Village of Carol Stream

Urban Forest Management Plan

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Prepared On

May 2nd, 2022

This publication was made possible with a grant from the Illinois Department of Natural Resources and United States Department of Agriculture Forest Service, with assistance from the Morton Arboretum

Table of Contents

OVERVIEW OF CAROL STREAM'S URBAN FOREST MANAGEMENT PLAN

Carol Stream, Illinois currently manages 8,237 trees throughout its Village parkways, rights-of-way, and Village owned properties. There are 758 inventoried open planting spaces along with up to 2,000 possible planting spaces in areas of the Village where planting was not previously allowed which represents a potential for growth of the Urban Forest resource. The Village's trees were inventoried as part of a project in 2021 culminating in this Urban Forest Management Plan which will detail how these trees will be managed for the benefit of the Village of Carol Stream over the next 10 years, with a focus which begins in 2022, and projects out to 2032.

In terms of the condition of the Urban Forest in Carol Stream, there are both strengths and opportunities for improvement. One strength is the fact that there are 104 species represented in the tree population which is good diversity for a mid-sized municipal population. Additionally, the condition of the population as a whole is above average. There are, however, opportunities for improvement. The tree population here is largely young, where large trees over 25" DBH, which generally provide the greatest community benefits, make up less than 3% of the population, so a goal of this Urban Forest Management Plan will be to give younger trees the best opportunity to thrive, so that they can mature with vigor and subsequently move into the larger DBH and older age class categories. Additionally, the overall tree canopy coverage makes up for a lower percentage of land cover than other similar communities, and we will look at opportunities to set goals and increase the tree canopy coverage. Another strength, that is important to mention is that the Village faced a formidable foe in the Emerald Ash Borer infestation and did an outstanding job in managing the impact of the pest. Also, the ensuing reforestation efforts have been commendable.

In order to enhance the Urban Forestry program to produce long term benefits while attempting to reduce tree related costs through a continued high-level of long-term tree maintenance, the following Urban Forest Management Plan (UFMP) will address each one of these strengths and challenges, and create goals and milestones for each. Below is a broad view of the direct goals to come in the 2022-2032 period. Further detail is given in the body of the Plan, with separate sections detailing specific urban forestry activities, and how we propose they are achieved, along with standards and Best Management Practices for each.

An urban forestry program has been created in this Plan which attempts to achieve the greatest benefit for the community, based on the available data we have from the inventory, as well as input from Village staff working in tandem with Great Lakes Urban Forestry Management.

However, all plans are subject to change based on new information, budgets, or other unforeseen circumstances. For this reason, it is asked that readers consider that this plan is to be an evolving document, and goals and strategies will be updated to fit new circumstances as needed. No part of this plan is written in stone or absolute, and deviations and changes are to be expected in the course of managing living organisms in an ever-changing climate.

This Plan should be and is intended to be reviewed periodically, at which point the Village will have an opportunity to provide input and help improve the Plan during those annual reviews. These strategies and goals are not absolute, but rather serve as guideposts to mark the road to success.

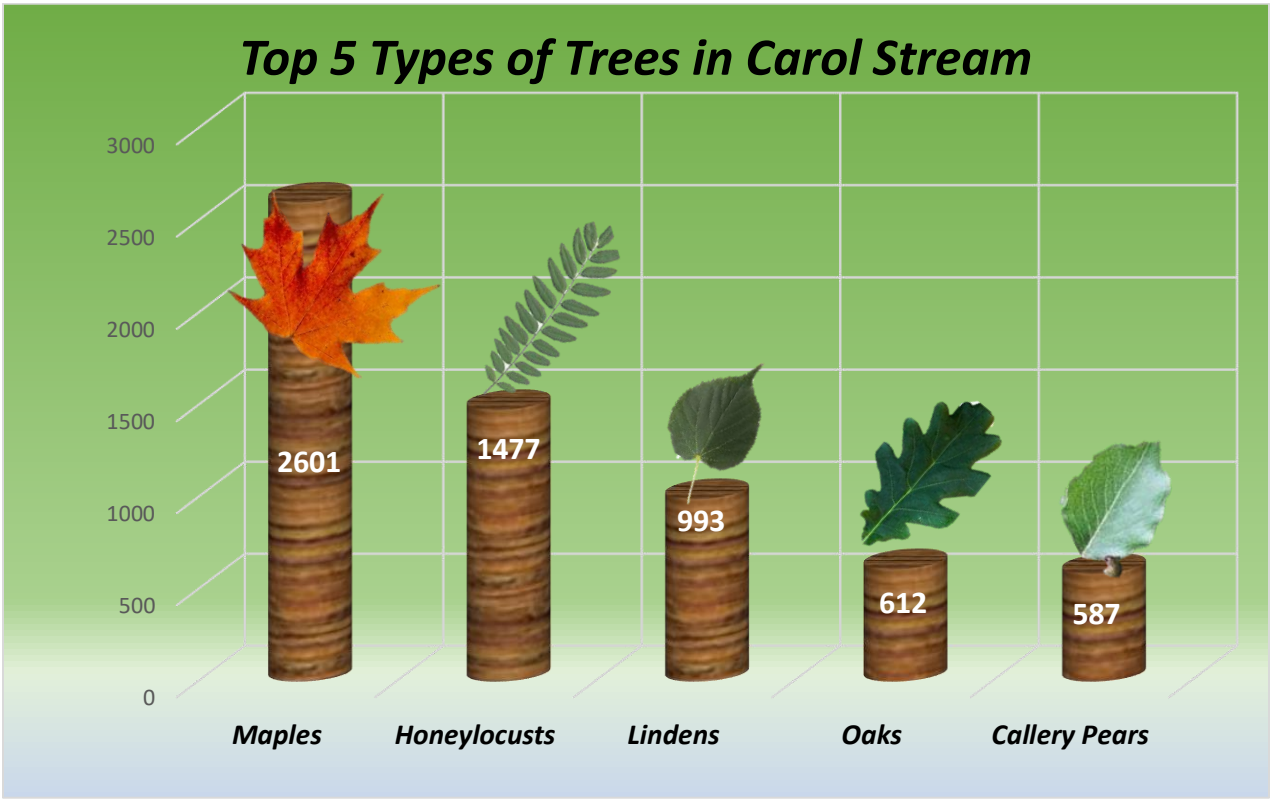
MISSION STATEMENT

It shall be the mission of this Urban Forest Management Plan to outline goals and Arboricultural Best Management Practices for the management of the urban forest to increase canopy cover, maximize the benefits of trees while minimizing cost, mitigate against climate change, and create a program to manage the urban forest in a manner that is sustainable, while maintaining flexibility.

CAROL STREAM'S URBAN FOREST: AT A GLANCE…

Total Number of Trees	*8,237*
Open Planting Spaces	*758*
Total Number of Species	*104*
Annual Benefits Provided	*$1,168,181/yr*
Standing Value	*$13,187,087*

Values calculated by iTree Software
(www.itreetools.org) by the US Forest Service



DIRECT GOALS

Listed below are the direct goals of this Urban Forest Management Plan (herein referred to as "UFMP", or "the Plan"), as well as a brief discussion of how they may be met. Direct goals are those which this plan addresses very explicitly in describing pruning, removal, planting, and other activities. Every attempt was made to make these goals realistic and achievable, so they do not place an undue burden on the Village of Carol Stream, its residents, or its resources. Instead, the direct goals of this UFMP are to save money and provide greater benefits over time through proactive, as opposed to reactive, management. The Plan is also meant to be adaptive: new concepts, introduction of new pests or pathogens, or changing climate may all alter the way the Urban Forest is viewed.

The Plan is intended to be reviewed periodically by the Public Works Department and shared with the Village Administration and the Village Board. The review process should include evaluation of progress made towards these goals. Goals may be altered after the review, as conditions warrant. This UFMP is written with the understanding that circumstances and priorities change over time, and therefore its goals require a degree of flexibility. Since trees represent a long term (50-80 year) commitment, this UFMP is intended to provide guidance and continuity through those changes, while also adapting to them as the need arises. Below is a table summarizing this UFMP's direct goals and the narrative that follows will provide details on all these goals.

Establish Goals	**Update Ordinances**	**Increase Diversity**	**Maintain an Acceptable Species List**
Manage Tree Removals	**Maintain or Enhance Cycle Pruning**	**Maintain the Tree Invenotry**	**Mulch New Plantings Properly**
Maintain Best Management Practices	**Create and Maintain a Tree Risk Assessment Policy**	**Increase Overall Tree Canopy**	**Mitigate the Effects of Climate Change**
Enhance Tree Preservation Measures	**Manage Invasive Species**	**Increase Awareness of the Urban Forest**	**Increase The Number of Trees on Public Right of Ways**

Create a Needs Analysis for the Current Tree Population

Every tree population today is the result of decades of past management decisions. Over time, we increase our overall level of knowledge, skill, and efficiency in managing trees. Based on that new knowledge, we sometimes discover that decisions made decades ago may appear in retrospect to be in conflict with current best practices or local priorities. It is the goal of this Plan to assess the current state of the Village's urban forest and examine its overall strengths and benefits, as well as look for opportunities for improvement to inform future decisions.

Each aspect of Carol Stream's tree data has been analyzed: How many trees, what condition they are in, how old they are, what needs do they have, and more were all examined to create goals to improve the tree population. Specific goals in terms of planting, removals, pruning, budgets, personnel, and maintenance are all addressed by acknowledging both strengths and opportunities and suggesting how they might be used to the Village's advantage.

These strengths and opportunities will be the guiding principles for the management strategies and specific goals outlined in each section below. To avoid repeating past mistakes, the Plan will also leave room for adaptive management, so the plan may be changed when appropriate.

Establish Goals in Order to Enhance Strengths and Realize Opportunities

In order to accomplish anything, goals are necessary to help guide organizations through the process. Establishing or enhancing a highly functional forestry program will require a series of attainable goals in order to be achieved. This UFMP seeks to provide guidance to accomplish those goals within a realistic budget and attainable timespan. As stated previously, goals are intended to change over time as the Village's capacity to manage the resource may increase or decrease.

In each section of the Plan related to direct goals, language has been included which incorporates both a budget and a time frame in which those goals can be accomplished. The overarching goal will be to have Carol Stream use this UFMP to create a more sustainable and adaptable forestry program within a 5-10 year period.

This program will include tree planting, tree maintenance, and tree removal for Carol Stream's urban forest, so that the tree population will be healthy, while maximizing benefits and minimizing risk. To learn more about the budgets, see the individual goals in each section below, or turn to the budget table on page 69.

Update Village Ordinances for Enforcement of Tree Policies

As part of the IDNR grant program, work has been performed by Morton Arboretum working in tandem with Carol Stream staff in order to edit and improve ordinances governing trees on public properties. These ordinances are meant to reinforce proper practices while discouraging improper practices and care, and are not meant to be overly punitive, but rather to encourage the proper tree care practices.

These ordinances are common industry regulations, such as enforcing rules about what trees cannot be planted because they are restricted or undesirable trees, or defining exactly what trees are the Village's and the homeowner's responsibility, among other things. The goal of these ordinances is to create a tree population which is diverse, healthy, and improving, providing the greatest benefit to the Village and its residents over the long term. The full text of the updated ordinance can be found in Carol Stream Municipal Code 12-3-16.

Increase Overall Diversity by 2032 Through Tree Planting

Tree species diversity is one of the most important concepts in Urban Forestry today. The reason pests and diseases like Emerald Ash Borer (EAB) and Dutch Elm Disease were so devastating is that there were too many Ash and Elm trees. When EAB arrived, many communities' Ash population was 20% or more, resulting in mass tree loss. This can be avoided in the future by planting a greater diversity of tree species, so that when new pests or pathogens are introduced, we only lose small amounts of specific tree species. Diversity leads to stability, and stability leads to reduced costs and increased benefits over time. Carol Stream was well-prepared to deal with the impact of EAB and every Ash tree that was removed from rights-of-way and public properties was replaced through a robust reforestation program.

A "Diversity Vision" has been created for 2032 which will see the tree population become far more diverse than it is at present. The current population includes a respectable 104 individual species and the diversity vision included in the Plan aims to reduce the number of trees that are over-represented and/or lower quality species while also seeking to increase the number of species that are under-represented or not present in the tree population.

Not only will trees be planted which are underrepresented or not present in the current population, they will also be planted in a way that selects the right tree for the right site. A direct goal will be to create a tree planting program where trees are matched to existing sites. This plan establishes a goal of planting 150-200 trees per year over the course of this plan, to both be able to replace older declining trees, as well as to grow the tree population by approximately 750 trees overall by 2032 with the goal of plantings outpacing removals by nearly 2 to 1. Ideas such as contract growing, creating an in-house liner nursery and others may be explored. To learn more about tree planting and reforestation, turn to page 53.

Maintain an Acceptable / Unacceptable Species List

The urban environment is a difficult place for a tree to live. Between road salts, urban pollutants, limited soil, and other challenges, not all trees will thrive in the urban environment. Trees which have very weak wood, which are known invasive species, which produce messy or foul-smelling fruits, or which create a public nuisance should also be avoided. Acceptable species are those which are adapted to our Midwest climate, are not invasive, and do not pose high risk. Included in this Plan is an "acceptable and unacceptable" list which details specific trees which may be planted on Village rights-of-way and Village-owned properties. The Village will review the list periodically to ensure that it is maintained in accordance with the latest information on specific trees. For more information on approved and unapproved species in Carol Stream, see the Acceptable Species list in Appendix A.

Manage Tree Removals

For public safety, or to prevent the spread of tree pests and pathogens, sometimes tree removal is unavoidable. At present, there are 278 trees which have been called for removal during the inventory. Of these, 24 are listed as a Priority Removal, 130 are listed as Standard Removals, and 124 are listed as Low Priority Removals based on the Arborist Recommendation in the tree inventory data. Definitions of these Arborist Recommendations terms can be found in the "State of the Urban Forest" section on page 16. A tree removal program has been created in this Plan which budgets for the removal of all these trees over the next 3 years. Cost projections for tree removals have been made based on the expected 100 removals per year over the next 10 years, so that long term budgeting projections can be made. Also included are ANSI and ISA safety standards in Appendices I-K, as well as suggested bid specifications to ensure the Village is hiring qualified contractors who will be held to the highest industry standards. For more information on Carol Stream's proposed tree removal program, turn to page 49.

Maintain the Current Cycle Pruning Program

Properly pruned trees establish faster, grow quicker, and live longer lives than trees which are not pruned, or improperly pruned. Since large trees provide the greatest benefits to the community, pruning is a critical part of the Urban Forestry program in Carol Stream. Pruning will be done by Carol Stream staff and Certified Arborist contractors. Beginning this year and over the next several years, the trees identified during the inventory as requiring priority pruning, pruning of dead limbs, or establishment pruning will be addressed through scheduled tree-trimming and/or as resources allow. More details will be discussed in the Tree Pruning section of this plan.

Currently, the Village maintains a 6-year pruning cycle, supplemented with intermediate pruning on an as-needed basis to remove sight obstruction and hazards to pedestrians, bicyclists, and vehicles. This program ensures that all trees on public property are pruned at a minimum every 6 years, increasing tree health and vigor while reducing costs associated with storm damage and tree failure. It should be mentioned that the Village has been very proactive in its maintenance of their long-time implementation of cycle pruning program. For more information on tree pruning and maintenance, turn to page 57.

Maintain an Accurate Tree Inventory on an Annual Basis

Managing an urban forest requires a clear understanding of the trees, their ages, conditions, and locations, so that Village crews and contractors can perform work on these trees. A stem-by-stem tree inventory was completed in August 2021. This inventory resulted in an assessment of all of the trees on public rights-of-way in the Village, and will serve as the base data which will guide the forestry program throughout the next 10 years.

All inventories are a snapshot in time. With 8,237 trees on Village parkways and ROWs, the tree inventory should be maintained at a high level of accuracy so that it doesn't become out of date. Public Works maintains an Asset Management and Operation System which allows the tracking of all tree-related work from planting, to pruning to removals. It is also recommended that beginning in 2023, that a portion of the inventory be updated using a phased approach so that trees scheduled for cycle pruning will be reassessed and remeasured for a current DBH in advance of the pruning cycle.

This will ensure that pruning contractors have accurate DBH information on which to base their pricing. To keep the information at its most current on a Village-wide scale, these phased updates should be done on an annual basis, so with a 6-year pruning cycle, each Village tree will be updated in advance of its pruning cycle once every 6 years. Maintaining the tree inventory data at a high level is vital in the execution of this Management Plan.

Proper Mulching of All New Plantings

As noted above, the urban environment is a difficult place for a tree to become established and to live a long, healthy life. Proper mulching can significantly increase a tree's ability to do this. Mulch helps to conserve water during the summer by preventing it from evaporating from the soil. It also helps prevent weeds from growing around the tree and competing for water and nutrients and keeps lawn equipment such as weed whips away from the trunk where they can damage the tree. All new Village plantings will be properly mulched at the time of planting.

Another intended outcome of this initiative will be to educate residents about proper mulching care and notify them when poor mulching techniques are being used. Of particular concern is the practice known as "Volcano Mulching" which has the opposite effect of proper mulching and can severely damage a tree over time. For more information on proper mulching, turn to 62.

Incorporation of Best Management Practices in Tree Care Operations

"Best Management Practices" is a term which means being on the cutting edge of your industry. All contractors working for the Village should be compliant with the latest industry Best Management Practices, based on the appendices in this report. The ANSI and ISA Best Management Practices shall be integral parts of any Request for Proposal (RFP) or bid documents when seeking contractors. Full text of all referenced standards shall be made available to all Village employees and contractors performing tree care operations. This UFMP will be placed in the public domain for all residents to use as a reference.

Creation, Utilization, and Maintenance of a Tree Risk Assessment Policy

Trees create great benefits, but they may also pose various degrees of risk. Tree limb failure can have catastrophic effects on people or property, and trees need to be well-managed and healthy to avoid that risk. A risk assessment policy has been created as part of this Plan. This policy will aid in identifying, documenting, and designating for removal or mitigation, trees which may pose a threat to public safety in a timely manner. This will reduce the overall level of risk posed by trees, as well as exposure to liability from tree related incidents. Basic risk assessment language is included in this document, and a basic Tree Risk Assessment Policy has been created on 67, and the ISA Basic Tree Risk Assessment form can be found in Appendix H.

Increase Urban Tree Canopy from 13.35% to 15%

Tree canopy is important to the community because more and larger trees provide greater benefits such as decreased heating and cooling costs, pollution reduction, and increased storm water uptake. Tree lined streets are more attractive to homebuyers and potential new businesses, which increases home values, home ownership, and tax revenue (see https://www.arborday.org/trees/benefits.cfm for references). Increases in tree canopy also come with increases in total benefits provided to the entire community, so a direct goal will be to increase tree canopy.

Currently, Carol Stream contains 13.35% tree canopy coverage. (see page 35 for land cover map), compared to other land cover types. This includes all land, both public and private. Canopy cover is different from stocking density as well as different from the planting and diversity projections later in this document which specifically targets trees that the Village has direct jurisdiction over on its rights-of-ways and Village-owned properties. Part of the 15% goal is encouraging tree planting on private property by residents and business owners. A link to an interactive Chicago Region Trees Initiative (CRTI) canopy over map can be found at http://chicagorti.org/interactivemap

Based on this data from the CRTI, we believe that an increase to 15% canopy cover is a realistic goal for Carol Stream by 2032. This will be accomplished by increasing the number of trees on publicly owned property, encouraging private property planting, and encouraging the Village to look for opportunities to enhance tree selection and tree care practices as new information and knowledge becomes available, in order to help trees to establish well, live longer, become larger, and create more canopy cover. Part of this effort will be to consider establishing trees in parts of town where historically none have been planted in the public rights-of-way, as well as encouraging tree planting in industrial areas.

