CITY of MADISON

URBAN FORESTRY TASK FORCE

DRAFT-FINAL REPORT- FOR DISSCUSSION AND REVIEW

(cover design tbd)

TABLE OF CONTENTS

I. Urban Forestry Task Force Mission

II. Madison Urban Forest

- Composition of Urban Forest Species
- Shape of the Urban Forest Canopy
- Decision Making Landscape
- City Funding for Forestry
- Trees on the Street: A Contest for Space

III. Goals & Recommendations

- Land Use Planning and Design
- Outreach and Education
- Canopy Coverage and Growth
- Forestry Operations and Public Lands

IV. Appendix

- Sustainable Madison Committee White Paper
- Trees in Madison General Ordinance
- Urban Forestry Task Force Annotated Bibliography & Meetings

URBAN FORESTRY TASK FORCE MEMBERS

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Liz Levy and especially Tesha Zimmerman of the City of Madison Parks Department have also made significant administrative and organizational contributions.

I. Madison Urban Forestry Task Force

Trees are a foundation for Madison's community and ecosystem health, sustainability, and resilience. Our urban forest plays a vital role in stormwater management, protecting our drinking water, and reducing energy costs and human stress. With this mind, our urban forest must be managed holistically and urgently as a potentially fragile resource. We must look to its future with a focus on the hard science and policies that affect its growth, decline, and composition.

This document presents findings and recommendations intended to preserve and grow the Madison urban forest canopy. They are presented by the Madison Urban Forestry Task Force (UFTF) which was formed via a city council resolution to complete the following charges:

I. Review available research and best practices on promoting a vibrant, healthy and sustainable urban forest.

II. Review city policies, practices, programs, and operations that impact the urban forest (e.g. Zoning Code, Emerald Ash Borer Mitigation Plan).

III. Solicit input from local stakeholders with additional information on the issue as needed (e.g. WI DNR).

IV. Develop recommendations to the Mayor, Common Council, Committees or Commissions, and/or City agencies on the establishment of a Canopy Coverage Goal and action plan for the city covering both public and private trees.

V. Develop recommendations to the Mayor, Common Council, Committees or Commissions and/or City agencies to preserve and expand our urban forest resources through a well-planned and systematic approach to tree management.

VI. Develop recommendations to encourage private landowners to protect, preserve and promote a diverse and sustainable urban forest.

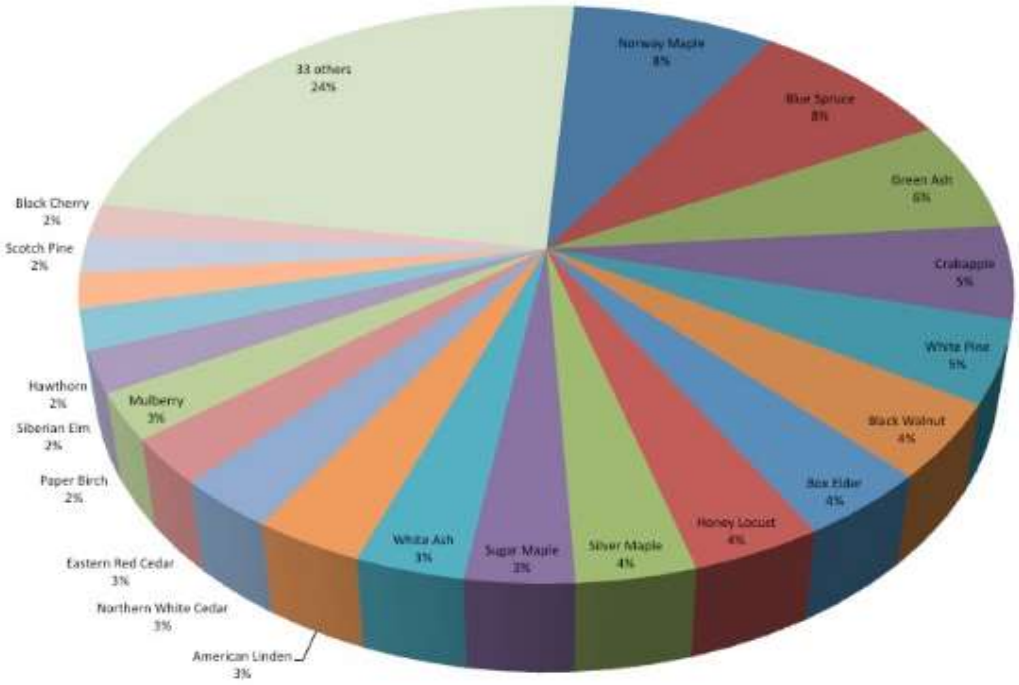
VII. Provide guidance for a long-term strategy to departments to promote the sustainability of a healthy urban forest.

The work presented here is arranged to address the city's stated tasks and to provide a basis for subsequent progress on issues affecting our urban forest. The UFTF is one step in ongoing process that was recently begun by the Sustainable Madison Committee to raise awareness about the issues facing Madison's street trees. Following their progress, the UFTF has attempted to set a direction for a series of urban forest priorities and initiatives. It has also considered both the complexities of enacting new policies and the existing expertise of staff that will initiate and strengthen the recommendations. The UFTF's work is the next step in the necessarily continuous urban forest management process. Urban forests are dynamic and our relationship to them must be long-term and evolutionary.

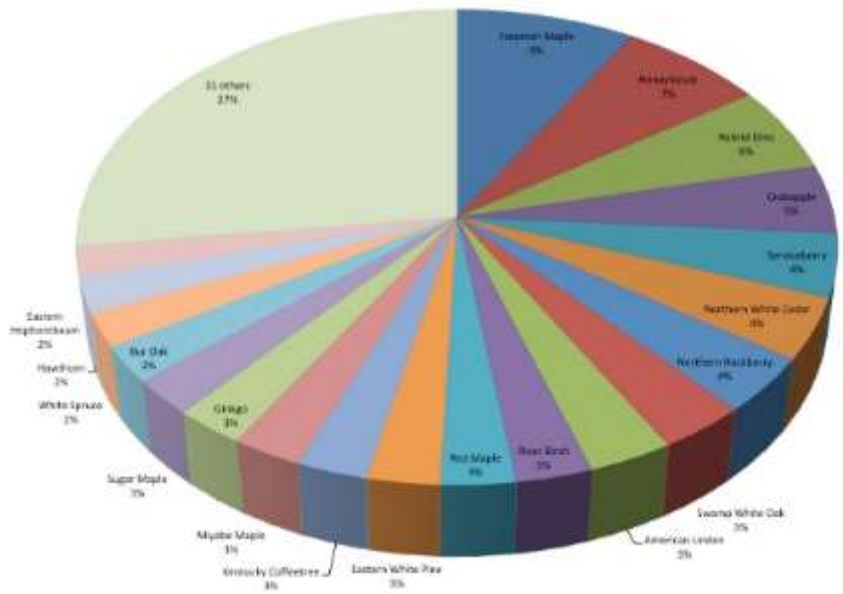
Amidst the approximately 17 sq. miles that account for Madison's land mass, measurements of the city's urban forest canopy coverage have ranged between 23 – 27%, meaning that approximately one-quarter of Madison's land is covered by trees. However, such generalized statics perhaps overshadow the complexities on the ground. Several trends are apparent:

Composition of Urban Forest Species

The composition of urban forest species is ever changing; ash trees are diminishing, new species are being introduced with warming climates, and both future and known pests are a continual concern. In general, the types of species and their relative distribution across Madison are typical of Midwestern urban areas and reflect decades-long trends in taste and selection by public agencies and private property owners. There are threats due to both over representation of individual species (e.g. maples, honey locusts, crabapples) and gaps in the age of the canopy, which are more difficult to measure. Likewise, a recent survey suggests that current trends still tend toward relative homogeneity in species selection; i.e. maples, honey locusts, and crab apples are still the most commonly planted species. In response, the Forestry section has adopted a policy of purchasing and planting no more than 10% of a genus for their total street tree program. Private industry, however, still relies heavily on a relatively small selection of trees, a trend built on consumer tastes, lack of market choice, and professional familiarity.



