanced approach that combines preservation, proactive care, and strategic planting. Key priorities include protecting existing mature canopy trees through preventive maintenance, ensuring the successful establishment of young and newly planted trees through consistent aftercare, and diversifying species, genera, and families to reduce vulnerability to pests and diseases.

By aligning age distribution with long-term canopy goals, integrating adaptive and climate-resilient species, and investing in adequate staffing and resources, Princeton can strengthen both the health and resilience of its urban forest. With this strategy, the municipality will not only restore canopy lost to past threats such as the emerald ash borer, but also secure a sustainable and thriving urban forest into the future.

Moving forward, Princeton should:

- Strengthen establishment care to maximize survival of the large cohort of young trees.

- Ensure taxonomic and age diversity in planting plans, so that no single age group or genus is disproportionately vulnerable.

- Focus on transitioning established and maturing trees into the mature cohort, extending canopy longevity and ecosystem benefits.

- Use adaptive species selection to address climate shifts, urban heat, and pests like bacterial leaf scorch (BLS), beech leaf disease (BLD), and spotted lanternfly (SLF).

Defects

For each tree inventoried, DRG assessed conditions indicating the presence of structural defects and recorded the most significant condition. Defects were limited to the following categories:

- Broken and/or hanging branches
- Cracks
- Dead and dying parts
- Missing or decayed wood
- None
- Other

- Root problems
- Tree architecture
- Trunk condition
- Weakly attached branches and codominant stems

Table 1. Tree defect categories recorded during the inventory

Defect	Street Trees	Percent of Street Trees	Park Trees	Percent of Park Trees
Broken and/or Hanging Branches	807	4%	77	7%
Cracks	23	0%	2	0%
Dead and Dying Parts	7,250	40%	577	51%
Missing or Decayed Wood	2,687	15%	67	6%
None	3,242	18%	210	18%
Other	13	0%	1	0%
Root Problems	662	4%	17	1%
Tree Architecture	1,149	6%	54	5%
Trunk Condition	536	3%	27	2%
Weakly Attached Branches and Codominant Stems	1,642	9%	105	9%
Total	**18,011**	**100%**	**1,137**	**100%**

Among the recorded defect categories for the inventoried trees, one stood out as the most prevalent issue: "Dead & Dying Parts" accounted for 40% of the total cases in the ROW and 51% in the parks (Table 1). Within the 1,827 trees afflicted by "Dead & Dying Parts," a recommendation for removal was issued for 416 trees. These removal recommendations were made based on assessments that indicated the tree's inability to recover from the associated defect, necessitating their removal from the urban forest.

It's worth noting that a portion of the inventoried trees, approximately 18% for both ROW and parks, did not exhibit any associated defects, signifying their relatively good health and structural integrity. This underscores the importance of proactive tree management and maintenance practices to ensure the continued well-being of these trees and to address defects in a timely manner where necessary.

Defect Observation Recommendations

When considering the defect recorded for each tree, there are two important qualifiers to keep in mind. First, the categories are broadly inclusive. For example, the "Dead and Dying Parts" category can include trees with just one or two smaller diameter dead limbs as well as trees found with large-diameter dead limbs or entire sections of dead canopy. Therefore, inferences on overall tree condition or risk rating cannot be derived solely from the presence or absence of a defect recorded at the time of the inventory. Second, an inventoried tree may have multiple defects; the 2022 The Municipality of Princeton inventory recorded only the most significant defect observed for each tree. These two qualifiers are important to keep in mind when considering urban forest management planning and the prioritization of maintenance or monitoring activities. With proper pruning, the overall health of trees in Fair condition with a defect of "Dead and Dying Parts" can be improved over time.
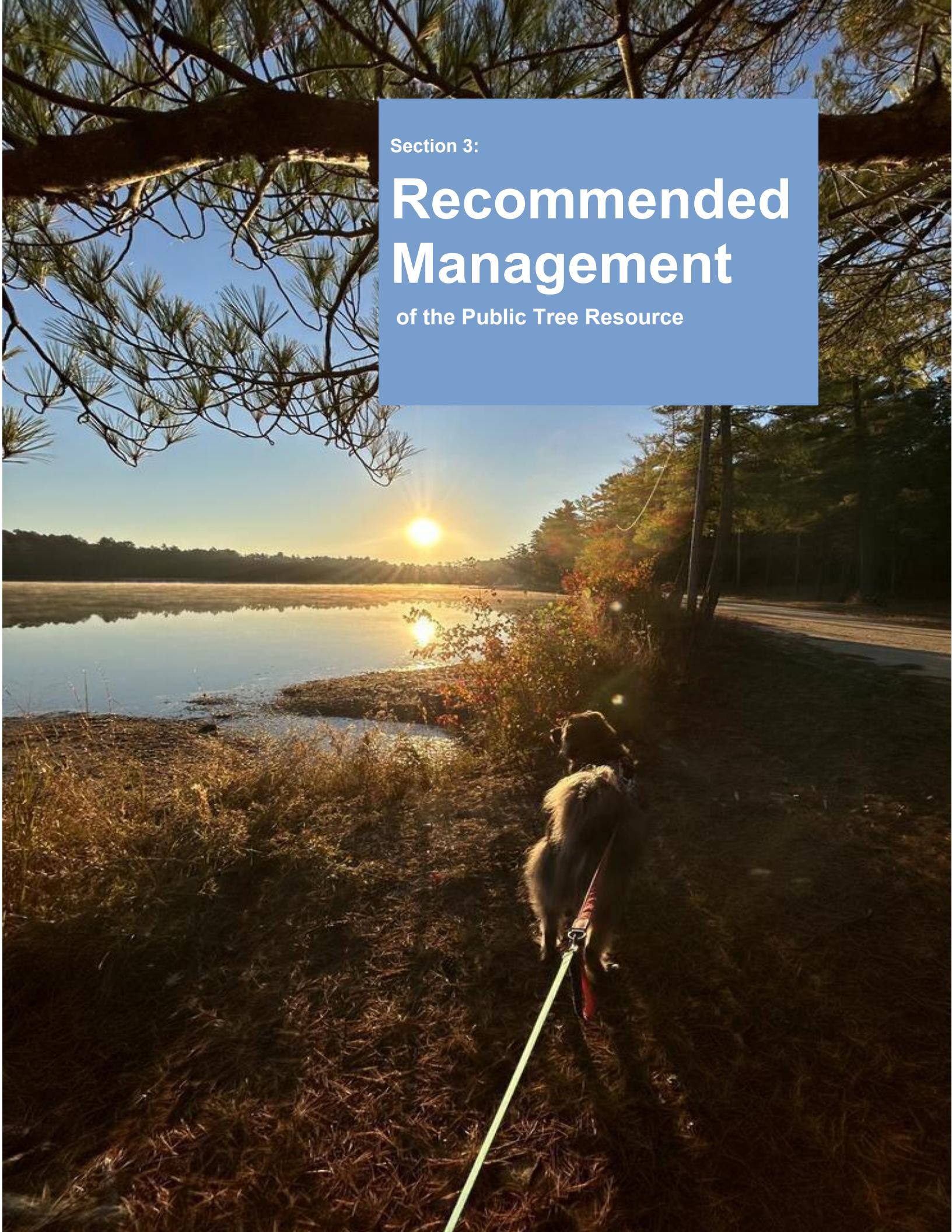
Section 3:

Recommended Management

of the Public Tree Resource

OVERVIEW

During the inventory, both a risk rating and a recommended maintenance activity were assigned to each tree. DRG recommends prioritizing and completing each tree's recommended maintenance activity based on the assigned risk rating. This five-year tree management program takes a multi-faceted and proactive approach to tree resource management.

PRIORITY MAINTENANCE
Extreme Risk Tree Maintenance
High Risk Tree Maintenance
Further Inspections

- Moderate Risk Tree Maintenance
- Routine Inspections & Inventory Updates
- Routine Pruning
- Young Tree Training
- Low Risk Tree Maintenance
- Stump Removal
- Tree Planting

RISK MANAGEMENT AND RECOMMENDED MAINTENANCE

Every tree, regardless of condition, has an inherent risk of whole or partial tree failure. During the inventory, DRG performed a modified Level 2 qualitative risk assessment for each tree and assigned a risk rating based on *ANSI A300* (Part 9) and the companion publication *Best Management Practices: Tree Risk Assessment* (ISA 2011). Trees can have multiple potential modes of failure, each with its own risk rating. The potential mode of failure with the highest risk rating was recorded for each tree during the 2025 tree inventory. The specified time frame for the risk assessment was one year.

DRG strongly urges prioritizing and swiftly executing tree maintenance tasks in alignment with the risk assessments assigned to each tree during the inventory. Trees bearing Extreme or High Risk ratings demand immediate attention and should be addressed as the foremost priority. Subsequently, trees labeled with Moderate Risk ratings should be promptly attended to, with the maintenance of Low Risk trees scheduled only after the higher risk ones have undergone necessary pruning or removal. The ensuing sections delineate the crucial maintenance protocols designated for each risk rating category. Prompt attention to this matter is of utmost importance to safeguard the safety and vitality of our urban forest.

EXTREME AND HIGH PRIORITY RECOMMENDED MAINTENANCE

Prioritizing the pruning or removal of trees exhibiting an elevated risk level, namely those with Extreme, High, or Moderate Risk ratings, is strongly advised and should be carried out promptly. In the overall sequence of maintenance activities, it is generally recommended to address the largest diameter trees first, as they often pose the highest risk. Once these sizable trees have been addressed, attention should be directed toward implementing recommended maintenance procedures for smaller diameter trees that also present significant risks. Timely and proactive management of High Risk trees may necessitate a substantial allocation of resources. However, executing these tasks promptly is instrumental in risk mitigation, enhancing public safety, and reducing long-term expenses.

