Fridley Sustainable Urban Canopy Management Plan Recommendations

Recommendations for a sustainable urban canopy management plan for the city of Fridley, MN by students of FNRM 4501/5501. May, 2016

ACKNOWLEDGEMENTS

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FNRM 4501/5501 - Class of 2016

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EXECUTIVE SUMMARY

The residents of Fridley benefit greatly from the investment the city has made in its natural resources. With thirty-eight city parks, five county parks, Rice Creek with its surrounding forested parkway, and part of the Mississippi National River & Recreation Area (MNRRA), Fridley has a wide range of outdoor recreation opportunities for its residents and visitors to enjoy. The management of any public green space must respond to the inevitable natural changes that occur as they mature, and take into account the changes in how people use them. This report is intended to be a resource for all those interested in the sustainable management of Fridley's urban canopy.

An investment in the urban canopy can go a long way towards making Fridley a desirable place to live, work, and recreate. With the support from city officials, designated staff members or a trained group of citizen foresters can do much to effectively manage public green space. In order to sustain the financial, ecological, and environmental benefits that the city receives from its natural resources we recommend that these actions be taken:

I. Designate a staff member to coordinate volunteers, build partnerships with community groups, engage civic organizations, school groups, faith-based communities, local businesses, and others who want to become more involved in the management of the city's natural resources.
II. Continue to improve upon Fridley's street tree inventory by working with volunteers to conduct a residential tree survey. With easy to use web-based geographic information tools, such as Open Tree Map, city managers can take advantage of publicly sources information relating to the distribution and condition of Fridley's urban forest.
III. Develop a tree ordinance that includes provisions relating to tree preservation, disease and pest management, including the appropriate enforcement measures.
IV. Allow for the creation of two subcommittees which will take on the management of Fridley's urban forest. This tree board should have representation from members of both the Environmental Quality and Energy Commission and the Parks and Recreation Commission, as well as citizen representatives of faith based, business, and minority communities.
V. Provide the support necessary to enable Fridley to become both a GreenStep City step 2 and a Tree City USA.

To the best of our abilities each management practice was paired with volunteer training resources and grant funding opportunities to help overcome the challenges of implementing such programs and policies.

INTRODUCTION

When thinking about how to manage and develop the urban canopy in the City of Fridley, it is important to recognize the tremendous amount of green space that currently exists in the community. With thirty-eight city parks, five county parks, Rice Creek and its surrounding forested parkway, and part of the Mississippi National River & Recreation Area (MNRRA), Fridley has a wide range of outdoor recreation opportunities for its residents and visitors to enjoy. Trees make up a vital part of the city's public infrastructure, adding value to public green space, business districts, and neighborhoods. A healthy urban canopy has a positive impact on air quality, stormwater capture, property values, and the overall public perception of a community. Street trees make main streets a more welcoming place for both drivers and pedestrians and make residential neighborhoods more enjoyable places to live.

This report is designed to provide local decision makers with the information needed to address some of the challenges facing the urban forest. The recommendations, to the best of our ability, take into account the applicable tree related policies and the capacity of the relevant commissions to enact them. It is clear that Fridley officials have realized the benefits of investing in their urban canopy, and have aspirations of becoming both a Tree City USA and a GreenStep City step 2. This report offers a series of best management practices combined with the resources necessary to enact them with a focus on pairing recommendations with funding options, training resources, and public outreach strategies.

It would be very challenging for any city to maintain its urban canopy without organized community involvement. Resident engagement lowers the costs associated monitoring the city's trees and creates lasting, community-driven initiatives for developing Fridley's urban canopy. This report includes a Residential Tree Survey Protocol that can be conducted by resident volunteer groups. We have included training resources that can be used by a volunteer coordinator and a guide to best practices for gaining, training, and retaining the people necessary to conduct the surveys and support Fridley's canopy . These methods can be adapted for the use of a tree inspector or city arborist.

INTRODUCTION CONT.

The information collected from a survey of street and residential trees can guide the way the urban canopy is managed and how decisions about the urban canopy can be worked into the city's master plan. Information on the location, species, age, size, condition, and surroundings of trees can help with species selection or the establishment of tree protection zones. This report contains best practices for developing a preservation protocol, a disease and pest management plan, and creating a tree ordinance. The canopy management plan will be the basis for ensuring that the future of Fridley is a safe, vibrant, friendly and stable home for trees, families, and businesses.

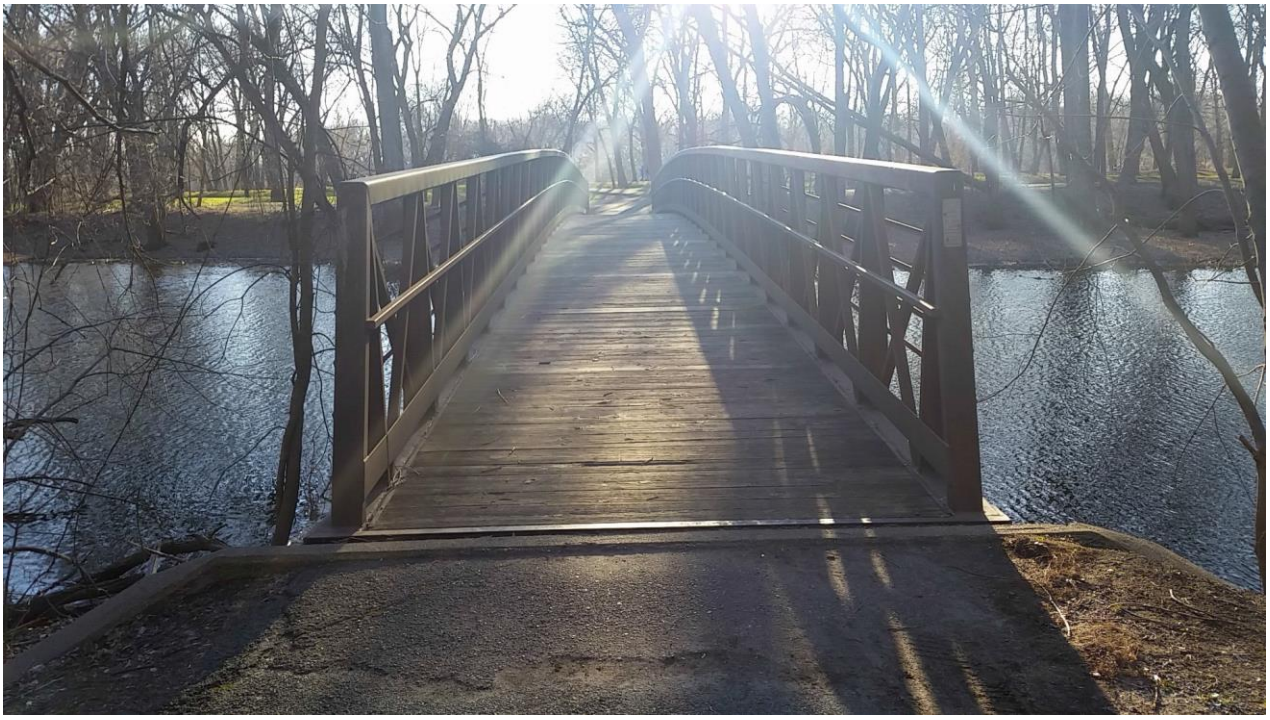


Photo by: Carl Reim

PRIVATE TREE SURVEY - Purpose of a Survey

The Purpose of a Survey

Through a partnership with Minnesota GreenCorps, the City of Fridley has been able to improve upon a comprehensive inventory of the city's street trees. This information is invaluable for the management of the urban forest. However, in order to get a full picture of the distribution and conditions of the urban forest, the trees existing on private property must be taken into account. A range of exotic stressors such as emerald ash borer and Dutch elm disease (see Disease and Pest Protocol Section) threaten the urban canopy. To best prepare and combat these issues a management protocol must be established and kept up to date given the changing circumstances. An effective management plan begins with an inventory or a survey of the trees to be managed, for it is difficult to manage what you have not measured.

Knowing the distribution and condition of trees in a given area will allow resources to be properly allocated to areas where there is greater need. With a public tree inventory completed the next step is to survey the private trees. A private tree survey can be filled out by tree owners without extensive technical expertise, and still yield information that is valuable for decision makers. A survey of private trees can be done efficiently with the support of volunteers and community members.

Engaging residents in the survey process can foster a sense of community pride. Many citizens understandably will not want strangers wandering their yard. Therefore homeowners and landowners may conduct a self-inventory of trees on their property.

The following section is a resource designed to assist a survey coordinator in the process of conducting a residential tree survey. While this report recommends the use of volunteers, the method described can be adapted for use by a Tree Inspector or City Forester.

The Value of Residents Self-Reporting

Fridley currently lacks the necessary resources to monitor and care for every tree in the urban canopy. Engaging community members and providing opportunities for them to help manage the urban canopy is cost effective and creates social cohesion amongst survey participants. Providing residents with the means to self-report on their own trees can help collect valuable information to assist with management. Residents can be provided with informational materials that both highlight the many benefits of urban trees and assists them with filling out the survey. Additionally, gathering information on residential trees can provide local homeowners with the knowledge to manage avoidable risks before they become costly.

Without knowing the risks, citizens may have to unexpectedly pay for tree removal and the community would lose all of the quality of life values that the tree provided. Replacement options can be made available to give tree owners viable replacement selection. *A list of appropriate species for planting in Fridley can be found in Appendix A.*

Tree Survey vs. Tree Inventory

The information needed to manage city forests can be collected in a variety of ways. A tree inventory provides city managers with invaluable information on the specific conditions and location of all trees. Tree surveying differs from tree inventorying in terms of necessary time and resources needed for completion as it examines trees within selected areas. Surveying combined with statistical analysis can provide information accurate enough to make essential management decisions. If employed correctly a well-designed survey need only be conducted on a fraction of the whole tree population to provide useful insights. Information such as relative species representation, age of the urban forest, and net benefits of the urban canopy can calculated. Tree inventorying is similar except every tree is counted and recorded, usually in greater detail. This process can be more accurate, but is time consuming and resource intensive. While the data collected through a survey will be statistically significant, there is much to learn about the conditions of individual tree and site locations.

Without the resources to secure staff, volunteers can still be used effectively to conduct either a survey or an inventory of city trees.

Funding resources for volunteer programs can be found in Appendix J.