2010 Forest Composition. This diagram displays the results of a random species sampling of 200 plots in 2010. It includes both public and private properties.



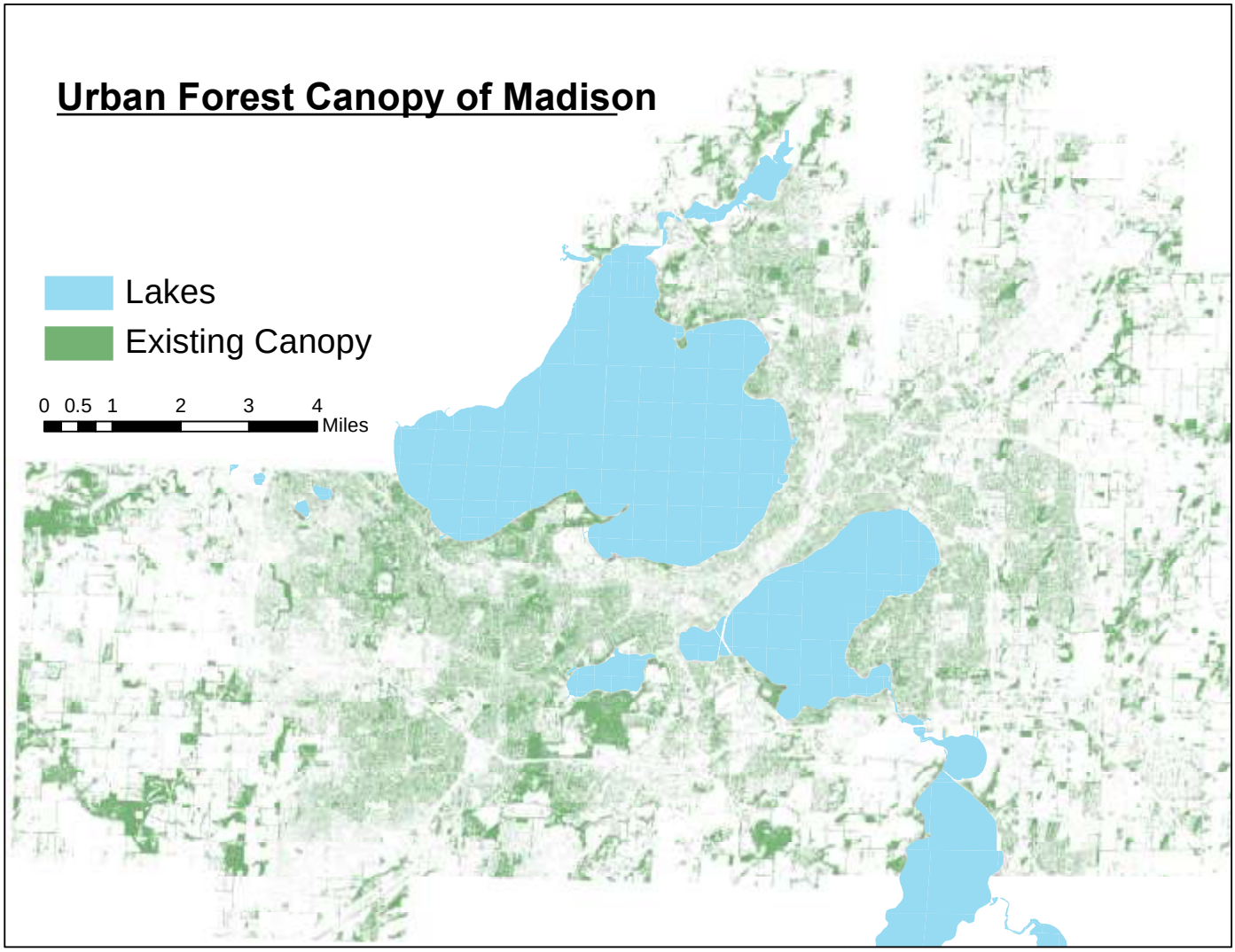
Composition of Planted Trees. The diagram to the left displays the results of a 2010 survey of local nurseries, landscape architects, and landscape contractors designed to determine species trends in the private market.

Certainly, the single most influential force on the current composition of our urban forest is the proliferation of the Emerald Ash Borer (EAB). The EAB was first noted in the Warner Park in 2013. At that time, an inter-department planning team was organized to set the city's policies regarding ash tree treatment, removals, and replacements through an Emerald Ash Borer Mitigation Plan. At the time of the plan, the City estimated that 22% of all city street trees are ash and that 20,000 ash trees are in city park properties. According to the EAB Mitigation Plan, by 2017, 10,724 ash trees along Madison streets have been treated (and will to continue to be treated) on three -year cycles. Approximately 6200 ash street trees have been preemptively removed, leaving 4500 trees still slated for removal. Replacements of removed ash street trees are planned for installation within three planting seasons from the removal by 2017; of these, 3,065 have been successfully planted. Further, in 2017, 1,386 ash tree replacements accounted for 48% of the 2,864 street trees planted for the year. To accomplish the replacement goal and insure effective species diversity, the forestry division has contracted tree growing with Johnson's nursery until 2020. In 2019, the city will enter the sixth year of the known infestation and should reasonably expect approximately 32% of all ash trees to show significant decline in and then 64% the following year.

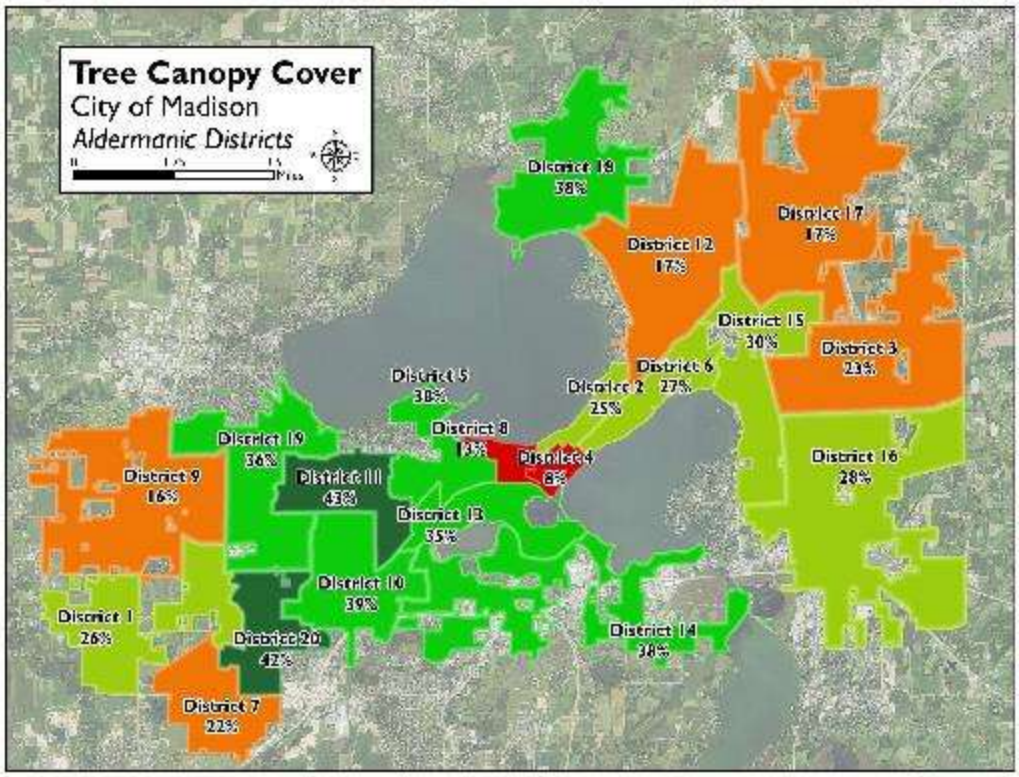
The effects of the EAB are clearly evident across the city. These trees were photographed on Madison's north side in 2016.