High Priority Pruning and Removal Recommendations

Trees categorized with Extreme or High Risk ratings, which necessitate pruning or removal, should receive immediate attention. High Risk pruning typically involves the removal of defective elements such as dead or dying limbs, broken branches, and portions with missing or decayed wood within the tree canopy. These measures are instrumental in reducing risks associated with the tree while promoting its overall health and growth. When pruning can rectify these defects and mitigate risks effectively, it is the recommended course of action.
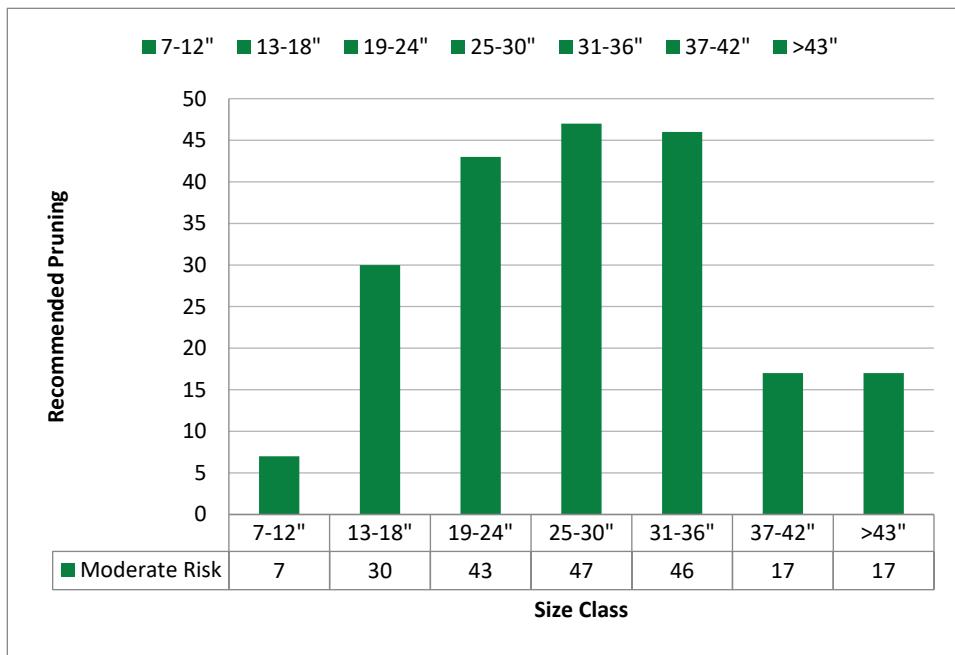
Figure 9a. Recommended pruning by size class and risk rating of inventoried trees.
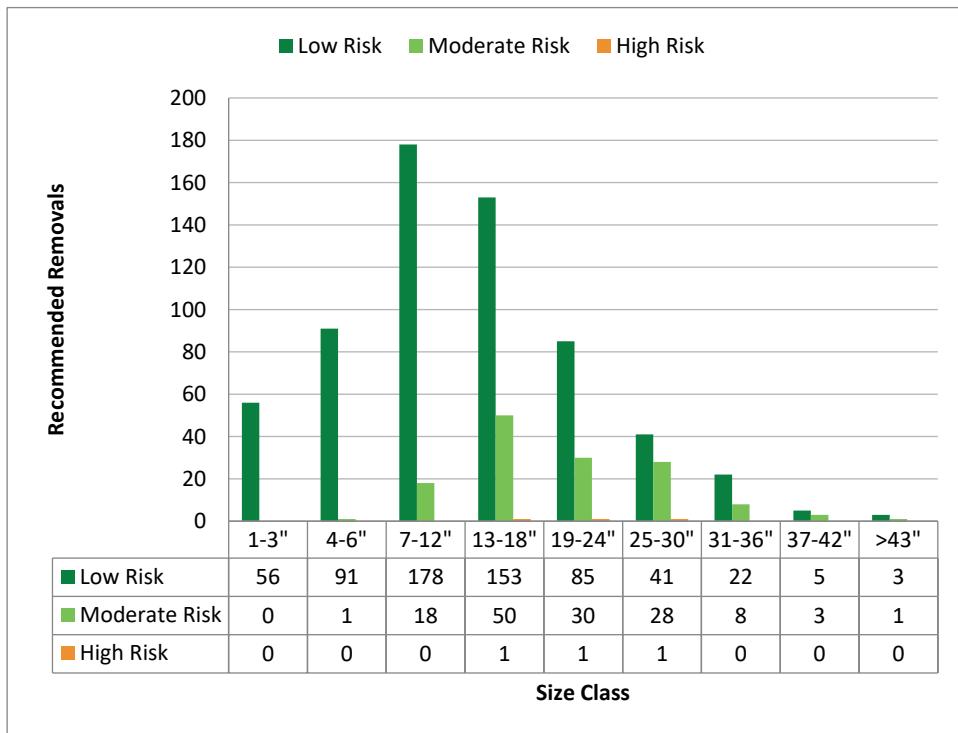

Figure 9b. Recommended removals by size class and risk rating of inventoried trees.

MODERATE AND LOW PRIORITY RECOMMENDED MAINTENANCE

Following the priority of addressing Extreme and High Risk trees, the subsequent focus should be on the maintenance of Moderate and Low Risk trees. As only 3 High Risk trees were identified during the inventory assessment, it is recommended that a proportion of Moderate Risk trees receive attention within the first year of the five-year maintenance plan. Once the maintenance tasks for Moderate Risk trees have been completed, the municipality can shift its focus to Low Risk trees and transition into a proactive and routine pruning maintenance schedule. This systematic approach ensures the comprehensive care and management of the urban forest while optimizing resource allocation and long-term maintenance planning.

Moderate Risk Pruning and Removal Recommendations

The inventory identified 139 trees recommended for Moderate Risk removal and 207 trees for Moderate Risk pruning. These trees should ideally be addressed within the first two years, contingent upon budget availability.

Low Priority Pruning Recommendations

There were 3,273 Low Risk trees recommended for pruning. Low Risk trees recommended for pruning were included in the routine pruning cycle, starting in year one of the five-year management plan.

Low Priority Removal Recommendations

DRG identified 634 Low Risk trees recommended for removal. Low Risk removals pose little threat; these trees are generally small, dead, invasive, or poorly formed trees that need to be removed. Eliminating these trees will reduce breeding site locations for insects and diseases and will increase the aesthetic value of the area. Healthy trees growing in poor locations or undesirable species are also included in this category. If pruning cannot correct a tree's defects and/or adequately mitigate risk, then the tree should be removed. All Low Risk trees should be removed when convenient after all higher risk pruning and removals have been completed and may be performed concurrently with routine pruning.

FURTHER INSPECTION

The Further Inspection data field indicates whether a tree requires additional and/or future inspections to assess and/or monitor conditions that may cause it to become a risk to people, property, or other trees. Further inspections are beyond the scope of a standard tree inventory and can be one of the following:

- Annual Inspection (e.g., a healthy tree that has been impacted by recent construction, weather, or other damage, or which has a defect that may require further monitoring to determine whether it is a hazard).
- Advanced Risk Assessment (e.g., a tree with a defect requiring additional or specialized equipment for investigation).
- Insect/Disease Monitoring (e.g., a tree that appears to have an emerging insect or disease problem).
- No further inspection required.

In the ANSI A300 system, there are three levels of risk assessment. Each level is built on the one before it. The lowest level is designed to be a cost-effective approach to quickly identifying tree risk concerns, while the highest level is intended to provide in-depth information to make management decisions about an individual tree. These levels are:

- **Level 1:** Level 1 inspection is defined as a limited visual assessment, which is often conducted as a walk-through or windshield survey designed to identify obvious defects or specified conditions.

- **Level 2:** Level 2 inspection is defined as a basic assessment and is a detailed, 360-degree visual inspection of a tree and its surrounding site, and a synthesis of the information collected. All trees in the 2021 The Municipality of Princeton tree inventory were assessed to this level, provided that 360-degree access around the tree could be gained.

- **Level 3:** Level 3 inspection is an advanced assessment and is performed to provide detailed information about specific tree parts, defects, targets, or site conditions. A Level 3 inspection may use specialized tools or require the input of an expert.

Further Inspection Recommendation

DRG arborists found 109 trees in need of advanced risk assessment, 502 trees noted for insect and disease monitoring, and 849 trees recommended for annual inspections. The trees recommended for advanced assessment should receive a Level 3 risk assessment by a Tree Risk Assessment Qualified (TRAQ) arborist as soon as possible to determine whether these trees require removal, pruning, or other corrective action to reduce the risk associated with their observed defects. Advanced risk assessments may require specialized or additional equipment, such as bucket trucks, to access and assess tree defects.

Most of the trees recommended for insect and disease monitoring dead and dying parts are listed as the primary defect. Signs of symptoms of pests and diseases were often noted as present at the time of inspection. All trees recommended for insect/disease monitoring should be assessed to confirm the presence of damaging insects or diseases and should be treated, if necessary, to reduce the pest species load and improve the health of the public trees in The Municipality of Princeton.

Trees recommended for annual inspection should be assessed routinely to monitor their condition and look for signs of worsening defects that may merit intervention. Some of these trees will likely recover given time, and will no longer need additional monitoring, while others may require removal if their defects worsen.

ROUTINE INSPECTIONS

Inspections are essential to uncovering potential problems with trees. They should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care. Ideally, the arborist will be ISA Certified and hold the ISA Tree Risk Assessment Qualification credential.

Routine Inspection Recommendations

To maintain the health and safety of The Municipality of Princeton's urban forest, it is essential that all trees undergo regular inspections and receive timely care as needed. It is recommended that tree assessments be conducted every two to three years. Additionally, inspections following major storm events are advised to quickly identify and address any potential damage or safety concerns.

To streamline the inspection process, DRG suggests implementing a Level 1 limited visual assessment, which can serve as an initial screening to identify trees requiring further attention. This preliminary evaluation can help prioritize trees for more in-depth Level 2 inspections, ensuring a focused and efficient use of resources in maintaining the health and safety of the urban forest.

Whenever a tree demands additional or new work, it should promptly be integrated into the maintenance schedule, accompanied by an adjustment of the budget to accommodate the additional workload. The implementation of advanced computer management software, such as TreeKeeper®, facilitates seamless updates, edits, and the maintenance of detailed work records. These inspections extend beyond defect identification; they also provide a valuable opportunity to detect early signs of potential pest infestations and disease outbreaks. Given the municipality's sizable tree population, particularly the susceptible maple (*Acer* spp.) varieties, this proactive approach to monitoring is paramount.

ROUTINE PRUNING CYCLE

The Routine Pruning cycle includes all Low Risk trees that received a "Prune" or "Discretionary Prune" maintenance recommendation. These trees pose some risk but have a smaller defect size and/or a lower probability of impacting a target. Over time, routine pruning can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Based on Miller and Sylvester's research, DRG recommends a five-year Routine Pruning cycle to maintain the condition of the inventoried tree resource. However, not all communities are able to remain proactive with a five-year cycle based on budgetary constraints, the size of the public tree resource, or both. In these cases, extending the length of the Routine Pruning cycle is an option; however, it is in the community's best interest to not approach or exceed a 10-year pruning cycle. This is around when tree condition deteriorates significantly without regular pruning, when previously minor defects have worsened, reducing tree health and potentially increasing risk (Miller and Sylvester 1981).

Routine Pruning Cycle Recommendations

The Municipality of Princeton's inventory identified 14,366 trees that should be routinely pruned. DRG recommends that the Municipality of Princeton establish a five-year Routine Pruning cycle and prioritize Priority Pruning before starting on Routine Pruning.