With targeted training on individual tasks and data recording procedure, any individual has the potential to be an effective member of the surveying team. There are local training programs that are willing and eager to give community members the skills to conduct the work that Fridley needs to survey or inventory the private tree canopy *which can be found in Appendix B.*

PRIVATE TREE SURVEY - Residential Survey Design

Residential Survey Design

Trees on residential properties make up a significant part of any urban forest. It would be impractical to try and assess these trees in full by sending a staff to visit every property. An easier method is to allow residents to self-report some basic information about their trees. With a few basic insights into the location, species, and size of the tree, decisions about tree management can more readily be worked into management plans. Information, such as tree condition, can be very useful but can be difficult to train citizens to accurately and consistently assess. If a citizen is encouraged to go the extra mile, then information for condition assessments can be reviewed and recorded. With the help of an the online open source mapping software, Open Tree Map, residents can submit the results of their survey without the hassle of distributing a paper form.

Connecting residents with physical data collection sheets and informational handouts is still useful to reach survey participants who view technology as a barrier to participation. Whether a survey is taken online or with a hard copy form, it can be paired with information about tree identification and benefits as well as ways to become involved with local tree care initiatives. (See page 18 for best practices for gaining volunteers).

Information To Ask For in a Residential Survey

Tree Species

The survey should include easy to understand visuals of the twenty most abundant trees in Fridley for quick identification as seen in Appendix D. Criteria for tree identification typically depends on leaves, fruit/seeds, bark, and buds. For species outside of the twenty most abundant there should be a resource on the City of Fridley's website that will go more in depth on a wider variety of species. Surveys should also include a method of contacting volunteer advisors in case they would like to schedule assistance to assist them with identification. Extending the volunteer support to residents completing the survey can help to educate community members about the goals of Fridley and its canopy.

Make Data Mobile

Open Tree Map can increase response rate by making data widely accessible.

PRIVATE TREE SURVEY - Residential Survey Design

Diameter at Breast Height (DBH)

The survey should include simple instructions and a few visuals to measure DBH. DBH is simply the diameter of the tree at 4.5 feet off of the ground. By collecting the DBH Fridley can approximate the age and size of the trees. The measurement can be collected to the nearest inch.

Crown Width

The instructions should be presented similar to the DBH, showing the correct way to estimate the width of the foliage and branches on the tree. This measurement can be collected to the nearest foot.

This information should be paired with instructions on how to accurately take and record each measurement. *Appendices A and E* provide additional resources for helping residents identify tree species and accurately measure trees. Included is a sample survey template for residents. Note that if residents choose to add their information straight into an online platform, such as Open Tree Map or an online survey, then such a survey is not necessary. Tree identification may at first seem daunting to those who are not familiar with the practice. Providing clear and useful tree identification information is the first step towards engaging residents in the process. By empowering community members to identify and assess their trees, they are encouraged to have a relationship with the urban canopy. In order to not overwhelm those who decide to participate in the self-reported survey, only these three fundamental elements should be surveyed.

On top of ensuring that the surveys are usable and designed well, it is important that reliable information can be gathered from the surveys. Protocol for collecting and managing the survey data are important for reducing the amount of error that results from an inconsistent process.

For a template with which to collect this information, please reference
Appendix C.

The Data Collection Protocol

Open Tree Map

The indicated targeted and useful information can be collected from residents using Open Tree Map (OTM). To submit information to the OTM online platform, participants must create an account. They can then use their house address to place tree locations, or they can use high-resolution aerial imagery to determine the precise location of their trees. The data that participants submit mimics that of the mail-in or online surveys, and is added to the city's cloud-based database. Administrators can restrict survey participants from editing or changing information submitted by others. More information about the Open Tree Map platform can be found in *Appendix F.*

Filling out the inventory datasheet

Please use this as a guide to complete the inventory datasheet. Tree identification, tree measurements, and tree condition rating will be explained in the sections that follow. Printable datasheets can be downloaded from

www.mntreesource.com/forms

General Information

Community Name – Write in the name of the city being inventoried

Group members – record the names of the inventory team in case clarification is needed

Date – record the date of the inventory

Zone – record the zone where the block is located (this should be on the community map)

							Does the condition exist (yes or no) and to what severity?									
Community Name:							PUBLIC TREES ONLY									
Group Member Names:							Canopy Assessment (Deduction out of 4 points)				Stem Assessment (Deduction out of 4 points)					Review data sheet for completeness before anyone leaves.
Date:																
Zone:																
General Information				Tree Information			Stag Heading/Dead Branch	Tip Die Back	Symmetry	Live Crown Ratio	Cambium Loss	Decayed Wood	Sprout/ Sucker	Stem Cracks	Included Branch Unions	Comments/ Notes
Block #	Tree #	Priv	Pub	Species	DBH (to the nearest inch)	Crown Width (to the nearest foot)	Up to 1 pt	Up to 0.5 pt	Up to 1 pt	25% or less - 2 pts 33% or less - 1 pt 50% or less - 0.5 pt	Up to 3 pts	Minimum 0.5 pt up to 4pt	Up to 0.5 pt	Up to 2 pts	Up to 0.5 pt	

Example of a hard-copy survey data collection sheet

PRIVATE TREE SURVEY - The Data Collection Protocol

Block # - the block number as it appears on your inventory map
Tree # - the number of the tree, remember no repeating numbers on a single block
Priv – check the box if the tree is on private land
Pub – check the box if the tree is on public land

Tree Information

Species – enter the common or scientific name of the tree species
DBH to the nearest 1" – Using a diameter-tape (Diameter at Breast Height)
Crown Width – the diameter measurement of the spread of the branches (nearest foot)
Measurement instructions can be found in Appendix E.

Tree Board Data Collection

With residents self-surveying their trees Fridley would best organize their volunteers by establishing a core group of trained citizen foresters to monitor the urban canopy. They will lead groups of volunteers to survey selected areas. Volunteers can go through a brief tutorial on the process of inventorying trees while providing handy tree ID guidebooks for easy identification. This is a terrific volunteering opportunity that could attract many interested parties. A weekly or bi-weekly event will be easy to organize if there is support from the local government.

A core group of citizen foresters have the potential to operate small groups of volunteers in the summer to conduct visual surveys of the city's trees. A reasonable amount of core seasonal volunteers should be from 10-15 people, divided into smaller working groups. Groups consisting of 4-8 people can work effectively in the following data collection roles to create an efficient survey process.

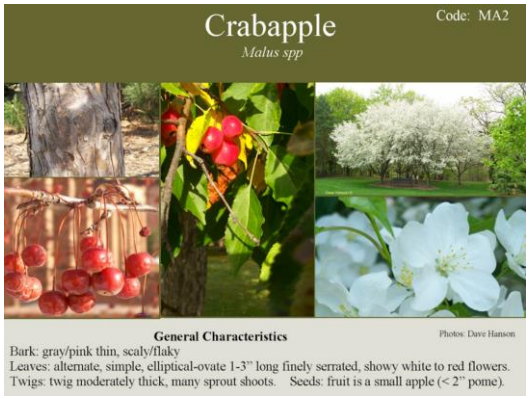
Team Leader - Educate volunteer members and distribute information on inventorying trees.
They will be in charge of the group and will establish order and procedure for the day. They may go house to house asking for permission to inventory the trees depending on the inventory protocol. They will hold business cards with the city insignia to confirm their identity.
They will make final decisions on organization of the day and where to inventory alongside guidance from city staff.

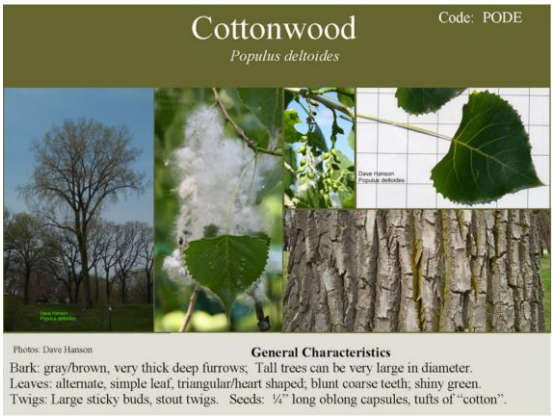
PRIVATE TREE SURVEY - The Data Collection Protocol

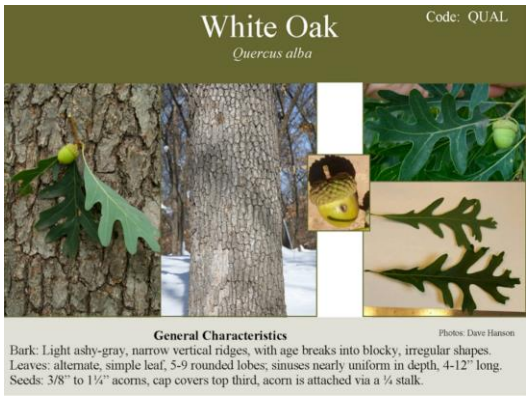
Data Collectors - They will utilize Open Tree Map to plot trees on an accurate GPS map. They will record the targeted information via smartphone or laptop.

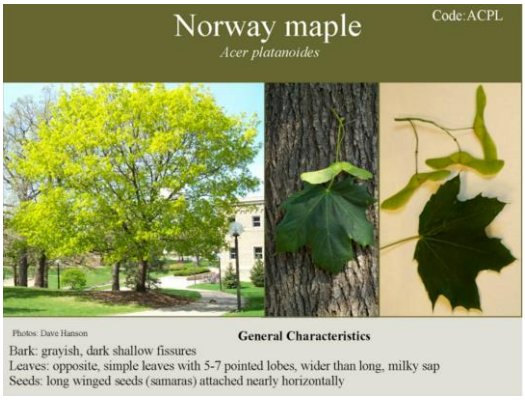
Measurers - They will assess tree DBH, crown width, and possibly tree condition factors.

Identifier - They will utilize tree ID guides to identify trees. They will also partake in possible condition reports.









The Data Management Protocol

Introduction

Collecting data for a complete inventory is very time consuming, and could require several full time workers to complete the entire city. Conducting a series of surveys is more efficient and effective, providing decision makers with valuable information that they can use to manage the urban canopy. A well conducted survey should assure less than a 10% error rate compared to the actual inventory. Both are useful in identifying areas of overplanting of one species, or a particular tree condition. Identifying areas that are at risk of the negative impacts from emerald ash borer (EAB) or have been impacted by construction projects may indicate a general trend for similar areas. For instance, a poorly maintained and old neighborhood with a prevalence of broken tree limbs may indicate sites with poor planting conditions, or invasive pests that have invaded nearby trees.