Carol Stream is unique in that it manages many ROWs throughout the village without trees, as well as a sizable industrial area. At 13.35%, canopy coverage in the Village is lower than some similarly sized communities, though this is not due to management shortfalls with the Village, but rather it's zoning makeup as noted above. Carol Stream may have additional opportunities to further increase the tree canopy goal by allowing plantings on ROWs in neighborhoods where there have previously been no ROW trees allowed. It is estimated that an additional 2,000 or more planting spaces are available in these areas, which provide an excellent opportunity for public property planting. Additional opportunities may exist in the form of encouraging tree planting in industrial areas which are often surrounded by mostly empty large grassy areas privately owned by those businesses.

Tree planting on private property will also be encouraged through promotion of educational materials, Arbor Day recognition and other community events. As we will show in the detailed portions of this Plan, these are real benefits that may help Carol Stream residents save money. For more information on Urban Tree Canopy, tree benefits, and other information, turn to pages 30-35.

Mitigate Climate Change Effects

An proactive and effective strategy to mitigate a changing climate is to plant more trees, and in fact the United States Environmental Protection Agency lists tree planting as one of the more effective solutions to mitigate climate change through absorption of carbon dioxide (https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands). Outside of their aesthetic value, trees have a great variety of environmental benefits, specifically offsetting climate change by producing a cooling effect in urban heat islands, and flood abatement by absorbing stormwater that otherwise would run off. Trees also act as long-term sinks for carbon dioxide, where carbon from the atmosphere becomes "sequestered" in the tree's woody parts like the trunk and limbs as a result of photosynthesis, which is how trees create energy to grow.

Increasing tree canopy creates greater sinks for carbon dioxide, reduces localized heating from the urban heat island effect, and reduces environmental issues stemming from flooding. It also provides great habitat for birds, pollinators, and other beneficial wildlife that can enhance the urban environment. This will all be examined at several different points throughout this UFMP, in terms of examining the hard dollar benefits trees provide, looking at where trees can be planted to maximize their effect on heat islands and flooding, and looking at what species could be planted in the future as we are subject to higher average temperatures. For more information on using trees to mitigate climate change, turn to page 43.

Tree Preservation / Invasive Species Management

Sometimes trees can become damaged by construction activities, costing the Village money, and eliminating the benefit the tree had to the community. A basic tree survey and assessment should be conducted prior to the issuance of a permit for construction activities that may affect public trees. A tree protection zone for Village trees must be established and maintained during construction and the Village should monitor construction activities to ensure local ordinances are adhered to.

While the Village will not require the preservation of trees on private property, they do encourage it and are available to offer insight on tree preservation. Should a developer propose to maintain existing high-quality landscape materials to count toward satisfying certain landscape requirements of the Unified Development Ordinance, the Community Development Director may, upon receipt of an approved landscape preservation plan, waive certain landscape requirements if mature, high-quality plant materials on a lot are preserved. The removal of lower quality or invasive species on private property is also encouraged. A direct goal of this Urban Forest Management plan is to preserve trees during construction, and reduce the amount of undesirable species within the Village.

Increase Awareness of the Urban Forest in the Village of Carol Stream

The reason for the establishment and enhancement of an Urban Forestry program in Carol Stream is to improve the lives of the residents, business owners, and other stakeholders who want to enjoy the benefits a well-managed tree inventory can provide. In order to make this happen, Carol Stream will direct efforts towards an on-going educational program through a variety of media outlets to encourage residents and businesses to plant and maintain trees on private properties.

Increase Current Stocking Density from 92% to 95%

Currently, there are 758 inventoried planting spaces in Carol Stream's rights-of-way, and the stocking density is comparably high in currently plantable areas at approximately 92%. Stocking density differs from total canopy coverage in that stocking density is a statistical percentage calculation of the total number of suitable and available planting spaces on Village ROWs versus the number of spaces that are currently actually occupied by trees. This only refers to available spaces on Village ROWs and does not apply to any private properties.

An important thing to mention is that there are areas of the Village where ROW plantings were previously not allowed, so the stocking density percentage would change drastically if these neighborhoods became eligible for public tree planting. It is estimated that an additional 2,000 or more planting sites may exist on public rights-of-way. While including these in the stocking density calculations would reduce the overall percentage in the short term to closer to 75%, it would also result in much higher benefits to the community in terms of the environmental services provided by trees in the long term as these open sites are planted with trees.

This increase in stocking density will be achieved primarily by increased tree plantings in the coming years, when budgets allow, and use of innovative strategies to fund increases in tree planting.

Additional Goals

There are not necessarily strategic timelines set forth here for these "additional goals" programs, however the suggestions here are meant to spur discussions outside of the UFMP. As the direct goals of the Urban Forestry program in Carol Stream are met or exceeded, these are goals to be discussed by the Village as time and budgets become available. We believe that many of these programs represent some of the most progressive Urban Forestry policies in the current climate, and that they should all be seriously considered for implementation.

"No Tree Area"/ Industrial Area Canopy Development

As seen on the Land Use map on page 35, Carol Stream is home to significant amount of industrial development surrounded by large grassy areas. As mentioned above, Carol Stream has further opportunity to increase tree canopy coverage by encouraging its industrial and standard commercial businesses to have trees planted on their large grass areas. Additionally, many residential neighborhoods were also categorized as "No Tree" areas where there are standard sized parkways with virtually no parkway trees. Carol Stream can further increase their desired canopy goal by reevaluating these areas for some limited future tree planting. It is important to note that tree-lined streets and their shade-providing canopies can increase property values, as shown below on page 32.

Public Education

It is suggested that Carol Stream hold several annual tree education sessions, to coincide with annual Spring and Fall planting cycles. These sessions may be taught by the Village Arborist and/or Forestry Consultant, or other such qualified parties, and cover tree watering, fertilization, pruning, and the basics of how to spot insects and diseases. In addition, basic tree care pamphlets can be made available on the Village website and via social-media outlets. An Arbor Day celebration is an example of one such outreach event where trees could be planted and education sessions run.

Explore the Establishment of Village of Carol Stream Propagation Nursery

Consideration should be given to the establishment of a small propagation nursery on Carol Stream-owned land, or in partnership with land owned by its park district. The Village can grow a share of its own trees, using much smaller trees obtained from wholesale nurseries at a fraction of the cost of a full-sized tree. Small trees can be purchased wholesale, and then grown to maturity in Carol Stream. Such programs have been successfully instituted in many communities and represent a quality investment that results in cost savings over the long term.

We would recommend that the Village work with the Forestry Consultant, Park District, local nurserymen, and other strategic partners in order to explore this concept, and, if it is determined to be feasible, establish a program with the goal of having a functional nursery by 2032. The amount of time required for the care of young trees is minimal, and at an average cost of $350 per tree wholesale, the Village may save money in their tree planting program by pursuing this goal.

Maintain Contract Growing Program

One of the keys to a successful Tree Planting Program is the availability of high-quality nursery stock from local sources. Incorporated with the UFMP for the Village is a diversity vision for 2032 that includes a great variety and diversity of different trees. A new approved species list has also been developed, as well as the tree species that are prohibited on public property. Having this information is an advantage for the Village, in that the future composition of the urban forest in terms of species is generally already known. It is believed that a comprehensive tree planting plan will be an important part of this process as well.

This knowledge, however, does not guarantee the availability of those specific trees when the time arrives to fill a particular site, which is a condition that a contract growing arrangement can solve. The Village currently has a working relationship with a local nursery and has effectively utilized contract growing agreements to successfully implement reforestation efforts in response to the Emerald Ash Borer infestation. By continuing this program, the Village will not have to compete with the landscape industry, other local organizations responsible for tree planting, or local retailers. Trees are ordered in annual increments. Each year, Carol Stream will purchase the trees previously ordered for that year and place an order for the following year. This gives the supplying nursery time to procure, plant, and bring the agreed upon trees to the size and branching habit specified.

This already successful program could be expanded to include other nurseries as well, at the discretion of the Village. Supplying nurseries should be located within a specified distance from the Village, to ensure climatic zone compatibility and reduced transportation costs and planting stock exposure to the elements. Nurseries should be of sufficient production capacity to furnish all trees ordered in advance by the Village, as well as possible increases when necessary. Nurseries should be chosen not only on their capacity to produce stock, but to meet quality, form, and health standards as specified by the Village. The nursery should allow tagging by the Village Arborist or other representative as well.

Trees should be evaluated one year after planting and assessed for health and survival. Responsibility for replacement of trees that have not survived the one-year guarantee period is divided equally between the supplier, the planter, and the Village. Trees that are dug or balled improperly will be replaced by the nursery. Trees improperly handled or planted are replaced by the planter. Trees that do not survive because of lack of maintenance are replaced by the Village.

Private Property Tree Planting Education Programs

Tree planting on private property is actually a direct goal of this Urban Forest Management Plan, as noted above. Though the Village has no formal jurisdiction to plant trees on private property, the benefits of tree planting on private property are substantial in terms of energy savings, storm water benefits, and other benefits. The Village should consider encouraging residents and business owners to plant trees on their property, using the tools available at their disposal. Partnering with local nurseries to create a program where residents can purchase trees from that nursery at a reduced price may also be a way to encourage tree planting on private property.

Another idea which has been successfully implemented is having the Village purchase trees from a wholesale nursery at wholesale prices, and then have an annual tree sale to local residents. The Village resells the trees at a slight markup from the wholesale cost, but still less than retail, and uses the proceeds to fund its forestry initiatives. Such programs would encourage tree planting on private property by reducing tree costs to the residents.

There are many ways to think creatively about how to encourage tree planting on private property, and no single solution which is universally applicable. We encourage the Village to explore such opportunities to build tree canopy throughout its entire land area.

Strategic Partnerships

Strategic partnerships are a very effective means of getting forestry projects accomplished when in-house resources may be limited. These typically involve either public-private partnerships or partnering with other public entities. Typically, the organizations seen participating in these programs include local garden clubs, scout groups, rotary clubs, businesses, school districts, state departments of natural resources, and other such groups. This will be an ongoing goal, and continuing partnerships with new organizations will be sought as needs arise and resources allow.

Personnel

In order to streamline urban forestry operations, tasks are assigned to various staff and contractors. Below is a representation of the Village's various roles and a brief summary of their duties.

Public Works Director

The Public Works Director is responsible for implementing forestry programs with the approval of the Village Board. With the advice and support of Certified Arborists on staff, this position will seek bids from qualified tree care contractors to complete the work approved and budgeted, as well as maintain the tree inventory when possible, and act as a representative for public concerns. The Public Works Director or their designee will exercise authority related to decision-making concerning pruning or removal of parkway trees.

Certified Arborists on Staff

The Village's Certified Arborists on staff will be a primary part of the in-house staff who perform day to day forestry operations in the Village. They will advise the Public Works Director when required and will carry out in-house work orders as instructed by the Public Works Director.

Tree Care Contractors

Tree care contractors are responsible for performing work solicited by the Village in a timely, safe, and expeditious manner. The tree care contractor must have at least one International Society of Arboriculture Certified Arborist on site when work is being performed. The contractors will also guide and participate in the performance of tree trimming, pruning, removal, and plant health care operations. Other operations, such as tree planting, tree watering, and tree mulching do not have to be performed under the direct supervision of a Certified Arborist.

Forestry Consultant

A Forestry Consultant may be utilized for impartially assessing the tree population on a periodic basis, at the discretion of the Public Works Director. A Forestry Consultant will generate reports as requested by the Village so that needs in terms of tree planting, removal, and maintenance can be assessed and planned. A Forestry Consultant may also provide services otherwise performed by a staff Certified Arborist at the discretion of the Public Works Director.

Director of Community Development

The Director of the Community Development Department will exercise authority related to enforcing the existing and proposed changes to the Village Code and Ordinances as referenced by this document.

Tree Commission

The Tree Commission as established by Ordinance according to grant requirements is the steward of this Urban Forest Management Plan. As the representatives of the Village, the Commission is tasked with ensuring the proper oversight of the urban forest so that all community members can realize its benefits. The Commission will be composed of Village staff from various departments and can be tasked with making informed decisions to bring to the Village Board as it pertains to decisions affecting the urban forest. The Commission may seek guidance from the Board, Forestry Consultant, and the Village Arborist, and use its opinions and independent research to make decisions. The Commission will be involved in periodically updating the Urban Forest Management Plan based on new information and new Commission Members.

State of the Urban Forest

Using the tree inventory data collected for the Village, it was determined that there are a total of 8,237 trees and 34 stumps on Village-owned rights-of-way and Village-owned properties, along with 758 open planting spaces that were inventoried and the potential for another 2,000 trees in parkways not traditionally approved for parkway tree planting. The charts and statistics in this portion of the Management Plan illustrate that the tree population in Carol Stream can be characterized as being in overall above average condition and the stocking density is high in plantable areas, at 92%. There are, however, several areas of the Village that remain treeless and if the additional 2,000 planting spaces become available, stocking density can be recalculated. The species diversity in Carol Stream is impressive with 104 individual species represented. Based on the following data in the Management Plan, the Village will be equipped to use this valuable information to address short term concerns, long term management considerations, and overall planning objectives.

Basic Statistics – Managed Trees

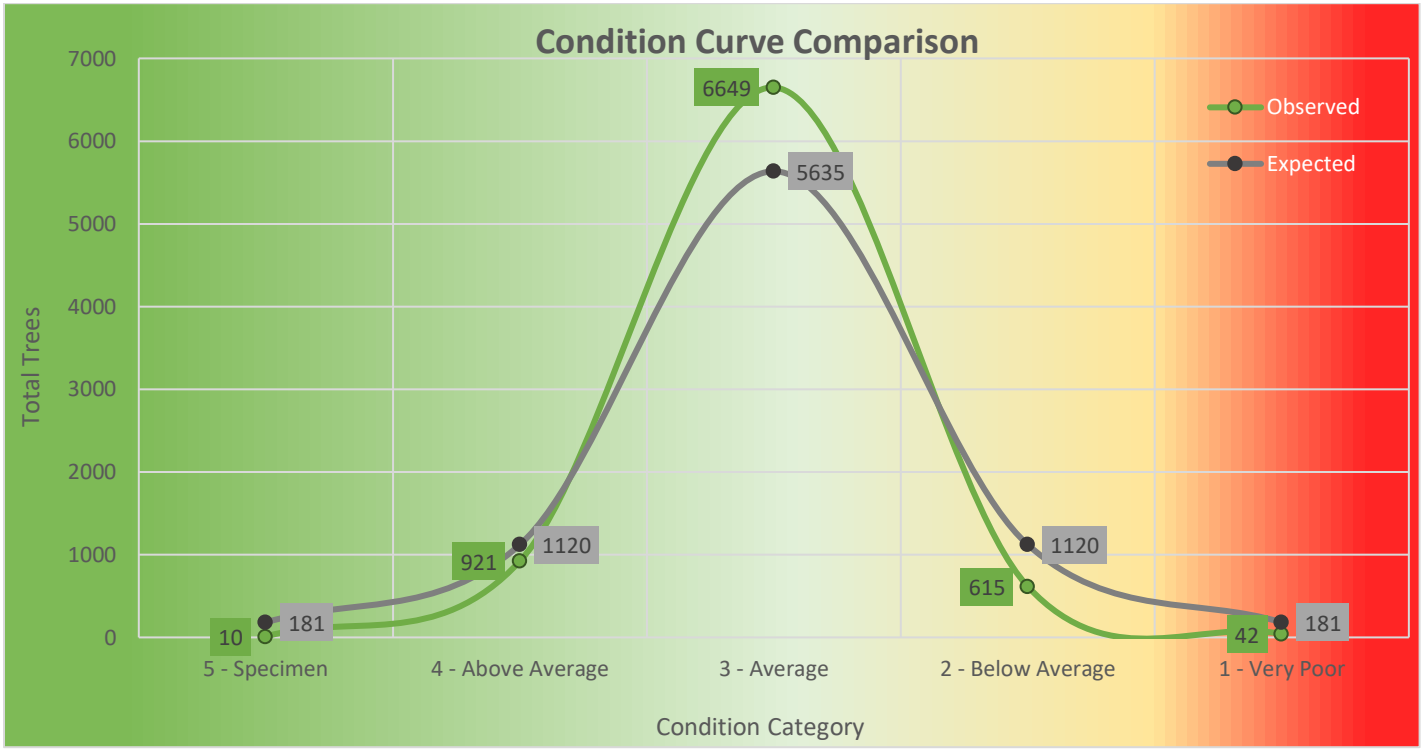
Number of Trees Inventoried	8,237
Number of Stumps Inventoried	34
Number of Planting Spaces Inventoried	758
Total Number of Species	104
Total Diameter Inches	75,471"
Average Tree Diameter	9.16"
Average Tree Condition	3.03 (Slightly Above Average)
Average Mature (8" and up) Tree Condition	3.13 (Above Average)

Condition Statistics

During the tree inventory, the condition of each tree was rated using a 1-5 rating system as described below which is consistent with the system currently used in the Village. The rating criteria is as follows:

Condition 5	**Specimen** – Tree has no observable defects, wounds, diseases, and has perfect form for the species. Since younger trees are generally trouble free, a condition 5 tree must by the Forestry Consultant's definition be a minimum of 16" DBH and are generally much larger. These are legacy trees, and as such are rare.
Condition 4	**Above Average** – Tree may have a small amount of deadwood, or a very limited number of minor defects. The overall form of the tree must be good, and consistent for the species. These trees, by the Forestry Consultant's definition, must have a minimum 8" DBH.
Condition 3	**Average** – Tree has moderate amounts of deadwood, wounds, or other defects, but is generally healthy. A wide variety of forms is acceptable for this group, which is meant to define the middle ground around which better or worse trees can be defined. Trees less than 8" DBH are automatically assigned this category unless they happen to be in worse condition.

Condition 2	**Below Average** – Tree has defects, deadwood, wounds, disease, etc. which are likely to cause a need for removal. Very poor form or architecture can put an otherwise healthy tree in this category as well.
Condition 1	**Very Poor** – Tree must be removed. Defects are too far advanced for the tree to be reasonably saved. Like condition 5 trees, these are rare, as generally trees approaching this level are removed before they deteriorate to this level.



The chart above represents the distribution of trees in each of the 5 categories. We have included the tree condition ratings we observed in the field, as well as a curve representing an "average" distribution so that comparisons can be made. The green line represents what we observed in the field, and the grey line represents an average or "normal" tree population. The condition curve for the Carol Stream inventory indicates a tree population that is in overall above average condition.

The Condition 5, or specimen trees, were significantly lower than would be predicted by the standard distribution alone, but we always expect that the specimen trees (and often Condition 1 trees as well) will come in lower than their statistical norm because of their relative rarity. In Carol Stream, this is mostly due to most trees not meeting the minimum DBH threshold for this category. A Condition 5 tree, by definition, must be at least 16" DBH (and generally much larger), have textbook perfect architecture for the species, and have no observable defects. In Carol Stream, they are more rare because almost 85% of Carol Stream's tree population is less than 16" DBH and are not eligible for the Condition 5 category.

It's important to note that Carol Stream's devastating tree loss due to EAB, approximately 3,000 Ash trees were removed over the past decade and replaced with 3,200 new trees, which is a commendable effort. As the more recently planted trees mature and more younger trees are planted in sites with adequate growing space, and if they are properly pruned and maintained, they should develop with good structure and may mature to become Condition 4 and eventually Condition 5 trees.