PROACTIVE PRUNING

Relationship between tree condition and years since previous pruning.
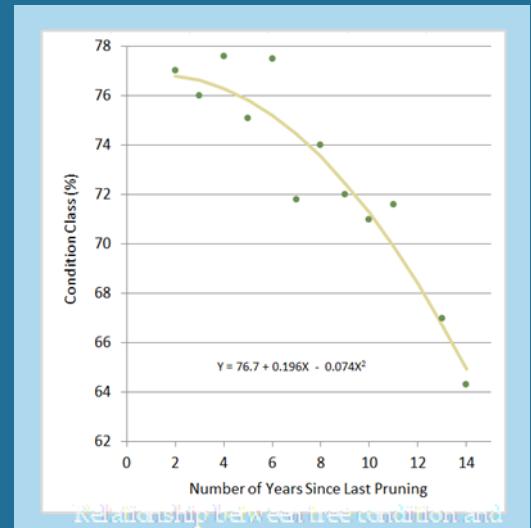
(adapted from Miller and Sylvester 1981)

Miller and Sylvester studied the pruning frequency of 40,000 street trees in Milwaukee, Wisconsin. Trees that had not been pruned for more than 10 years had an average condition rating 10% lower than trees that had been pruned in the previous several years. Their research suggests that a five-year pruning cycle is optimal for urban trees.

Routine pruning cycles help detect and correct most defects before they reach higher risk levels. DRG recommends that pruning cycles begin in the first year of the maintenance program.

DRG recommends two pruning cycles: a young tree training cycle and a routine pruning cycle. Newly planted trees will enter the young tree training cycle once they become established and will move into the routine pruning cycle when they reach maturity. A tree should be removed and eliminated from the routine pruning cycle when it outlives its usefulness.

Keep in mind that as priority pruning work is completed, those trees should enter the routine pruning cycle, which will result in higher numbers of trees recommended for routine pruning in future years beyond the five-year management plan presented here. However, not every tree will require pruning every cycle, and actual costs of administering a routine pruning cycle for The Municipality of Princeton's trees may be lower than projected in Table 3. DRG recommends that the routine pruning cycle begins in year one of the proposed five-year program after all extreme and high risk recommended maintenance is complete.

|	1-3"	4-6"	7-12"	13-18"	19-24"	25-30"	31-36"	37-42"	>43"
Streets	984	1,448	4,348	3,554	1,948	1,081	594	276	133
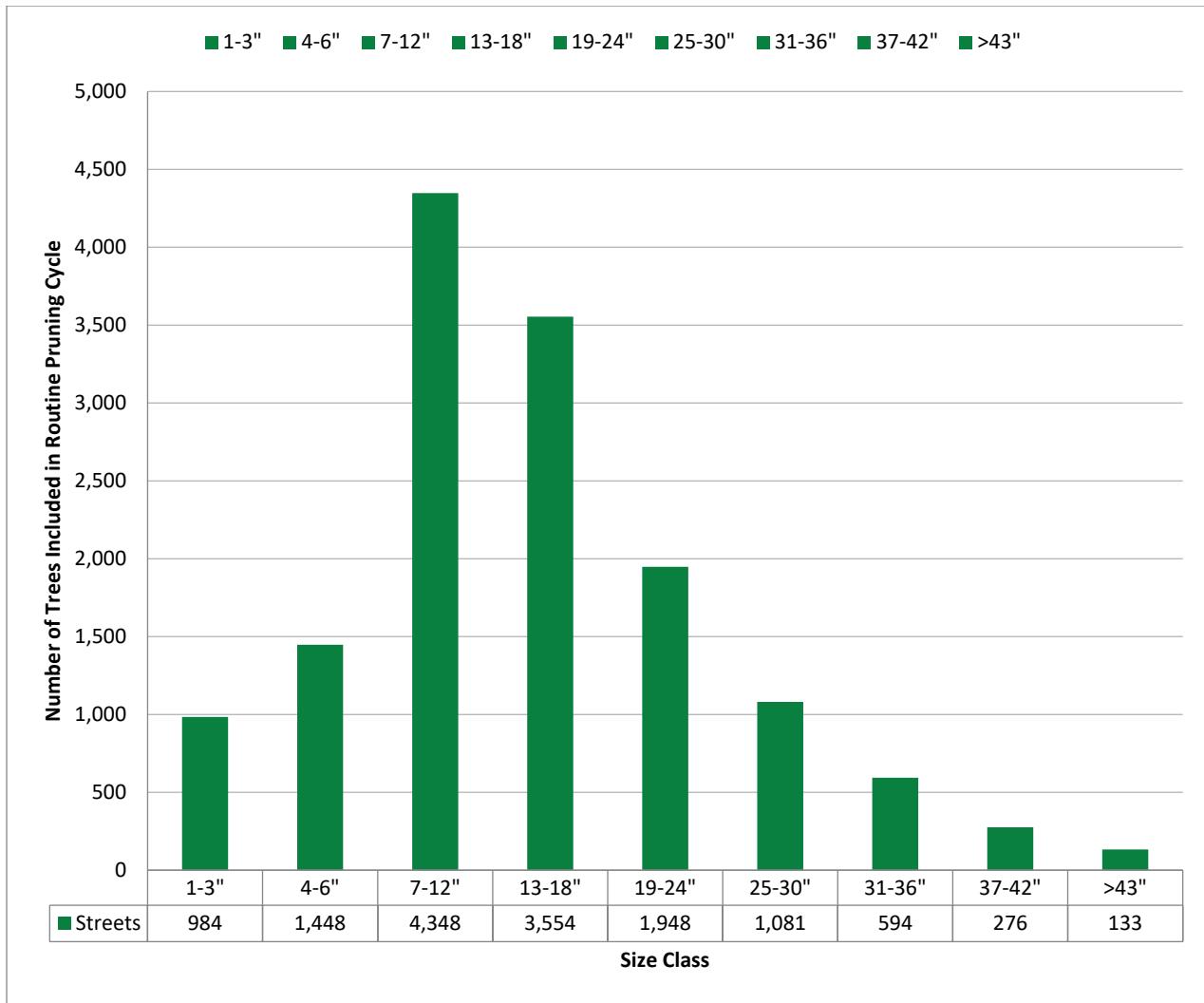
Figure 10. Routine pruning cycle by size class.

ELEMENTS, OBJECTIVES, AND ACTION ITEMS

The Municipality of Princeton aims to set goals that will inform how to move forward with the stewardship of the community's urban forest, not only within the activities performed by the municipality's governmental bodies but also involving the private sector and the community public in the activities that will lead to a healthier and more sustainable urban forest.

This is the third five-year Community Forestry Management Plan since Princeton formed on January 1, 2013, through the consolidation of Princeton Borough and Princeton Township. The Shade Tree Commission has an important role in the implementation of the plan.

Note: Footnotes are provided below for some objectives and action items to illustrate how they correlate with provisions in Princeton's Master Plan.

Element I: Training and Education

- **Objective 1:** Maintain full compliance with NJDEP CORE Training and Continuing Education Unit (CEU) requirements for municipal staff and Shade Tree Commission members.
    - **Action Item #1:** Track and document completion of CORE and CEU training annually.
    - **Action Item #2:** Collaborate with urban forestry networks to host CEU-approved workshops in Princeton, prioritizing topics such as native species selection, invasive species prevention, and tree maintenance.

Element II: Community Forest Ordinance

- **Objective 1:** Annually assess Princeton's Shade Tree Ordinance and, as relevant, other municipal ordinances and update as needed to strengthen canopy conservation, reflect best practices, and ensure enforceability.[1]
    - **Action Item #1:** Prohibit the planting of species on the NJ Invasive Species Strike Team's Do Not Plant List for municipal projects and in projects subject to land use board approval.[2]
    - **Action Item #2:** Draft amendments to close gaps, enhance enforcement mechanisms, and align with Master Plan natural resource goals.
- **Objective 2:** Prohibit the planting of species on the NJ Invasive Species Strike Team's Do Not Plant List for municipal projects and projects subject to land use board approval.
    - **Action Item #1:** Draft amendments to close gaps, enhance enforcement mechanisms, and align with Master Plan natural resource goals.

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[1] In Element II, Objective 1 reflects provisions in the Master Plan's CONSERVATION, OPEN SPACE, AND RECREATION element which, on p. 170, recommends: "Assess and amend the zoning code and tree removal and replacement plan to ensure that the Municipality's tree canopy continues to grow"; and, on p. 171, recommends: "Amend the zoning code provisions for cluster development to streamline and incentivize the preservation of open space through cluster development."

[2] Objective 2 reflects provisions in the Master Plan's CONSERVATION, OPEN SPACE, AND RECREATION element which explain, on p. 149, that "Princeton has partnered with the New Jersey Invasive Species Strike Team and other organizations to control nuisance and non-native invasive species and to minimize their environmental damage"; and on p. 170, recommends: "Amend the zoning code under the Municipality's design standards to codify the Do Not Plant List…."

[3] Objective 2 reflects provisions in the Master Plan's LAND USE element such as, on p. 61, item 3, which states: "Require contextual use of native drought-tolerant and flood-tolerant plants. Require appropriate plantings as part of the Municipality's land use and development standards…." It also reflects provisions in the Master Plan's CONSERVATION, OPEN SPACE. AND RECREATION element such as, on p. 169, Item 3, which states: "Maximize contextual planting of native and adapted species that are tolerant to drought, flood, pests, and disease, through zoning requirements and public improvements" and, on p. 170, item 15, which states: "Amend zoning and design standards to incentivize or require more densely vegetated alternatives to lawn cover," and, further on p. 170, in item 22, which states: "…require approval of variances for new development and proposed non-native plantings, in order to reinforce native biodiversity."

- **Objective 3:** Require the use of native and adapted non-invasive species tolerant to drought, flood, pests, and disease.[3]
- **Objective 4:** Establish tree planting standards that reflect ANSI A300 and ISA best practices. (including requirements for sufficient soil volume, drainage, mulching, management of conflict with utility infrastructure, and site selection for private developments subject to municipal approvals.[4]
  - **Action Item #1:** Require the conservation and planting of trees to stabilize steep slopes (slopes where natural grade is more than 25 percent in residential development and 15 percent in nonresidential development) to help prevent soil instability and erosion.[5]
- **Objective 5**: Strengthen stream buffer protections to enhance water quality and flood resilience.[6]
  - **Action Item #1:** Adopt a Stream Corridor Conservation Zone overlay with more restrictive allowable uses and activities within stream corridors.
- **Objective 6:** Support the development and adoption of a Complete Streets and Green Streets policy that guides the management of street trees.[7]

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[4] Objective 4 reflects provisions in the Master Plan's CONSERVATION, OPEN SPACE, AND RECREATION element which, on pp. 170-171, item 25, states: "Develop and adopt tree planting standards that implement best practices for urban forestry, including sufficient soil volume, drainage, conflict management with utilities, site selection, and optimal public uses of trees."

[5] Objective 4, Action Item #1, is relevant to Goal 54 set forth on p. 23 in the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section. This goal states: "Limit disturbance of environmentally sensitive lands such as steep slopes, floodplains, wetlands, critical habitat, and unique environmental features." The Master Plan's CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 152, further explains: "Conservation of steep slopes is key to preventing soil instability, erosion and sedimentation, and loss of significant natural topography." Additionally, on p. 170 of the CONSERVATION, OPEN SPACE, AND RECREATION element, item 18 advises: "Amend the zoning for new development to require stabilization and reinforcement of steep slopes with vegetation and implement during public improvements."