To successfully conduct a survey, the city must first be zoned by land use to identify areas with similar numbers of trees. Stratification of zones spreads the sample area across the city without excluding areas of potentially large genetic diversity from other zones. Zone types follow the major land use category within the city's zoning code. Related zones targeted by a tree survey include:

- Residential or Commercial Neighborhood
- Physical Street Layout – e.g. rectilinear blocks
- Time of Land Development – aka, age of neighborhood housing

Since a public tree inventory currently exists in the city of Fridley, zones will be stratified by residential blocks. Map generation is critical for proper organization, so a GIS technician will be very useful. These blocks are stratified using the following terms:

- Rectilinear Residential Neighborhoods (RR)- Contain the majority of street trees found in the city. These areas are typically the first developed areas of the city and often contain sidewalks with street trees.
- Curvilinear Residential Neighborhoods (CR)- Zones usually developed later within a city. These zones often do not contain sidewalks or street trees.
- Downtown (DT)- These zones typically contain trees that are at risk of high mortality due to construction and heavy traffic corridors.

Other zone features may indicate tree health, and may be incorporated into a survey as a site condition. This information will be further detailed in the site condition assessment plan. When these zones are identified, they will be shaped to include the same amount of area. Rectilinear and downtown zones will be surveyed by following the inside perimeter of a square block. This mitigates the potential for overlapping regions. Curvilinear zones are measured using the same perimeter length as the average rectilinear and downtown zones, but will survey both sides of the street. The length of the surveyed curvilinear block will be half the length of the average block perimeter due to surveying both sides. Sampling at the block level rather than randomly selecting trees is cost effective, more accurate, and mitigates variance between regions.

The following steps will detail the methods used for determining the percentage of a specific genus of tree within the city. This can be utilized for public street trees or a private survey.

Methodology for Statistical Inference of Tree Population

1. Obtain an accurate street map with a scale between 1"=400' and 1"=900'.
   Hypothesize a range of trees that are expected to be counted in the assessment, maximum of 2,300
2. Stratify the city into homogenous zones based on the three zone types: RR, CR, and DT.
   Every RR and DT zone should be between 20 and 500 blocks.
3. In each zone, assign a block number between 1 and B (the amount of blocks within the zone).
4. Calculate the average block perimeter within the RR and DT zones using random selection
   a. If there are 20-50 blocks in a zone, randomly select and measure 20% of total blocks
   b. If there are 50-500 blocks, randomly measure 10 total blocks.
   c. Measure and sum the perimeter for the selected blocks, and average this by dividing by the number blocks.
5. Weight the average block length per zone by the number of blocks within the zone.

$$\frac{\sum_{1}^{B}(Block\ Count\ x\ Average\ Block\ Perimeter)}{Total\ Number\ of\ Blocks}$$ = weighted average block length

PRIVATE TREE SURVEY - The Data Management Protocol

6. Divide Weighted Average Block Length by 2 to measure the necessary street segment length within CR zones.
   Mark off street segments in CR zones according to this number.
7. Inventory boulevards or rights of way selected zones via use of volunteers.
   Necessary information needed from inventory described in Residential Survey Design Section
8. Estimate amount of trees in city using statistical calculations
   a. Total trees within zone = # of Inventoried trees on one block x Amount of blocks within zone.
   b. Total trees= sum of total trees within each zone.
      i. Does this number seem feasible or accurate within 10% of expected number?
9. Estimate number of each tree species in city
   a. Same process as 8, however selecting each specific species to calculate.
   b. Calculate % of tree in city by dividing number of tree species by total number of trees.

Make Data Mobile

Open Tree Map provides data management tools that can assist in data analysis

This survey process reduces the amount of time a tree inventory would take by statistically inferring that similar areas will have a similar genetic makeup. Data regarding tree condition must be analyzed as well, and can typically be calculated using similar statistical methods. Managing data will be easiest through utilization of a web-based, collaborative tree inventory platform. Open Tree Map collects both bulk-uploaded and crowdsourced inventory data with both qualitative and quantitative attributes. Some basic analysis tools are available in modules for Open Tree Map, but data can also be extracted in CSV, Shapefile, or KML format with which more robust analyses can be performed. For more information, refer to *Appendix F.*

Once data is collected, it must be presented in graphic or table format for effective communication. Communicating results is crucial for justifying the work involved. Utilizing related maps, pictures, or statistics will allow for visual help in reading the data. Using Open Tree Map to depict the distribution of specific trees may reveal powerful information to decision makers that will encourage them to direct funds where necessary.

The existing public tree survey can also be incorporated into Open Tree Map to give the big picture of the tree makeup of the city. With this information and generated data from the survey, a report can be generated highlighting areas of 1) tree sparseness or 2) urban forest health concerns. Results may target areas with high prevalence of one species, areas demonstrating poor site conditions, or areas affected by invasive pests. Targeted recommendations for planting or maintaining these areas can be provided to the EQEC. These reports should be available to the public to promote community engagement and education. Since Open Tree Map can be accessed by citizens, it is important to maintain these data long term and ensure that citizens are seeing the results of their contributions.

VOLUNTEER MANAGEMENT - Introduction/Tree Board Structure

Introduction

Volunteer opportunities give people a chance to invest in the communities and issues about which they are passionate. Volunteers have the capacity to bolster community support for local initiatives and can make positive contributions to organizations that need assistance overcoming budgetary constraints. The recommendations in this section will look at how volunteer urban forestry subcommittees to the Fridley Environmental Quality and Energy Commission (EQEC) can help maintain and develop Fridley's Urban Forest.

In addition to recruiting and engaging volunteers, it is critical to reach out to the residents of Fridley to build support behind tree surveying and canopy management. Fridley's residents are essential for maintaining a healthy canopy since they are the direct recipients of their many environmental, economic, and social benefits. Public outreach, conducted with the help of volunteers, should be carried out through a three-tier strategy of best management practices and guidelines.

Tree Board Structure

It is recommended that two groups be created to help Fridley manage their canopy. The Tree Board is recommended to fulfill Tree City USA requirements. This group would be focused on surveying and making recommendations to both the Parks and Recreation Commission and EQEC. However, the community engagement side of trees is just as important and requires its own group of volunteers. This group, Friends of Fridley's Forests (FFF), will focus on public engagement and volunteerism. They will not have the reporting and recommendation power of the Tree Board, but they will act on the city's behalf to create political and social support for trees and Fridley's sustainable management plan. Utilizing a subcommittee like FFF to help make changes in the community is proven to be a powerful resource.

By dividing canopy responsibilities between the Tree Board and FFF, Fridley is ensuring a wide range of perspectives contribute to a sustainable canopy. It also creates more manageable work loads for volunteers in both subcommittees.

VOLUNTEER MANAGEMENT - Tree Board Structure

It is recommended that both the Tree Board and FFF will be subcommittees of the EQEC, reporting to them and the managing city staff member. There may be potential for the Tree Board to report jointly to EQEC and Parks and Recreation. The Tree Board will have the authority to make recommendations to larger boards while FFF plays a supporting role, advocating to citizens on behalf of the trees.

Specific responsibilities of the Tree Board

1. Advocate and promote periodic street tree surveys updating the initial street tree inventory.
2. Become trained in identification of tree diseases and pests.
3. Give targeted recommendations to the EQEC & Parks and Rec on how to improve Fridley's urban canopy.

Formation of a tree board is a core standard of Tree City USA

Specific responsibilities of Friends of Fridley's Forest

1. Engage in Public Outreach, fostering a greater environmental literacy amongst Fridley's residents most specifically relating to trees, and creating political will.
2. Recruit and properly utilize pool of volunteers to match skills with volunteer opportunities.
3. Plan the annual Arbor Day Celebration + other relevant events.
4. Maintain Fridley's urban canopy website.
5. Fundraise.
6. Become trained in identification of tree diseases and pests (if desired, though strongly recommended).

If Fridley wants to become a designated Tree City USA, it must budget $2 per citizen towards managing its city's trees. There is an incredible opportunity to use a portion of this budget towards establishing a volunteer coordinator. Cities who have hired an experienced volunteer coordinator, like Brooklyn Park, have successfully created a sustained volunteer program that continues to flourish.

VOLUNTEER MANAGEMENT - Tree Board Structure

These volunteer coordinators are able to build partnerships with community groups, engage civic organizations, school groups, faith communities, local businesses, and others who want to become more involved in the management of the city's natural resources. This position can be temporary or seasonal or a cooperative internship with a university since it is largely essential from late spring to early fall. Volunteer coordinators can also serve one city on a full-time or part-time basis or can share time with a neighboring city. They do their best work when they have program budgets for recognition, supplies, database management and funds for continuing education. The position may report to Administration, HR or the City Manager/Clerk and can define the return on investment of volunteer engagement and build new friends for the community.

Many grants are available to fund urban canopy management projects as well as related staff.

(See Appendix J)

VOLUNTEER MANAGEMENT - Gain, Train, Retain

Volunteers are a pathway to create social cohesion and organize the community around an issue or common goal. They are also a cost effective way to complete short or seasonal tasks for city staff. Both the Tree Board and Friends of Fridley's Forests can provide these and other services for Fridley if "gained, trained, and retained" effectively through best management practices.

Best Practices in Gaining Volunteers

- **Tap into existing volunteers** and community leaders. These leaders and volunteers may lack time for new projects, but they have different networks to spread the information.
- **Recruit groups**. Many groups of all ages look to do service together to fulfill requirements or for the social aspect. Volunteering for Fridley's forests would provide a consistent way for groups to gather and serve.
- **Reach out via social media and community events**. Diverse methods should be used to reach and engage a diversity of people. It is most helpful to focus on specific needs or event as much as possible.
- **Set up a time limit.** A term of service established as part of the subcommittee will help people commit to either the Tree Board or FFF. Having a set timeline with list of duties helps residents envision what they are signing up for and prepares them for their responsibilities.

Best Practices in Training Volunteers

- **Structured training program.** Organizations often run compulsory training programs which volunteers must successfully complete before they can join. These courses form an opportunity for the organization to get a sense of the commitment people are willing to make and ensures that volunteers have a shared knowledge base.
- **On-the-job training.** Every job requires some element of learning. Training or short courses should be offered or encouraged to help volunteers bridge the gap between what they know and what they need to know as new responsibilities emerge.
- **Proper training.** Training content should be built around what volunteers need to know. The best approach to developing a lean curriculum is being selective - choosing the "need to know" before the "nice to know." Be sure to provide printed resources that will be utilized.