Shape of the Urban Forest Canopy

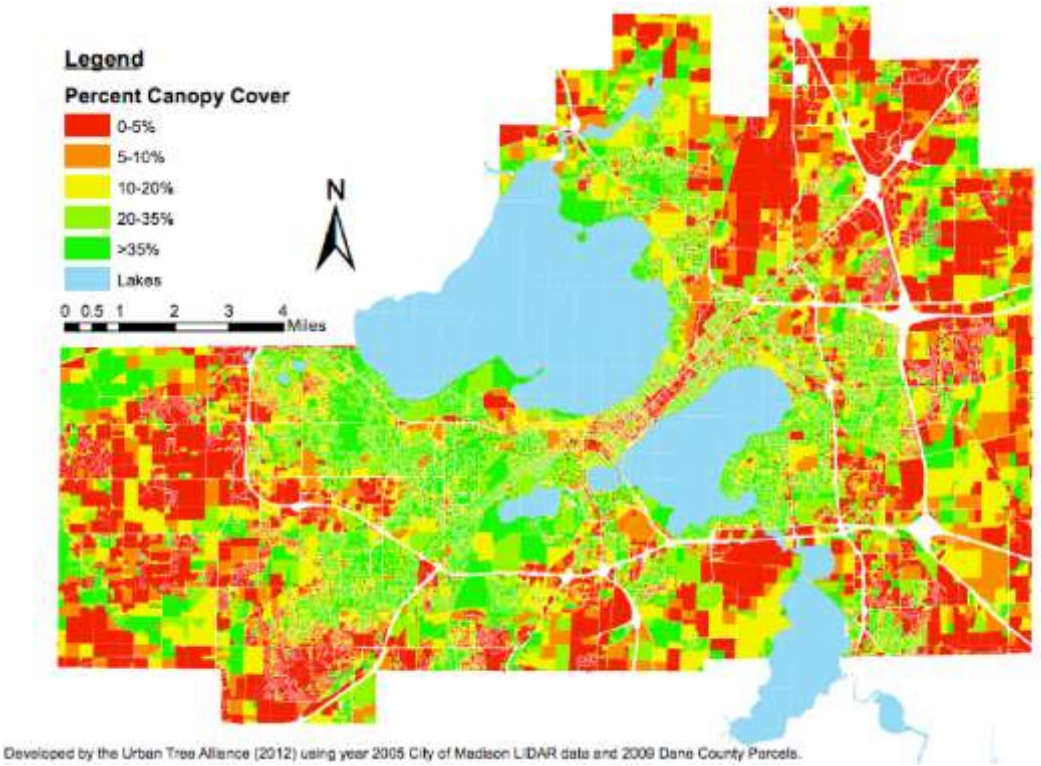
Although canopy coverage rates for the City of Madison range between 24 – 27%, the shape of the contiguous urban forest canopy is not evenly distributed. Neighborhoods with lower relative canopy coverage seem to correlate to higher population densities, lower household incomes, and newer development. Neighborhoods with higher canopy cover benefit from opposing trends.



Urban Forest Canopy. The image above was produced using LIDAR data from 2009.



Canopy Coverage by Aldermanic District. This image was provided by the WI DNR in 2018 and depicts relative canopy coverages according to aldermanic boundaries.



Canopy Coverage by Parcel. This map illustrates canopy coverage on individual parcels across the city.

Decision Making Landscape

Decisions affecting the management of urban trees are complex and dispersed. Policies, programs, and funding sources affecting trees are spread through multiple city departments, public utilities, and institutions. Even within the city, multiple committees, boards, and commissions set and execute municipal urban forest policy affecting. And arguably, the largest single constituency affecting the future of the urban forest canopy is the public itself. The majority of the urban forest lies on thousands of private properties, and decisions affecting trees on those properties are made by thousands of property owners. A brief overview of the primary municipal groups that shape our urban forest follows:

- **Forestry Section** – Located within the Parks Division, the Forestry section is responsible for the planting, maintenance, and removal of street trees. It also reviews private development proposals as they relate to public projects, plays an enforcement role in private property violations, and manages city-wide urban forestry health initiatives such the gypsy moth suppression program.

- **Parks Division** – The Parks Division plants, maintains, and removes trees within the park system and sets long-term policy goals through the 5-year Parks and Open Space Masterplan.

- **Planning Division** – Located within the Department of Planning, Economic and Community Development, the Planning Division leads the review of private developments according to the city's zoning and subdivision codes. Planning also conducts long-term planning projects for both existing and proposed neighborhoods.

- **Engineering** Division – The Division of Engineering leads design on public infrastructure projects (such as road construction, road reconstruction, storm water facilities, and traffic signaling and signage), reviews private development proposals, and manages public lands designated as Greenways.

- **Fire Department** – The Madison Fire Department reviews the placement of public and private trees to insure emergency access.

- **Streets Department** – The Streets Division is responsible for the removal of stumps for street trees, management of brush and waste, and fleet maintenance.

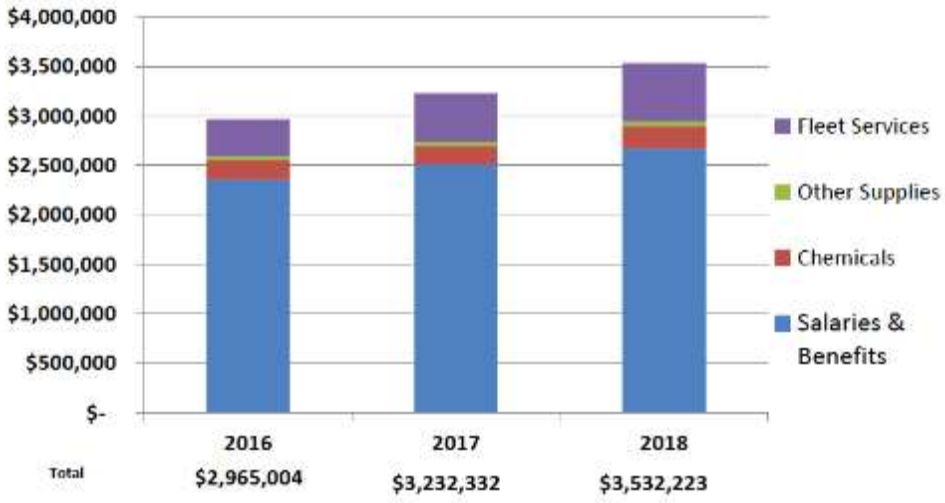
- **Citizen Municipal Involvement** – Land use decisions and general policies regarding trees are made by the Habitat Stewardship Committee, Sustainable Madison Committee, Urban Design Commission, and Plan Commission.