[6] Objective 5 reflects provisions in the Master Plan's LAND USE element, which, on p. 53, states: "Drought and precipitation pose threats to all development in Princeton.… These conditions will drive the need to increase resiliency of building systems, transportation infrastructure, and the stewardship of natural areas and open space for increasing extremes of wet and dry weather conditions. Further, in the Master Plan's UTILITY element, on p. 104, the Master Plan explains: "In March 2020, NJDEP revised the Stormwater Management Rules for the first time since 2004. Among several stricter standards, the revised rules replace the requirement that major developments incorporate nonstructural stormwater management strategies to the 'maximum extent practicable' with a requirement to use green infrastructure to meet stormwater standards."

[7] Objective 6 is relevant to Goal 21 set forth on p. 19 in the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section. This goal states: "Integrate Complete Streets and Green Streets policies into the design of mobility improvements." The Master Plan's MOBILITY element, on p. 75, explains that "Green Streets provide green stormwater infrastructure within public rights-of-way. Features of Green Streets include street trees, bioswales, permeable pavement, vegetated curb bump-outs, and other improvements…."; and, on p. 88, the MOBILITY element, sets forth the following as goals:

- "Adopt a Complete and Green Streets Checklist to guide capital improvement planning and street design."

- "Coordinate all street repair and design projects with the Municipality's Stormwater Management Plan, Community Forestry Management Plan, Climate Action and other elements of the Master Plan, and incorporate their recommendations for street trees, stormwater management, and climate resiliency wherever feasible."

And, on p. 168, the CONSERVATION, OPEN SPACE, AND RECREATION element highlights the value of the Green Streets policy with respect to stormwater management: "Connecting open space, recreation, and trails is a key principle of the Mobility Plan Element, in addition to the inclusion of green stormwater infrastructure through the implementation of Green Streets policies."

Element III: Tree Resource Management

- **Objective 1:** Maintain and update Princeton's TreeKeeper® inventory.[8]
  - **Action Item #1**: Use the database for planting prioritization, hazard tree identification, and performance tracking.
- **Objective 2:** Maintain and expand canopy through strategic planting.[9]
  - **Action Item #1:** Establish canopy-based goals—such as a defined percentage target for tree cover and determine Princeton's long-term canopy percentage goal.
  - **Action Item # 2**: Create a multi-year planting plan informed by inventory data, UTC report, municipal priorities, and equity considerations, while accounting for limiting factors such as planting strip width. This plan will guide planting efforts to maximize diversity, ecological benefits, and canopy growth over time.[10]
  - **Action Item #3:** Commit to planting at least 1,500 trees on municipal lands over the five-year plan period, replacing removed street trees within two years, and ensuring planting programs are strategically aligned with canopy and climate goals.
  - **Action Item #4:** Maintain a list of existing visual arboreal resources such as tree-lined streets and woodlands for preservation and enhancement. [11]
  - **Action Item #5:** Prioritize tree planting and management strategies that maximize canopy benefits to mitigate urban heat, improve resilience, and deliver ecological services. Recognize the differences in benefits among tree species, ages, and locations, and incorporate this knowledge into public policy decisions and municipal operations.[12]

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[8] In Element III, Objective 1 reflects provisions in the Master Plan's CONSERVATION, OPEN SPACE, AND RECREATION element which, on p. 169, explains that: "The Shade Tree Commission and municipal staff maintain an extensive online map of Princeton's street trees via TreeKeeper® inventory management software, providing data on more than 19,000 trees, stumps, and vacant tree pits on municipal streets and parks"; and recommends, on p. 170, in item 23: "Continue to update and use the TreeKeeper® municipal tree inventory map."

[9] Objective 2 addresses maintenance of the municipality's tree canopy, which was raised as a priority by respondents to the first Community Visioning survey. The Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section reports, on p. 9, that respondents ranked as the most important the need to address "preserving the Municipality's existing forest, woodland, and wildlife habitat and protecting its environmental quality and natural resources…" This priority is reflected throughout the plan, including in the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 169, which states: "Forests and urban tree canopy provide a wide array of benefits to Princeton's ecosystems and communities. To reinforce these benefits, the Municipality continues to prioritize the preservation, maintenance, and expansion of its forested areas and urban tree canopy."

[10] Objective 2, Action Item 2, reflects the goal set forth in the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 170, which states: "Expand urban tree canopy with a focus on equity and environmental justice."

[11] Objective 2, Action Item #4, reflects Goal 59 which is set forth, on p. 23, in the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section. This goal states: "Preserve and enhance existing visual resources such as scenic corridors, tree-lined streets, historic landscapes, open agricultural land, and woodlands."

[12] Objective 2, Action Item #5, recognizes and encapsulates the many ecosystem services that Master Plan calls on the municipal canopy to provide. The LAND USE element, on p. 53, states: "Increasing temperatures pose a threat …. Ecosystems will need to adjust and may require additional stewardship…. As Princeton continues to develop…, it will mitigate the heat island effect of its urban areas by "de-paving" areas with excessive impervious coverage, expanding shade tree canopy coverage, and facilitating the development of green roofs to minimize solar heat gain." Also, the LAND USE element, on p. 53, states: "Drought and precipitation pose threats to all development in Princeton. … More extreme drought and rainfall affect the viability of natural plant and animal communities, which may begin to adapt in a manner that changes the nature of these systems for the worse. … These conditions will drive the need to increase … the stewardship of natural areas and open space for increasing extremes of wet and dry weather conditions." Therefore, on pp. 61-62, the Master Plan includes the following in its climate resiliency recommendations:
- Mitigate urban heat island effect by maximizing vegetated cover and shade tree plantings in public spaces and along public streets. Reduce retention of solar heat through vegetation, heat-reflective building materials, and natural shade cover.
- Protect and restore wetlands, floodplains, mature tree canopy, and vegetated cover to maximize natural stormwater management and temperature control.
- Maximize urban tree canopy to minimize solar heat gain and provide passive temperature control.
- Include in the Community Forestry Plan detailed strategies to address the effects of climate change on Princeton's forests per this Element and the Conservation, Open Space, and Recreation Plan Element.
- Provide appropriate urban forestry management strategies in the Community Forestry Management Plan to mitigate loss of mature forest canopy. Significant loss of mature forest shade trees resulting from pests and disease may contribute to increased risk of wildfire.

- ○ **Action Item #6**: Remove non-native plantings in natural areas and replace them with native vegetation. Focus on protecting and restoring natural ecosystems, including planting trees in floodplains and adjacent uplands to improve water quality and ecological resilience.[13]
- ○ **Action Item #7:** Develop and promote tree planting standards that reflect best practices for urban forestry.[14]
- ● **Objective 3:** Invest in long-term tree maintenance.[15]
  - ○ **Action Item #1:** Strengthen the municipality's ability to manage and maintain trees by supplementing staff with contracted tree care services and by pursuing funding opportunities available through nonprofit organizations and public sources.[16]
  - ○ **Action Item #2**: Develop a protocol for the routine maintenance and care of municipal trees that is in accord with applicable standards established by the American National Standards Institute (ANSI) (e.g., A300) and the ISA. The protocol will consider factors such as the availability of municipal resources, overhead wires and underground utilities, pedestrian and traffic safety, and efficiencies that can be realized by carrying out tree maintenance on trees in a block or area, rather than tending to single trees most in need.
- ● **Objective 4**: Acquire for preservation as natural woodlands lands identified in the Master Plan as key resources for flora and fauna.[17]
- ● **Objective 5:** Add public green spaces within and near the central areas where density of population and development is the highest, such as creating new small parks and playgrounds, incorporating treed open space in new affordable housing projects, and adding shaded pedestrian and bikeway corridors.[18]

Further, in the MOBILITY element on p. 88 the Master Plan recommends:

- Identify and address flood-prone rights-of-way pursuant to the climate change vulnerability assessment of the Land Use Plan Element and incorporate green stormwater infrastructure strategies as part of mitigation efforts where feasible.
- And in the CONSERVATION, OPEN SPACE, AND RECREATION element on p. 170, the Master Plan recommends:
  - o Maximize the use of green stormwater infrastructure, especially in developed areas of the Municipality. Develop incentives to retrofit existing development with green stormwater infrastructure, "de-pave" areas with excessive impervious coverage, and install green stormwater infrastructure on public property where possible.
  - o Amend zoning and design standards to incentivize or require more densely vegetated to lawn cover. Denser vegetation can absorb greater quantities of stormwater while providing habitat, noise management, buffering, and other additional benefits.

[13] Objective 2, Action Item #6, reflects the recommendation in the LAND USE element, on p. 61: "Require contextual use of native drought-tolerant and flood-tolerant plants. Require appropriate plantings as part of the Municipality's land use and development standards to minimize resource consumption and maximize adaptation of vegetation …."; as well as the recommendations in the CONSERVATION, OPEN SPACE, AND RECREATION element which, on p. 169, state: "Maximize contextual planting of native and adapted species that are tolerant to drought, flood, pests, and disease, through zoning requirements and public improvements"; and, on p. 170, which state: " Continue to partner with the New Jersey Invasives Strike Team and other organizations to control nuisance and non-native invasive species and to minimize their environmental damage."

[14] Objective 2, Action Item 7, reflects the goal set forth in the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 170, which states: "Develop and adopt tree planting standards that implement best practices for urban forestry, including sufficient soil volume, drainage, conflict management with utilities, site selection, and optimal public uses of trees."

[15] Objective 3 reflects goals set forth in the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section, on p. 23, which include:

- Foster stewardship and management of already preserved lands and natural resources.
- Promote stewardship of Princeton's parks.
- Reduce the threats to natural landscapes from pests, disease, and non-native invasive species.

It also reflects recommendations in the LAND USE element, on p. 62:

- Provide appropriate urban forestry management strategies in the Community Forestry Management Plan to mitigate loss of mature forest canopy. Significant loss of mature forest shade trees resulting from pests and disease may contribute to increased risk of wildfre. Objective 3 also reflects the recommendation in the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 173, which states: " Prioritize maintenance and stewardship of existing resources. Public outreach has identified a desire to focus municipal resources on maintaining and enhancing existing open space."[16] Objective 3, Action Item #1, echoes several recommendations in the Master Plan. In the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 170, is the recommendation: "52. Continue to allocate municipal funds and pursue external grant funding opportunities for maintenance and stewardship. Funding from outside sources and matching grants can help supplement municipal funds to maximize maintenance and stewardship efforts." On p. 171 is the recommendation: "Partner with nonprofits to expand and maintain passive open spaces in ways that are cost-effective and resource-efficient. And Princeton has an abundance of nonprofit organizations that continue to establish and maintain conservation areas and trails within and around Princeton." On p. 172 is the recommendation: "Pursue funding opportunities from nonprofit organizations and public sources as cost-effective strategies for maintenance, stewardship, and improvement of parks and open spaces." And on p. 173 is the recommendation: "Continue to partner with nongovernmental organizations and nonprofits. Partnerships can help extend municipal maintenance capacity through additional resources, volunteer efforts, and cost control."
- Improve access and equity of recreation and open space resources. Review geographic distribution of assets, ease of travel to locations, programming, and facility design, and adjust to provide equitable access and opportunities for participation among all residents.