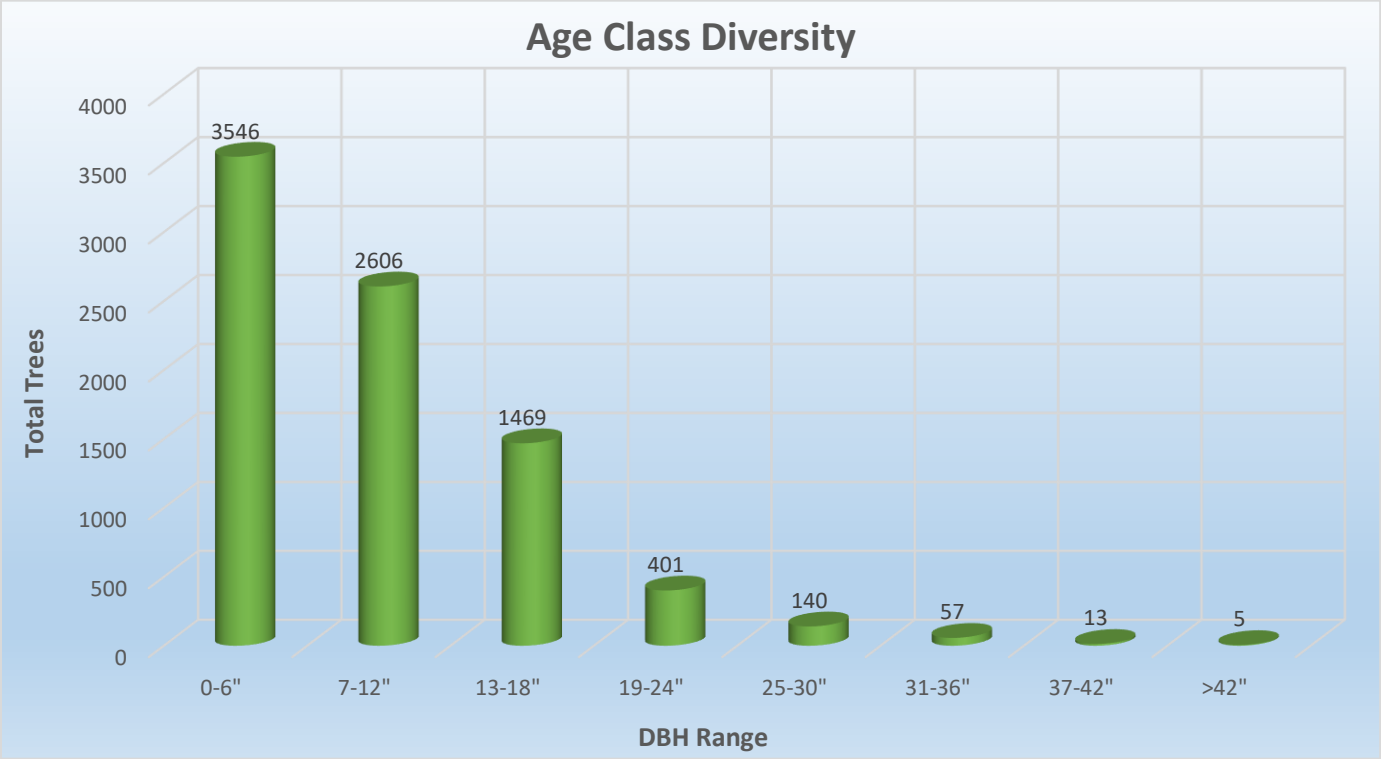
The Condition 1, or very poor trees, came in below the expected norm as would be expected since municipally managed trees are often removed before they reach this rating. The 42 trees in this category should be prioritized and removed.

The Condition 4, or above average trees, are lower than what statistical analysis would predict. Similar to the Condition 5 category, Condition 4 trees need to have good structure that is consistent with the species in question, be free of major defects, and also be over 8" DBH. Looking toward the future, Carol Stream has an opportunity to increase the number of trees in the Condition 4 category. In general, if trees are properly mulched and maintained, newly installed trees are done so correctly and cared for well, and site selection for the trees is well matched to the species, trees will often mature with good form and without significant defects. These trees can eventually become Condition 4 trees.

The Condition 2, or below average trees are significantly lower than what would be statistically expected. This category includes a variety of species that have developed excessive deadwood and/or other structural defects. Using the tree inventory data to locate trees in need of removal and maintenance, Carol Stream can look to further decrease this number over the next few years as they move forward and attend to issues we have identified. These actions will continue to shift the Condition Curve even more toward Above Average.

The trees in the Condition 3, or average, category are higher than the expected norm. The reason for this is simply that this is the average category and generally has the most trees in it. Another reason this number is inflated is due to Carol Stream's tree population being largely young and all trees under 8" DBH are automatically assigned this category unless they happen to be in worse condition. In the next few years these more recently planted trees will begin to show their adaption to their environment, and we would expect these average trees to deviate from the norm.

Age Class Analysis



In terms of the ages of trees in Carol Stream, we have split the tree population into 8 "classes" of 6" diameter increments. This tells us how many trees are in each "age class". Because trees are measured by Diameter at Breast Height (DBH) as a standard measure, this breakdown can help show where trees are in their life cycles. Some trees like Cottonwood and Silver Maple grow in diameter very quickly, up to 1" per year or possibly more. Other slower growing trees such as Oak and Hickory may only add ¼" or less every year. As a broad generalization, it can be said that most trees on average grow at around ½" per year.

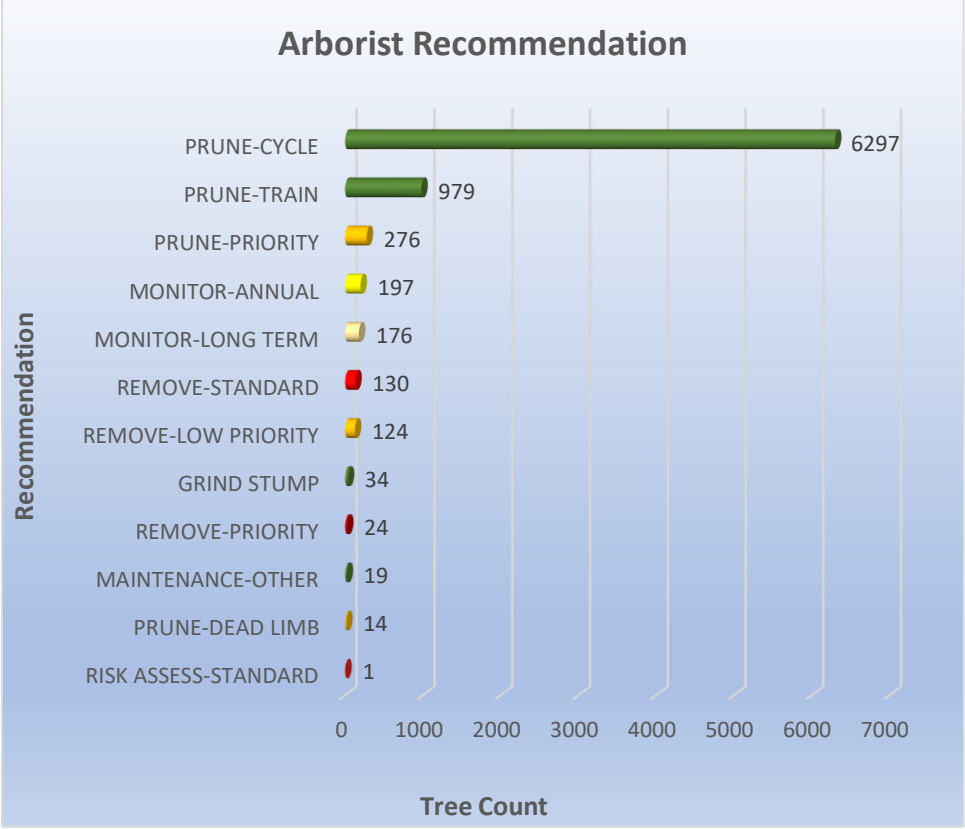
This age class analysis chart illustrates a somewhat typical trend in the overall age spread of a tree population seen in a municipal setting. Often, we see many trees being younger to middle aged and a relatively lower number of trees in the older age categories. The Carol Stream tree population is largely young with almost 75% of tree population measuring less than 13" DBH, an indication of recent commitment to continual tree planting, as evidenced by the number of trees in the 1-12" ranges. As shown above, 43% of the total population has a DBH of 6" or less which we generally consider to be less than about 15 years old. It is assumed that most trees grow on average approximately ½" per year, although that figure varies significantly depending on the species in question. Nearly 32% of Carol Stream's trees have a DBH of 7-12" which are generally considered to be about 15-25 years old. The 13-18" DBH category makes up less than 20% of the population and is considered to be approximately 25-35 years old. The 401 trees (less than 5%) in the 19-24" DBH category are generally mature trees over 35-45 years old.

Trees measuring 19-24" DBH account for almost 5% of the total tree population. The 215 trees in the 25"+ DBH categories are considered to be about 45-50+ years old. Many of these may be nearing the end of their natural life. Almost a quarter of these trees are in below average or worse condition. It should be mentioned that the number of trees in the 30"+ categories are often lower due to the natural senescence and ensuing decline of trees in urban settings. An equal number of trees in each age class is desirable and indicative of a consistent focus on tree planting and maintenance. As the younger trees continue to grow, Carol Stream will have an opportunity, over time, to bring the tree age classes to a more balanced level. Going forward, Carol Stream should continue to take a targeted approach when it comes to choosing new species to plant in its parkways and focus on planting a wider variety of tree species and genera.

The table of Carol Stream's population growth since 1960 is shown at the right, and it is apparent that the growth in the number of trees on the Village ROWs increases around the same time as the population of the Village was increasing dramatically. For the Village, population growth spiked between 1980 and 2000. This corresponds directly with the increase in tree planting between 7-18" diameter inches ago, which equates to 20-40 years ago, in tree terms.

YEAR	POPULATION
1960	836
1970	4,434
1980	15,472
1990	31,716
2000	40,438
2010	39,711
2020	39,203

Arborist Recommendation / Maintenance



During the inventory, the Forestry Consultant's staff recorded an Arborist Recommendation for each tree which outlines what maintenance work needs to be performed in the coming years.

In terms of Arborist Recommendations of maintenance needs in the Carol Stream tree population, the statistics displayed above show that almost a quarter of the population is recommended for a mitigation other than cycle prune. Most importantly, 278 trees are recommended for removal. The 278 trees in the "Remove" sets include a variety of tree species which have declined or developed structural defects and are beyond the point of salvaging and are prioritized into 3 levels. The remaining categories were used to indicate trees in need of maintenance which should be prioritized over those in the Cyclical Prune category and will be discussed briefly below.

The 276 trees in the "Prune-Priority" group and the 14 trees in the "Prune-Dead Limb" group are trees which are simply overgrown, or have parts which need to be removed promptly, and should have pruning prioritized over the trees in the cyclical prune set. Generally, we consider this to be a "within 1-3 years" level of pruning.

The 197 total trees in the "Monitor-Annual" category and the 176 trees in the "Monitor-Long-Term" can be viewed as being in a transitional phase and did not properly belong into the other recommendation categories. For the most part, the tree has a notable defect and/or shows signs of developing structural issues, pest or pathogen problems, or general decline which should be observed. These trees should be reassessed periodically, and their maintenance status updated appropriately when necessary.

Trees categorized as "Prune-Train" are typically trees smaller than about 6" DBH and have structural issues or are overgrown and require selective pruning to establish better architecture in the future. Establishment pruning, or the pruning of young trees to establish proper branching habit and structure, is one of the least expensive yet most effective maintenance items that can be performed on a young tree.

The 19 trees in the "Maintenance-Other" category typically need some other form of maintenance not covered in the rest of the categories, mostly the removal of girdling objects, anchor staking, or no longer needed trunk wrapping. A description of the maintenance needed should be found in the reasons or comments field.

There is 1 tree recommended for a standard risk assessment. This is a tree of higher quality which has developed defects and require a more in-depth inspection and analysis to determine Carol Stream's risk tolerance threshold and the need for mitigation efforts. It is recommended that a Level 2 Basic or Level 3 Advanced Risk Assessment be performed on these trees (per TRAQ or ANSI A300 Pt 9 Standards), or equivalent (ISA Tree Risk BMP methodology, Matheny and Clark, etc).

It should be noted that trees are complex living organisms. Maintenance recommendations, tree condition, and tree risk ratings may not always be in agreement with one another. For example, a tree may be high risk because of one dead limb. Once that limb is pruned off, the tree may be low risk, and therefore not be a removal. Please bear this in mind when considering the charts in this section.

Risk Assessments

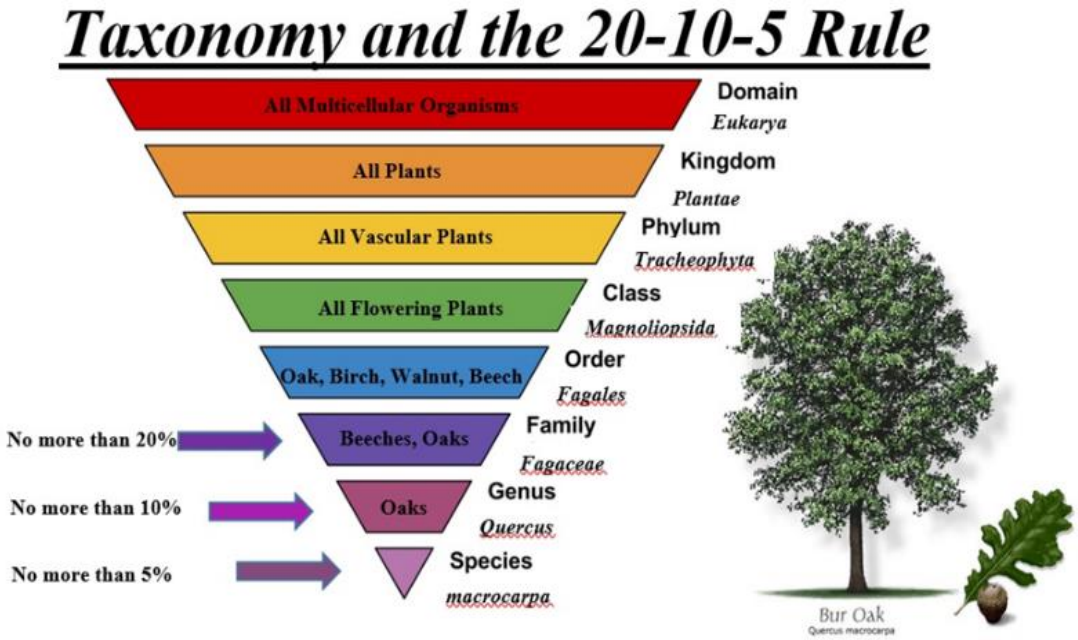
Each tree inventoried was subject to a rapid tree risk assessment. The International Society of Arboriculture has a professional qualification program called "TRAQ" (Tree Risk Assessment Qualification) which uses specific information for assessing how much risk a tree poses. The Forestry Consultant's staff used a rapid tree risk assessment based on this protocol. Such rapid assessments are used in applications such as disaster relief assessments after extreme weather events where tree risk must be documented, but time frames are very short. For this reason, we must state unequivocally that these assessments are NOT meant to be legally binding, and do not represent a full TRAQ evaluation of the level of risk individual trees may pose.

As illustrated in the chart above, the majority of Carol Stream's inventoried trees were found to have no observable risk level. The 3 trees that fall into the critical risk level category should receive immediate mitigating actions. All of these trees are recommended for priority removal. Of the 33 trees falling into the substantial risk category, 21 are recommended for priority removal, 11 are recommended for standard removal, and 1 is recommended for prompt pruning of a large dead limb. There are 210 trees that were found to pose an elevated risk. Of these 210 trees, 37 can have the risk mitigated through pruning and 80 are recommended for removal. A mature White Oak is the elevated risk category is recommended for an ISA Basic Risk Assessment. The remaining 92 trees have defects that should be monitored, and a threshold of risk tolerance established. Some of the other trees which were assigned a risk rating and are recommended for monitoring may also be considered for a Level 2 Risk Assessment if the tree is a higher-quality species or if the tree has a high location value.

It is important to mention that the trees in the elevated risk category do not necessarily pose an immediate threat, however they have defects that have an elevated potential to worsen. Great Lakes Urban Forestry Management would be pleased to assist Carol Stream in performing Level 2 Basic Risk Assessments or Level 3 Advanced Risk Assessments. A Tree Risk Assessment Policy will be discussed in more detail later in this UFMP.

Diversity Analysis

Taxonomy is the method by which scientists classify plants, animals, and other life forms into distinct categories. A species is unique. There is only one type in that category, such as Bur Oak (*Quercus macrocarpa*), which refers to only one specific type of tree. A genus, however, is a group that may contain multiple species. All Oak trees, for instance, are in the genus *Quercus*. The further down the taxonomic ladder you go, the more similar things become.



The more similar tree species are to each other, the higher the likelihood that an insect or pathogen can exploit every species of that genus. Emerald Ash Borer is a classic example of this, as it affected every tree species in the ash genus. The most effective prevention of tree loss we have is to limit the number of trees planted that a new pest or pathogen can affect. While diversity at the species level is important, it is also important to achieve diversity on the genus and family levels, so that a large selection of trees are planted.

The "20-10-5" rule for Carol Stream's future tree plantings is recommended, which states that no more than 20% of any one family, 10% of any one genus, and 5% of any one species shall be planted during any one planting cycle. It will also be a long-term direct goal of the tree management program to have the tree population as a whole in compliance with the 20-10-5 Rule, although it is unlikely possible by the 2031 date used in this document. This level of taxonomic diversity is consistent with today's arboricultural industry standards (see above graphic).

The old paradigm of urban forestry was to create tree lined streets and parks in which every tree was the same type, shape, age, and height. This was thought to produce a uniform appearance. Urban foresters have now learned that once a pest or pathogen is introduced into a monoculture planting such as this, an epicenter of infestation is created that may cause serious damage, both ecologically and financially. Diversity in the urban forest helps to prevent and reduce the impacts of pests and pathogens. There are three aspects of diversity in the urban forest. We will examine these in detail, below.

Taxonomic (Species) Diversity

Why is it important to plant a diverse set of trees at the species, Genus, and Family levels? Simply put, it is to ensure that we will not fall victim to mass tree loss from pests and pathogens in the future. The reason Emerald Ash Borer (EAB) was such a devastating expense for many organizations was because their tree populations were composed of over 20% Ash trees. When these trees died and had to be removed, those organizations lost 20% of their trees. In Carol Stream, Ash trees made up approximately 30% of the entire urban forest. The Village had a remarkable response to the EAB infestation, and successfully removed around 3,000 Ash trees and replaced them with 3,200 trees.

This comes with the obvious expenses of having to remove these trees and replace them. But it also comes with hidden expenses as well, namely the loss of the ecological services that those trees provided: Homes cost more to heat and cool, storm water infrastructure falls under heavier pressure, and increases in pollutants and greenhouse gases may be observed. For all of these reasons, a more diverse group of trees needs to be planted, such that we are never at risk of losing more than 5-10% of our trees at any given time due to a pest or pathogen.

As will be discussed in further detail below, the tree population in Carol Stream is by far dominated by Maple species and Honeylocust trees. In decreasing numbers, the remaining next top 5 include species of Linden, Oak, Callery Pear, Elm, and Hackberry.

Spatial Diversity

Spatial diversity is the concept of mixing tree species over the whole geographic area. The easiest way to slow the spread of any new pest or pathogen is to increase the distance between potential host trees. Every pest or disease, such as EAB or Dutch Elm Disease (DED), has a limited area to which it can spread in a given time frame. The more difficult it is to get to the next host tree, the less of a problem the pest or pathogen becomes, and the easier quarantine becomes.

In addition to the functional benefits provided by increasing spatial diversity, organizations which have implemented diverse planting over the past several decades have demonstrated that such diversity yields an arboretum-like landscape that is both functional and aesthetically pleasing. At present, the Spatial Diversity in Carol Stream is relatively low due to the considerable number of Maples and Honeylocusts. During the tree planting planning phase, extra care should be taken to ensure that new plantings are done in a manner that yields a highly spatially diverse tree population, and creation of areas of low spatial diversity (monocultures) will be avoided.

Age-Class Diversity

Age-class diversity is also an important consideration. A healthy natural forest has trees of many ages. Young, intermediate, and mature trees allow for regeneration, replacement, and vigor in the overall forest community. A mixture of tree species, locations, and ages will lead to great diversity, which insulates a natural forest against pest and pathogen outbreaks. The Urban Forest is no different. The outdated urban forestry paradigm promoted even-aged tree plantings, so that all trees were approximately the same size and age. However, once these trees begin to decline, most will require removal and replanting simultaneously. This can leave an entire street segment or neighborhood without shade and aesthetics for a long time.