- **Madison Gas and Electric (MG&E)** – MG&E maintains tree clearance around primary electric lines through contracts with private arborists and coordination with the city's Division of Forestry.

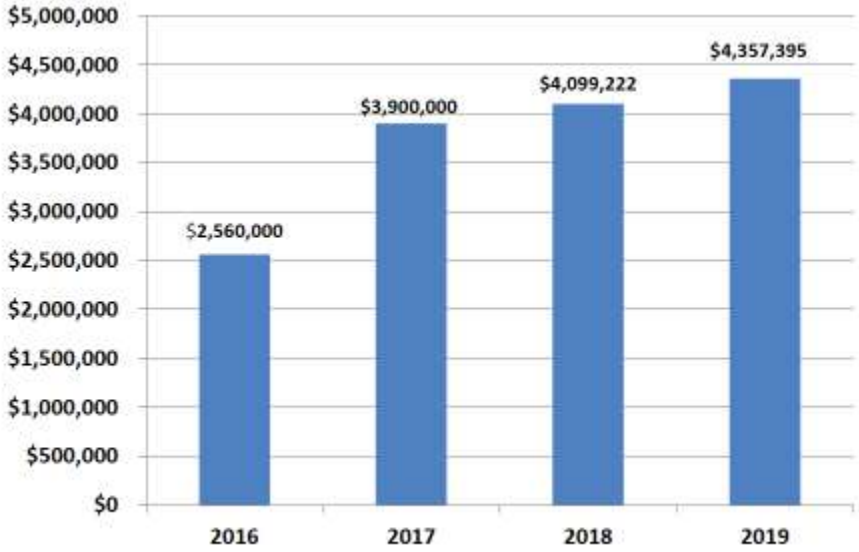
- **Division of Building Inspection** – The Division of Building Inspection enforces property maintenance laws in cases where private trees become hazardous.

City Funding for Forestry

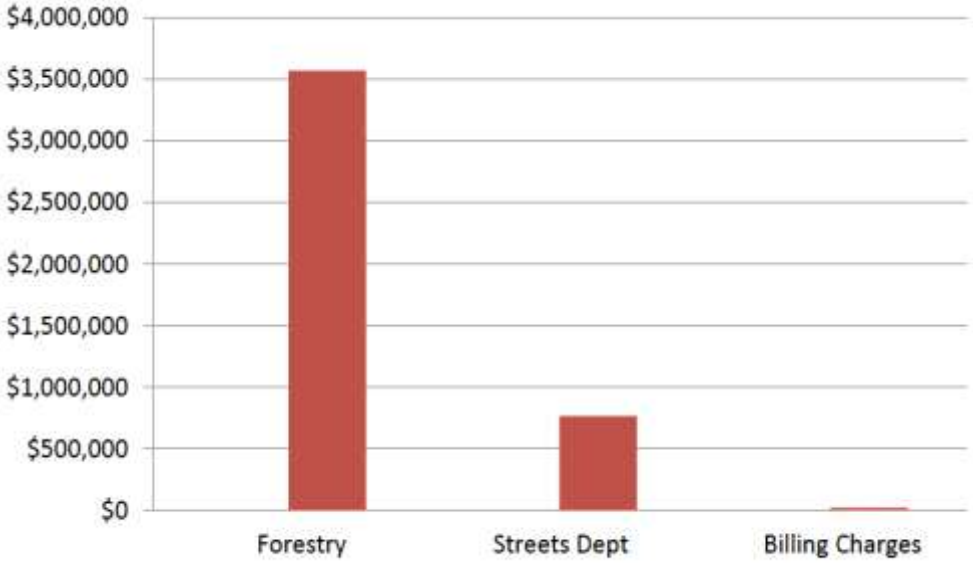
Funding for forestry operations accounts for approximately 2% of the city's operating budget. Forestry funding is further supported through the Urban Forestry Special Charge, which was established to allow the City to recover its costs in performing the services associated with the City's Urban Forestry Program.



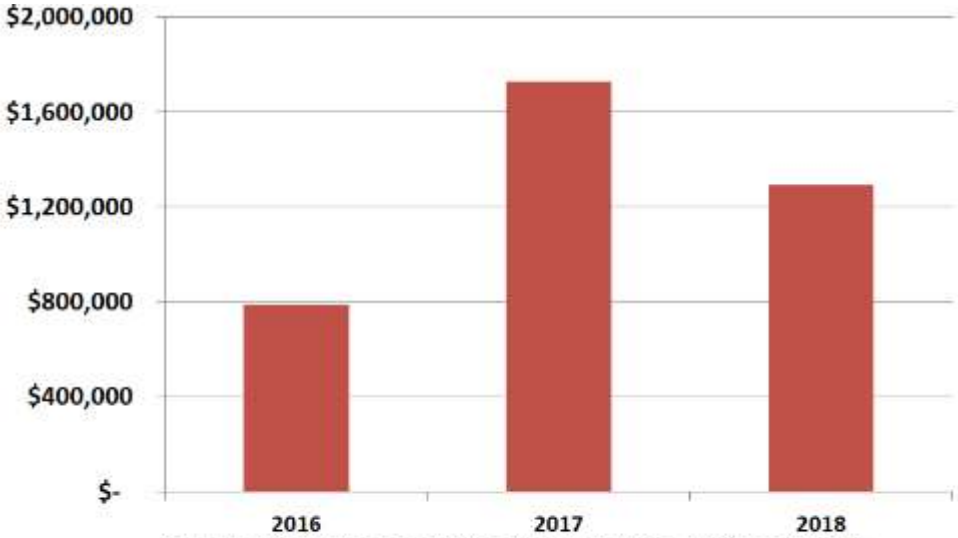
Forestry Division Expenses by Year. These graphs demonstrate the rate of growth and categories of spending for the Forestry Division's expenses



Revenue from Urban Forestry Special Charge. Rises in yearly expenses have been matched by rises in revenues gathered from the Urban Forestry Special Charge.



Allocation of Special Charges.