Best Practices in Retaining Volunteers

- **Show and Tell.** Tell residents how survey results are helping Fridley with its sustainable canopy management plan. The more specific, the better. Open Tree Map can help engage and retain volunteers by providing them with an accessible, interactive, and informative data management platform. Resident volunteers can see first-hand the benefits and importance of their efforts, use the map for educational purposes, or even personalize a tree by adding a story. Citizen foresters can easily manage and monitor the efforts of volunteers to ensure high quality data.
- **Keep residents informed at every step**. Let residents know about any progress with the survey or new ideas Fridley is considering to support canopy growth and diversity via local newspapers and the city's website. Also let everyone know about new and future volunteer needs. Transparency is good for building trust and future support for urban forestry initiatives.
- **Learn what motivates each volunteer** and make their recognition appropriate to what he or she thinks is important.

Recognize your volunteers

- Give volunteers tasks in which they will be successful.
- Give volunteers whatever training is necessary to perform well.
- Give volunteers feedback.
- Invite volunteers to participate in decision making.
- Promote volunteers to other roles that take better advantage of their talents.
- Ask volunteers for their feedback.
- Ask volunteers to recruit others.
- Make sure the volunteers are doing work that is meaningful to them and the community.
- Let the volunteers know about the outcomes from the program.
- Never forget the power of a genuine thank you, oral or written.

Strategies for Resident Engagement & Outreach

If Fridley chooses to engage the potential of residents in a private tree survey, residents need to understand and support Fridley's canopy initiative. Public outreach about the purpose and goals of Fridley's canopy management plan is essential to inform residents and garner political and social support for trees. To gain and retain the interest and support of residents and increase engagement in Fridley's urban forest, the following recommendations would be best utilized by Friends of Fridley's Forests.

Educate residents about the benefits of a sustainable urban forest. Provide simple, easy to understand materials and make them widely available. Using well designed **flyers** can remove language barriers and using printed information can remove technological barriers. Sample flyers can be found in *Appendix H.* Provide all the information residents need about surveys, events, volunteer opportunities, and EQEC in one place, clearly noted on the **city's website**.

Make Data Mobile
Provide access to tools on website

Useful external resources like University of Minnesota Extension websites can be linked with permission. These resources should offer helpful information, tree identification and pest management tools. Implementing a tree calculator allows community members to calculate the benefits of the tree on their property. Along with providing printed and online resources, partnering with existing **community events** can increase the amount of people who hear about the efforts of the Tree Board and FFF. Community events reach all residents and can help build a "canopy community" while developing relationships with city staff, public works, and Friends of Fridley's Forests. Incorporating tree outreach with existing events can save money and planning energy.

Potential Partnerships for Immigrant and Minority Communities:

School carnivals, religious institutions, Northeast Hispanic Seven Day Adventist Church, Russian Orthodox Church, Church of all Nations, Islamic Center of MN, Bilal Oromo Dawa Center, Masjid Al-Israa, Michael Servetus Unitarian Society (green sanctuary program dedicated to stewardship).

Incentivize Participation. Incentives are a nice gesture when residents are taking time out of their schedule to complete private tree surveys. While the survey benefits the City of Fridley, the incentives do not have to create cost for the city; they can all be donations from supporting businesses. For example, Brewing a Better Forest in Minneapolis is a partnership between the city and local breweries and coffee shops. Residents agree to water Minneapolis street trees in exchange for a free drink at a participating sponsor. The city is improving its canopy while businesses are receiving advertising, business, and building rapport with the community. This model can easily be applied to any interested local business through coupon, discounts, or vouchers.

Make Data Mobile

Make survey data available to decision makers and interested members of the public using a web-based platform such as Open Tree Map. Residents can see first hand the benefits and importance of their efforts, use the map for educational purposes, or even personalize a tree by adding a story. Citizen foresters can easily manage and monitor the efforts of volunteers to ensure high quality data.

Involving a Volunteer Coordinator

There is an inherent tension in trying to bring about public change. Even if that change is one that would have a positive effect on the people's quality of life there is still resistance to a new method, a new aesthetic or a new perceived set of risks. Open communication and collaboration with residents can ease changes and calm concerns. Urban trees grow in a social tension, just as much as they grow in a soil medium. There is positive feedback between creating space for interested community members to participate in the management of public green space and an increase in public support for management goals. To help make this a reality, we recommend that the City of Fridley invest in a volunteer coordinator who can connect the people with the opportunity to have a positive impact in this way.

Value of a Management Plan

A management plan serves as both a unifying tool and roadmap. The plan gives city officials, and community members a shared model - summarizing what needs to be accomplished for maintenance of the existing canopy and the city's vision for future canopy development overall.

The well designed management plan discloses long term costs and benefits to inform decision making at multiple scales. Without such invested insight into the systems, local planners and managers are not able to effectively make decisions needed to address future risks, uncertainties or take advantage of opportunities. Long term planning allows cities to take advantage of state and federal partnerships.

The following section offers examples and recommendations for the design of a sustainable urban canopy management plans. We hope to show how tree ordinances, protocols, and guidelines can be used to describe the specific steps parties should take in contexts ranging from data collection to conflict resolution, ensuring consistency. These components are key for sustaining a healthy, vigorous, and safe urban canopy.

Best Practices for Tree Ordinances

A tree ordinance is an important tool for sustaining a healthy, vigorous, and safe urban canopy. A tree ordinance provides the guidelines in which forest managers work to improve the canopy. The International Society of Arboriculture published an excellent guide for developing a tree ordinance titled "Guidelines for Developing and Evaluating Tree Ordinances". A condensed reference to these guidelines can be found in *Appendix I.*

Creating a tree ordinance will also fulfill one of the four core Tree City USA standards. Adopting city ordinances to support sustainable sites and environmentally protected land use development is a best practice in achieving the next step in GreenStep City. In the process of reviewing other city's tree ordinances we found a few things to be effective, outlined below.

Creating a Quality Tree Ordinance

- Clearly stated goals
- Responsibility delegated
- Set measurable standards
- Flexible and allow for digression of responsible officials
- Contain proper enforcement methods (fines, jail terms, occupancy permit withholding)
- Part of a comprehensive canopy management strategy
- Developed with community support

Importance of Involving Community

A successful ordinance will have community support. It is important to involve the community in the formulation process. The ordinance should be written in a language that is understandable to a wide audience if the community is to be involved. Goals should be clearly stated and specific terminology – aka, jargon - should be defined.

Appropriate Tree Program Goals

- Establish and maintain maximum tree cover.
- Maintain trees in a healthy condition through best management practices.
- Promote conservation of tree resources.
- Select, situate, and maintain street trees appropriately to maximize benefits.
- Foster community support for the local urban forestry program.
- Facilitate the resolution of tree-related conflicts between citizens.

What if a property owner can't pay for removal?

When creating enforcement measures for the tree ordinance, room for exceptions and special circumstances needs to be allotted. One case is when property owners cannot afford tree removal through private companies or city maintenance and assessment. This can occur through an appeals process or deferment. The City of Maplewood addresses this issue in the following manner:

The City Council can defer the payment of special assessments if: The property is homesteaded, and the property is owned by an individual who is at least 65 years old or is unemployed due to a total and permanent disability, and the average annual payment for all assessments levied against the individual's property exceeds one (1) percent of the adjusted gross income of the individual.

High-cost abatement. If the cost of abating a nuisance from a shade tree pest will exceed five thousand dollars ($5,000) in a given year or in two consecutive years, based on a reasonable, good faith estimate from a certified arborist, the owner or occupant may request the matter be referred to the city council for a hearing as outlined in the Tree Standards. This does not apply to hazardous trees.

Disease and Pest Management Protocol

The potential for a pest or disease to wipe out a substantial portion of the canopy is an ever present concern. These exotic stressors are made more alarming due to their ability to spread within an area undetected. To maintain a healthy and stable urban forest there must be protocols to deal with these threats. Diseased trees can be incredibly burdensome for property owners due to the cost of tree removal falling to the residents. To reduce this burden for citizens, Fridley must create a protocol and budget to manage pests and diseases upon discovery. This allows for diseased trees to be quarantined or removed before further damage can occur. Both the Tree Board and Friends of Fridley's Forests have the potential and are recommended to be trained as tree inspectors and first responders. Monitoring Fridley's canopy for hazards can easily be incorporated into board member responsibilities. If FFF is trained in these measures, they have the additional potential of teaching other residents and one-time volunteers about pest and disease identification and monitoring. The more community members there are to watch for signs of disease and pest infestation, the more likely these issues will be caught in a timely manner.

Five specific diseases have the potential to inflict serious quality of life and financial damage to the people of Fridley: emerald ash borer, oak wilt, bur oak blight, Dutch elm disease, and Asian longhorn beetle.

Photo: www.na.fs.fed.us

Dutch Elm Disease (DED)

DED was discovered in Minnesota in 1961. This highly destructive fungal disease is carried by elm bark beetles from DED afflicted trees to healthy trees, where the fungus will spread and kill the elm tree. This disease is incredibly stealthy and will kill every elm tree unless properly managed. DED can affect the tree in very unnoticeable ways to the untrained eye. DED kills Elm trees by preventing water flow through the tree's xylem, so usual symptoms include noticeable leaf wilting. Symptoms often first appear in late spring and early summer but can occur any time during the growing season. Treatments make little financial sense on smaller, less shading trees. When elm trees are specifically desired for their age and stature, more involved methods may be necessary.

Dutch Elm Disease Symptoms

- Leaves on the outer crown of the tree turn yellow, wilt, and turn brown.
- Leaves fall from elm unseasonably.
- Yellowing and wilting of leaves progress from high to low on the elm.
- Brown streaking can be seen along the sapwood of wilted branches when the bark is removed.

Methods to Prevent Spread of Dutch Elm Disease

- Prune infected branches within the same season as fungal colonization.
- Prune infected branches before the disease has moved into the main stem.
- Sever root grafts prior to removing the entire tree to prevent spreading.
- Using a trained arborist, inject preventative fungicide every 1-3 years to protect trees from infection by beetle feeding.

Emerald Ash Borer (EAB)

EAB has erupted as a major invasive species in the U.S. since 2001. Since then, it has millions of ash trees have been lost and will continue without intensive management. Multiple counties in MN, including Hennepin and Anoka County, have placed ash trees in quarantine in hopes to prevent the spread of EAB. The closest infestation to Fridley is only four miles away in North Minneapolis (2016), so it is likely that it will be found in Fridley soon. Ash tree quarantines manage the transportation of ash firewood, cut trees, wood chips, and other timber products. Since Fridley is under quarantine, it is important to inform citizens about recognizing ash trees and not transporting any ash firewood or branches outside of the county.