Element IV: Community and Capacity

- **Objectives 1:** Promote awareness of the benefits of both public and private trees by providing information to residents, commercial property owners, landscapers, and gardeners on their care, planting, and maintenance, including proper mulch application, tree selection, and the Do Not Plant List maintained by the New Jersey Invasive Species Strike Team.
    - **Action Item #1:** Develop monthly and seasonal outreach topics such as Tree of the Month and "Tree Tips" campaigns for spring planting, summer watering, fall pruning, and winter protection, distributed via the municipal website, Mayor's newsletter, and social media.
    - **Action Item #2:** Create and maintain an online "Princeton Tree Resource Hub" with downloadable guides, species selection lists, invasive species alerts, and videos demonstrating best practices.
    - **Action Item #3:** Annually plan and execute an Arbor Day event for at least one third grade class at each local elementary school. This typically involves the schoolchildren planting a tree and watching a demonstration by the Municipal Arborist and Department of Infrastructure and Operations (DIO) personnel of tree pruning, climbing, and chipping equipment.
    - **Action Item #4:** Continue participation in Princeton's annual community events, such as Porchfest and Community Night Out. Distribute trees, shrubs, and tree-related literature and answer questions about trees.
    - **Action Item #5:** Establish a calendar of topics to increase public awareness of tree-related issues, including pest alerts and STC activities.

- **Objective 2:** Maintain Princeton's Tree City USA designation and pursue Growth Awards.
    - **Action Item #1:** Complete and submit annual Tree City USA application materials, including updated canopy data and community engagement metrics.
    - **Action Item #2:** Document and track activities that qualify for Growth Awards, such as innovative projects, partnerships, and expanded education programs.
- **Objective 3:** Partner with Sustainable Princeton, the Princeton Environmental Commission, and other environmental groups to increase tree awareness.
    - **Action Item #1:** Host joint events, such as "Trees & Climate" workshops or tree-planting volunteer days, to highlight co-benefits of canopy growth and climate resilience.
    - **Action Item #2:** Develop joint grant proposals for tree planting, invasive species removal, and urban heat island mitigation projects.[19]

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[16] Objective 3, Action Item #1, echoes several recommendations in the Master Plan. In the CONSERVATION, OPEN SPACE AND RECREATION element, on p. 17*0*, is the recommendation: "52. Continue to allocate municipal funds and pursue external grant funding opportunities for maintenance and stewardship. Funding from outside sources and matching grants can help supplement municipal funds to maximize maintenance and stewardship efforts." On p. 171 is the recommendation: "Partner with nonprofits to expand and maintain passive open spaces in ways that are cost-effective and resource-efficient. And Princeton has an abundance of nonprofit organizations that continue to establish and maintain conservation areas and trails within and around Princeton." On p. 172 is the recommendation: "Pursue funding opportunities from nonprofit organizations and public sources as cost-effective strategies for maintenance, stewardship, and improvement of parks and open spaces." And on p. 173 is the recommendation: "Continue to partner with nongovernmental organizations and nonprofits. Partnerships can help extend municipal maintenance capacity through additional resources, volunteer efforts, and cost control."

[17] Objective 4 reflects the recommendation In the CONSERVATION, OPEN SPACE AND RECREATION element on p. 169, which states: "Preserve significant contiguous woodland resources through amendments to zoning requirements and strategic acquisitions and conservation easements."

Element V: Disaster Planning

- **Objective 1:** Prepare and maintain a FEMA-compliant Debris Management Plan for inclusion in the municipal emergency operations plan.
  - **Action Item #1:** Identify and map high-priority areas for debris clearance, including critical transportation routes, utility corridors, schools, hospitals, and other essential facilities. Maintain GIS-based mapping that can be quickly updated following major storm events.
  - **Action Item #2:** Create and regularly update a contact list of all entities involved in storm response, including municipal staff, contractors, utility providers, and state and county emergency management contacts, ensuring that communication lines are clear and efficient.
  - **Action Item #3:** Train municipal crews and contractors on FEMA documentation requirements for tree and debris removal reimbursement.
  - **Action Item #4:** Establish pre-arranged agreements or contracts with local contractors to provide rapid post-storm debris clearance and tree removal services, supplementing municipal capacity during large-scale events. Agreements should specify equipment availability, response times, and compliance with FEMA requirements.
  - **Action Item #5:** Develop public communication protocols to inform residents of debris clearance procedures, designated drop-off or collection points, and timelines for recovery, ensuring community awareness and cooperation.
  - **Action Item #6 :** Integrate disaster preparation with ongoing urban forestry management by identifying vulnerable tree populations, prioritizing preventive maintenance (such as pruning or removals of High Risk trees), and expanding canopy resilience to reduce future storm impacts.
- **Objective 2:** Support the preparation of a community wildfire protection and evacuation plan.[20]
  - **Action Item #1:** Identify and map High Risk areas (e.g., forested edges near development) and integrate with emergency response GIS layers.

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[18] Objective 5 reflects the preferences and priorities for open space investment expressed by November 22 Open House participants, as reported both on p.9 of the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section and on p. 165 the CONSERVATION, OPEN SPACE, AND RECREATION element. On page 165, it reports that "priorities included small passive spaces such as tot lots and dog parks, particularly as part of the redevelopment at the Princeton Shopping Center and in existing green spaces such as Quarry Park and Harrison Street Park. Attendees were also clear that any redevelopment of the Westminster Choir College site, the Butler tract, and the Princeton Theological Seminary site should preserve and incorporate passive open space." This public input was acknowledged, on p. 166, as an identified recreation need: "Public outreach identified a community vision for greater access to new or existing green spaces and recreation facilities in the former Borough, where density of population and development is highest. In particular, additional facilities for young children and families were a priority in the Visioning Survey." These public comment preferences and priorities are reflected in the goals set forth on p. 23 in the Master Plan's INTRODUCTION AND STATEMENT OF OBJECTIVES, PRINCIPLES, ASSUMPTIONS, POLICIES, AND STANDARDS section, which include:

- Retrofit urban areas to accommodate more green infrastructure, enhanced vegetation, and resiliency to the effects of climate change.
- Meet active and passive recreation needs through easements, strategic and selective acquisitions, partnerships with appropriate entities, and optimization of existing assets.
- Enhance accessibility of open space and recreation facilities by prioritizing safe, convenient, and universal access regardless of age, ethnicity, size, income, ability, or disability.
- Integrate open space and recreation facilities into private development.

Also the Master Plan's COMMUNITY FACILITIES element, on p. 134, recognizes the public health benefits of such small green spaces: "Princeton's parks, recreational facilities, trails, and open provide a framework for outdoor activities, exercise, sports, and general well-being. These elements of the community bear a direct relationship to public health." And the Master Plan's HISTORIC PRESERVATION element, on p. 206, recognizes that conservation of green space to benefit historic preservation: "Open-space preservation has the potential to dovetail with historic preservation where publicly accessible historic sites may benefit from open-space resources. Sensitive adaptation or use of historic sites for passive activities may weave together preservation and recreation." Accordingly, in the CONSERVATION, OPEN SPACE, AND RECREATION element, on p. 172, the plan offers the following three recommendations:

- Incorporate open space to the extent feasible in all new development and redevelopment projects by amending zoning requirements to ensure that large development projects incorporate open space. Include a requirement for open space in redevelopment plans.
- Identify locations for additional playground equipment and tot lots, particularly where access to facilities is limited, and in walkable locations where possible.
- Improve access and equity of recreation and open space resources. Review geographic distribution of assets, ease of travel to locations, programming, and facility design, and adjust to provide equitable access and opportunities for participation among all residents.

MAINTENANCE SCHEDULE AND BUDGET

Utilizing the 2025 tree inventory data, an annual maintenance schedule was developed to outline recommended tasks for completion over the next five years. DRG created budget projections based on industry expertise. A detailed table of estimated costs for The Municipality of Princeton's five-year tree management program is provided below.

This schedule serves as a guideline for implementing the recommended maintenance tasks and transitioning from reactive to proactive tree care. Given budgetary constraints, the municipality should prioritize high- and moderate-priority tree removals and pruning during Years 1 and 2. Proactive tasks, such as tree training, and planting, should be deferred until the municipality secures the necessary funds to undertake these activities. If additional funds are available after completing priority tasks in Years 1 and 2, proactive maintenance can begin earlier.

The recommended budget for the first three years, focusing on high- and moderate-priority items, is as follows:

Year 1: $1,903,885

Year 2: $1,822,075

Year 3: $1,926,035

Year 4: $1,887,855

Year 5: $1,667,505

The following budget table includes the total costs for all priority and proactive maintenance tasks, providing the municipality with a comprehensive assessment of the investment required to implement various aspects of an urban forestry program. The yearly totals represent funding goals the municipality should strive to meet through grants and annual forestry budgets. By following this flexible schedule, the municipality can address urgent needs while working towards a sustainable, proactive tree care program over the next five years. The budget table below reflects estimated costs for priority actions identified in the 2021 tree inventory. It does not represent the full scope of urban forest activities, including initiatives such as tree planting and microforest establishment.