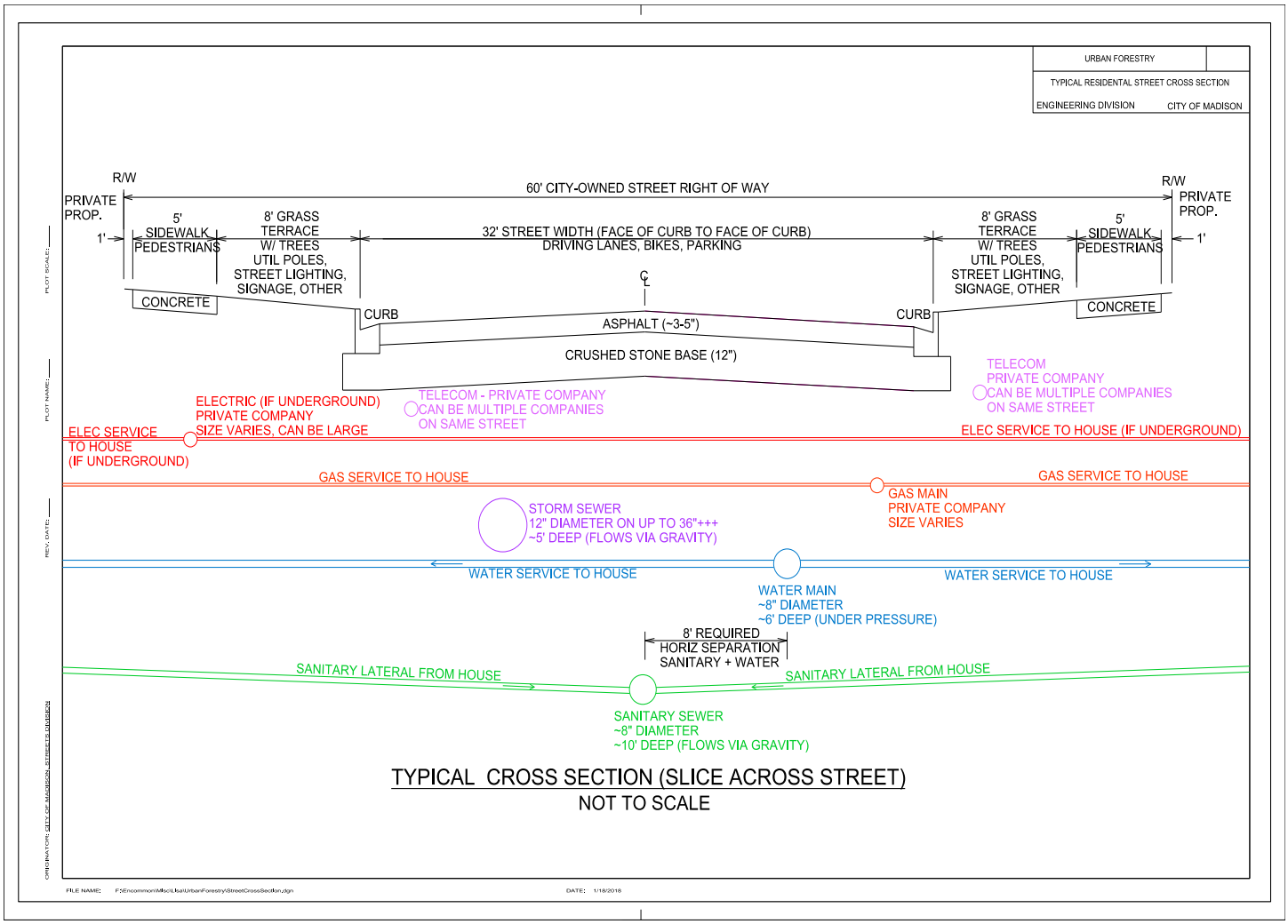
1.EAB Capital expenses include 4 FTE and wood chipper (2017).
All expenses were borrowed- not funded by Special Charge_
2. $350,000 transferred from EAB to non-forestry account.

EAB Budget for the Department of Streets.

A Contest for Space

….the placement and allocation of street trees is determined by disparate policies. The dimensional restrictions on placement can be generally characterized by the following considerations:

- Trees must be six feet from driveways.
- Trees must be at least 20 feet from a street light
- Trees must be at least 10 feet from a fire hydrant.
- Trees must be at least 10 feet from a traffic sign
- Trees must generally be at least 20 feet from a corner to protect “line of sight.”
- Height and design of trees must allow the placement of aerial ladders on buildings taller than 30 feet.
- Height and design of trees must take into consideration of utility poles and overhead cables. They must also be at least 10 feet from utility poles.



III. GOALS AND RECOMMENDATIONS

The UFTF recommendations have been broadly organized into four categories:

- **Land Use Planning and Design**
- **Outreach and Education**
- **Canopy Coverage and Growth**
- **Forestry Operations and Public Lands**

Within each category broad goals are defined and individual recommendations are addressed.

PLANNING & DESIGN

Trees and tree health are affected thorough the planning, design, and construction phases of both public infrastructure projects and private developments. Further, multiple departments and public commissions administer the policies, standards, and processes that influence decisions regarding tree preservation, removal, and planting. These dynamics can lead to contradictory policies and ill-timed decisions affecting the fate of the urban canopy. However, trees must be comprehensively integrated in to the City of Madison's infrastructure systems and building practices.

Goals

- The decision-making process regarding land uses planning and design benefits from earlier and more comprehensive consideration of canopy. Issues affecting trees and tree health should be integrated as early as possible into land use decision-making processes and formally account for tree benefits.

- The quality of the physical environment in which trees are planted is instrumental to their future health. City policies and standards should ensure optimal growing conditions for large canopy trees, including maximizing soil volumes for tree rooting zones and removing overhead impediments.

- The calculated and perceived values of trees multiply as they mature. Accordingly, those existing values should be formally considered, and often preserved, when assessing design decisions.

- Individual projects and the city as a whole will benefit in proportion to which the canopy can be grown. Policies and practices should seek to maximize species diversity, canopy coverage, and landscape aesthetics.

- During the public planning and design phases of street reconstruction projects, **alternative design scenarios** should illustrate and account for each scenario's potential for tree placement and soil volume. The dimensions of the terrace and potential for street tree plantings should be given consideration in relation to designs for sidewalks, bike lanes, and streets.

- New construction that will affect terraces and public right-of-ways should provide 800 cubic feet **soil volume** for new and replacement trees. For downtown areas and reconstruction projects, 800 cubic feet soil volume should be designed for and implemented whenever possible.

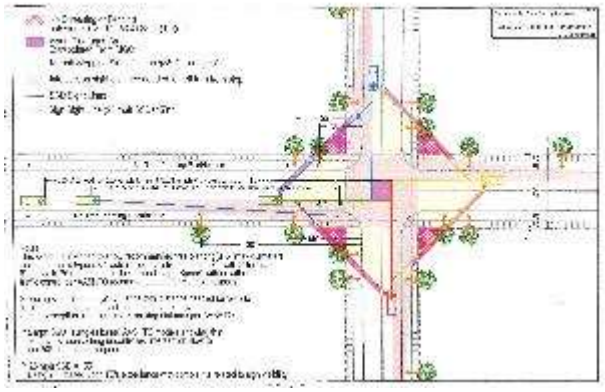
- The UFTF recommends that residential street designs for new developments and urban redevelopments should include terrace widths for a minimum of 8', with 10' being optimal. Arterial and collectors should include a 12' terrace as is possible.

- Street construction projects should introduce **engineered soil volume** construction methods (such as structural soils and suspended pavements) in order to assess the local suitability of various technologies and accumulate cost and performance data. Public works design specifications should be updated to allow for such innovative methods and standardized details. These methods should be further identified with interpretive signage to raise awareness of the methods.