Recognizing EAB in a neighborhood as soon as possible is the most effective way to mitigate its effects on Fridley's urban canopy. Ash makes up over eighteen percent of the public trees in Fridley, and it is likely that a similarly high percentage exists for residential trees. Both volunteers and homeowners alike must recognize the indications of EAB.

Emerald Ash Borer Symptoms and Red Flags

- Clusters of Woodpecker Holes. Woodpeckers eat EAB larvae among other insects.
- Vertical Bark Cracking. Not definitive, but often an indicator of EAB.
- An 1/8th" D-shaped hole. Insects leave this exit hole after maturing.
- Serpentine shaped insect galleries/tunnels under bark.

Methods to Prevent Spread of Emerald Ash Borer

- Remove small or poorly developed ash trees. Chip or burn after removal
- Ash trees worth saving must be treated with an insecticide between April 1-May 15.

Oak Wilt

Oak wilt is common in southeast Minnesota, with many infected trees in Anoka County. The distinction between members of the red oak family and the white oak family is important because infected red oaks are more likely to die in a single summer. White oak species can actually live for multiple years after infection, losing parts of the crown each year before eventually dying.

Oak wilt is commonly spread via two ways: 1) sap beetles that carry spores between diseased and healthy trees and 2) the pathogen can spread between two or more trees via grafted root systems. Beetles are attracted to the smell of the inner sapwood of recently wounded oaks. Red oaks are more susceptible to infection but preventative fungicidal treatments are effective, although once infected, the trees soon die. Infected white oaks can be saved.

Oak Wilt Symptoms

- Bronze-colored wilt beginning at the margin and moving toward the base of the leaf
- Branches die in a top-down fashion as wilted leaves fall off the tree
- Dark discoloration in the sapwood when bark is peeled back from wilted leaf stems
- Bare patches in an otherwise green and healthy-looking crown

Methods to Prevent Spread of Oak Wilt

- Creating two mechanical barriers around the outermost infected tree in an infested area before removal. Vibratory plows are recommended in Minnesota. To be effective, each barrier should be at least 5 feet deep. Where utility lines may be an issue, chemical barriers are an alternative.
- Burning, burying, debarking, or chipping the wood after removal.
- Not moving the wood from an infested area, even as firewood.
- Prune all oak trees in the winter months when the sap beetles are not yet hatched. Paint all wounds if forced to prune in the summer or fall months.

Bur Oak Blight (BOB)

This pathogen lived undetected in the Midwest until the mid-1990s and was only recently confirmed in southern Minnesota. It is likely this pathogen will be identified in Fridley in the near future. The spread of infection depends on the spores landing on healthy leaves, infecting new hosts. Despite this, bur oak blight seems to be a slow moving disease. The pathogen will manifest and weaken the tree, which can in turn make it more susceptible for insect predation and other infections. BOB can be successfully controlled with fungicidal injections.

Bur Oak Blight Symptoms

- Vein necrosis (black spots) in the leaves
- Brown, wedge-shaped lesions that are delimited by the veins in the leaves
- Leaf death
- Persistent leaves during the winter months
- Symptoms showing from the bottom of the canopy and upward

Methods to Prevent Spread of Bur Oak Blight

Spores can travel from tree to tree by rainfall and morning dew. They can also spread via wind, so quarantining infected trees is difficult. The focus of management is either on removal or injection of a fungicide on a 2 year cycle. After removal of an infected tree, it is important to not introduce the wood to an uninfected area, even as firewood.

Asian Longhorned Beetle (ALB)

ALB is not yet in Minnesota, though there is a high probability that it will be in the future. ALB is an invasive wood-boring insect that currently threatens the Northeastern portion of the country. ALB risks many species of hardwood trees, including members of the maple, birch, ash and elm genera. This insect is spread via the movement of trees and firewood by people. If it were to spread nationwide it would be expected to kill **30%** of all urban trees.

Asian Longhorned Beetle Symptoms

- Dime-sized, perfectly round exit holes on the larger limbs of the crown
- Dead or dying limbs
- Yellowing of leaves when no drought conditions are present

Methods to Prevent Spread of Asian Longhorned Beetle

- Enforce DNR Legislation that prohibits the movement of firewood
- Chipping infected trees on-site before moving

These management strategies must not conflict with the current management protocol, but should enhance it. Many of these diseases can be identified by well trained or educated volunteers or homeowners. Open Tree Map allows for citizen foresters to mark potentially afflicted trees in their neighborhood to assist in the management of pests and diseases. Volunteers conducting surveys must be aware of these symptoms while identifying trees, otherwise serious red flags can be overlooked and tree communities will fall.

The community must work in conjunction with the Urban Forester to efficiently manage pests and diseases before mass colonization and death. First responders must be utilized as they are properly trained and dedicated to protecting the urban forest. Finally, management practices must be implemented into Fridley's budget. An adequate budget will allow Fridley to curb potential threats and properly allocate resources to protect the environment. Assisting citizens to remove their trees will prevent persistence of pests, as often immediate cutting is an effective control.

USDA Plant and Animal Disease, Pest Control, and Animal Care Grant

Funding is available to conduct a private tree inventory for better pest and disease management in sustainable urban forestry plan.

Photo: www.hungrypests.com

Purpose

The goal of a tree preservation plan is to provide guidelines and best practice methods to aid in the preservation of the benefits that urban trees provide. While the successive planting of new trees is an important part of managing an urban forest, those trees that grow in the the constructed urban environment contend with the limitations stresses of the engineered world. The multiple uses of land in cities places trees in close proximity to many, sometimes conflicting land uses. This proximity may create conflict, especially in land preparation for construction. Having the best protocol in place can prevent stress and damage to urban trees. Following the guidelines in a tree preservation plan is an economically efficient investment which provides a great deal of benefit to the city.

It is worth noting the progress other cities in the metro region have made in securing their urban canopy. Here is the work that a few of Fridley's neighbors are doing to preserve their urban forests:

- The City of Shoreview has provided in their municipal code for the preservation of existing woody vegetation to be "left intact to the maximum extent possible to retard surface runoff and soil erosion, to utilize excess nutrients, and to conserve nutrients in the soil and to preserve shoreland aesthetics." (Ch. 200 §209.050).
- The City of Oakdale has incorporated a tree preservation provision into their city code. With requirements listed for the planning and implementation of construction and development projects. Developers are required to prepare, implement, and submit a tree preservation plan for any site for which application for a city grading permit is being made and trees will be affected.

It is our recommendation that the City of Fridley adopt a protocol to ensure the preservation of their urban forest.

Tree Preservation Plan

A successful tree preservation plan will guide a city through the process of protecting and conserving their natural tree resources with the use of best management practices. Best management practices are standards that landscaping and tree care professionals widely accept and utilize during the process of site planning and maintenance. These practices will include the following:

1. **Construction and Demolition Regulations**
2. **Site Protection Outline**
3. **Existing Tree Resources Protection Standards and Rules of Conduct**
4. **City Expansion Guidelines and Party Collaboration**
5. **Tree Removal and Replacement**
6. **Selecting and Transplanting New Trees**

The hope is that this preservation plan will be constructed in collaboration with the results of the tree surveys that have been processed in Open Tree Map, and the Tree Board's reports to the Environmental Quality and Energy Commission. This data will allow for the creating of tree protection zones to be established in areas where trees are of the greatest public benefit.

(1) Construction and Demolition Regulations

A vast amount of the environmental impacts cities experience generally come from construction disturbance . Because of the sizable impacts that a site development project can have on existing trees, precautions must be taken to avoid harm. The developers and construction crews have the ability to implement a site protection plan prior to and during site development, whereas actions taken later may be too little too late. We recommend that the city require developers to do the following:

- Prepare a site protection plan that shall be submitted to the Environmental Quality and Energy Commission (EQEC) for review. (See Section Below)
- Implement the Site Protection Plan prior to and during site development.
- Submit a performance guarantee for compliance with the site protection plan.
- Comply with the city's Tree Replacement Schedule.

If a site protection protocol is not implemented or followed, detrimental health affects to the trees will likely follow. These tree health problems, which will also cause future financial burdens, can all be simply avoided by planning ahead.

Consequences to parties that break these rules should be enforced. A tree preservation enforcement officer could be implemented to make sure standards are being followed. Possible consequences issued could include the following:

- Payment fine per day until standard or regulation is met;
- Value of the tree damaged or killed would be the fine owed.
- Party would be required to replace or plant a given amount of trees for every tree killed or damaged.

(2) Site Protection Outline

A well formulated Tree Preservation plan should include a Site Protection Outline. This outline will allow for the best possible site layout to be made while protecting the health and vitality of existing trees. The following factors should be considered and addressed before any site development or construction begins.

- The name(s) and address(es) of property owners and Developers.
- Delineation of the buildings, structures, or impervious surfaces situated thereon or contemplated to be built thereon.
- Delineation of all areas to be graded and limits of land disturbance.
- Size, species, and location of all significant trees and significant woodlands located within the area to be platted or within the parcel of record. For significant woodlands and large wooded sites, a representative sample may be used to determine the number of significant trees outside the limits of land disturbance.
- Measures to protect significant trees and significant woodlands. (See Section Below)
- Identification of all Significant Trees and Significant Woodlands proposed to be removed within the construction area.
- Size, species, and location of all replacement trees to be planted on the property in accordance with the Tree Replacement Schedule.
- Signature of the person preparing the plan.

(3) Existing Tree Resources Protection Standards and Rules of Conduct

In order to protect the existing tree resources that Fridley already has, rules of conduct and protection measures should be set in place to guarantee the success of tree preservation. This conduct should include the following:

- Trenching alternative such as tunneling or directional drilling
- If trees are harmed, position a fixed support structure around the tree
- Irrigation to trees that are isolated by construction activities
- Dust control around construction sites
- Report any Injury to trees as soon as they are discovered
- Alternative Methods for Hardscaping (Pathway Installation)
    - Grinding a raised walkway or concrete pad
    - Ramping the walkway surface over the roots or lifted slab with pliable paving.
    - Routing the walkway around tree roots
    - Permeable paving materials (e.g., decomposed granite),
    - Interlocking pavers, or flagstone walkways on sand foundations
- Prevent soil erosion with the appropriate mitigation methods.