Table 2. Estimated budget for recommended five-year tree resource management program

Activity	Diameter	Cost/Tree	Year 1 Count	Year 1 Cost	Year 2 Count	Year 2 Cost	Year 3 Count	Year 3 Cost	Year 4 Count	Year 4 Cost	Year 5 Count	Year 5 Cost	Five-Year Cost
High Priority Removals	1-3"	$250		$0		$0		$0		$0		$0	$0
	4-6"	$400		$0		$0		$0		$0		$0	$0
	7-12"	$500		$0		$0		$0		$0		$0	$0
	13-18"	$950	1	$950		$0		$0		$0		$0	$950
	19-24"	$1,500	1	$1,500		$0		$0		$0		$0	$1,500
	25-30"	$2,500	1	$2,500		$0		$0		$0		$0	$2,500
	31-36"	$2,750		$0		$0		$0		$0		$0	$0
	37-42"	$3,500		$0		$0		$0		$0		$0	$0
	>43"	$2,750		$0		$0		$0		$0		$0	$0
Activity Total(s)			**3**	**$4,950**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$4,950**
Moderate Priority Removals	1-3"	$250		$0		$0		$0		$0		$0	$0
	4-6"	$400		$0	1	$400		$0		$0		$0	$400
	7-12"	$500		$0	18	$9,000		$0		$0		$0	$9,000
	13-18"	$950		$0	50	$47,500		$0		$0		$0	$47,500
	19-24"	$1,500	30	$45,000		$0		$0		$0		$0	$45,000
	25-30"	$2,500	28	$70,000		$0		$0		$0		$0	$70,000
	31-36"	$2,750	8	$22,000		$0		$0		$0		$0	$22,000
	37-42"	$3,500	3	$10,500		$0		$0		$0		$0	$10,500
	>43"	$2,750	1	$2,750		$0		$0		$0		$0	$2,750
Activity Total(s)			**70**	**$150,250**	**69**	**$56,900**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$207,150**
Low Priority Removals	1-3"	$250		$0		$0		$0		$0	56	$14,000	$14,000
	4-6"	$400		$0		$0		$0	45	$18,000	45	$18,000	$36,000
	7-12"	$500		$0		$0		$0	178	$89,000		$0	$89,000
	13-18"	$950		$0		$0		$0	153	$145,350		$0	$145,350
	19-24"	$1,500		$0		$0	85	$127,500		$0		$0	$127,500
	25-30"	$2,500		$0		$0	41	$102,500		$0		$0	$102,500
	31-36"	$2,750		$0		$0	22	$60,500		$0		$0	$60,500
	37-42"	$3,500		$0	5	$17,500		$0		$0		$0	$17,500
	>43"	$2,750		$0	3	$8,250		$0		$0		$0	$8,250
Activity Total(s)			**0**	**$0**	**8**	**$25,750**	**148**	**$290,500**	**376**	**$252,350**	**101**	**$32,000**	**$600,600**
Moderate Priority Pruning	1-3"	$75		$0		$0		$0		$0		$0	$0
	4-6"	$150		$0		$0		$0		$0		$0	$0
	7-12"	$350		$0		$0		$0		$0		$0	$0
	13-18"	$650		$0	30	$19,500		$0		$0		$0	$19,500
	19-24"	$850		$0	44	$37,400		$0		$0		$0	$37,400
	25-30"	$1,000		$0	47	$47,000		$0		$0		$0	$47,000
	31-36"	$1,200	46	$55,200		$0		$0		$0		$0	$55,200
	37-42"	$1,500	17	$25,500		$0		$0		$0		$0	$25,500
	>43"	$1,800	17	$30,600		$0		$0		$0		$0	$30,600
Activity Total(s)			**80**	**$111,300**	**121**	**$103,900**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$215,200**

| Activity Cost | | | Year 1 | | Year 2 | | Year 3 | | Year 4 | | Year 5 | | Five-Year |
Activity	Diameter	Cost/Tree	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Cost
Young Tree Training (3-year Cycle)	1-3"	$20	392	$7,840	393	$7,860	392	$7,840	392	$7,840	392	$7,840	$39,220
	4-6"	$30		$11,790		$11,790		$11,820		$11,790		$11,790	$58,980
	6"<	$40		$1,880		$0		$0		$0		$0	$1,880
Activity Total(s)			**392**	**$21,510**	**393**	**$19,650**	**392**	**$19,660**	**392**	**$19,630**	**392**	**$19,630**	**$100,080**
Routine Pruning (5-year Cycle)	1-3"	$75	196	$14,685	196	$14,685	196	$14,685	196	$14,685	196	$14,685	$73,425
	4-6"	$150	285	$42,780	285	$42,780	285	$42,780	285	$42,780	285	$42,780	$213,900
	7-12"	$350	858	$300,370	858	$300,370	858	$300,370	858	$300,370	858	$300,370	$1,501,850
	13-18"	$650	701	$455,390	701	$455,390	701	$455,390	701	$455,390	701	$455,390	$2,276,950
	19-24"	$850	381	$324,190	381	$324,190	381	$324,190	381	$324,190	381	$324,190	$1,620,950
	25-30"	$1,000	210	$209,600	210	$209,600	210	$209,600	210	$209,600	210	$209,600	$1,048,000
	31-36"	$1,200	116	$139,680	116	$139,680	116	$139,680	116	$139,680	116	$139,680	$698,400
	37-42"	$1,500	54	$81,300	54	$81,300	54	$81,300	54	$81,300	54	$81,300	$406,500
	>43"	$1,800	27	$47,880	27	$47,880	27	$47,880	27	$47,880	27	$47,880	$239,400
Activity Total(s)			**2,828**	**$1,615,875**	**2,828**	**$1,615,875**	**2,828**	**$1,615,875**	**2,828**	**$1,615,875**	**2,828**	**$1,615,875**	**$8,079,375**
Activity Grand Total			**3,373**		**3,419**		**3,368**		**3,596**		**3,321**		**17,077**
Cost Grand Total				**$1,903,885**		**$1,822,075**		**$1,926,035**		**$1,887,855**		**$1,667,505**	**$9,207,355**
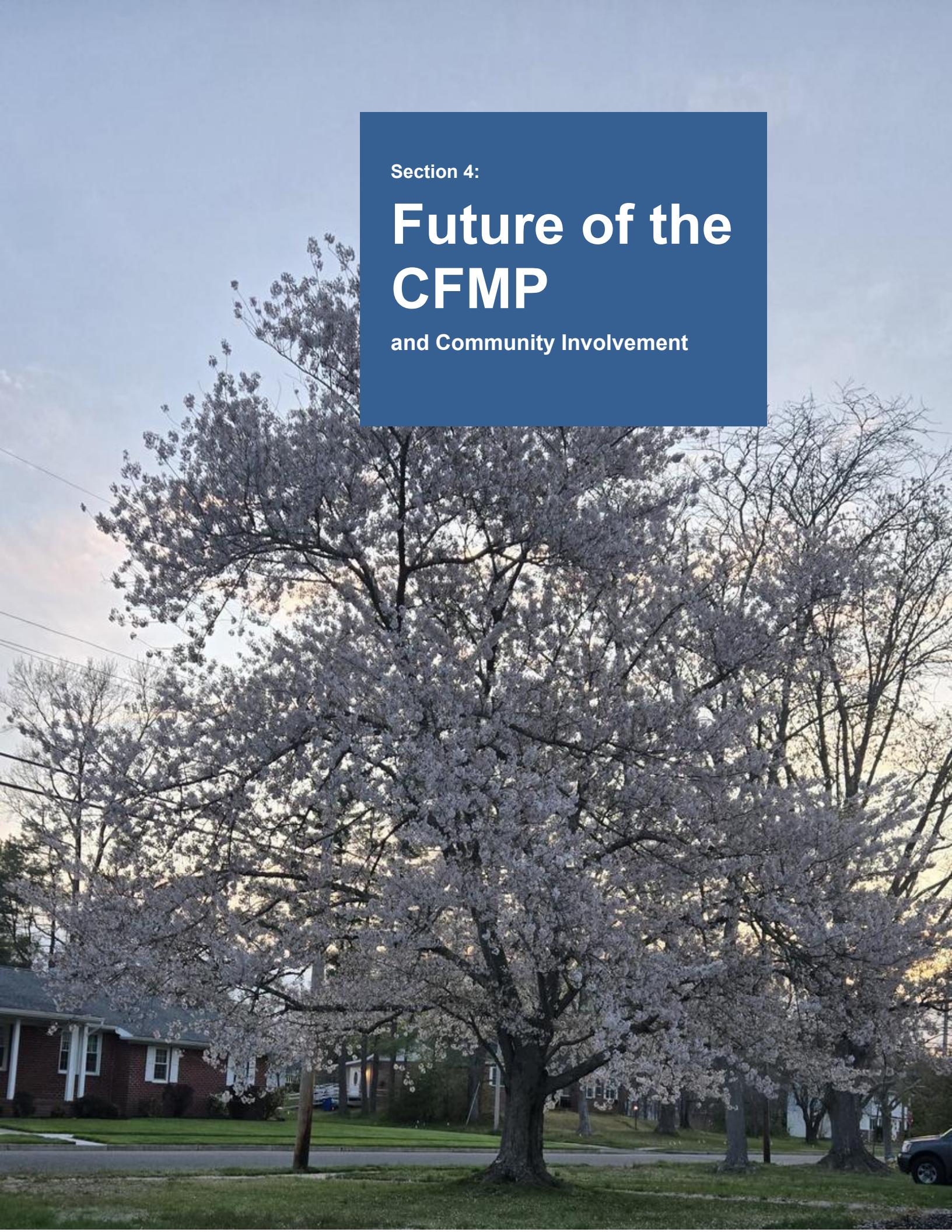
Section 4:

Future of the CFMP

and Community Involvement

EVALUATING AND UPDATING THIS PLAN
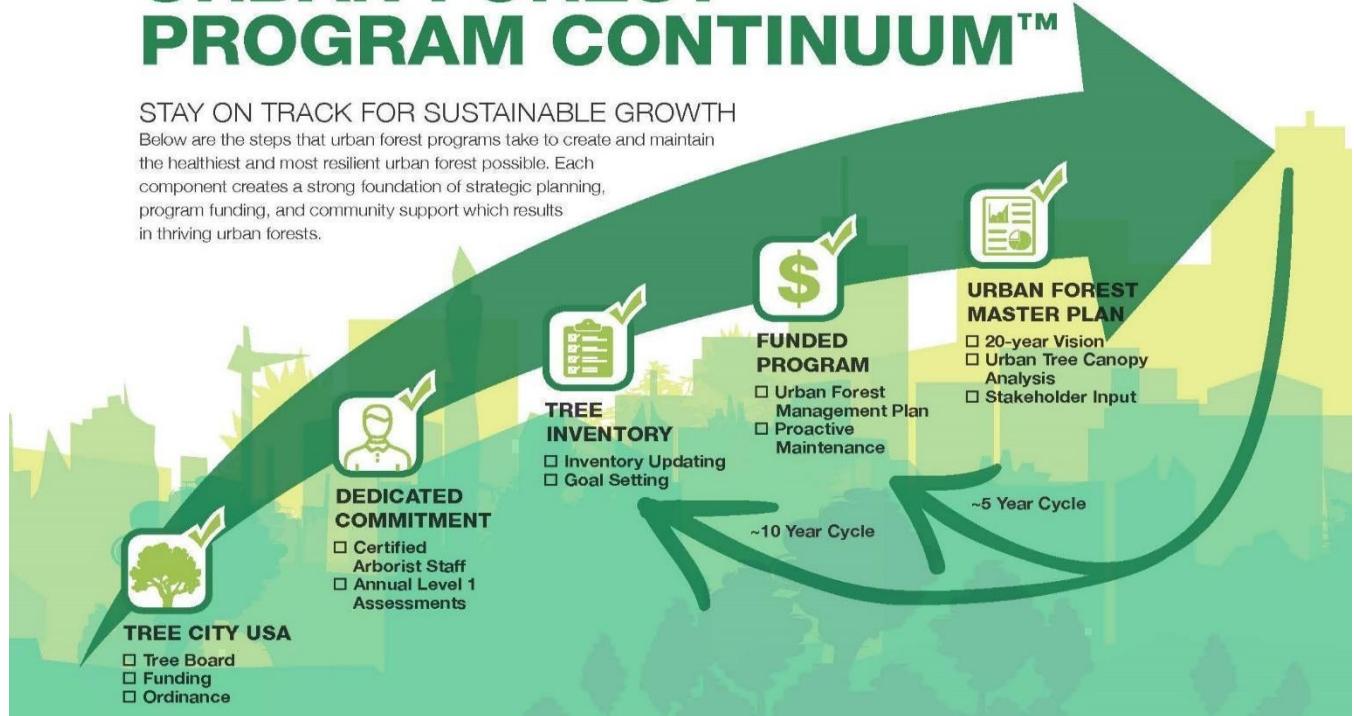
This Standard Inventory Analysis and Management Plan provides management priorities for the next five years, and it is important to update the tree inventory using TreeKeeper® as work is completed, so the software can provide updated species distribution and benefit estimates. This empowers The Municipality of Princeton to self-assess progress over time and set goals to strive toward by following the adaptive management cycle. Below are ways of implementing the steps of this cycle.