The current approach of the urban forestry community is to strategically plant trees on streets or in neighborhoods over a longer timeframe. With this strategy, trees will grow to maturity in different stages, and decline at different times. When declining trees are eventually removed, there will always be a variety of age classes and tree sizes on a block or in a neighborhood. This reduces the pressure to plant trees in an area immediately after tree removal, helping to manage costs. A mixed age-class planting ensures that mature trees are always present in a neighborhood. It also will allow for strategic planting of smaller or medium-sized trees.

An additional benefit of mixed-age plantings is the ability to plant shade-loving trees as well as sun-loving trees. When a street or neighborhood is newly planted with trees of the same age, all the trees are essentially in full sun. This reduces the ability to plant shade-loving trees, as they tend to dry out in the summer sun. With mixed-age stands, shade-tolerant trees may be planted underneath the canopy of larger, mature trees. This approach may be used, where practical, to help to create an Urban Forest that has mature trees, middle aged trees, and young trees in similar quantities.

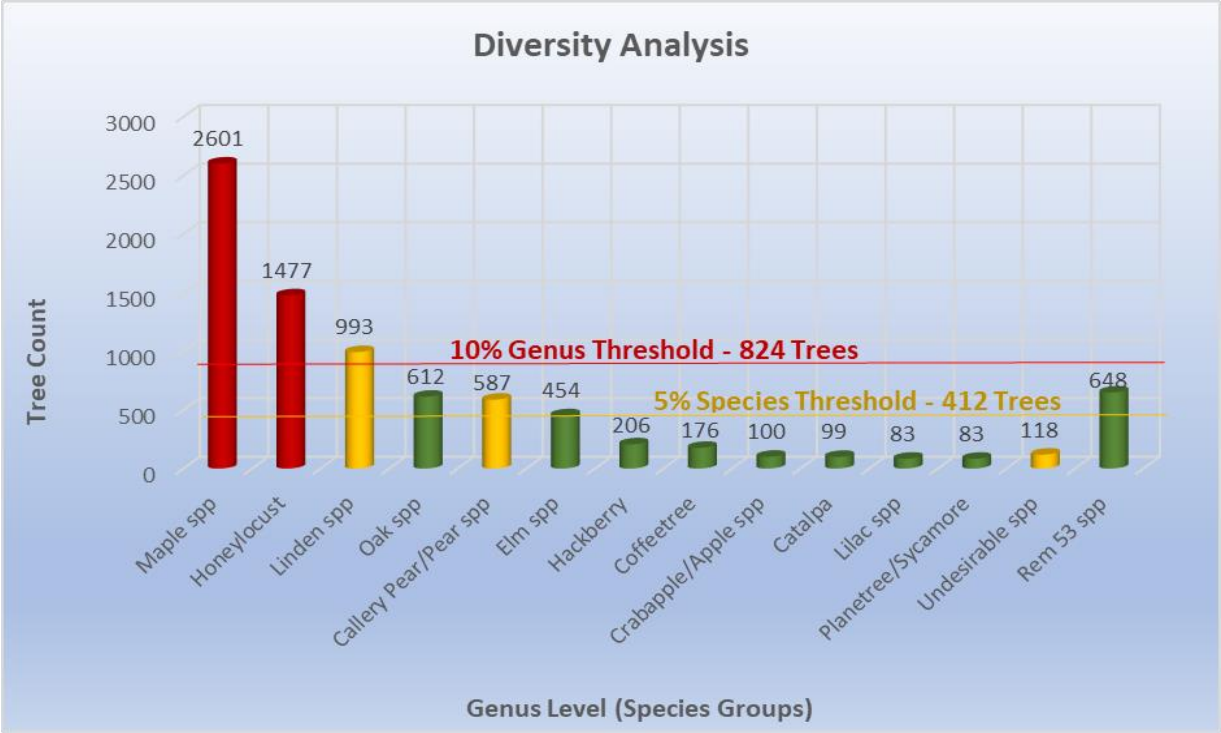
Current Tree Population

SPECIES	COUNT	% OF TOTAL	AVG DBH	AVG COND
HONEYLOCUST	1477	17.93%	12.86	2.79
MAPLE-AUTUMN BLAZE	672	8.16%	6.85	3.00
LINDEN-LITTLELEAF	656	7.96%	9.07	2.97
MAPLE-NORWAY	645	7.83%	11.13	3.13
MAPLE-RED	631	7.66%	6.37	3.05
PEAR-CALLERY	582	7.07%	6.72	3.04
ELM-HYBRID	448	5.44%	7.49	2.89
MAPLE-SILVER	319	3.87%	21.84	2.98
LINDEN-AMERICAN	312	3.79%	8.94	2.84
MAPLE-SUGAR	276	3.35%	5.50	3.03
HACKBERRY	206	2.50%	5.00	2.96
KENTUCKY COFFEETREE	176	2.14%	4.37	2.99
OAK-RED	167	2.03%	5.38	2.98
OAK-SWAMP WHITE	152	1.85%	7.80	2.82
OAK-CHINQUAPIN	107	1.30%	4.07	2.99
CATALPA	99	1.20%	6.85	2.95
LILAC-TREE	80	0.97%	2.79	3.04

SPECIES	COUNT	% OF TOTAL	AVG DBH	AVG COND
APPLE-CRAB SPP	76	0.92%	7.86	3.00
LONDON PLANETREE	73	0.89%	6.81	2.90
OAK-ENGLISH	72	0.87%	4.65	3.00
OAK-BURR	52	0.63%	8.90	2.96
BIRCH-RIVER	50	0.61%	9.72	3.16
SERVICEBERRY-SPP	47	0.57%	6.15	3.15
ASH-WHITE	44	0.53%	12.80	3.18
GINKGO	42	0.51%	3.60	3.07
ELM-SIBERIAN	40	0.49%	17.23	3.08
SPRUCE-BLUE	40	0.49%	12.55	3.15
BALDCYPRESS	39	0.47%	8.41	2.92
ASPEN-QUAKING	36	0.44%	3.11	3.00
HAWTHORN-SPP	34	0.41%	5.91	3.12
EASTERN REDCEDAR	33	0.40%	10.27	3.00
MAPLE-MIYABEI	33	0.40%	5.36	2.97
PINE-AUSTRIAN	28	0.34%	12.89	3.39
OAK-PIN	27	0.33%	13.70	2.96
ASH-GREEN	25	0.30%	11.24	3.36
APPLE-EDIBLE	24	0.29%	4.33	3.13
DOUGLAS FIR	24	0.29%	10.04	2.96
MULBERRY-SPP	23	0.28%	18.78	3.43
LINDEN-SILVER	21	0.25%	8.14	2.95
ARBOR VITAE	19	0.23%	6.21	3.05
BUCKTHORN	19	0.23%	5.26	3.58
DAWN REDWOOD	17	0.21%	8.24	3.00
OAK-SHINGLE	17	0.21%	4.82	3.12
OAK-WHITE	13	0.16%	17.54	2.85
SPRUCE-NORWAY	13	0.16%	8.23	2.92
ALDER-SPP	12	0.15%	13.92	3.08
HAWTHORN-WASHINGTON	10	0.12%	10.90	3.80
SPRUCE-WHITE	10	0.12%	6.30	3.10
SYCAMORE	10	0.12%	22.50	1.90
ZELKOVA	10	0.12%	11.50	2.70
ASPEN	9	0.11%	3.44	3.11
CHERRY-SPP	9	0.11%	8.89	3.00
MAPLE-AMUR	9	0.11%	6.33	3.11
BOXELDER	8	0.10%	19.00	3.25
MAPLE-BLACK	8	0.10%	3.13	3.13
BUCKEYE-OHIO	7	0.08%	7.43	3.00
COTTONWOOD	7	0.08%	23.00	3.29
WILLOW-SPP	7	0.08%	26.14	3.86
BIRCH-WHITE	6	0.07%	12.67	3.00
MAGNOLIA-CUCUMBER	6	0.07%	4.33	3.00
ROSE OF SHARON	6	0.07%	5.17	3.17
TULIPTREE	6	0.07%	3.17	3.50
WALNUT-BLACK	6	0.07%	14.33	3.17

SPECIES	COUNT	% OF TOTAL	AVG DBH	AVG COND
WILLOW-WEEPING	6	0.07%	28.83	3.67
DOGWOOD-SPP	5	0.06%	2.60	3.20
HAWTHORN-COCKSPUR	5	0.06%	6.20	3.20
MAGNOLIA-SPP	5	0.06%	4.20	3.00
MAPLE-HEDGE	5	0.06%	5.40	3.00
PEAR-EDIBLE	5	0.06%	2.80	3.00
PINE-WHITE	5	0.06%	6.00	3.20
PLUM-SPP	5	0.06%	4.80	3.20
SPRUCE-SPP	5	0.06%	9.80	4.20
EUONYMUS	4	0.05%	3.75	3.00
LINDEN-SPP	4	0.05%	3.00	3.00
OAK-CHESTNUT	4	0.05%	5.00	3.00
AMERICAN REDBUD	3	0.04%	14.33	3.00
BLACK LOCUST	3	0.04%	22.67	3.67
CHERRY-BLACK	3	0.04%	14.67	3.33
ELM-AMERICAN	3	0.04%	19.33	3.00
ELM-ENGLISH	3	0.04%	4.00	3.00
LILAC-SHRUB	3	0.04%	6.67	3.33
ASH-BLUE	2	0.02%	12.00	2.50
MAGNOLIA-STAR	2	0.02%	4.00	3.00
MAPLE-JAPANESE	2	0.02%	2.00	3.00
SWEETGUM	2	0.02%	9.50	3.00
WITCH HAZEL	2	0.02%	6.50	3.00
YEW	2	0.02%	9.50	3.00
AMERICAN HORNBEAM	1	0.01%	3.00	3.00
APRICOT	1	0.01%	2.00	3.00
BEECH-EUROPEAN	1	0.01%	7.00	3.00
BIRCH-GRAY	1	0.01%	10.00	3.00
BLACKGUM	1	0.01%	1.00	3.00
BURNING BUSH	1	0.01%	5.00	3.00
DOGWOOD-CORNELIANCHERRY	1	0.01%	2.00	3.00
HONEYSUCKLE	1	0.01%	8.00	3.00
IRONWOOD	1	0.01%	4.00	3.00
KATSURA	1	0.01%	3.00	4.00
MAPLE-SPP	1	0.01%	2.00	5.00
OAK-SAWTOOTH	1	0.01%	3.00	3.00
PINE-MUGO	1	0.01%	9.00	3.00
PINE-SCOTCH	1	0.01%	15.00	3.00
POPLAR-WHITE	1	0.01%	5.00	3.00
UNKNOWN	1	0.01%	2.00	5.00
VIBURNUM	1	0.01%	8.00	3.00

As shown in the table above, the Carol Stream's tree population consists of 104 distinct, individual tree species, accounting for 8,237 total trees, which is very good diversity for a moderately sized municipal tree population. The above table shows the percent of the total population each species makes up, as well as the average Condition and Trunk Diameter. To see which trees are performing well, we would look for trees with a Condition rating of greater than 3 and with a large DBH. This population is shown graphically below:



As previously mentioned, a genus is a group that may contain multiple species. For example, all Maples are in the genus *Acer*. For the purposes of these diversity charts, an analysis was essentially made at the genus level and species belonging to particular genera were grouped together for a statistical comparison. As can be seen above, the tree population in Carol Stream is very good overall, but by far is dominated by the Maple genus which includes the 11 individual Maple species found in the Carol Stream tree population. In decreasing numbers, the remaining top 5 genera, or species groups, include Honeylocust, and species of Linden, Oak, Pear, and Elm. From there, the number of tree species representing more than 1% of the total tree population drops off steadily.

Maple species account for almost one-third of Carol Stream's tree population. It should generally be said that reducing the number of Maples overall while increasing lesser represented species should be a strategic goal, and our Diversity Vision will help to accomplish this. Honeylocust trees also well exceed the recommended 5% species threshold and account for almost 18% of the total population. Another species that exceeds the recommended 5% species threshold is the Callery Pear. Callery Pear is currently on the Morton Arboretum's "not recommended" list and may be listed as an invasive species in the near future due to its tendency to spread aggressively, therefore new plantings are discouraged.

A long-term tree planting plan would be an invaluable tool for Carol Stream to pursue in the future. Such a plan would not only further improve overall diversity, but also maximize the lifespan of trees on the parkways by carefully matching tree species requirements and tolerances with each individual planting site. Trees that are well adapted to their growing conditions will establish more quickly, require less maintenance, be healthier overall, and more resistant to disease and insect problems. By matching the right trees with the right planting spaces using a tree planting plan, the Village can help protect its investment in each new tree.

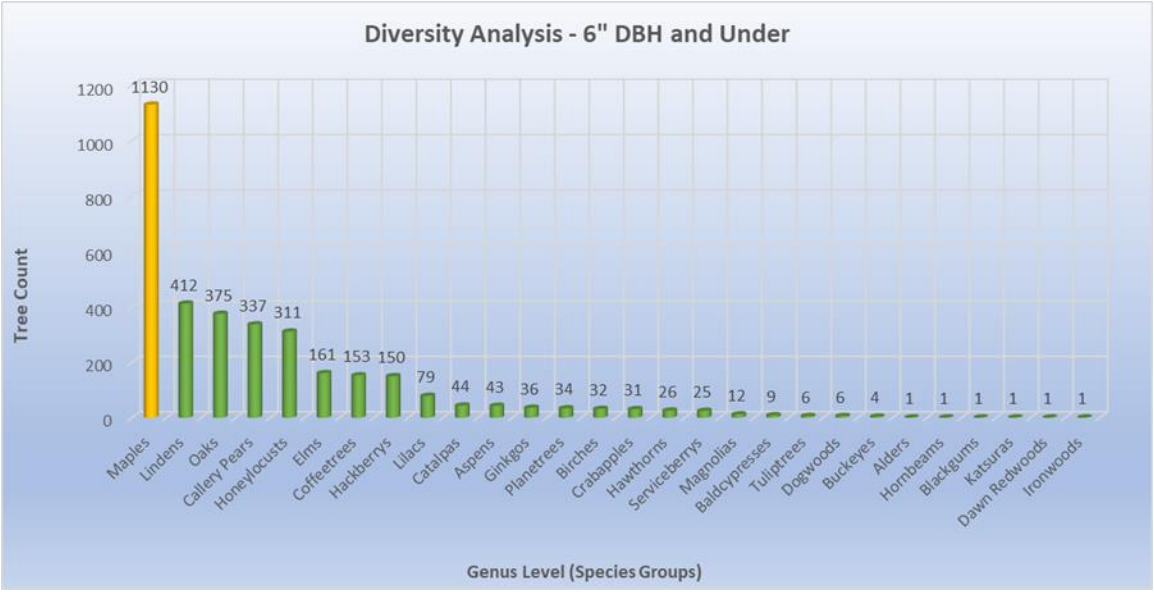
Going forward it is recommended that the Village sets a goal to limit widespread planting of Maple species and to opt for improved varieties of Maple species when necessary.

Additionally, the 118 trees in the "Undesirables" category include trees such as Buckthorn, Cottonwood, Siberian Elm, Mulberry, Black Cherry, White Poplar, Boxelder, Black Locust, and Willow spp. These trees are known for either being invasive or weak-wooded trees that often develop a variety of structural defects as they mature. For safety, aesthetic, and ecological reasons, it is recommended that the Village set a goal of gradually reducing the number of undesirable trees on its parkways as they decline or develop structural defects and replanting them with a diverse set of tree species to increase overall diversity and improve tree population stability.

Although Carol Stream's diversity is quite good overall (with the exception of the Maples), the Village has a number of species to choose from which are commercially available and underrepresented in their population. As mentioned above, the Urban Forest Management Plan will lay out strategies to even further improve diversity, and we will examine the specific species recommended in the "Future of the Urban Forest" Section below.

Young Tree Diversity

This Management Plan has spent significant time discussing the existing diversity. It should be noted that the diversity of new plantings has been much improved, as can be seen from the chart showing all trees 6" in diameter and less below, which represents trees planted in the last 10 years or so.



As shown above, Maples are still by far the most highly represented species even among the younger population and it is recommended that this trend be curtailed. In addition, the planting of more, and more diverse, sets of smaller ornamentals other than Lilacs, Crabapples, and Hawthorns is suggested in order to contribute to the multilayered canopy mentioned previously and to increase small species diversity.

iTree Report / Urban Tree Canopy Assessment

iTree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides Urban Forestry analysis and benefits assessment tools. The iTree tools help communities of all sizes to strengthen their forest management and advocacy efforts by quantifying the structure of trees and forests, and the environmental services that trees provide.

The iTree suite calculates hard dollar values that trees provide to communities. Trees provide "ecological services" that may save homeowners money, such as in heating and cooling costs, where large trees help shade houses in the summer, saving on air conditioning and electricity bills, and provide windbreaks during the winter, saving on heating and natural gas costs. They also provide CO2 uptake, reducing the effects of climate change, as well as air quality improvements by the absorption of urban pollutants. Trees also absorb stormwater, which reduces strain on stormwater infrastructure, and may save money in replacement costs. Finally, trees can contribute up to 15% of the total value of a property, so they have monetary aesthetic benefits as well. Although this plan focuses only on parkway trees, neighborhoods with tree lined parkways often may have higher property values than neighborhoods devoid of many public trees.

Using the data from the tree inventory, several iTree reports have been prepared for the Village. Below you will find reports on the Net annual benefits of the tree population, replacement values, and breakdown of benefits per species. We performed both the iTree Streets analysis which looks primarily at energy savings, and an iTree Eco analysis which focuses more on ecological benefits such as Carbon Storage and Sequestration. The results of these analyses are below, and full tables and iTree Reports are available.

iTree Streets Analysis Results

Carol Stream

Total Annual Benefits, Net Benefits, and Costs for Public Trees

9/20/2021

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	54,158	(N/A)	6.57	(N/A)	1.38	(N/A)
CO2	12,356	(N/A)	1.50	(N/A)	0.32	(N/A)
Air Quality	12,720	(N/A)	1.54	(N/A)	0.32	(N/A)
Stormwater	468,175	(N/A)	56.84	(N/A)	11.94	(N/A)
Aesthetic/Other	549,447	(N/A)	66.70	(N/A)	14.02	(N/A)
Total Benefits	1,096,855	(N/A)	133.16	(N/A)	27.98	(N/A)

iTree Eco Analysis Results

- Number of trees: 8,237
- Tree Cover: 56.42 acres
- Most common species of trees: Honeylocust, Silver maple, Littleleaf linden
- Percentage of trees less than 6" (15.2 cm) diameter: 43.0%
- Pollution Removal: 1.495 tons/year ($19.1 thousand/year)
- Carbon Storage: 1.975 thousand tons ($337 thousand)
- Carbon Sequestration: 53.25 tons ($9.08 thousand/year)
- Oxygen Production: 142 tons/year
- Avoided Runoff: 130.6 thousand cubic feet/year ($26.4 thousand/year)
- Building energy savings: N/A – data not collected
- Avoided carbon emissions: N/A – data not collected
- Structural values: $6.64 million

Total Standing Eco Value of Carol Stream's Trees $6,977,000

Total Annual Eco Value of Carol Stream's Trees $71,326/year

To summarize all of these values together, we have created the following table:

Annual Values	
Benefits to Residents	$1,096,855/year
Benefits to Environment	$71,326/year
SUBTOTAL (Each Year)	**$1,168,181/year**
Standing Values	
As a Commodity	$6,210,087
As an Ecological Resource	$6,977,000
SUBTOTAL	**$13,187,087**

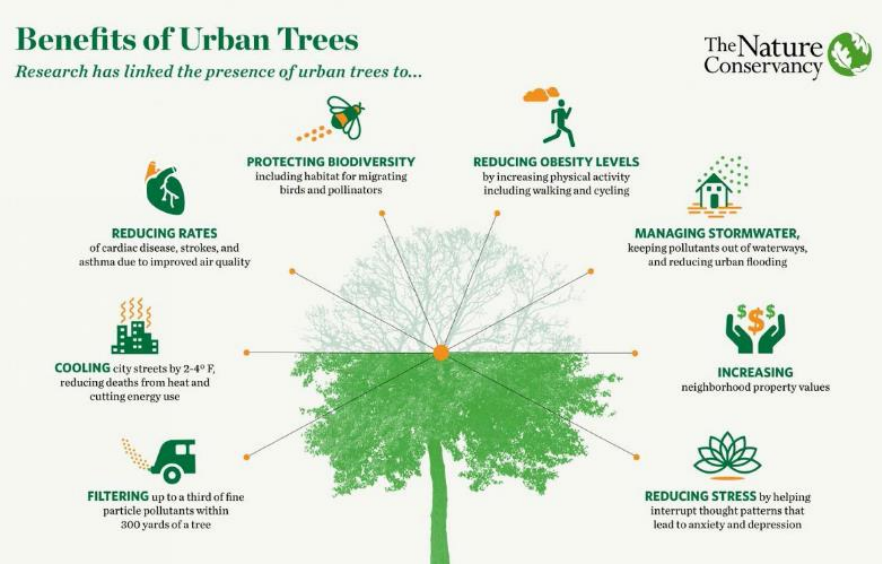
As can be seen from the above tables, the tree population in the Village of Carol Stream currently provides approximately $1,168,181 in benefits every year, directly related to trees and their effect on homes, businesses, and the environment.