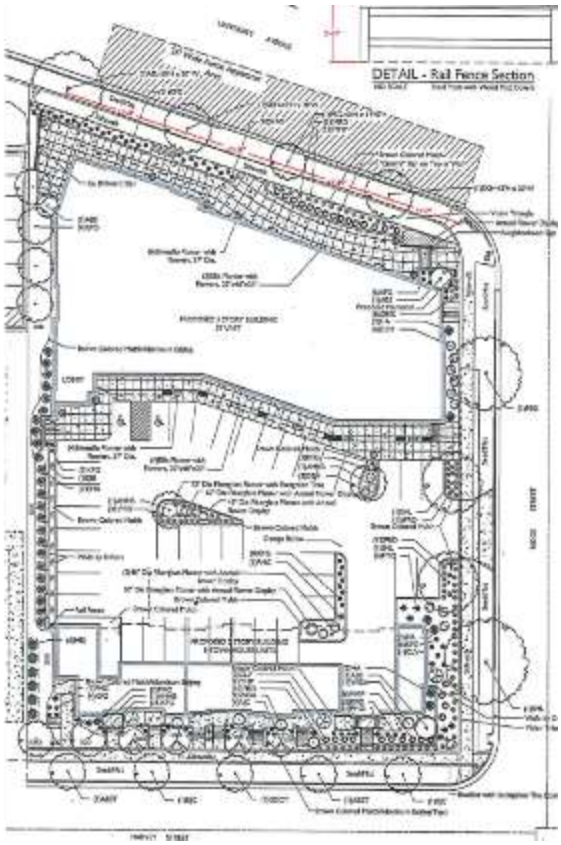
- For street reconstruction projects, **tree preservation priorities and measures** should be identified and included in final designs and design specifications.

- The 5-year street reconstruction plan should be reviewed to identify candidates for **full or partial undergrounding projects** in order to prioritize and create cost estimates for city projects affecting distribution lines in residential areas where the terrace width is sufficient for large trees. Furthermore, criteria for undergrounding decisions that actively assess enhanced tree canopy benefits should be established.

- The UFTF recommends that the Common Council set aside consistent annual funds for partial underground projects that will be independent of spending on forestry programs.
  A separate task force should be organized the city to examine undergrounding policy and planning. The task force should include representation from at least the following entities: MG&E- operations, planning, engineering, and legal, City Engineering, Mayor's Office, City Forestry, State Public Service Commission, and a private consumer advocate.



- Lighting, Solar, Traffic Vision….



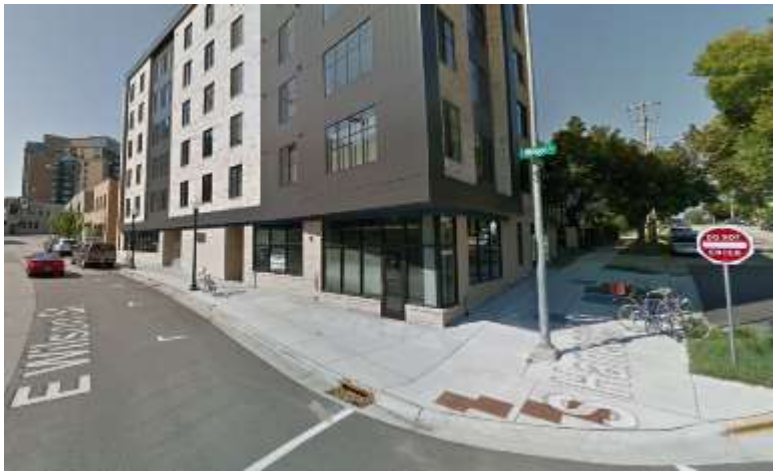
These images illustrate a mixed-use redevelopment project where the site was cleared of all trees (including several in the right-of-way). And although a new terrace and street trees were included in the initial site plan approvals, it was later determined that underground infrastructure would limit their implementation. By accounting for the value of existing canopy during the decision making process and expanding the scope of site plan review to the right-of way, trees can be better planned for. It is understood that trees will be removed during development, but these decisions should be documented. Although new trees are will be planted, there should be equal accounting for the public loss of value when mature canopy is removed.

- Private development proposals subject to city review should create and provide a **Tree Management Plan**. The Tree Management Plan can include, but not be limited to:
    - An **inventory** that identifies the locations and species of trees larger than 5" DBH for both private trees and possibly affected public trees within the adjacent public right-of-ways. Accommodations for stands of contiguous trees can be made, but should still be accounted for in order to generalize species composition and canopy coverage.
    - A **statement** describing the impacts of the development on the tree resources that includes a description of trees to be preserved and removed.
    - A **construction** plan illustrating how practices may affect existing trees and details physical tree preservation measures such critical root zones protection, locations for materials storage, site access, and prescribed tree management measures such as pruning.
    - In situations where existing trees are necessarily affected, remediation measures should be identified and implemented.

- The site plan review and approval process should expand in its **scope**: 1) to a consideration of affected and adjacent public right-of-ways (not to exceed the center of line of adjacent roads); 2) the related implications for existing and proposed street tree plantings therein. It is further recommended that the design and review of adjacent right-of ways establish a corridor for clustered utilities that extend to the development site and that utility-free zones be established in order to maximize soil volume capacity.

- Mature trees lost during construction reduce the public value of Madison's urban forest canopy. Even when new trees are planted, it can be several decades until they can provide the eco-service value of mature trees. In such cases where existing canopy value is lost or diminished, the city should develop measures to **remediate losses** even if those measure are outside of the project bounds.

- **Building set back** allowances have been reduced in urban areas to increase density. These policies have likewise reduced usable soil areas in critical areas. The city should consider the loss of tree potential as a detriment to the public value of city streets and street trees. The city should develop zoning policies that do not prevent the provision of street trees or trees on privately developed properties.



Trees in densely developed areas suffer multiple space and material constraints. However, these are precisely the areas where thriving trees can provide the most value. The development scale and tight relationship to the street in this recent project precludes the possibility of street trees and represents a loss of potential for the urban forest canopy.

- Larger development project represent the potential for both increased canopy growth and loss. It recommended that **landscape requirements and canopy coverages** increase from their current level as the physical size of proposed private developments increases. In particular, it is recommended that parking lot landscape requirements be amended to increase both the density of trees and the soil volume of planting areas. Incentives should be established for private developments that exceed landscape requirements.

- Regulations and codes affecting trees should be consolidated into a **Tree Guidance Manual** for private developers and governmental bodies involved in reviewing proposed projects. This should, at minimum, include a summary the regulations and practices that influence tree placements on public and private projects.

Neighborhood Planning & Long-Term Planning Recommendations

This concept plan illustrates the type of spatial planning completed within the City's neighborhood planning process. The resulting neighborhood development plans are intended to provide a framework for the growth and development of the City's peripheral urban expansion areas where development is expected to occur in the foreseeable future.

- City planning documents, such as but not limited to Neighborhood Development Plans and Neighborhood Plans, should include an **urban tree canopy statement** that details a canopy coverage percentage for focus areas and identifies localized issues that impact the health of the canopy. It is further recommended that these planning documents identify areas for canopy preservation and growth. As appropriate, it is recommended that existing plans be amended to address these issues.

- Existing planning documents and policies as Complete Streets, Rural to Urban Roads, Madison in Motion, and Comprehensive plan should be reviewed in order to insure consistency in tree policy.

Subdivision Recommendations

These pre- and post-development photos illustrate the potential for new subdivisions to grow the canopy. Through the provision of trees on public and private property, development on the city's periphery represents new opportunities to expand the urban forest.

- The city should investigate and develop strategies to grow trees on **newly developed single-family lots**. These may include, but not be limited to, incentives for developers and/or homeowners to plant and maintain trees and the use of neighborhoods covenants. It is further recommended that the city provide guidance on best practices regarding the location of trees of lots and species selection to encourage diversity and large canopy trees. See also street terrace dimensions for width minimums.