What do we have?
Assess

What do we want?
Engage

How do we get there?
Advise

How are we doing?
Implement, Gauge & Update

- Prepare planting plans well enough in advance to schedule and complete stump removal in the designated area, and to select species best suited to the available sites.

- Annually comparing the number of trees planted to the number of trees removed and the number of vacant planting sites remaining, then adjusting future planting plans accordingly.

- Annually comparing the species distribution of the inventoried tree resource with the previous year after completing planting plans to monitor recommended changes in abundance.

- Schedule and assign high-priority tree work so it can be completed as soon as possible instead of reactively addressing new lower priority work requests as they are received.

Include data collection such as measuring DBH and assessing condition into standard procedure for tree work and routine inspections, so changes over time can be monitored.
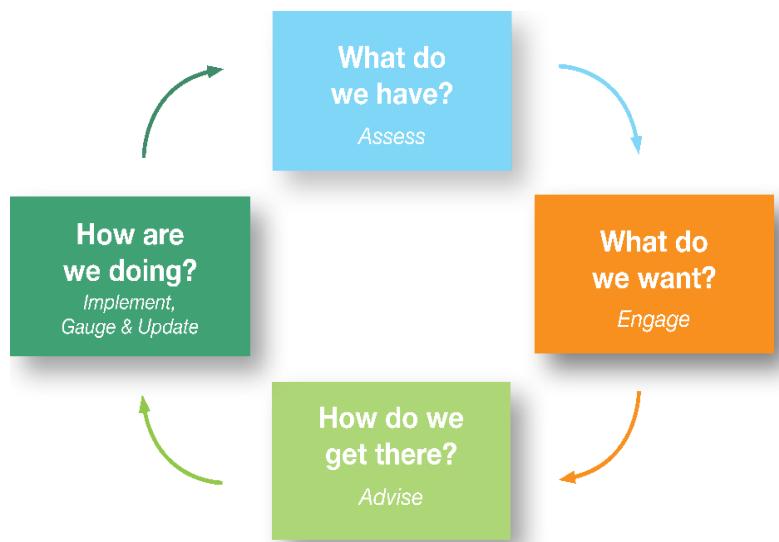
PLAN CONNECTIONS AND OTHER CONSIDERATIONS

Coordination with the Master Plan

On November 30, 2023, Princeton adopted a new Master Plan. This plan is a comprehensive, future-oriented document that addresses the various elements of municipal governance, including land use, mobility, utilities, municipal stormwater management, community facilities, conservation, open space and recreation, economic development, and historic preservation.

This Community Forestry Management Plan (CFMP) is, to a significant extent, an extension of that Master Plan with respect to advancing the stewardship of Princeton's tree canopy. While attention to the preservation, maintenance, and enhancement of Princeton's community forest is mentioned most frequently in the CONSERVATION, OPEN SPACE, AND RECREATION element of Princeton's Master Plan, the CFMP's objectives relate variously to almost all Master Plan elements. The Master Plan itself acknowledges, on page 62, the interrelationship between the Master Plan and the CFMP by stating that the CFMP is to be used "to inform all elements of the Master Plan."

The objectives set forth above in the "Elements, Objectives, and Action Items" section of this CFMP are the shade tree milestones that Princeton will be making progress toward or achieving over the five years of the plan period. Footnotes are provided for many of these objectives to illustrate how the objective is rooted in or is an extension of provisions in various Master Plan elements.

Public Education/Awareness/Outreach

COMMUNITY STEWARDSHIP INCENTIVE PROGRAM (CSIP) MUNICIPAL SERVICES

The Municipality of Princeton maintains an active and collaborative relationship with the New Jersey Urban and Community Forestry (NJ UCF) Program and will continue to pursue grant funding to advance local tree planting, maintenance, and stewardship objectives. This includes leveraging NJUCF resources to expand canopy coverage, strengthen long-term management capacity, and enhance public engagement around urban forestry.

Princeton is also exploring opportunities to secure funding for the development of a comprehensive Forestry Management Plan focused on the municipality's natural areas. This plan would guide long-term stewardship of Princeton's forested lands and ensure their continued ecological function. Key priorities driving this effort include:

- Climate-driven changes to species composition, storm frequency, and drought stress.
- Increasing pressure from invasive plants, insects, and diseases that threaten native forest health.
- Heightened wildfire risk during extended dry periods, particularly along forest–residential edges.

Princeton's urban forestry initiatives align with multiple Community Stewardship Incentive Program (CSIP) elements, including:

- Wildfire Protection – Reducing fuel loads, managing vegetation at wildland–urban interfaces, and providing public education.
- Tree Recycling – Continuing leaf and brush collection and sustainable repurposing of wood materials.
- Sidewalk Maintenance – Coordinating sidewalk repair with tree preservation, planting, and root-zone protection.
- Stormwater Management – Leveraging trees and forested buffers to reduce runoff, erosion, and localized flooding, especially along stream corridors.
- Education & Community Engagement – Partnering with local groups (e.g., Sustainable Princeton, FOPOS) to advance environmental education, expand volunteering opportunities, and integrate green infrastructure strategies into public planning.

Collectively, these actions support Princeton's goal of maintaining a resilient, climate-ready urban forest that protects public health, enhances environmental quality, and preserves the community's ecological heritage.

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Appendix A
Data Collection and Site Location Methods

DATA COLLECTION METHODS

DRG collects tree inventory data using their proprietary GIS software, called Rover, loaded onto pen-based field computers. At each site, the following data fields were collected:

*	Address	*	Park Name
*	Comments	*	Primary Maintenance Recommendations
*	Condition	*	Relative Location
*	Date of Inventory	*	Risk Assessment Complete
*	Defect	*	Risk Rating
*	Further Inspection	*	Size*
*	Multi-stem Tree	*	X and Y Coordinates
*	Overhead Utilities		

The knowledge, experience, and professional judgment of DRG's arborists ensure the high quality of inventory data.

EQUIPMENT AND BASE MAPS

Inventory arborists use FZ-G1 Panasonic Toughpad® units with internal GPS receivers. Geographic information system (GIS) map layers are loaded onto these units to help locate sites during the inventory. This table lists these base map layers, along with each layer's source and format information.

Data Source	Data Year	Projection
Shapefile Avineon, Inc.	2020	NAD 1983 2011 StatePlane Michigan Central, International Feet
Aerial Imagery Avineon, Inc.	2016	NAD 1983 2011 StatePlane Michigan Central, International Feet

STREET ROW SITE LOCATION

Individual street ROW sites were located using a methodology that identifies sites by *address number*, *street name, side*, and *on street*. This methodology was used to help ensure consistent assignment of location.

ADDRESS NUMBER AND STREET NAME

Where there was no GIS parcel addressing data available for sites located adjacent to a vacant lot, or adjacent to an occupied lot without a posted address number, the arborist used their best judgment to assign an address number based on nearby addresses. An "X" was then added to the number in the database to indicate that it was assigned, for example, "37X Choice Avenue."

Sites in medians were assigned an address number by the arborist in Rover using parcel and streets geographical data. Each segment was numbered with an assigned address that was interpolated from addresses facing that median and addressed on that same street as the median. If there were multiple medians between cross streets, each segment was assigned its own address. The *street name* assigned to a site was determined by street centerline information.

SIDE VALUE

Each site was assigned a *side value*, including *front*, *side*, *median*, or *rear* based on the site's location in relation to the lot's street frontage. The *front* is the side facing the address street. *Side* is either side of the lot that is between the front and rear. *Median* indicates a median or island surrounded by pavement. The *rear* is the side of the lot opposite of the address street.

PARK AND PUBLIC SPACE SITE LOCATION

Park and/or public space site locations were collected using the same methodology as street ROW sites; however, nearly all of them have the "Assigned Address" field set to 'X' and have the "Park Name" data field filled.

SITE LOCATION EXAMPLE

These two tree sites are on Taft St, but have E Mac Arthur St addresses.

These four tree sites are on Davis St, however, the tree on the left has a different address than the three on the right.

Corner Lot A

Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.

Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.

Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.

Address/Street Name:	205 Hoover St.
Side:	Front
On Street:	Hoover St.

Corner Lot B

Address/Street Name:	226 E Mac Arthur St.
Side:	Side
On Street:	Davis St.

Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.

Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.