(4) City Expansion Guidelines and Party Collaboration

With the site protection plan in place, City expansion can begin. Every expansion or planting project will involve multiple parties with different interests and assignments. These parties must work together to comply with protection standards to avoid future environmental and tree health complications. Guidelines for all parties to follow would include the following:

- Delineation of critical areas (tree preservation zones)
- Consideration of critical areas in development
- Contouring of pathways
- Pairing underground utilities in the same channel
- Protective tree fencing established

(5) Tree Removal and Replacement

Although it is vital to preserve and protect the tree resources already available in the city of Fridley, it is also unrealistic to preserve every tree. Trees that are at risk of failure should not be saved and should be removed and replaced. Examples of when this would be appropriate would be if the tree shows signs of:

- Being structurally unstable and thus hazardous
    - Evident internal cavity formation
- Being diseased
    - Shows signs of cankers, decay, or dead and dying limbs
    - Shows signs of nutrient deficiencies, unhealthy leaves
    - Evident insect attack
- Having severe injury
    - Has broken branches
    - Has large frost cracks
    - Mechanical injury
- Having poor projected adaptability to new site conditions
- Considered an obstruction or risk to other city assets
    - Is found to be located too close to new construction
    - Prevents clear street sight lines
    - Obstructs sidewalks
    - Risks damages to private or city property

Trees that are young, healthy, or vigorous are the best individuals to save when determining whether or not to save a tree. These trees have the best chance of surviving the stress caused by environmental change such as construction.

(6) Selecting and Transplanting New Trees

After a site plan has been finalized, trees can then be chosen for planting. The most common growing methods for trees include being grown in containers and in balled and burlap bags. A few issues associated with these growing methods include root systems that can become encircled and weak. Inspection before purchase, buying high quality stock, and planting properly is the best way to avoid future tree health problems. Aspects of trees that should be looked at before purchase include the following:

- Tree injury
    - Branch damage
    - Harm to bark
- Root damage
    - Small, loose soil balls
    - Undersized containers
    - Pot-bound root symptoms
- Signs of disease
    - Leaf spots
    - Canker, blight, or rust signs
    - Bacterial infections
    - Signs of insect pests or galls

Every city is faced with a unique set of challenges, and there is no "one size fits all" model for managing an urban canopy. Qualitative natural resource management standards should be applied with care, plans should reflect local resource availability, governance structures, and histories. While some best practices are born out of a world of physical constants or broader social structures, even these recommendations must be communicated in a way that is responsive to the local circumstances.

There are methods that have been shown to work time and time again across localities, and city managers should not be forced to reinvent the wheel when it comes with improving the quality of local natural resources. We as students from the University of Minnesota have had a chance to work with planners, arborists, and operations managers from the City of Fridley. Through the process of synthesizing, adapting, and applying the knowledge and resources we have gathered in our study, we hope that this report can be used as the start to a thoughtful conversation about how Fridley's urban canopy might be managed in the future.

We know that urban green space has the power to promptly reflect and enhance local identity. The natural features of any city reflect the values and the complex culture of the surrounding communities. We hope that this report is a useful tool for those who read it and becomes a piece of that conversation when thinking about how to best affect the communities we live in.

FNRM 4501/5501

Managing Public Greenspaces for People

University of Minnesota

Site Conditions and Planting Guidelines

	Salt Tolerant	Drought Tolerant	Under Power Line	Boulevard	Park	Maintenance Requirement
Seedless ginkgo "Autumn Gold" (*Ginkgo biloba*)	Spray	Tolerant	No	Yes	Yes	Low
Thornless honey locust (*Gleditsia triacanthos var. inermis*)	Soil & Spray	Tolerant	No	Yes	Yes	Low
Japanese tree lilac (*Syringa reticulate*)	Soil & Spray	No	Yes	Yes	Yes	Low
Seedless kentucky coffeetree "Espresso" (*Gymnocladus dioicus*)	Soil & Spray	Tolerant	No	Yes	Yes	Low
Tamarack (*Larix laricina*)	Spray	No	No	Yes	Yes	Moderate
Swamp white oak (Quercus bicolor)	Soil	No	No	Yes	Yes	Moderate

Site Conditions and Planting Guidelines continued

	Salt Tolerant	Drought Tolerant	Under Power Line	Boulevard	Park	Maintenance Requirement
Ohio buckeye (Aesculus glabra)	**Soil**	**Moderate**	**No**	**Yes**	**Yes**	**Moderate**
Thornless cockspur hawthorn (Crataegus crus-galli inermis)	**No**	**Tolerant**	**Yes**	**No**	**Yes**	**Moderate**
Prairie Crabapple [Malus (Prairiefire)	**No**	**No**	**Yes**	**Yes**	**Yes**	**Low**
Amur maackia (Maackia amurensis)	**No**	**Tolerant**	**Yes**	**Yes**	**Yes**	**Low**
Bur oak (Quercus macrocarpa	**Soil & Spray**	**Tolerant**	**No**	**Yes**	**Yes**	**Low**
Hackberry (Celtis occidentalis	**Soil**	**Tolerant**	**No**	**Yes**	**Yes**	**Low**
Hardy rubber tree (Eucommia Ulmoides)	**Soil & Spray**	**Tolerant**	**No**	**Yes**	**Yes**	**Low**

Local Training Resources

First Responder Training

Available through University of Minnesota Extension. A program focused on invasive species put on through the University of Minnesota. A one-day workshop costs $50. However, funding is available if a large group of people are interested in training.

http://www.myminnesotawoods.umn.edu/forest-pest-first-detector

Tree Inspector Training

Available through University of Minnesota. The Tree Inspector program requires workshop attendance and a passing grade on an exam at the course's end. This certification costs $85 and lasts 1-2 years depending on time of certification. If subcommittee members are committing to multiple year terms, this could be a worthwhile investment. Otherwise, city staff in public works and parks and recreation should receive training to begin developing a knowledge base in Fridley.

http://www.mntreeinspector.com

Minnesota Shade Tree Short Course

The STSC is held every spring and offers an opportunity for volunteers and staff to mature and learn to retain and manage Minnesota's greatest assets and nurture regeneration. The STSC hits all of the tree care and urban forestry topics, from planning to planting, pruning to preservation. More importantly, though, it is that time of the year that pulls us all together again as we mature and regenerate, learn and teach.

www.mnshadetree.com

Tree Survey Template

Community Name:			PUBLIC TREES ONLY									
Group Member Names:			Crown Assessment				Stem Assessment					
Date:												
Zone:												
Tree Information			Stag Heading	Tip Die Back	Live Crown Ratio	Total from Canopy	Cambium Loss	Exposed or Decayed Wood	Sprout/ Sucker	Stem Cracks	Total from Stem	Comments/ Notes
Species	DBH (to the nearest inch)	Crown Width (to the nearest foot)	Up to 1 pt	Up to 0.5 pt	25% or less - 2 pts 33% or less - 1 pt 50% or less - 0.5 pt	Excel will substract the sum of the deductions from 4 pts	Up to 3 pts	Minimum 0.25 pt	Up to 0.5 pt	Up to 2 pts	Excel will substract the sum of the deductions from 4 pts	
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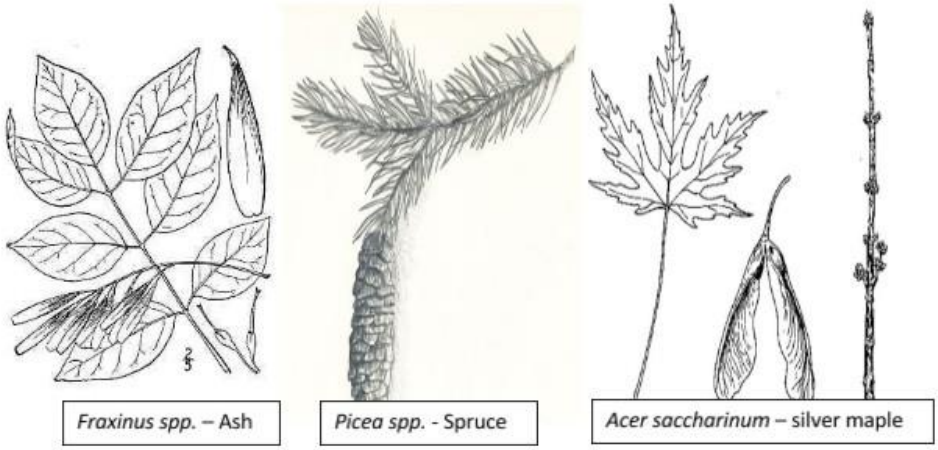
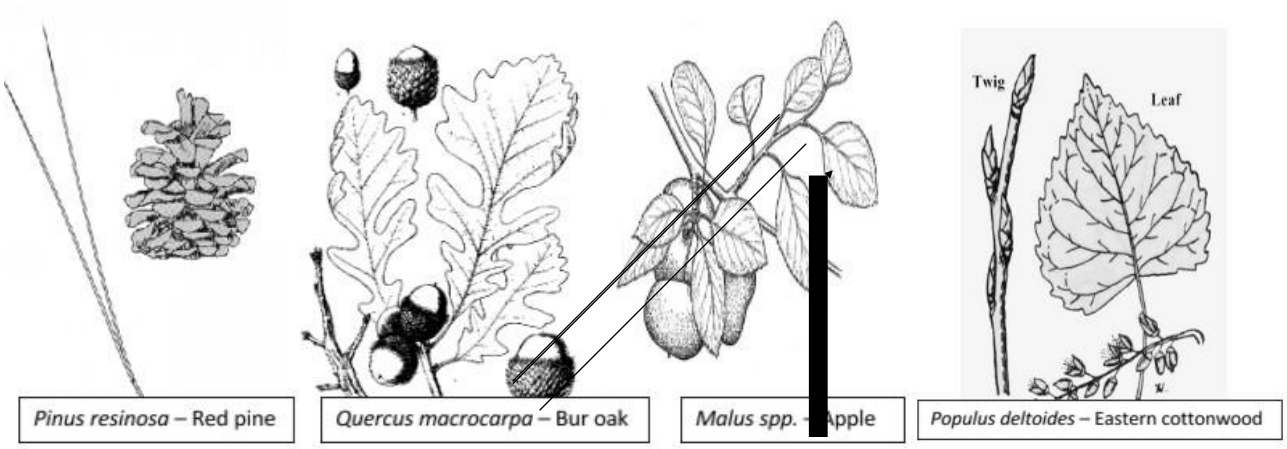
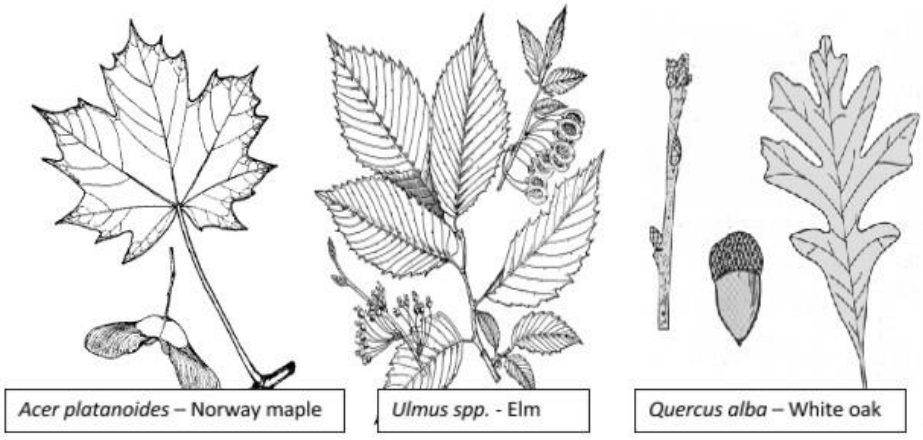
APPENDICES - Appendix D - Top Ten Abundant Trees