OUTREACH & EDUCATION

An engaged and empowered citizenry is crucial to the future preservation, growth, and sustainability of the local urban forest canopy. Because the urban forest is a public resource, its future relies on broad public commitments. Strategies designed to increase knowledge about our trees and to involve people in stewardship activities diverse can increase the social and environmental value of our urban trees.

Goals

- Outreach strategies should be designed and implemented by a coalition of interested groups but managed in a comprehensive program.

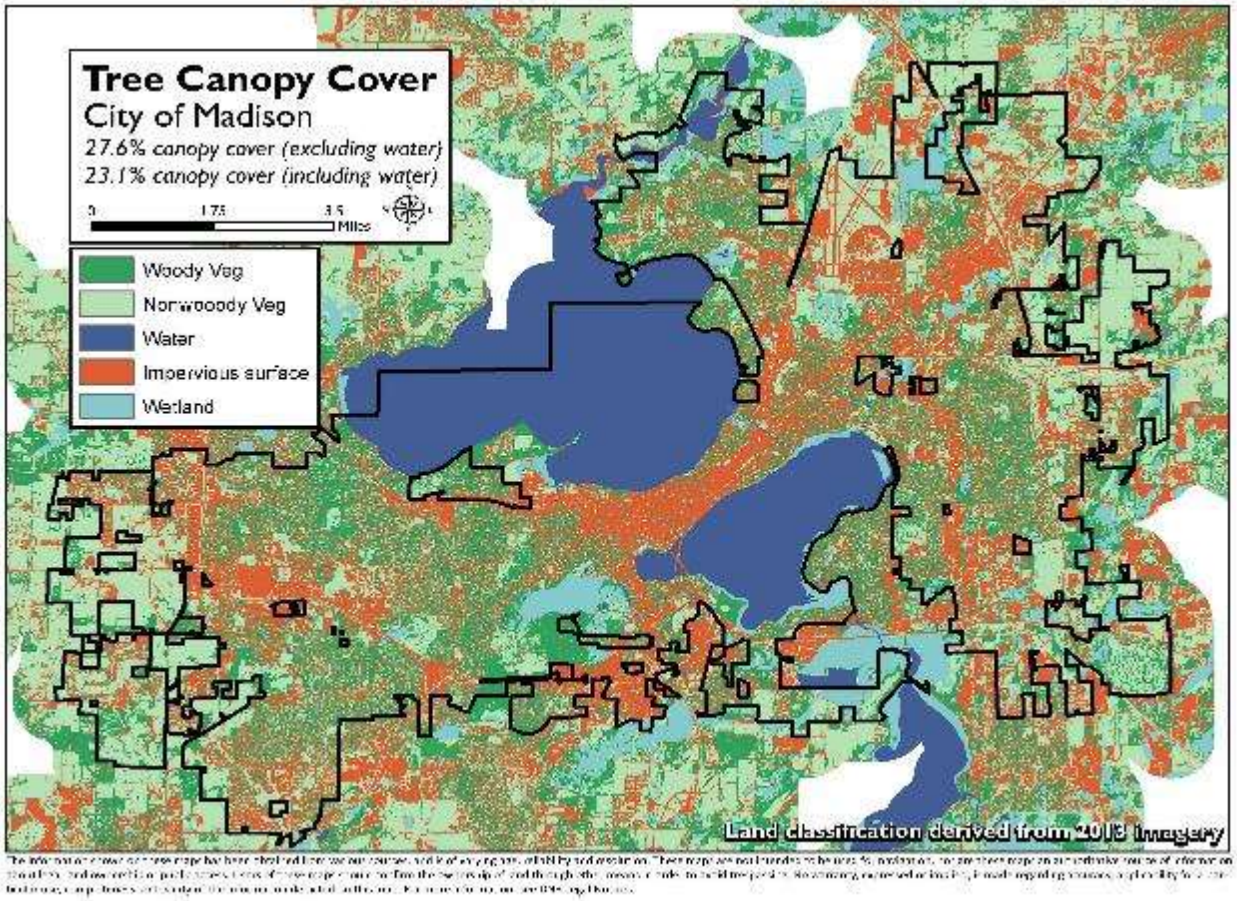
- Outreach strategies should be tailored to diverse groups such as developers, homeowners, apartment owners, and environmental groups to increase enthusiasm about our urban forest and convey technical knowledge.

- Outreach efforts should be long-term.

- The city should initiate and facilitate an urban forestry outreach initiative in order to "brand" Madison's urban and to raise consciousness and enthusiasm for urban forestry issues. Future programming should ultimately attempt to operate with the city as a partner, rather than leader. This may entail the creation of a paid outreach/organizer position.

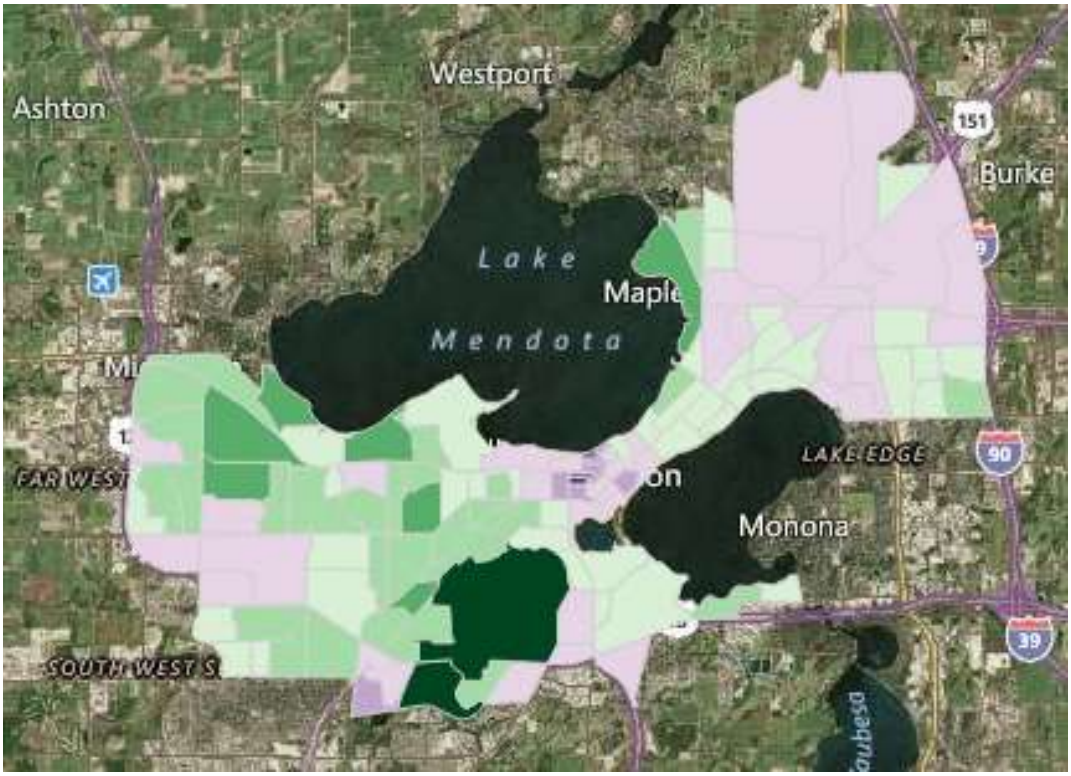
- An advisory board should be created in order to partner with groups such as the Arboretum, UW-Extension, the Urban Tree Alliance, Wisconsin Arborist Association, and others to guide an outreach program.