It should be noted that the annual budget for all forestry activities recommended in this plan, projected for the calendar year 2032, will total approximately an average of $160,000 per year, so the benefits from the tree population are worth over 7 times what the annual cost put into them is. We will examine this further below. In addition, the total standing value as a commodity and an ecological resource of the whole tree population is $13,187,087.

These benefits can be viewed as "income" to Carol Stream's residents, and so long as the trees are well maintained, they will continue to provide these benefits, and more. As trees grow, they also increase their benefits. For example, a 3" diameter tree provides less than $50/year in gross benefits, whereas as 20" tree can provide up to $500 gross benefits per year. The goal is to increase benefits even more, where the tree population pays for itself and even yields "profits".

The replacement value of trees was also calculated. Currently, the standing value of all trees in the Village of Carol Stream population is $6,210,087. This value is calculated using the industry standard reference, the *9th Edition Guide to Tree and Landscape Appraisal*, which is published by the Council of Tree and Landscape Appraisers.

The iTree Eco data looks at the value of the trees in the absence of the effect of homes or businesses, and looks at trees more from an ecological perspective, mostly what the tree's value is in sequestering and storing carbon. These numbers are based on peer reviewed science in both arboriculture as well as climatology and other disciplines.



Below are several examples of Ecological Services provided by trees:

Energy Savings: During the summer when temperatures are warm, trees create shade, and temperatures are cooler in the shade. Cooler temperatures cause air conditioners to have to work less, which reduces the amount of energy a household uses. During the winter when temperatures are cold, winter winds cool your home quickly. Trees act as windbreaks, causing heating systems to use less natural gas, saving energy and money.

Carbon Dioxide (CO2): The amount of CO2 which is put into the atmosphere each year has a direct correlation with global climate change. That change causes more severe storms, greater drought conditions, and many other costly outcomes. Reducing CO2 from our atmosphere lessens these effects. Trees uptake CO2 and act as a carbon sink, putting carbon into long term storage in its woody tissues, removing it from our atmosphere, creating a net benefit to society, and saving money.

Air Quality: Industrial processes and vehicle emissions put pollutants into our air. These pollutants can cause or worsen health conditions such as heart disease, asthma, and lung disease. In addition, these pollutants can mix with water in the atmosphere and create nitric and sulfuric acid, causing acid rain, which can destroy fisheries and contaminate water supplies. Trees absorb these compounds with their leaves and other tissues, and prevent them from remaining in the atmosphere. Reductions in these pollutants results in overall better health, reducing the cost of healthcare to society, and saving communities money.

Storm water: The cost of delivering fresh water to homes, as well as removing and treating wastewater and storm water, is considerable. One of the greatest costs comes when these systems are overwhelmed, such as during flooding, which can cause millions of dollars of damage to homes and vehicles, or when these systems need to be replaced. Fortunately, trees take water from the soil and put it back into the atmosphere through the process of transpiration. Therefore, the more trees an organization has, the less flooding is an issue, and the less strain is put on storm water infrastructure, resulting in fewer repairs and replacements. In addition, tree canopy slows rainfall's effects on flooding by "intercepting" it with leaves and branches, delaying how quickly rainfall can become floodwater. All of this adds up to savings for an organization.

Aesthetic/Monetary: Up to 15% of the value of a property may be attributed to its trees and other landscaping. Tree lined streets are often found to be more appealing to homebuyers than streets devoid of trees, which may result in increased property values.

The goal of this Urban Forest Management Plan is to create a tree population which maximizes all of these ecological benefits to Carol Stream residents by increasing the number of trees in the Village, and how long they live, while minimizing costs in order to create a healthy, well maintained, and vibrant tree population.

Urban Tree Canopy Assessment

Based on data available from the US Forest Service and Morton Arboretum, the total Urban Tree Canopy of Carol Stream can be determined. This is expressed as the percent of the Village covered by tree canopy from an aerial view. This assessment included 7 total land cover types, including trees, grass and shrub, bare soil, water, buildings, roads/railroads, and other paved surfaces. The result of this tree canopy assessment was that Carol Stream contains 13.35% total tree canopy, (see page 35 for land cover map), compared to other land cover types. This includes all land, both public and private. Canopy cover is different from stocking density as well as different from the planting and diversity projections later in this document which only deal with trees that the Village has direct jurisdiction over on its rights-of-way and Village-owned properties. A link to an interactive Chicago Region Trees Initiative (CRTI) canopy cover map can be found at http://chicagorti.org/interactivemap

The tree inventory itself was only conducted on publicly owned land such as parkways and boulevards, etc. Detailed information on each tree is not included in this assessment, only total coverage. Aerial images were used to estimate how much tree and other land cover types were in the Village using a software which is similar to Google Earth or other aerial imagery viewers.

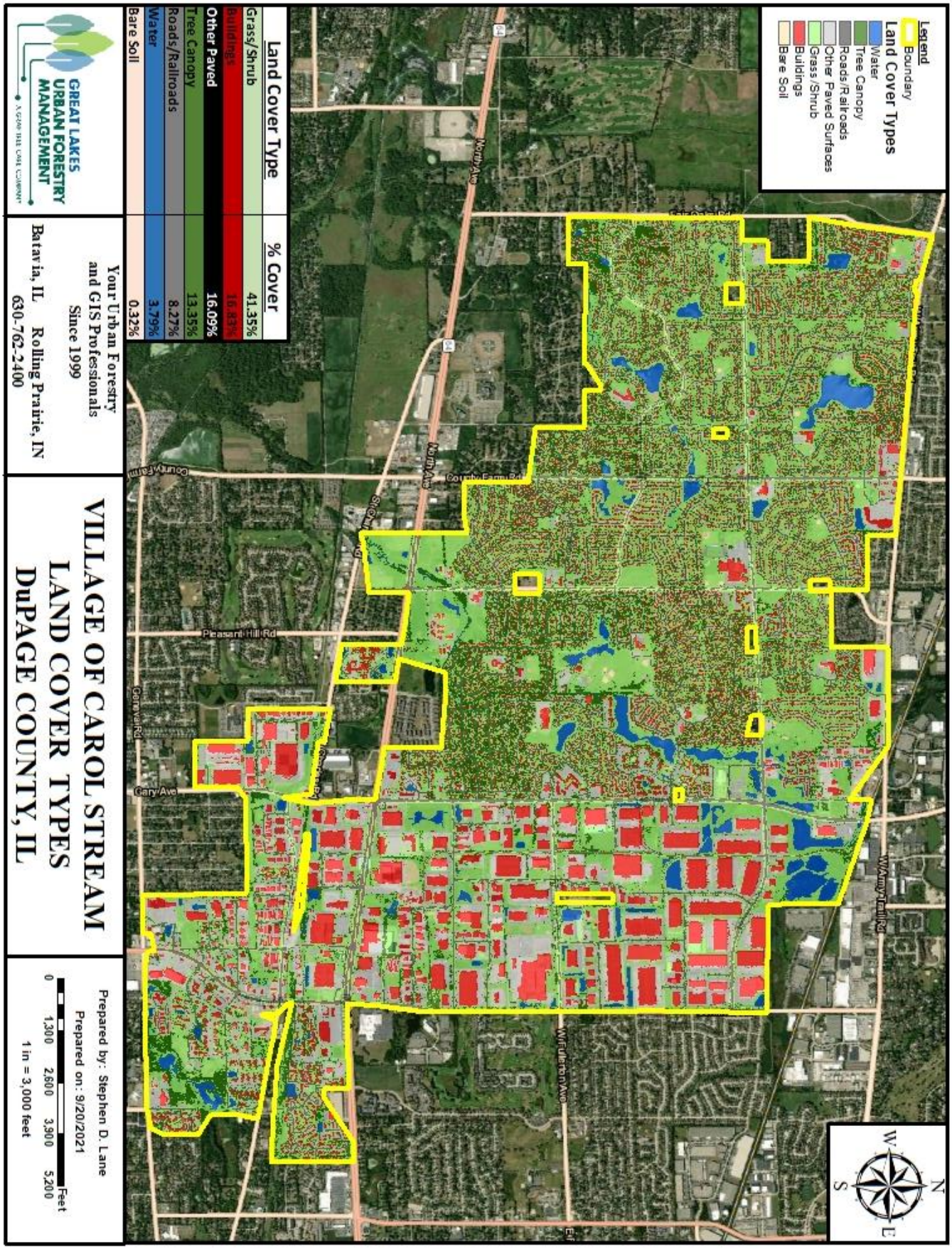
The goal is to increase the total tree canopy in Carol Stream to 15% by 2032. Part of the 15% goal here is encouraging tree planting on private property by residents and business owners, as well as enhancing the Village's annual tree planting program. This goal has been estimated by analyzing data from many different urban tree populations in the Chicago region and is based on preliminary data from the Chicago Region Trees Initiative's (CRTI) Forest Composition Workgroup.

We believe this is an attainable goal over this time period and budget projections for enhancing the Village's annual tree planting program are included in this Plan (see page 53). Carol Stream has an overall lower amount of tree canopy compared to other similar suburban communities of Chicagoland. However, there are several reasons for this including the devastating tree loss due to the EAB infestation, the considerable square mileage of the Village occupied by industrial properties, and the presence of several state and county roadways that are not maintained by the Village. The goal of 15% is a modest, but reasonable, increase, which will still yield beneficial results.

This will be accomplished through increasing the number of trees on the Village owned rights-of-way and on Village owned properties. It will also be accomplished by continuing to maintain the existing tree population in an appropriate and proactive manner, and enhancing the Urban Forestry program in Carol Stream when there is opportunity to do so. Tree planting and maintenance will also be encouraged on private property, by encouraging residents and business owners to plant trees when possible. Outreach and education will also be provided to residents through events such as Arbor Day and Earth Day celebrations. This goal will be monitored by using aerial imagery analysis like the analysis presented below. Every 10 years, the imagery will be assessed, and a new canopy cover percentage will be calculated for Carol Stream.

As seen on the map on the next page, Carol Stream is home to a significant amount of industrial development surrounded by large grass areas. As mentioned above, Carol Stream has further opportunity to increase tree canopy coverage by exploring ways to encourage its industrial businesses to have trees planted on their large grass areas. Also, several residential neighborhoods in Carol Stream were also categorized as "No Tree" areas where there are standard sized parkways but have virtually no Village trees. Carol Stream can further increase their desired canopy goal by re-evaluating these areas for future tree planting. As previously mentioned, tree-lined streets and their shade-providing canopies can be found to increase property values, which makes this concept worth exploring further.

Land Cover Type	% Cover
Grass/Shrub	41.35%
Buildings	16.83%
Other Paved	16.09%
Tree Canopy	13.35%
Roads/Railroads	8.27%
Water	3.79%
Bare Soil	0.32%



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VILLAGE OF CAROL STREAM LAND COVER TYPES DuPAGE COUNTY, IL

Prepared by: Stephen D. Lane
Prepared on: 9/20/2021

The Future of the Urban Forest

In this section, a vision of what the tree population of Carol Stream could become by 2032 was created, and compared with the current population. Using the existing data, and the diversity vision, we will then define exactly how Carol Stream can move from where it is now to where it could be.

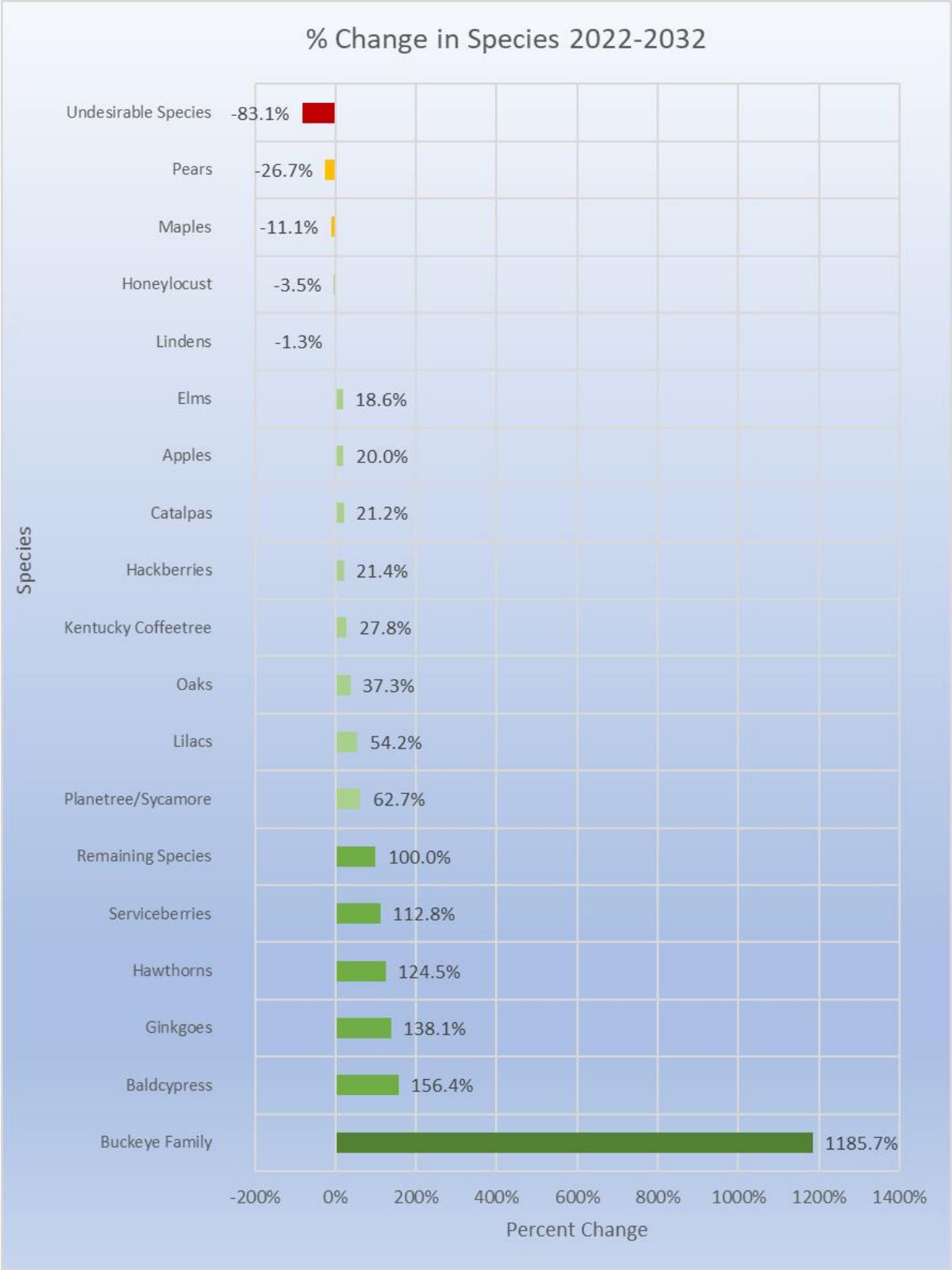
Change in Species Composition 2022 – 2032

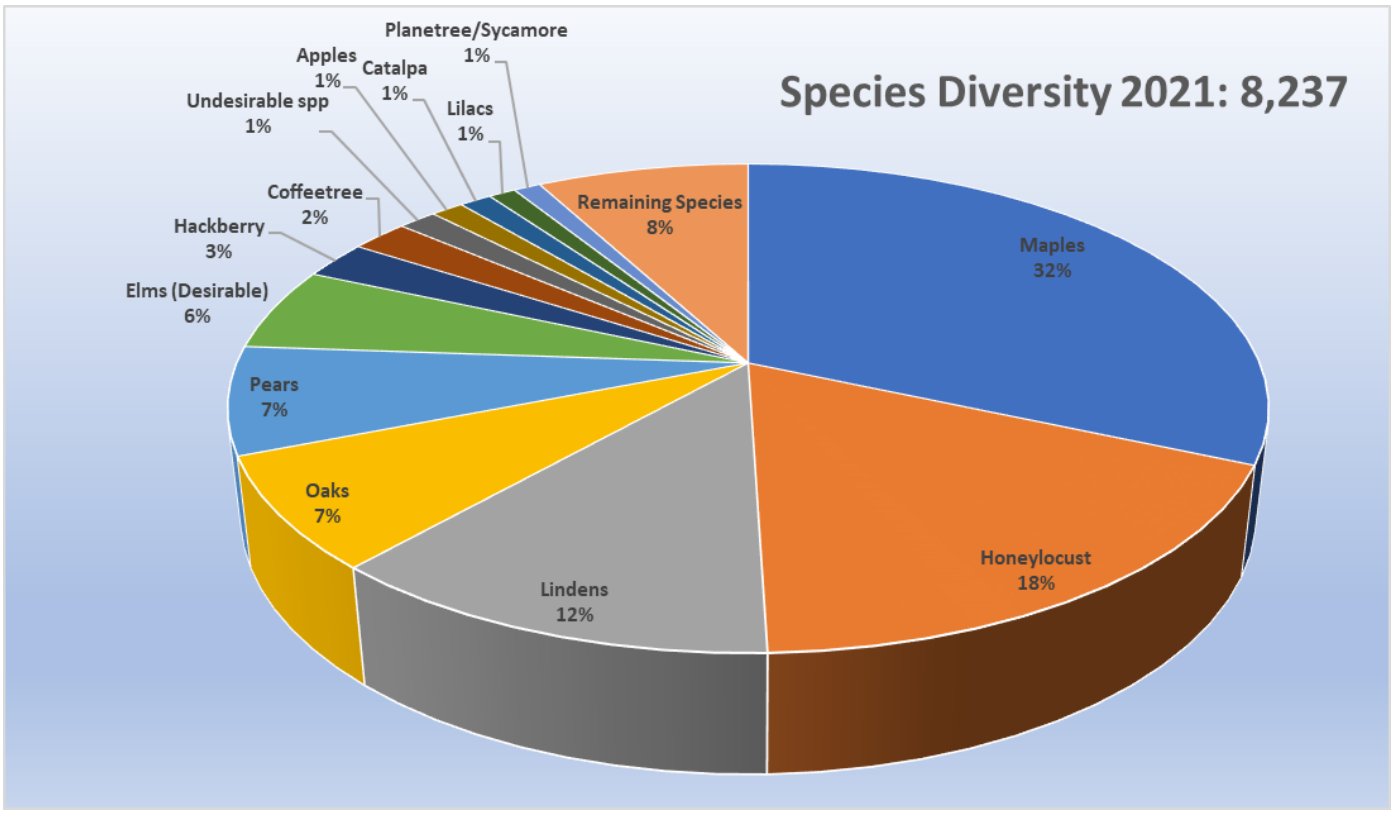
The calculations for this change in diversity were performed by hand. Knowledge of the trees, their conditions, what is growing well and what isn't were all used and yielded this forest composition change list. These goals are meant as guideposts, and not absolutes. This Plan, and the species goals are meant to be adaptively managed over time as new information becomes available.