Fraxinus spp. – Ash | *Picea spp.* - Spruce | *Acer saccharinum* – silver maple



Pinus resinosa – Red pine | *Quercus macrocarpa* – Bur oak | *Malus spp.* – Apple | *Populus deltoides* – Eastern cottonwood



Acer platanoides – Norway maple | *Ulmus spp.* - Elm | *Quercus alba* – White oak

Fridley's 10 Most Common Tree Species

Tree Measuring Guides

Measuring Diameter at Breast Height (DBH)

Overview
DBH stands for diameter at breast height which is a standardized point on the trunk 4.5 feet from the base for the tree. DBH can be measured using a diameter tape (D-Tape). Circumference can be measured using a standard measuring tape, and then converted to a diameter measurement by dividing the circumference by pi, 3.14.

Procedure
Using a D-Tape 1.

1. Measure 4.5 feet from the ground to a point on each volunteer, this will be your personal "breast height". Remember your "breast height" location
2. While standing next to the tree, wrap the D-tape around the tree (at the point determined in step 1). If the tree is on a slope, take this measurement on the up-hill side of the tree.
3. There are 2 sides on most D-tapes:
    a. One side measures distances in feet, similar to a standard measuring tape.
    b. The other side has been converted to measure diameter. **Make sure to use the diameter side of the tape when measuring DBH!**
4. To read the measurement, wrap the DBH tape completely around the tree at breast height. Record the number where the zero meets the tape. This is the tree's diameter.

Measuring Crown Width

Overview
Crown width refers to the average diameter of a tree's crown (the spread of the branches) and is used to calculated information regarding tree canopy cover and rainwater interception. A tree's crown diameter can be approximated by measuring radial measurements.

Measurement Method 1

1. One volunteer should stand under the edge of the canopy holding one end of the tape measure.
2. A second volunteer should walk with the opposite end of the tape measure to the center of the tree's trunk, remember or jot-down the distance (in feet). **HOLD the TAPE TIGHT!**
3. Select a side of the tree is approximately 90 degrees from the location in step 1.
4. Repeat Steps 1 & 2
5. To determine crown width, add the two radii measurements together and record diameter on your inventory sheet.

Measurement Method 2
(requires a flexible tape at least 50 feet long)

1. One volunteer should stand under the edge of the canopy holding the beginning of the tape.
2. A second volunteer should walk with the opposite end of the tape measure and wrap the tape around the trunk at approximately 90 degrees and walk to the edge of the canopy.
3. Read and record the total feet (rounding to the nearest foot) from the tape.

Note: Both methods should record the same measurement. Method 1 requires two measurements, whereas Method 2 only requires one measurement.

Open Tree Map

OTM (OpenTreeMap.org) is a web-based crowdsourcing platform that engages communities in urban forestry management. Not only does the system collect crowdsourced data, but entire inventories can be uploaded, analyzed, and shared within the collaborative application. The platform is mobile friendly, which allows users to submit data while in the field.

Cost

The code for OTM is available for download and developed independently at no cost. However, subscription service packages are easy to implement, manage, and are available at reasonable pricing.

The base subscription package is available for just $77 per month and allows users to manage up to 25,000 trees. This package also allows users to export/input data, customize fields, and utilize the mobile app.

The Customization Module is available for an additional $99 per month, and allows the user to implement a more unique and robust application. Some of the extra features in this module include creating customized stewardship roles and implementing a more refined mobile app.

Need Trees? Additional tree allotments can be purchased in increments of 5,000. The price increases exponentially as tree allotments are added.

75,000 Trees = $319/mo (Base Package)

150,00 Trees = $658/mo (Base Package)

Open Tree Map cont.

How it works

Organizations first create an account and begin a map.

Existing tree inventory data can be uploaded from a CSV file. Fields can be added, edited, or hidden from certain user groups.

Volunteers must create an account to access the map. Once they have access, trees can be placed by entering an address or by using the interactive map to find tree locations. Volunteers can then add information about the tree such as: species, DBH, condition, and any comments. Volunteers will only see the trees and fields that administrators allow. For example, if a city would like resident volunteers to view and edit private trees, they can hide the public trees.

Administrators (or an additional editor role) can monitor and manage the data submitted by volunteers to ensure the highest quality product.

Data can be downloaded as a KML, Shapefile, or CSV file. OTM also makes analysis tools available for users to determine optimal planting areas and calculate impact over time, among other operations.

Impact

By opening a platform such as OTM to the community, citizens become empowered and can easily become invested in the sustainability of the community. Residents can see the economic impact that a healthy urban forest can have on their city, and report when trees have are failing or in need of attention.

The accessibility and user-friendly interface make OTM an effective educational tool. Using and submitting data to a tree map can help students learn about science, math, climate change, and civic responsibility.

OTM can be utilized and shared through popular social media applications to help spread the impact to the entire community.

Website

https://www.opentreemap.org/

Additional Resources

Web Resources

Calculating Stormwater Credits

http://stormwater.pca.state.mn.us/index.php

Calculating_credits_for_tree_trenches_and_tree_boxes#Methods_for_calculating_credits

Community Engagement: Tree Inventory Manual

http://www.mntreesource.com/uploads/2/0/7/0/20706756/communitymanual-_2014.pdf

MNDOT Plant selector

http://dotapp7.dot.state.mn.us/plant/

Missouri Botanical Garden Plant Finder

http://www.missouribotanicalgarden.org/

Tough Trees and Shrubs for Tough sites

http://www.extension.umn.edu/garden/yard-garden/trees-shrubs/tough-trees-and-shrubs-for-tough-sites/

Volunteer Resources

Energize, Inc.

An international training, consulting and publishing firm managed by volunteer leader Susan J Ellis. Free website includes an always updating A-Z list of volunteer management guidelines and resources.

https://www.energizeinc.com/

Minnesota Association for Volunteer Administration (MAVA).

Unites administrators of structured volunteer programs as well as those who have an interest in promoting volunteerism across Minnesota and provides contacts to cities for ideas and advice.

http://mavanetwork.org/

Volunteermatch

Connects organizations with local volunteers and provides free online training to new coordinators via webinars.

Volunteermatch.org

Minnesota Association for Volunteer Administration
Building the Profession

Resources for Cities on Volunteer Engagement:

Volunteer Management Contacts

One of the most requested resources by cities regarding volunteers is for ideas on who to talk with in other cities. The following is a list of contacts at cities who welcomed others to call them. This information was gathered in a survey done by the Minnesota Association for Volunteer Administration (MAVA) in July 2015.

City Contact Information	Volunteer Positions Provided
Apple Valley, Inver Grove Heights, Rosemount, West St. Paul Diane Erickson, Volunteer Engagement Manager derickson@wspmn.gov	• Community Volunteer • Finance Volunteer • Endangered Species Volunteer • Office Support • Document Imaging Volunteer • Police Department Assistant Volunteer • Fire Department Educator • Golf Course Volunteer • Public Works Volunteer • Facility/Maintenance Volunteer • Customer Service Volunteer
Blaine Diane Heitkamp, Parks and Recreation dheitkamp@ci.blaine.mn.us	
Bloomington - Parks and Recreation Jackie Doncavage, Recreation Supervisor jdoncavage@bloomingtonmn.gov	• Teen Volunteers • Adaptive Softball Volunteers • Junior Counselors • Park Clean-Up Volunteers
Brooklyn Park Josie Shardlow, Community Engagement Coordinator josie.shardlow@brooklynpark.org	• Measurement Team member • Core Planning Team member • New Connect volunteer (Welcome Wagon)

City Contact Information	Volunteer Positions Provided
Brooklyn Park Amanda Jamison, Special Events amanda.jamison@brooklynpark.org	• Event volunteer • Arts and Crafts • Park Clean Up
Eagan Kerry Phillips, Recreation Supervisor kphillips@cityofeagan.com	
Edina MJ Lamon, Project Coordinator mlamon@edinamn.gov	• Police and Fire Chaplains • Reserves • Coaches
Hastings Phil Vargas, Sports & Recreation Supervisor pvargas@hastingsmn.gov	• Support Staff
Minneapolis Jeanette Wiedemeier Bower, Program Development Coordinator/Volunteer Coordinator Jeanette.Wiedemeier@minneapolismn.gov	• Dog Walkers • Cat Cuddlers • Photographers • Paw Patrol (events) • Admininstrative Team

City Contact Information	Volunteer Positions Provided
Minnetonka Dave Johnson, Recreation Services Director djohnson@eminnetonka.com	• Water resources volunteer • Restoration Volunteers • Police Explorers • Youth Sports Coach • Historical interpreter
Moorhead Leann Wallin, Community Policing Coordinator leann.wallin@moorheadpolice.com	• Police Volunteer • Beautification Volunteer • Youth Coach • Special Event Volunteer • Hjemkomst Center Volunteer • Comstock House Volunteer
Mounds View Desaree Crane, Assistant City Administrator des.crane@comcast.net	• Planning Commissioners • Charter Commissioners • Festival in the Park Committee • Economic Development Commission • Streets and Utilities Committee • Parks Recreation and Forestry Commission
Plymouth Jackie Maas, Volunteer Coordinator jmaas@plymouthmn.gov	• Front Desk • Greeter • Hockey • Ticket taker • Clerical Aide • Soccer Coach • Summer Teen Volunteer • Police Reserve • Adopt a Park/Trail/Street

Minnesota Association for Volunteer Administration
Building the Profession

City Contact Information	Volunteer Positions Provided
Roseville Kelly O'Brien, Volunteer Coordinator kelly.obrien@cityofroseville.com	• Parade Planning Committee • Display Case Designer • Special Events • Citizen Park Patrol • Adopt-a-Park • Natural Resource Restoration Steward • Litter-Free Roseville Team • Many, many more
South St. Paul Deb Griffith, Community Affairs Liaison Deb.griffith@southstpaul.org	• Blooming Parks Volunteers • Streets in Bloom Volunteers • South St. Paul Police Reserves • South St. Paul Mayor's Youth Task Force • Homebound Volunteers • Weed-Be-Goners
St. Louis Park Laura Smith, Volunteer Coordinator lsmith@stlouispark.org	• Photographer • Fire Hydrant Painting • Park Adoption • Adopt - a- Spot • Community Emergency Response Team • Archiver
Wayzata Kristin, Communications Specialist volunteers@wayzata.org	• Volunteer Committee Member

Thank you to Bush Foundation for funding this initiative on city volunteer engagement

Sample Flyers

Photo courtesy of Carl Reim

VOLUNTEER THIS SUMMER

PROTECT *OUR* URBAN FOREST FOR A LIFETIME

Become a Citizen Scientist with the Friends of Fridley's Forest!