Appendix B: Maps of Community and Inventoried Sites

| Family	Genera
Fagaceae	*Quercus* (oak), *Fagus* (beech), *Castanea* (chestnut), *Castanopsis*, *Lithocarpus* (stone oak), *Chrysolepis* (chinquapin), *Trigonobalanus*, *Notholithocarpus*
Sapindaceae	*Acer* (maple), *Aesculus* (horse chestnut, buckeye), *Sapindus* (soapberry), *Dodonaea*, *Paullinia*, *Serjania*, *Cardiospermum*, *Dimocarpus*, *Litchi* (lychee), *Nephelium* (rambutan), *Schleichera*, *Koelreuteria* (golden rain tree)
Altingiaceae	*Liquidambar* (sweetgum), *Altingia*
Rosaceae	*Rosa* (rose), *Rubus* (blackberry, raspberry), *Malus* (apple), *Prunus* (cherry, plum, almond, peach, apricot), *Pyrus* (pear), *Fragaria* (strawberry), Cotoneaster, *Crataegus* (hawthorn), *Sorbus* (rowan, mountain ash), *Spiraea*, *Amelanchier* (serviceberry), *Aronia* (chokeberry)
Pinaceae	*Pinus* (pine), *Picea* (spruce), *Abies* (fir), *Larix* (larch), *Tsuga* (hemlock), *Pseudotsuga* (Douglas-fir), *Cedrus* (cedar), *Keteleeria*, *Nothotsuga*, *Cathaya*
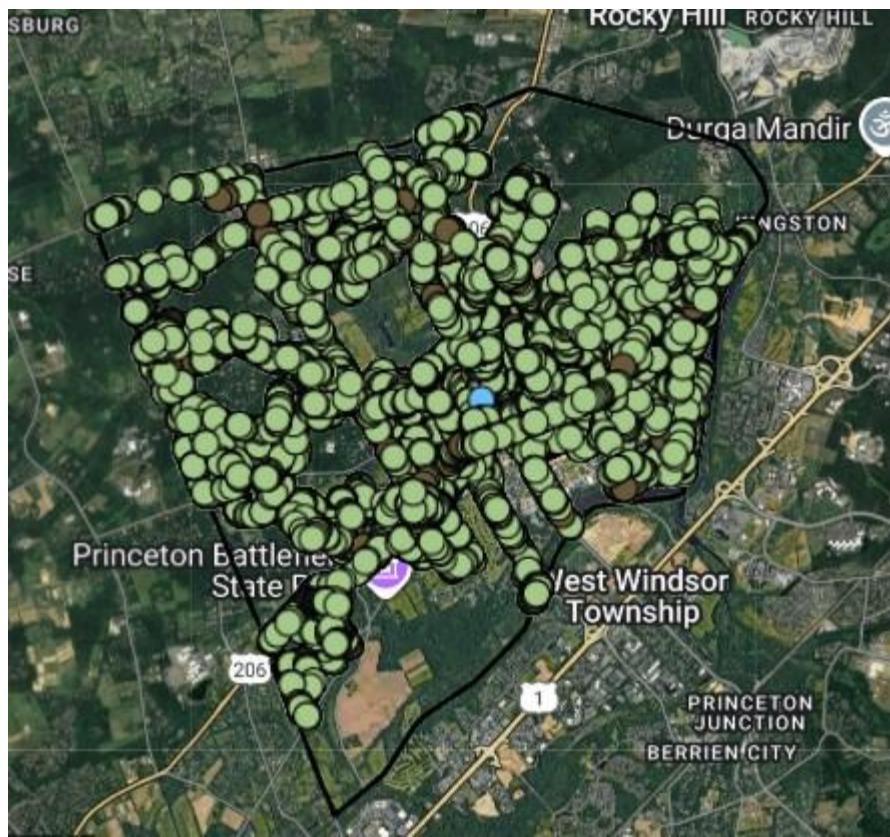
**Map of inventoried sites in The Municipality of Princeton, NJ pulled from TreeKeeper®.**

Princeton, New Jersey
## Canopy Coverage Percent
by Parcels

N
W + E
S

Municipal Boundary

Canopy Cover Percent

Less than 25%

25% to 45%

45% to 65%

Greater than 65%

| 0 | 0.5 | 1 | 2 |
Miles

Davey Resource Group, Inc.
Municipality of Princeton - Community Forest Management Plan

Princeton, New Jersey
2023 Land Cover Classification

N
W E
S
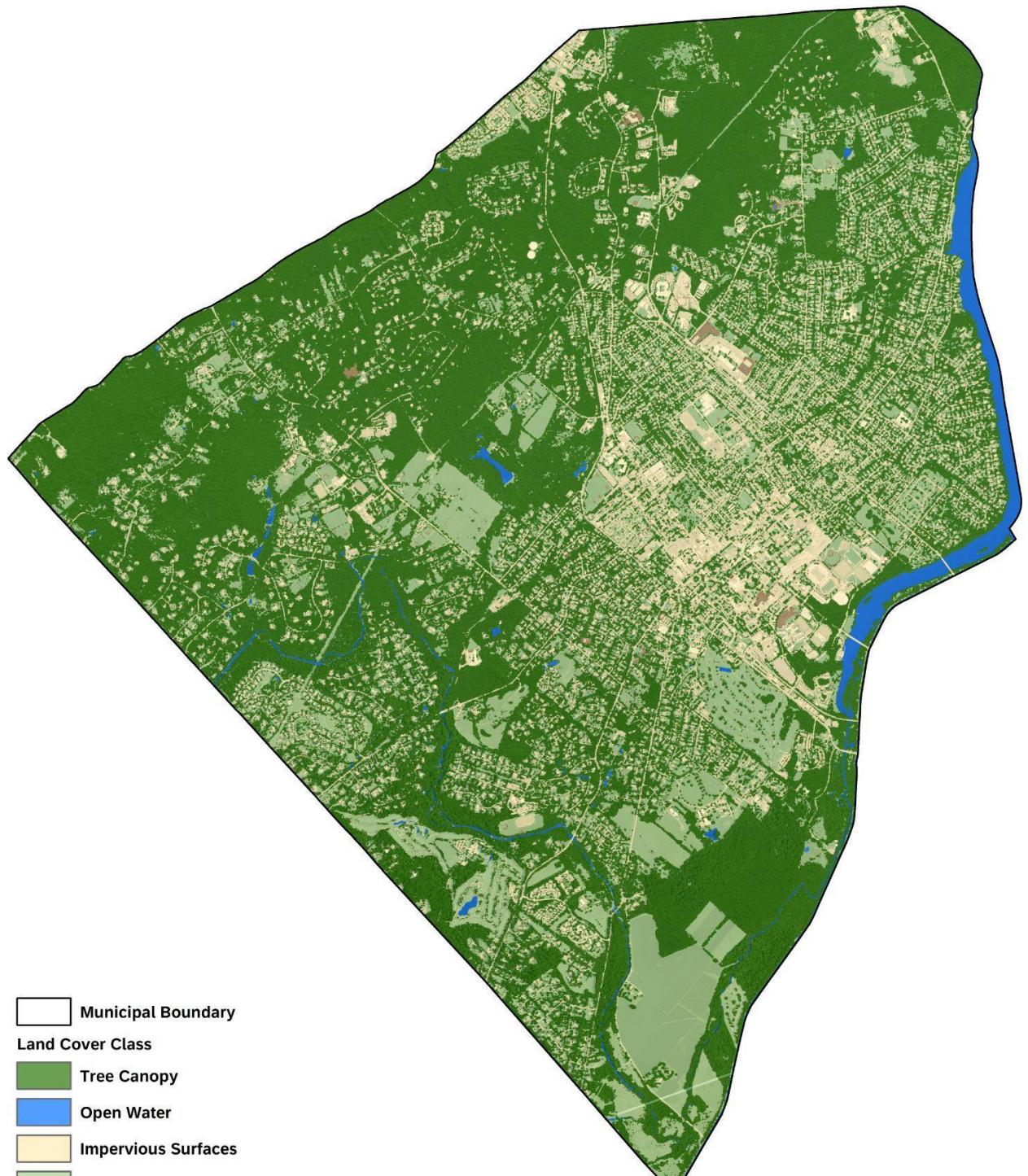
Municipal Boundary

Land Cover Class

Tree Canopy

Open Water

Impervious Surfaces

Grass/Low-Lying Vegetation

Bare Soil

0   0.5   1   2   Miles

Davey Resource Group, Inc.
Municipality of Princeton - Community Forest Management Plan
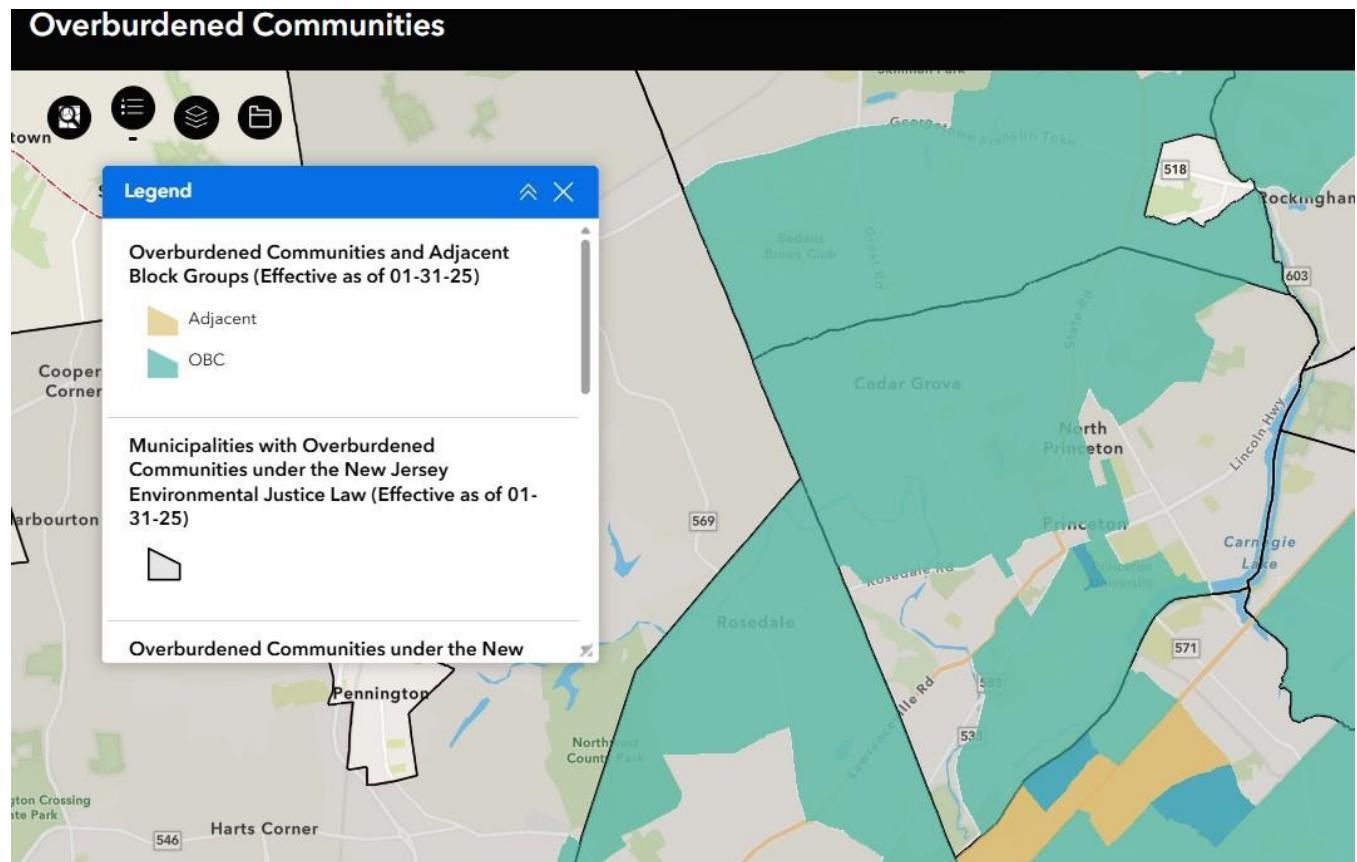
Map of Overburdened Community layer in The Municipality of Princeton, NJ pulled from the NJ Department of Environmental Protection website.