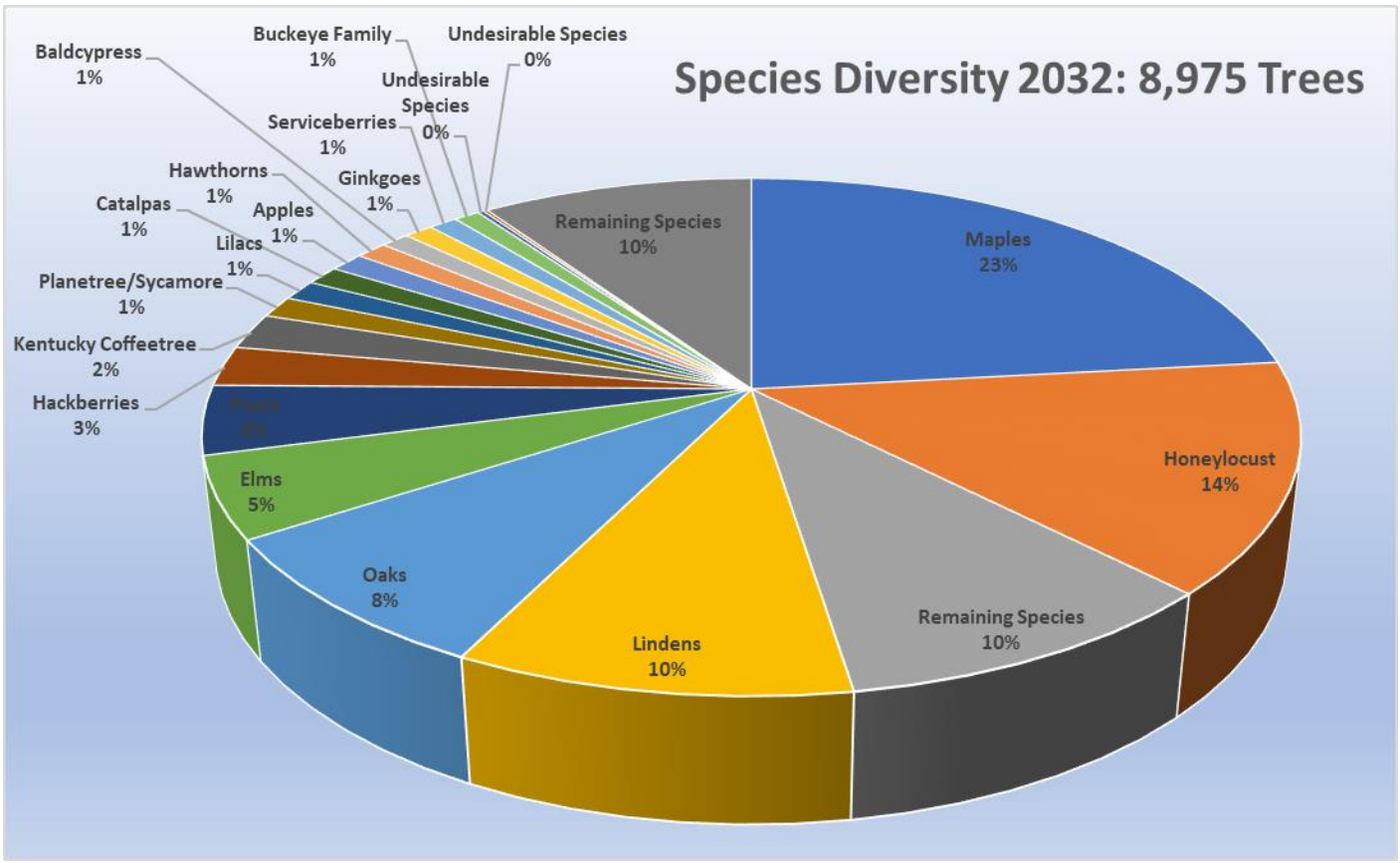
SPECIES	COUNT 2022	COUNT 2032	SPECIES	COUNT 2022	COUNT 2032	SPECIES	COUNT 2022	COUNT 2032
HONEYLOCUST	1477	1425	DAWN REDWOOD	17	30	SWEETGUM	2	30
MAPLE-AUTUMN BLAZE	672	625	OAK-SHINGLE	17	50	MAGNOLIA-STAR	2	10
LINDEN-LITTLELEAF	656	600	OAK-WHITE	13	30	WITCH HAZEL	2	5
MAPLE-NORWAY	645	550	SPRUCE-NORWAY	13	10	MAPLE-JAPANESE	2	2
MAPLE-RED	631	580	ALDER-SPP	12	20	ASH-BLUE	2	1
PEAR-CALLERY	582	425	ZELKOVA	10	40	YEW	2	0
ELM-HYBRID	448	500	HAWTHORN-WASHINGTON	10	30	BLACKGUM	1	30
MAPLE-SILVER	319	200	SPRUCE-WHITE	10	10	IRONWOOD	1	30
LINDEN-AMERICAN	312	300	SYCAMORE	10	10	AMERICAN HORNBEAM	1	30
MAPLE-SUGAR	276	225	MAPLE-AMUR	9	5	BIRCH-GRAY	1	10
HACKBERRY	206	250	ASPEN	9	15	DOGWOOD-CORNELIAN	1	30
KENTUCKY COFFEETREE	176	225	CHERRY-SPP	9	10	KATSURA	1	10
OAK-RED	167	175	BOXELDER	8	0	OAK-SAWTOOTH	1	10
OAK-SWAMP WHITE	152	200	MAPLE-BLACK	8	30	APRICOT	1	0
OAK-CHINQUAPIN	107	130	WILLOW-SPP	7	0	PINE-MUGO	1	0
CATALPA	99	120	BUCKEYE-OHIO	7	30	POPLAR-WHITE	1	0
LILAC-TREE	80	125	COTTONWOOD	7	5	BEECH-EUROPEAN	1	20
APPLE-CRAB SPP	76	100	WILLOW-WEEPING	6	0	HONEYSUCKLE	1	0
LONDON PLANETREE	73	125	MAGNOLIA-CUCUMBER	6	15	MAPLE-SPP	1	0
OAK-ENGLISH	72	90	ROSE OF SHARON	6	15	UNKNOWN	1	0
OAK-BURR	52	75	TULIPTREE	6	50	VIBURNUM	1	0
BIRCH-RIVER	50	70	BIRCH-WHITE	6	5	BURNING BUSH	1	0
SERVICEBERRY-SPP	47	100	WALNUT-BLACK	6	5	PINE-SCOTCH	1	0
ASH-WHITE	44	20	DOGWOOD-SPP	5	25	YELLOWWOOD	0	40
GINKGO	42	100	HAWTHORN-COCKSPUR	5	40	AMUR MAAKIA	0	20
ELM-SIBERIAN	40	10	MAGNOLIA-SPP	5	15	BUCKEYE-RED	0	10
SPRUCE-BLUE	40	20	MAPLE-HEDGE	5	25	BEECH-AMERICAN	0	10
BALDCYPRESS	39	100	PEAR-EDIBLE	5	5	BUCKEYE-YELLOW	0	20
ASPEN-QUAKING	36	50	PINE-WHITE	5	5	DOGWOOD-PAGODA	0	20
HAWTHORN-SPP	34	40	PLUM-SPP	5	5	EUROPEAN HORNBEAM	0	20
MAPLE-MIYABEI	33	50	SPRUCE-SPP	5	5	HARDY RUBBERTREE	0	10
EASTERN REDCEDAR	33	25	EUONYMUS	4	0	HORSECHESTNUT	0	30
PINE-AUSTRIAN	28	15	LINDEN-SPP	4	30	HYDRANGEA-TREE FORM	0	10
OAK-PIN	27	30	OAK-CHESTNUT	4	30	LARCH	0	20
ASH-GREEN	25	5	AMERICAN REDBUD	3	30	MAGNOLIA-SAUCER	0	10
APPLE-EDIBLE	24	20	BLACK LOCUST	3	20	MAPLE-PAPERBARK	0	20
DOUGLAS FIR	24	20	ELM-AMERICAN	3	1	OAK-BLACK	0	20
MULBERRY-SPP	23	5	CHERRY-BLACK	3	0	PAGODATREE	0	10
LINDEN-SILVER	21	50	ELM-ENGLISH	3	3	PERSIAN IRONWOOD	0	20
BUCKTHORN	19	0	LILAC-SHRUB	3	3	PERSIMMON	0	10
ARBOR VITAE	19	15				SMOKETREE	0	10

Actively Reduce
Maintain Existing
Modest Increase
Significant Increase

Percent Change in Species Composition 2022 - 2032




Species Diversity 2021: 8,237
Maples 32%
Honeylocust 18%
Lindens 12%
Oaks 7%
Pears 7%
Elms (Desirable) 6%
Hackberry 3%
Coffeetree 2%
Undesirable spp 1%
Apples 1%
Catalpa 1%
Lilacs 1%
Planetree/Sycamore 1%
Remaining Species 8%


Species Diversity 2032: 8,975 Trees
Maples 23%
Honeylocust 14%
Remaining Species 10%
Lindens 10%
Oaks 8%
Elms 5%
Hackberries 3%
Kentucky Coffeetree 2%
Planetree/Sycamore 1%
Lilacs 1%
Apples 1%
Catalpas 1%
Hawthorns 1%
Ginkgoes 1%
Serviceberries 1%
Undesirable Species 0%
Buckeye Family 1%
Baldcypress 1%
Remaining Species 10%

As can be seen from the above charts showing the change in species composition over the next 10 years, there will broadly be a move away from the overrepresented or lower-quality species discussed above, and a variety of different species, those which are underrepresented or not present in the tree population, will be planted. This will lead to an overall increase from 8,237 to 8,975 trees total on the Village's ROWs, as well as a change from the current total of 104 species to a total of 109 species. This will result in a more robust and resilient Urban Forest which is resistant to pest and pathogen outbreaks. It will also give Carol Stream an opportunity to apply to certify the Village as an Arboretum through the Morton Arboretum's ArbNet Certification program, which requires a minimum of 100 species.

The Benefits of Larger, Healthier Trees

Larger trees provide greater benefits to the community: They create more shade to offset cooling costs, absorb more storm water, create greater buffers against cool winter winds for heating costs, and absorb and sequester more carbon than smaller trees do. For the 2032 vision of the tree population, a variety of methods were used to arrive at a reasonable age-class distribution. We used the current population structure, and anticipated high rates of survival based on new planting practices which would involve a "right tree/right site" approach, as well as increased survivorship of existing trees due to a continued high level of proactive management. Predicted growth, survivorship, and eventual tree losses are based on current species composition and future plantings and removals. This allowed the creation of a vision of what the tree population, including species and size, will look like 10 years from now.

It can be seen from the above chart that the existing tree population (grey bars) shows a predominantly young to middle aged tree population with somewhat gradual decreases in numbers of trees through the 13-18" category and a sharp decline in numbers in the larger age class categories. The projected age class chart shows a significant decrease in the smallest age class category over the course of this Plan as the trees currently in this category will mature to move to the next range, and also projects more trees surviving into the older age classes, where they will provide the greatest benefits in terms of ecological services to the community. These DBH change projections are driven purely by the diversity projections presented in the beginning of this section which forecasts somewhat lowering the numbers of some of the over-represented and lower quality species. The table to the right shows this data in a tabular format.

	2022	2027	2032
0-6"	3546	2500	1900
7-12"	2606	3100	2800
13-18"	1469	1600	2200
19-24"	401	1000	1300
25-30"	140	230	550
31-36"	57	100	150
37-42"	13	45	50
>42"	5	10	25

This was based on the fact that maintaining and even enhancing the high levels of care for existing trees would enable them to survive longer. The graph and table show a general expectation of how the changes in tree diameters might change over the next 10 years based on the methods to be applied in this Urban Forest Management Plan. The numbers themselves were projected by hand, based on our prior experience, and the methods are detailed below. If these projections hold, Carol Stream could see a $460,081 or 39% increase in annual benefits up from $1,168,181 to $1,628,262. Standing values of the tree population could increase $3,637,983 or 28% from their current level of $13,187,087 to approximately $16,825,070.

For projections of future age classes of trees, a ½" per year growth rate was roughly estimated by assuming that it would take an average tree 10 years to go from one age class to the next (appx 5-6" = appx 10-12 years growth). Also used were the number of trees to be planted and removed annually, as calculated below in the Tree Planting and Tree Removal sections. These numbers were arrived at based on all the above, as well as the best professional opinion of the Forestry Consultant. As time goes by, these projections will likely change. These are rough estimates for the purposes of this Plan.

The overall increase in size of the tree population and diameters of the individual trees will yield a much greater dollar figure when it comes to the ecological services provided, and provide residents with a greater sense of being in an arboretum-like setting when they are enjoying the urban forest.

Return on Investment

Return On Investment (ROI) for an individual tree is strongly favorable over the life of a tree in terms of investment in planting, care, and removal versus the ecological benefits the tree provides. As we strive to justify the expenditures on trees and tree care, it is important that organizations and their staff are aware of this.

On the following page, we have provided an ROI calculation sheet. This sheet breaks the tree's lifetime down into three phases, based on the anticipated costs of pruning in the budgets sections below. These phases are the young (3-12" DBH), mature (13-24" DBH), and full grown (25-36") ranges shown below.

Data was taken from the iTree algorithm and applied towards the average benefits provided by a tree at each of these life stages, and multiplies it out over the 20 year period each phase accounts for. We also looked at costs for planting, watering, routine maintenance, emergency maintenance, and eventual removal of that tree over 60 years. The results are pictured below, with the calculations on the following page.

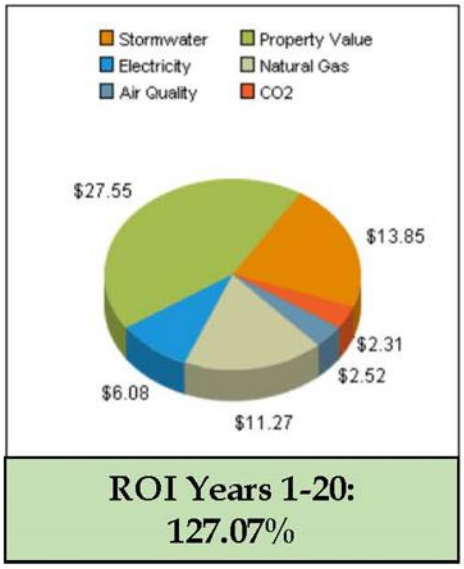
Total Investment	**$3,610.00**
Total Return	**$10,819.60**
Total ROI Over 60 Years	**199.71%**

Return on Investment: Years 1-20 (3-12″ Diameter)

Costs

Initial Purchase and Installation	$300.00
Watering for 2 Years	$100.00
Pruning - 4x @ $40/prune	$160.00
TOTAL INVESTMENT	**$560.00**

Benefits	Avg/Year	Over 20 Years
Electricty	$6.08	$121.60
Natural Gas	$11.27	$225.40
Property Value	$27.55	$551.00
Stormwater	$13.85	$277.00
Air Quality	$2.52	$50.40
CO2 Reduction	$2.31	$46.20
TOTAL RETURN		**$1,271.60**



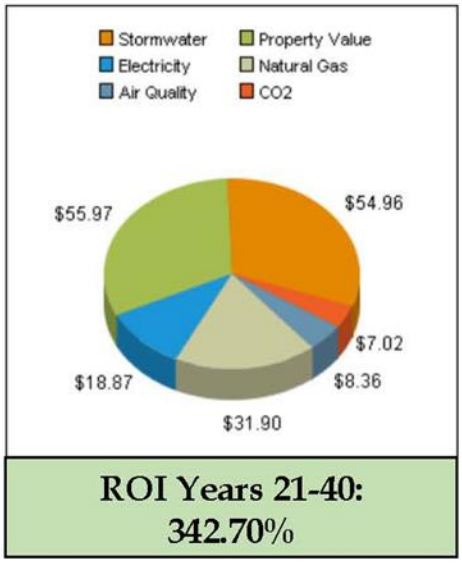
ROI Years 1-20: 127.07%

Return on Investment: Years 21-40 (13-24″ Diameter)

Costs

Pruning - 4x @ $75/prune	$300.00
Emergency Maintenance (2x)	$500.00
TOTAL INVESTMENT	**$800.00**

Benefits	Avg/Year	Over 20 Years
Electricty	$18.87	$377.40
Natural Gas	$31.90	$638.00
Property Value	$55.97	$1,119.40
Stormwater	$54.96	$1,099.20
Air Quality	$8.36	$167.20
CO2 Reduction	$7.02	$140.40
TOTAL RETURN		**$3,541.60**



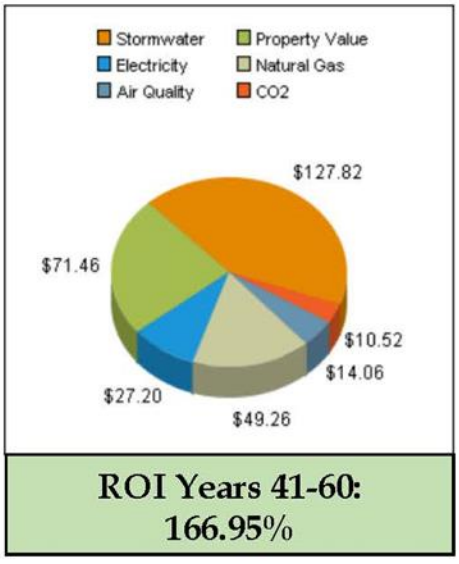
ROI Years 21-40: 342.70%

Return on Investment: Years 41-60 (25-36″ Diameter)

Costs

Pruning - 4x @ $150/prune	$600.00
Emergency Maintenance (2x)	$650.00
Eventual Cost of Removal	$1,000.00
TOTAL INVESTMENT	**$2,250.00**

Benefits	Avg/Year	Over 20 Years
Electricty	$27.20	$544.00
Natural Gas	$49.26	$985.20
Property Value	$71.46	$1,429.20
Stormwater	$127.82	$2,556.40
Air Quality	$14.06	$281.20
CO2 Reduction	$10.52	$210.40
TOTAL RETURN		**$6,006.40**