This summer, we are conducting our very 1st resident tree inventory!

Attend a **free, one-day** training session and you can lead your fellow neighbors in surveying our urban forest! No prior experience necessary!

We will use the information that you collect to make decisions to better our urban forest. Protecting this resource is good economically, environmentally, and socially!

Become an Expert in Identification and Health

Meet Your Neighbors!

Contribute to the City of Fridley's Urban Forest Plan

Help Improve Our Environment

FRIENDS OF FRIDLEY'S FOREST
6431 University Ave NE
Fridley, MN 55432
(763) 571-3450

FridleyMN.gov/FFF

May 7th at 11am
OR
May 28th at 3pm

Sample Flyers cont.

Does Money Grow on Trees?

The Bigger the Trees, the Bigger the Benefits

Average Annual Net Benefits:

- $3 to $15 for a small tree
- $4 to $34 for a medium tree
- $58 to $76 for a large tree

These net benefits do not include saved heating/cooling costs, so are likely to be higher on private property.

United States Department of Agriculture, Forest Service

- **Reduce Energy Costs:** Shade from trees reduce cooling costs in the summer and provide a wind buffer to cut heating costs in the winter.
- **Increase Property Values:** Studies suggest that each tree increases values by 1% with large trees adding 10%+ value.
- **Better Business, More Revenue:** In commercial areas with a healthy canopy, the number of shopping trips, the amount of time spent shopping, and the amount spent/willingness to pay increase by over 10%. Shoppers are also more willing to **pay for parking**.
- **Stormwater Management:** Trees slow and reduce rainfall runoff and increase the amount of water absorbed by soil, reducing soil erosion/flooding and their costs.
- **Reduce Crime Rate:** People are more likely to use spaces with a healthy tree canopy. More "eyes on the street" discourages crime.

Friends of Fridley's Forests

6431 University Ave NE
Fridley, MN 55432

(763) – 571 – 3450

FridleyMN.gov/FFF

An investment today can keep money in your pocket tomorrow.

Sources: Anderson, L.M.; Cordell, H.K. "Residential Property Values Improve by Landscaping With Trees." Southern Journal of Applied Forestry, 9 (1988): 162- 166.; McPherson, E.G., J.R. Simpson, P.J. Peper, S.E. Maco, S.L. Gardner, S.K. Cozad and Q. Xiao. 2005. Midwest community tree guide: benefits, costs and strategic planting.; Wolf, K.L. 1999. "Nature and Commerce: Human Ecology in Business Districts."

ISA Tree Ordinance Guidelines

This outline is a condensed version of the Tree Ordinance Guidelines produced by the International Society of Arboriculture.

1. Title

Purpose: To give the ordinance a brief descriptive title.

2. **Findings**

Purpose: To set forth the reasons the local government finds it necessary to adopt an ordinance.

Notes: This section is frequently used to present a list of benefits provided by trees and justify the local government's interest in protecting the tree resource.

3. Purpose and intent

Purpose: To set forth the goals to be achieved through the ordinance.

Notes: In this section, you should clearly state the goals you hope to achieve by enacting the ordinance.

4. Definitions

Purpose: To define keywords which are to be used in the ordinance.

Notes: It should become clear which terms require a definition as the ordinance is drafted. Communities have found it necessary to define what they mean by such words as “tree", "street tree", "prune", "Director","damage", "parkway" and many others.

5. Determination of definitions

Purpose: To establish an authority responsible for interpreting definitions.

Notes: The application of many provisions may hinge on the definitions of key terms. This provision reduces the chance that ordinance enforcement could be challenged on the basis of specific definitions.

6. **Jurisdiction**

Purpose: To set forth the jurisdiction of the local government over certain groups or classes of trees.

Notes: The example is typical of street tree ordinances. Some cities claim jurisdiction over trees on private property under certain situations as well.

ISA Tree Ordinance Guidelines cont.

8. Local government disclaims liability

Purpose: To avoid accepting liability for any personal injury or property damage caused by trees on private property.

Notes: Legal counsel should be consulted for an expert opinion on the drafting and validity of such clauses. A provision of this nature is usually included if a local government claims the authority to abate hazardous trees or regulate tree pruning and removal on private property.

10. Appeals

Purpose: To establish a procedure whereby decisions of the tree program manager can be appealed.

Key elements:

- Types of decisions subject to appeal
- Procedure for filing appeals
- Time limitations for appeals and responses to appeals
- Requirement to suspend actions during the appeal process
- Hierarchical sequence of appeals
- Rules governing the hearing process, unless provided for elsewhere

Notes: The appeal process provides a check against the authority of the tree program manager.

11. Penalty for violation

Purpose: To establish penalties for violating provisions of the ordinance.

12. Enforcement

Purpose: To designate the position responsible for enforcing the ordinance.

13. Performance evaluation of ordinance

Purpose: To provide for evaluation of the success of ordinance provisions.

ISA Tree Ordinance Guidelines cont.

15. Designate administrative responsibilities

Purpose: To assign responsibility and authority for implementation and enforcement of the ordinance.

Key elements:

- Position(s) responsible for implementing provisions of the ordinance
- Responsibilities assigned to each position
- Confirmation of authority necessary to carry out specified duties

Notes: A provision to designate responsibility for ordinance implementation is a basic requirement of any tree ordinance. This provision can also be used to help accomplish any of the specific urban forestry management goals, since it assigns the responsibility and authority for management activities.

21. Responsibilities of property owners

Purpose: To set forth any responsibilities for maintenance of trees, either public or private, assigned to property owners.

Key elements:

- Designation of responsible parties
- Assignment of responsibilities
- Performance standards for maintenance activities

Notes: In many communities, residents are responsible for some types of tree maintenance, particularly for trees which extend over public rights-of-way. In such cases, it is the responsibility of the municipal tree program to provide information on the types of care to be provided and complete instructions on proper methods. For example, if residents are responsible for tree trimming to maintain clearance for pedestrian and vehicular traffic, standards for clearances and information on proper pruning methods should be readily available to residents. Even if standards are set and distributed, the municipality may still have little control over the quality of maintenance performed by residents. As an alternative, the municipality may simply require residents to notify the tree program when problems occur, and have work done by municipal crews or contractors. This allows for greater control over the quality of tree maintenance.

ISA Tree Ordinance Guidelines cont.

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ISA Tree Ordinance Guidelines cont.

26. Situations which are declared to be public nuisances

Purpose: To define unacceptable situations which are subject to abatement by the local government.

Notes: Conditions and situations that jeopardize public health and safety are most commonly declared to be public nuisances. Hazardous trees and trees which obstruct travel or line of sight may fall into this category. Situations that threaten the health of the urban forest or are contrary to the community forest management strategy may also be declared nuisances. This second category includes trees which harbor diseases or insect infestations that may readily spread to adjacent trees and species which are considered undesirable. Improper maintenance practices which can lead to tree death or disfigurement have also been declared to be public nuisances in some communities.

28. Licensing of private tree care firms

Purpose: To improve care of private trees by ensuring that firms performing tree maintenance are qualified and have appropriate liability insurance coverage.

Key elements:

- Types of tree maintenance that require special licensing
- Requirements for professional qualifications
- Liability insurance requirements
- Method of documentation
- Authorization to suspend or revoke licenses for violations

Notes: Improperly performed tree maintenance work, including pruning, cabling, and removal, can cause property damage and endanger public health and safety. Therefore, many community tree ordinances require that firms engaged in tree work carry liability insurance.

Grants and Funding

	Grant Information	Purpose	Use for Fridley
Project UP	actrees.org	Transform under-utilized urban spaces into beneficial community resources.	Funding for tree planting projects within certain areas of the city.
2017 National Urban and Community Forestry Grant Program	Grants.gov: USDA-FS-UCF-01-2017	National urban and community forestry projects on nonfederal public land.	Funding for planting and inventory of private trees to better understand pest/disease issues and impacts.
USDA Plant and Animal Disease, Pest Control, and Animal Care Grant	ric.nal.usda.gov/10025	Conduct surveys, inspections to detect and appraise infestations, eradication and control activities, and carry out regulatory actions to prevent interstate spread of infestations and diseases.	Funding to conduct private tree inventory for better pest/disease management in sustainable urban forestry plan.
Global ReLeaf	americanforests.org/our-programs/global-releaf-projects/global-releaf-grant-application	Global ReLeaf tree planting projects provide long-term environmental, economic, and social benefits. We do occasionally work in urban areas with smaller parcels of land.	Funding for tree planting as well as invasive removal, site preparation, and tree maintenance.

Grants and Funding cont.

Arboriculture Education Program Grant	treefund.org/grants/education-program-grants/arboriculture	Supports the development of arboriculture educational programs and materials for K-12 students. Projects must relate to arboriculture or urban forestry and include a hands-on component.	Possible resource in connecting children and their families in the community to Fridley's urban forestry. Targets families and community building as well as education for residents of Fridley.
Community Innovation Grant	bushfoundation.org/grants/community-innovation-grants	Community Innovation Grants support communities to use problem-solving processes that lead to more effective, equitable and sustainable solutions.	Fridley can define their community and their issue. Possible resource for developing a funded community tree board program.
USDOT TIGER Grant	https://www.transportation.gov/tiger	$500 million available for capital projects addressing environmental sustainability.	Fridley can use funding for stormwater mitigation through landscaping/ planting and for new green infrastructure.

CONTRIBUTORS

The recommendations in this report were researched and written by the FNRM 4501/5501 Spring 2016 class at the University of Minnesota.

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