- Volunteer tree planting and tree maintenance programs should be developed for city parks in order to include citizens in tree stewardship.

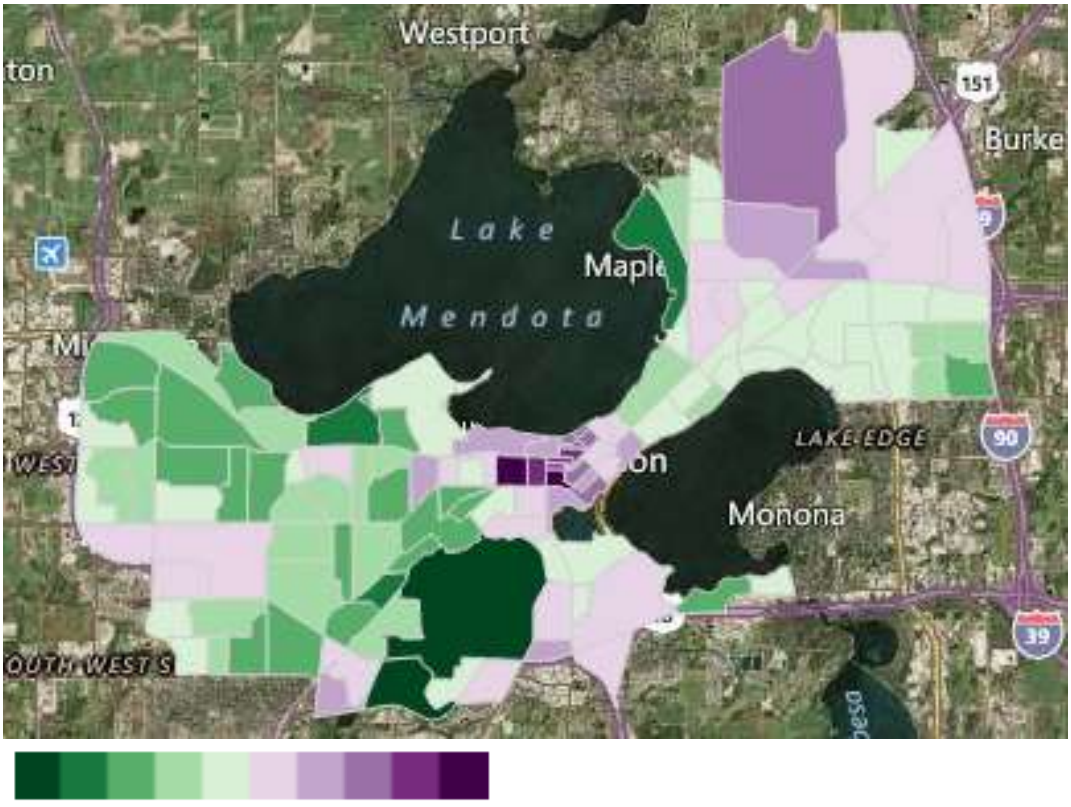


Researchers estimate that average tree canopy cover in urban and across the U.S. is approximately 27%. Yet, because of the well-established relationships between higher tree populations and improved human and environmental health, canopy coverage goals have been set in cities in order to guide canopy growth. For example, Pittsburgh has sought to increase its canopy coverage from 42% to 60%. Baltimore is committed to increasing its canopy from 28% to 40% by 2040. Arid Phoenix has set a goal of 30% by 2025, and Charlotte, with a tree canopy of 32%, is working to increase its canopy to 50% by 2050. New York City has met a goal of planting 1,000,000 trees in the period of 2010 – 2015 and now has a canopy of 21%.

However, the practicality and effects of broadly stated goals can be misleading since existing canopies and canopy growth is not evenly distributed; there are substantial differences in tree canopy by area. Accordingly, the downtown Madison and the UW-Madison campus areas have between 8 – 13% of canopy. Areas on the far east side (District 17) have only 17% canopy and far west (District 9) have 16% canopy.



These maps were produced with I-Tree Landscape, a web-based modeling program, to assess tree planting priorities according to census districts. The top map illustrates areas for tree planting based on existing canopy coverage and population density data. The map below illustrates priority planting areas based on existing canopy coverage and income data.



Tree Priority Scale from Low (Green) to High (Purple)

Goals

- Canopy growth strategies should be directed at the neighborhood level in order to account for variations in land uses and development densities and patterns.
- Canopy strategies should be associated with actionable programs and results.
- Canopy growth should be pursued in coordination with canopy preservation.

Recommendations

- Rather than set a city-wide forest canopy coverage goal in terms of a percentage, the city should institute a range of policies and programs designed to increase canopy coverage at the neighborhood level.

- Neighborhood based spatial canopy trends should be analyzed in order the understand rates and causes of canopy change and the relative distribution of the canopy across the city.

- Public plantings along streets, in parks, and within greenways should be prioritized according to a need-based neighborhood analysis. The city should consider subsidies for street trees in neighborhoods or census districts with household incomes below the area mean.

- The city should support multi-year programs to support tree planting for private homes, apartment/rental housing, schools, and other areas not currently covered with existing municipal plantings.

FORESTRY OPERATIONS & PUBLIC LANDS

The City Madison maintains hundreds of thousands of trees along streets, in parks, and along greenways. Accounting for approximately 20 – 30% of the total urban forest, public trees are essential to the health our landscape. Their vitality sets a tone and direction of the whole urban forest eco-system.

Goals

- The constraints for planting on public land are relatively few compared to private lands. The city should capitalize on this by increasing municipal planting rates.

- The management of public lands and trees is complex and labor intensive. Management practices should integrate technologies in order increase efficiency and leverage investments.

Recommendations

- Public parks should adopt a policy of **canopy growth**. A city-wide tree needs assessment for park properties should be considered in order to identify preliminary tree locations, set consistent design goals, and project both priority areas and rates for tree planting. Ash trees should be replaced on a one to one-basis, and total park plantings should aim to grow on annual basis.

	2017
Preemptive ash park/golf tree removals	1,310
Replanting	348
Adopt- a – Tree Program	254*

These statistics from the 2018 Emerald Ash Borer Plan update indicate the potential for tree planting on public land in order to keep up with the pace of ash tree removal.

- **Parks master planning documents** should include inventories of tree resources and address canopy implications for proposed improvements.

- Tree **planting design** within parks should prioritize species diverse, large, and visually similar canopy trees. Tree locations should be integrated into heavily used areas such as playgrounds and playing fields and their arrangement should be accommodated by turf management practice. In the event that view sheds are protected within parks, trees should be included in the management on those areas.

- The city should evaluate the construction and use of a **gravel bed nursery** to store and grow bare root trees for planting on public lands. This method has proven on both national and local levels to decrease tree-purchasing costs, decrease labor and shipping costs, increase successful transplant rates among multiple commonly used species, and allow for greater volunteer involvement.

- An assessment of the **street tree inventory** should prioritized in order to determine current and future needs. The assessment should include, but not be limited, to opportunities for public access to data, mobile applications for fieldwork orders and data editing, and strategies for a comprehensive update.

- The current approximate 20-year **pruning cycle** of street trees should be evaluated in order identify methods and resources needed to shorten the cycle.

- An **urban forest board** with regular meeting should be formed in order to advise on the recommendations made by the Urban Forestry Task Force and to address future urban forestry needs.