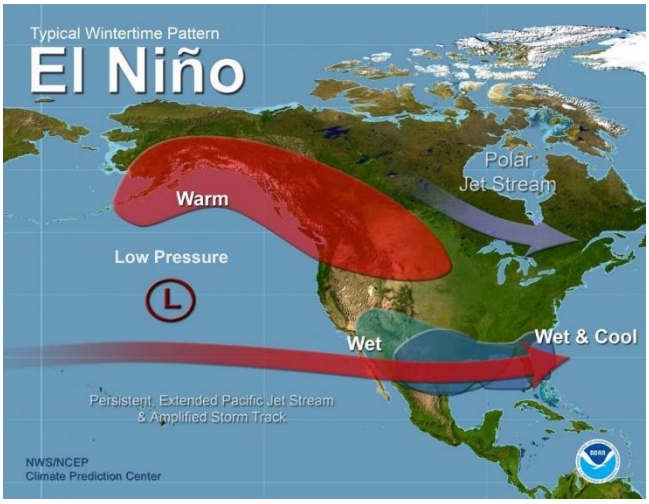


ROI Years 41-60: 166.95%

Trees and Climate Change

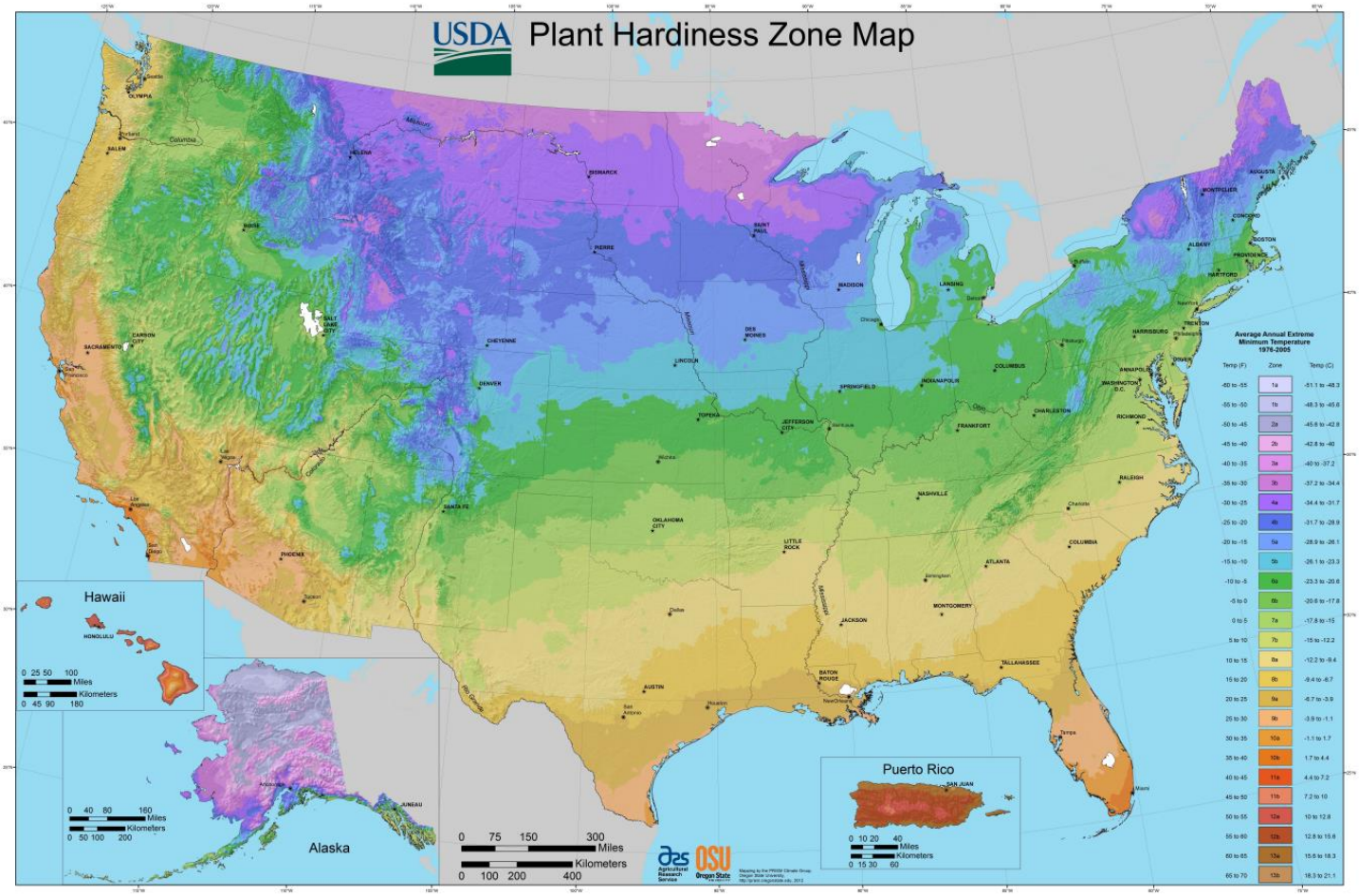
According to the United States Environmental Protection Agency, National Oceanic and Atmospheric Administration, Metropolitan Mayors Caucus, and a variety of other national and international reputable scientific and humanities-oriented sources, climate change will cause significant suffering over the coming hundreds to thousands of years. Increases in carbon dioxide, methane, and other greenhouse gasses in the atmosphere trap heat from the sun and will create a generally warming climate. Though it should be said that "climate change" means more than just warming trends.

Though the general trend will be towards a warmer climate, the transition process will be very chaotic, and will be one of more "extremes": hotter summers, colder winters, worse storm seasons, and the like will be the trend for quite some time before the full effects of a warming trend are realized. This is due to the immense complexity of the planet's climate, and all of the "teleconnections" which exist. Teleconnections are effects on one part of the planet from a corresponding change in another part. The most "famous" of these is the "El Nino" phenomenon, where changing ocean temperatures near the Galapagos islands strongly influences the amount of rainfall or drought in all North America. But there are literally dozens of these known teleconnections across the globe, and changing climate impacts all of them.



All of the organizations involved with changing climate and the carbon dioxide inputs that drive it have the same message: planting more trees, particularly in areas predisposed to changes in climate, will aid in pulling CO2 from the atmosphere and reducing the impact of climate change. So the number of trees we are planting is important, both on public as well as private land. But the types of trees we are planting matters as well. The US Forest Service is already starting programs of planting climate sensitive tree species outside of their historic natural ranges in anticipation of an overall warmer climate (https://www.fs.usda.gov/ccrc/story/helping-forests-keep-pace-climate-change).

When it comes to tree planting in anticipation of climate change for urban environments in our area, we need to be careful, however. While the general trend is towards warming, the "extremes" side of this makes for a difficult decision. While summers may be warmer and support trees which are adapted to warmer conditions overall, our winters will still reach down into the -30° F and even colder range for extended periods. And cold weather is the limiting factor for what can be planted in an area. See the USDA Hardiness Zone map on the following page for a more detailed explanation. It shows the **coldest** temperatures which can be expected in an area, not the **warmest** ones. So before we start planting trees in northern Illinois that are more native to southern Illinois, we must understand that we need to plan for the coldest temperature, not the warmest per se.



All of that said, we should start planting trees now at least on a somewhat experimental basis that will be more tolerant of a warmer climate. Below are some suggestions of trees which the Village could plant which are just outside of our climate region, and may be successful over the coming 30 years or so, depending how effective we are at combatting climate change using other methods:

Southern Catalpa (*Catalpa bignoniodes*)	Southern Hackberry (*Celtis laevigata*)	Swamp Chestnut Oak (*Quercus michauxii*)	Cherrybark Oak (*Quercus pagoda*)
Water Hickory (*Carya aquaticca*)	Pecan Hickory (*Carya illinoiensis*)	Sourwood (*Oxydendrum arborea*)	Mimosa Tree (*Albizia julibrissin*)
Carolina Silverbell (*Halesia Carolina*)	Crapemyrtle spp (*Lagerstroemia spp*)	Flowering Dogwood (*Cornus florida*)	Sweetbay Magnolia (*Magnolia virginiana*)
Southern Magnolia (*Magnolia grandiflora*)	American Holly (*Ilex opaca*)	Oklahoma Redbud (*Cercis reniformis*)	Ornamental Cherries (*Prunus spp*)

All of these species grow in Illinois, just not in our part of the state, per se. And some are certainly more risky than others. Crape Myrtle for instance is barely tolerant of the climate in southern Illinois, while Southern Hackberry can already be planted here with reliable success. But nonetheless they are good species to keep on our radar for experimental plantings.

Positive Tree Benefits for the Environment

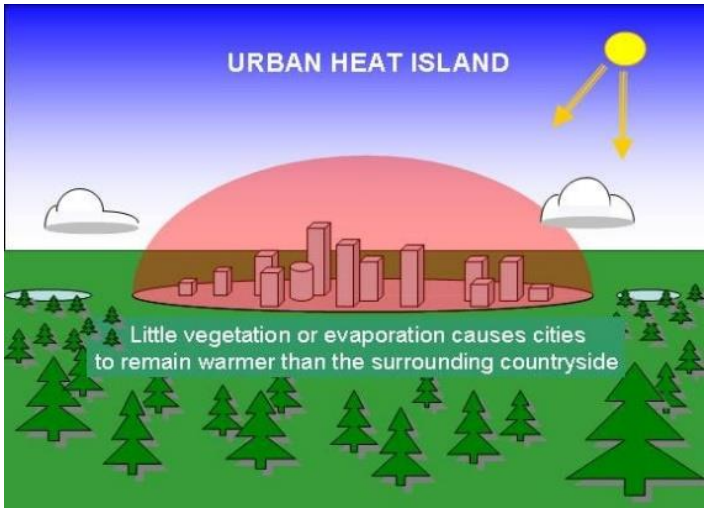
When it comes to trees and climate change, let's move on to some of the immensely positive benefits that trees provide. Here, we are focusing on 2 topics, those being the climate change and the urban heat island effect, as well as flooding prevention and stormwater benefits, since this was one of the primary focuses of this grant, and also some of the more important benefits trees provide.

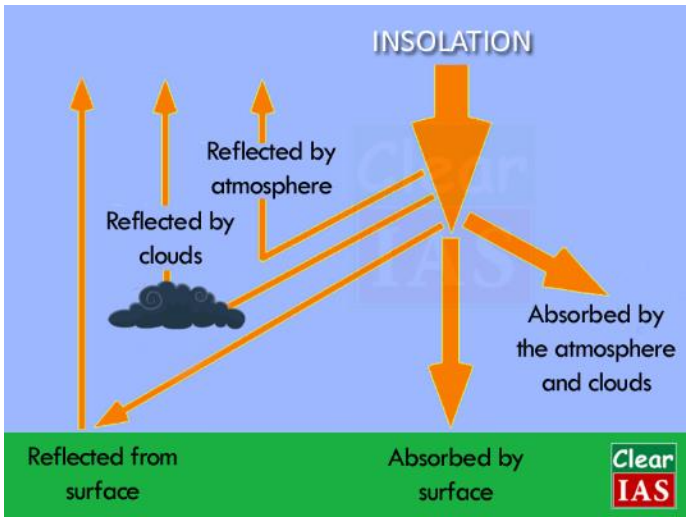
Climate Change / Urban Heat Island Mitigation

First, let's define a few terms: **Climate Change** is change in the climate, both human-induced as well as naturally occurring, that disrupts what we perceive to be the normal operation of climate. It should be noted here that climate is different than weather. Weather is the day-to-day meteorology such as rain on Tuesday and sunny on Wednesday. Climate is what the long-term averages are for an area, such as average June temperatures in the mid 70's with 2-3 inches of rain. The term **Global Warming** has been misapplied many times when speaking about climate change. Yes, increases in carbon dioxide emissions lead in general to a warmer climate, which comes with very specific problems. But the climate change we are seeing currently is one of extremes: higher highs, lower lows, more severe storms, etc. The important part is that during this process of change, year to year weather becomes more unpredictable as the climate changes to generally a warmer one.

The **Urban Heat Island Effect** is a separate but related issue. Trees and other green plants contain chlorophyll, a naturally occurring compound which is custom built by nature for absorbing the sun's energy and converting it to sugars by photosynthesis. And what an energy the sun has. The amount of energy from the sun hitting the Earth at any given time is approximately 1,350 Watts per square meter, which is a LOT of energy to absorb. When an area has fewer plants, and a lot of asphalt and other dark surfaces, this produces a lot of heat.

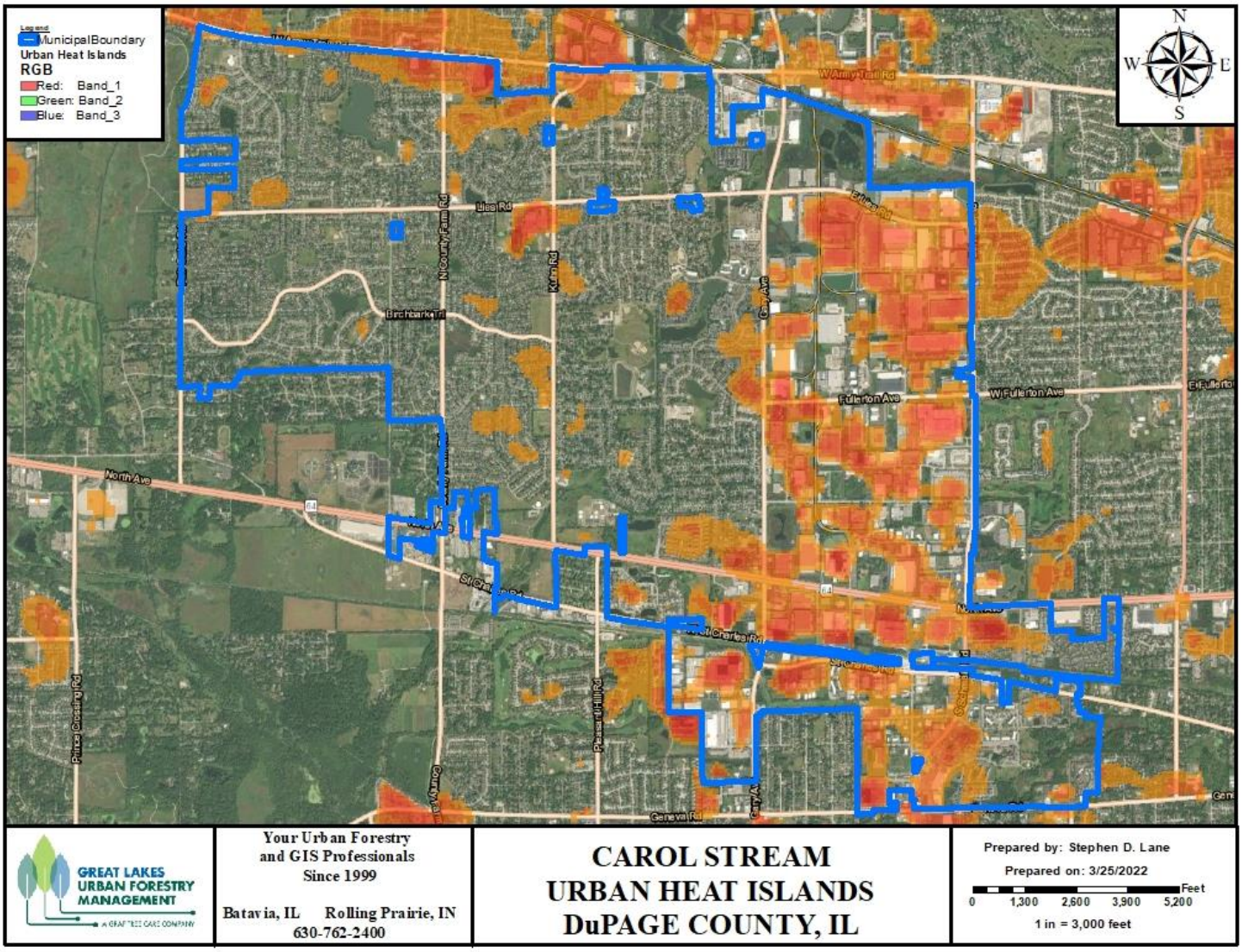
Think about it, if you wear a dark shirt when the sun is shining, you feel hotter than if you were wearing a white shirt. That is because different colors absorb things differently, and light colors reflect light while dark colors absorb it, and absorbing more light leads to more heat. So asphalt and other urban surfaces create local heating above normal atmospheric heating.





All of this is of course just scratching the surface of a set of very complex issues. But essentially, when we have a generally warming climate, combined with this urban heat island effect, it can dramatically raise temperatures in urban areas, leading to a variety of issues. This is where trees become a major factor in making things better. Not only do they absorb carbon dioxide from the atmosphere, which helps to reduce the effects of climate change, but especially in urban areas, if we can plant trees over areas of asphalt and dark surfaces, this will keep the sun from hitting those surfaces, and instead direct the sun's energy to photosynthesis in the tree's leaves. The combined effects of these things will lead to reductions in warming.

For the Village of Carol Stream, below is a map of the urban heat island areas. The darker red or orange areas represent greater heat island effects, but do not represent specific "degree based" deviations, and areas of no shading mean no deviation from long term averages:

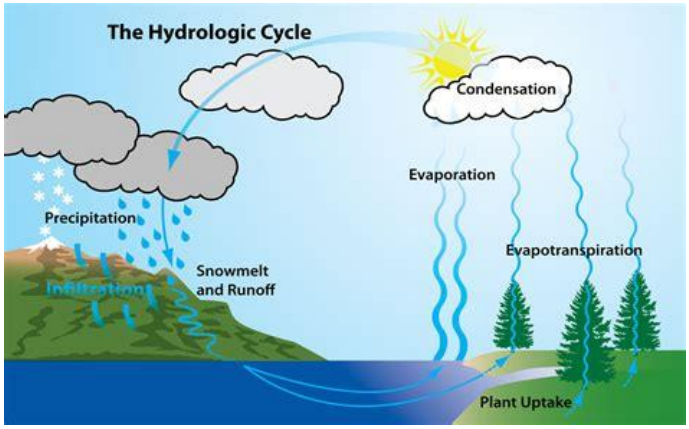


As can be seen from this map, the greatest heat island effects are along the transportation corridors, as well as the industrial areas where greenspace is lower overall. These are the areas where tree planting will create the greatest cooling effects.

Planting trees not just on Village owned property, but also encouraging residents and business owners to plant trees on their own property is a long-term goal of this management plan, and one of the big reasons is to offset the effects of climate change and the urban heat island effect. It should also be remembered that the climate is global, and there are no walls that separate cities, states, countries, etc. So, when one area warms, it has effects on the whole climate system. Conversely, when an area has more trees and vegetation planted, those benefits do not just stay confined to that area but benefit the whole planet. Trees are truly an example of acting locally and impacting globally.

Reduction in Flooding / Storm Effects

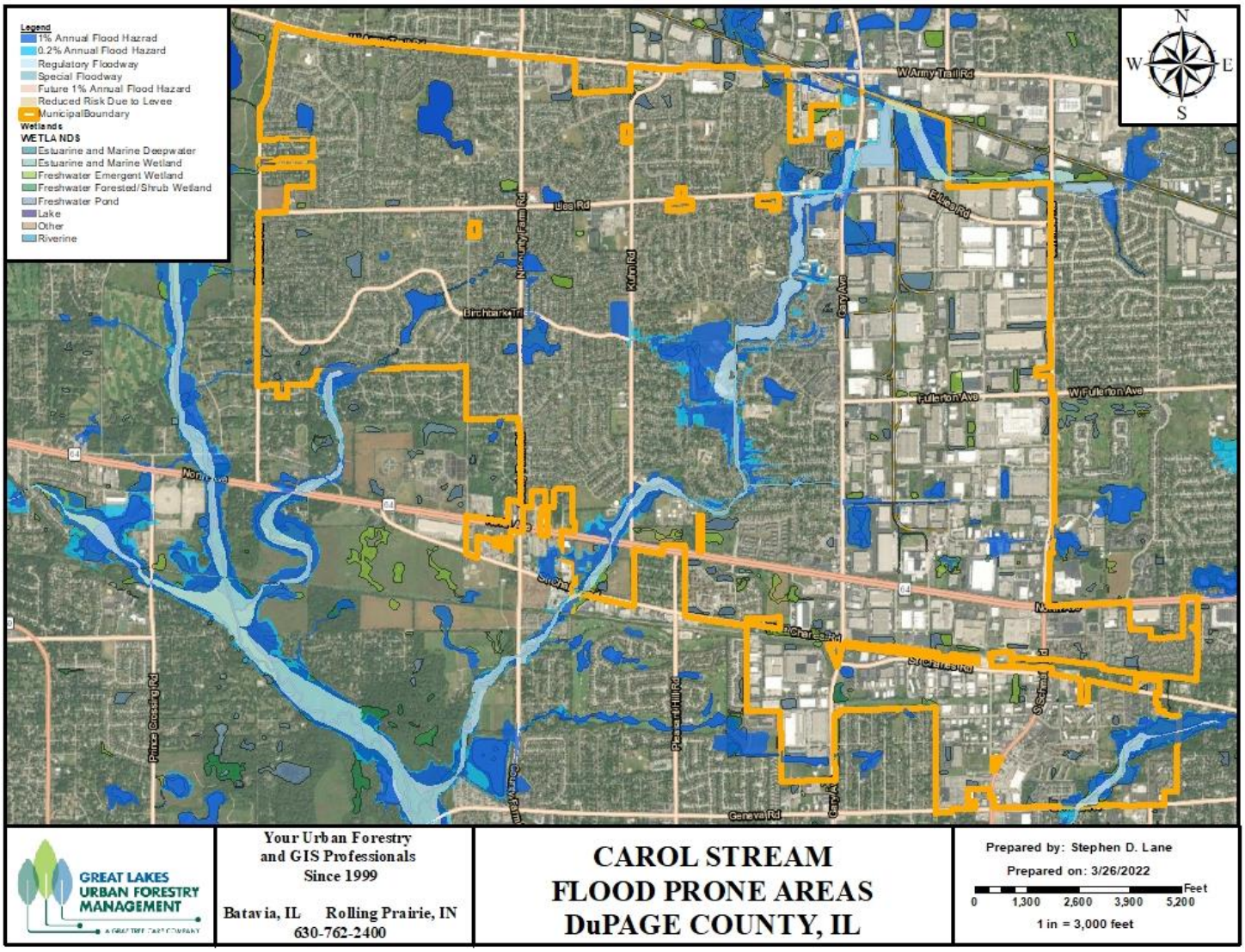
Once again, let's define a few terms here. First, the Earth has what is called a **Hydrologic Cycle**, which is pictured in a simple form to the right. All of the water that has ever existed on Earth was here when the Earth first formed around 5 billion years ago and has simply been recycled ever since then. Water stored in the oceans and lakes evaporates into the atmosphere where it forms clouds, and then rains down, either into the ocean to start again, or over land, where things get more complicated. When rain falls over land, several different things can happen to it that determine what happens next in the cycle.



If the rain falls onto the soil surface, some of that water **percolates** into the soil where it moves as groundwater (water under the soil surface). However, when there is so much rain that the soil becomes saturated like a wet sponge that cannot hold any more water, then any additional rainfall becomes **runoff**, which "runs off" over the top of the land surface. This is what we traditionally call **floodwater**.

When an area floods, the consequences can be enormous in terms of economic impact and the impact to humans and wildlife. And there is another side of this story as well. Most communities have what is called **stormwater infrastructure** to handle this water. Storm drains are things we all see regularly which are meant to handle this water. But those systems are expensive to maintain, and the more water they handle, the more often they need repair or replacing. So what can we do to reduce this floodwater? Plant more trees.

Trees do something called **transpiration**, which effectively means that their roots soak up excess water in the soil, and they release it through their leaves back to the atmosphere. So the more trees we plant, the greater the reduction in flooding, and the less our stormwater infrastructure is taxed, and the less economic and social suffering there has to be as a result of flooding. On the following page is a map showing flood prone areas in Carol Stream:



What is important to note from the above map is not what the exact colors mean, just know that these colors all show either known wetlands, water bodies, or flood prone areas in Carol Stream. Tree planting along any of these locations will help to transpire extra water out of the soil and prevent flooding from occurring. In particular, there are trees which are naturally adapted to growing in wetter soils, and these trees can really move a lot of water out of the ground, especially as they age. A mature tree can move as much as 6,500 gallons of water per year out of the system. Multiply that by thousands of trees, and you can see how quickly this adds up to a big difference. (https://www.epa.gov/sites/default/files/2015-11/documents/stormwater2streettrees.pdf)

Tree planting efforts should take these flood prone areas into account, as well as the areas which appear to be drier and more drought prone where there is no shading on the map. And just like climate change is not confined to a single area, neither is stormwater and flooding. Whatever floodwater is not absorbed in one area moves downstream to another area. So by reducing runoff in Carol Stream, it will help all downstream communities. And again, the more communities we can get to take action on this, the more flooding and runoff will be reduced.

Tree Removals

The first step towards attaining Carol Stream's forestry goals will be to remove trees which are diseased, dying, or pose high risk. The Village has historically done a remarkable job of maintaining a robust removal program when the need arises. This is evidenced by the outstanding removal work done to mitigate the devasting EAB infestation. At present, there are 278 trees which have been recommended for removal during the inventory. Of these, 24 are listed as a Priority Removal, 130 are listed as Standard Removals, and 124 are listed as Low Priority Removals based on the tree inventory data. A direct goal of this Urban Forest Management Plan is to have all identified trees marked as Removals during the inventory to be removed within 3 calendar years of this plan's adoption.

In each subsequent year, as more trees are identified as requiring removal based on inventory updates or other factors, this plan projects the removal of 100 trees per year as an average. This is simply an estimate which forecasts the anticipated decline of a percentage of under-performing, poor condition tree due to projected life expectancy and other factors such as storm damage, pests, etc. It also includes failed new plantings out of warranty.

Going forward, reevaluation of the tree population on an annual or semiannual basis by Village staff or a Forestry Consultant will specify which trees require removal. These numbers are meant to be placeholders for budget calculations and diversity standards. This does not require that 100 trees be removed each year, this is simply a projection based on the existing inventory data and is used to provide estimates for budgeting anticipated costs.

For purposes of projection, costs have been estimated using a rate of $25/diameter inch for tree removal and stump grinding, which is a conservative estimate based on current market pricing. Rates could certainly be found lower than this in a competitive bid process or using in-house labor. As is the case with all cost projections for this Plan, no cost increase is assumed for the first 5 years, and a 3% annual cost increase is assumed thereafter. This is also a conservative estimate based on the Consumer Price Index, and actual costs may differ than what is projected. As mentioned, these are anticipated averages of trees to be removed. Exact numbers of trees to be removed may be more or less, these are just data driven projections.

	Milestones	2022	2023	2024	2025	2026	2027-2032
REMOVALS	Avg Trees Removed	100	100	100	100	100	100/year avg
	Avg Diameter Inches	1,000"	1,000"	1,000"	1,000"	1,000"	1,000"
	Removal Cost (2022)	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
	Removal Cost (CPI)	$25,000	$25,000	$25,000	$25,000	$25,000	$25,750 - $28,980

As this is a program to be adaptively managed, this budget table can be revisited periodically to reflect actual costs being paid and actual number of removals.

Tree Removal Activities

Safe Removal of a Tree to an Appropriate Flush Cut

Tree removal can be dangerous, but when performed by professionals is very safe. Therefore, all tree removal activities on Carol Stream's public property shall be performed under the guidance of a Certified Arborist or experienced employee. The safe removal of a tree involves the safe removal and lowering of all portions of the tree according to all relevant ANSI standards and Best Management Practices. The stump must be flush cut such that the highest portion of the cut is no greater than two inches from the highest part of the ground surface to prevent a tripping hazard on public property.

Stump Grinding

Within a reasonable amount of time following the removal, stumps and surface roots should be removed using an approved stump grinding machine, such that the stump is ground to a minimum depth of 6 inches, and no surface roots are visible. If the site is to be planted with a new tree, that depth should be increased to 12 inches below the soil surface. This will ensure that a new tree may be successfully planted, and that no re-sprouting will occur from the old stump. The depths to which the stump must be ground may be altered by the Village depending on needs for specific circumstances or contracts. Until such time as the planting space is fully restored, the stump hole should be filled and compacted to ground level using the debris resulting from the stump removal.

Planting Site Restoration

Once the tree has been safely removed and the stump has been ground out, the open planting space must be fully restored if a tree is not scheduled to be planted in or adjacent to the old hole. Site restoration consists of removing the stump chips from the hole, filling it with a quality mineral topsoil, tamping down to match the surrounding grade, spreading grass seed over the top of the topsoil, and securing a degradable blanket over the topsoil. This will ensure that grass grows back to restore the aesthetics and function of the parkway, and prevent tripping hazards from the removal scar.

Reasons for Tree Removal

Removal of trees on public spaces is an unavoidable reality of managing large tree populations. When the trunk, branches or roots fail, a standing tree can cause personal injury or property damage, and even small dead trees can be an eyesore and reduce property values. Old trees can hold great sentimental value, and many people become attached to them. However, there are times when their presence creates a public hazard, and it is at those times that action must be taken to ensure public safety.

Removal of trees on Village public property shall always be at the discretion of the Department of Public Works and trees will never be removed without a sound reason. Residents may request a tree to be removed for reasons NOT covered below, and these requests will be reviewed by qualified, responsible personnel in the Department of Public Works. Removal requests may be granted and paid for under the annual forestry budget. However, trees with a greater need for removal based on public safety will always hold a higher priority. Under no circumstances will the Village be responsible for trees which are not in the rights-of-way or on public property.

Dead or Dying

If a tree is biologically dead or nearly dead, it will require removal. Trees which are standing dead, have approximately 50% dead crown or greater, or have less than approximately 40% structurally sound wood in the cross-section of the trunk shall be removed as expediently as practical. These determinations shall be at the discretion of qualified, responsible personnel in the Public Works Department.

Diseased or Infested

Diseases are caused by viral, fungal, or bacterial pathogens. Infestations are caused by insects or other small animals. Dutch Elm Disease and Oak Wilt, for example, are fungal diseases that kill Elm and Oak trees when they are infected. Emerald Ash Borer is an insect which kills Ash trees by infesting them. The prompt removal of diseased or infested trees limits the exposure of other nearby trees. The removal of 1 tree may save dozens of others. Trees deemed to be diseased or infested by qualified, responsible personnel in the Public Works Department shall be removed as expediently as possible in order to slow the spread of such insects and diseases.

Critical or Substantial Risk

"Tree Risk" is the potential of a tree or tree part to impact a nearby person or piece of property and cause property damage or personal injury. This topic is of great interest in Arboriculture today, and insurance companies are becoming increasingly involved in the process of assessing and managing the risk posed by trees. Litigation involving trees is a perennial concern for public entities.

All trees in Carol Stream were assessed for a basic level of risk during the initial inventory, and a number of trees were found to be at critical or substantial risk levels. If such risk can only be safely mitigated by tree removal, as opposed to pruning or other measures, then their timely removal is critical because of potential exposure of the public or property to potential harm.

Qualified personnel in the Public Works Department, the Forestry Consultant, or any other TRAQ Qualified Risk Assessor should assess the tree and prepare a report which will document the details of the situation prior to removal. Often, risk can be mitigated by removing a portion of the tree, or other corrective measures. If the entire tree is deemed to be at

high or extreme risk of failure, however, the entire tree shall be removed as a means of reducing its residual risk to zero.

Emergency / Storm Damage Removals

A tree shall be removed if it has been severely damaged and/or compromised by lightning, wind, or other such weather event. "Storm-damaged" shall be generally defined as a tree which has lost 33% or more of its crown, has a large crack or other wound in the trunk, has a lean of greater than ten degrees from vertical, has sustained a lightning strike, or other such issues directly related to storm events. Qualified, responsible personnel in the Public Works Department, or in some cases the Forestry Consultant, should determine the need for removal of a tree in these cases, although in an emergency such as a tree impacting a person, vehicle, home, power lines, or other such emergency, the Village may perform any actions necessary to abate public hazards so long as they are in compliance with all relevant Arboricultural standards and practices.

Damage from Construction or Vehicle Strike

Qualified, responsible personnel in the Public Works Department, or in some cases a Forestry Consultant, should assess trees that have been impacted by a vehicle strike or piece of construction equipment. If the tree has suffered physical damage or extreme root compaction and is likely to decline and become high risk, it will be scheduled for removal in order to maintain public safety. That decision will be based on the best professional judgement of qualified, responsible personnel in the Public Works Department, or in some cases a Forestry Consultant.

Reasonable Resident Request

If a tree has non-terminal pest or pathogen issues, moderately poor structure or is in somewhat poor condition, a resident may request the removal of the tree. Such requests will be reviewed by qualified, responsible personnel in the Public Works Department, or in some cases a Forestry Consultant, and evaluated on a case-by-case basis. If the tree shows significant potential to decline or pose a threat in the near term, the Village may agree to the removal. Note that young and/or healthy trees will generally not be considered eligible for this program. Priority will always be given to trees in danger of threatening public safety.

Interference with Utility or Signage

A tree shall be removed if it is interfering with the function or visibility of official traffic control devices or has impacted above or belowground utilities in a manner that cannot be mitigated by pruning or other measures. In these cases, it is likely that no new tree will be planted in these sites.

Overplanted and Underperforming

No healthy tree shall be removed for the sole reason of having been overplanted. As a result of this UFMP, Carol Stream will be enhancing their use of industry best management practices for diversity in the urban forest, with the goal of building a diverse urban forest. Overplanted species listed as being in poor condition will be reviewed to assess further decline or recovery.

Those trees in noticeable decline may be removed at the discretion of the qualified, responsible personnel in the Public Works Department, or in some cases the Forestry Consultant. This will be used as a preventative measure so that these trees do not continue to decline to a point where they become hazardous, and not used as a reason to remove an otherwise healthy tree.

Basic Village Tree Removal Requirements and Standards

All the following requirements and standards shall be met during tree removal activities as matter of local policy. For a more detailed view of the specific standards, please see Appendix I.

Village of Carol Stream

1. All personnel directly involved with process of chainsaw operation, climbing, bucket truck operation, and rigging limbs shall be provided with sufficient training and experience to perform such duties while employed by the Village of Carol Stream, as either Public Works staff, or performing work as a contractor employed by the Village.
2. Only qualified utility arborists may perform tree removal operations within ten feet of an electric utility line. Carol Stream employees or contractors may complete the process of trunk removal and stump grinding only if the remaining portion of the tree is greater than ten feet from a transmission line.
3. The Village will not remove healthy trees in order to meet diversity goals, unless the tree poses a risk to persons or property.
4. The Village of Carol Stream shall not perform or assist, programmatically or financially, with the removal of trees on private property. Public/Private tree ownership is defined that if any portion of the trunk of the tree has grown into the parkway or ROW, the Village will assume responsibility for the tree.

Tree Planting

Whereas tree removal is necessary to promote public safety, planting of new trees must happen to increase our diversity and canopy cover. Over the past decade, the Village carried out a massive reforestation effort after the loss of approximately 3,000 Ash trees and replaced those lost trees with approximately 3,200 new trees. At present, the Village has 758 open planting spaces identified on its parkways along with up to 2,000 possible planting spaces in areas of the Village where planting was not previously allowed. As a means of attaining the goals of increasing canopy cover to 15% and increasing overall diversity, this plan calls for the planting of about 1,500-2,000 trees over the coming 10 years.

For the goals and milestones shown below, the program began with being able to replace trees called out for removal above and also to begin planting in open spaces on the Village's parkways. The Village has the capacity to plant 150-200 trees per year and for the purposes of budget projections, an average of 175 trees per year has been used. This plan anticipates plantings to outpace removals. For the costs of planting, $350 per tree (installed) has been used.

As is the case with all cost projections for this Plan, no cost increase is assumed for the first 5 years, and a 3% CPI annual cost increase is assumed thereafter. Once again, as with all budget estimates in the plan, these are meant to be guideposts and not absolutes.

	Milestones	2022	2023	2024	2025	2026	2027-2032
PLANTINGS	Avg Trees Planted	175	175	175	175	175	175/year avg
	Planting Cost (2022)	$61,250	$61,250	$61,250	$61,250	$61,250	$61,250
	Planting Cost (CPI)	$61,250	$61,250	$61,250	$61,250	$61,250	$63,090 - $71,005

The Importance of Planning Your Tree Planting

Right Tree in the Right Site

Urban Forestry has an unfortunate history of not planning carefully for tree planting. Whatever was readily available, inexpensive, urban tolerant, and grew fast was seen as desirable, and often planning of tree plantings was left to developers or nurseries and plantsmen. With our history of invasive insects and diseases in the Midwest region, and with a possibility that these may get worse in the future, it is more crucial than ever that we have a process to plan our tree plantings.

This process should involve assessing each site to be planted in much the same way we would assess a tree, except that in this case, we look for factors such as available above and below ground growing space, how much light the tree receives, amount of soil moisture present, and possibly other factors such as soil pH and texture. Once this information is collected, planting sites can be matched with trees which are well suited to those sites. Matching the right tree to the right site like this will result in trees which establish faster, grow more vigorously, live longer, and provide far greater benefits. Even a simpler version of this process is better than nothing. When you have your species list for each site assembled, it makes bidding much easier since you already have a plan in hand.

Playing an active role in your tree planting planning also allows for meeting diversity standards such as the taxonomic, spatial, and age class diversity principles outlined above and attempts to get the tree population into compliance with the "20-10-5 Rule". With 758 inventoried planting sites to be assessed, tree planting planning can be phased off each year as the planting budget takes shape and diversity is evaluated. Being targeted about species selection also allows the use of species which are slightly more difficult to find appropriate sites for. These species that are considered "less urban tolerant" can still be planted when the appropriate site is found. We anticipate that over the timeline of this plan, nearly all of these inventoried planting spaces will be planted. As previously mentioned, there are also 2,000 possible planting spaces in areas of the Village where planting was not previously allowed which may eventually be eligible for planting.

The success of a tree depends on where and how it is planted. Qualified, responsible personnel in the Public Works Department, or in some cases the Forestry Consultant should assess planting sites before trees are purchased and installed each year, to ensure the correct tree is being planted for the correct site. Each tree planted represents a 25-75+ year commitment, and this planning helps to increase the benefits the community can reap from this commitment. A list of acceptable species to be planted for all land use types appears in Appendix A.

Nursery Stock Procurement

Nursery stock quality is yet another aspect of planning which can help a tree establish, survive, and thrive to provide great benefits to the community. Qualified, responsible personnel in the Public Works Department, or in some cases the Forestry Consultant should inspect and select every tree which is to be planted on Village property to minimize the possibility of installing lower quality nursery stock. Specifications should be for material no smaller than 1.75" caliper, with good form for the species, planted as either balled and burlapped or minimum 5-gallon containerized stock.

Currently, the industry is recovering from a nursery stock shortage due to high demand to replace Ash trees lost to Emerald Ash Borer, which impacted the availability of some species. We strongly recommend to not accept substitutions in the requested species lists, as many nurseries are still attempting to substitute overplanted trees for some of the higher diversity species which may still be difficult to obtain. It is recommended to have an approved substitution prepared for each planned tree species. A list of species and acceptable substitutes has been included in Appendix C.

Tree Transport and Planting

Proper transport and planting procedures determine a tree's success after planting. Even healthy trees from the field, if improperly transported, may dry out during transport, or have structural damage to root balls incurred. When it comes time to plant, trees planted too deeply will suffer from root compaction and trunk decay.

Trees planted without properly dug holes may suffer from stunting. Trees planted without proper removal of packaging materials may develop girdling roots. Trees planted too high may have surface root desiccation. Trees improperly staked or with improper trunk protection may suffer from trunk wounds or girdling of the entire trunk. The standards and Best Management Practices for tree transport and planting are detailed later in this section, as well as Appendix J.

Tree Spacing and Visibility Requirements

Minimum tree spacing between large, medium, or small sized deciduous shade trees should be appropriate for the species and conform to Carol Stream Municipal Ordinance 12-3-16 cited as follows. A minimum of 30 feet between trees which are on public or private property, shall be maintained. Trees will be planted a minimum distance of 15 feet from crosswalks, street lights, utility poles, and traffic control devices (not including signs); a minimum distance of 10 feet from driveway aprons and fire hydrants; and a minimum distance of 5 feet from water/sewer service lines and system structures. Planting trees under or within fifteen lateral feet of any overhead utility wire is prohibited, unless approved by the Director of Public Works. More information on tree spacing specifications and visibility requirements can be found in Carol Stream Municipal Ordinance 12-3-16.

Watering

Watering of newly planted trees is essential to their establishment, growth, and survival, particularly during the first 2 years of their lives. Currently the Village, bears the responsibility for watering newly planted trees and watering is not included in projected budget figures. The Village may consider sharing this responsibility with residents. When a site is planned for planting, the Village should provide residents with information on proper tree watering techniques. Such information can ensure sufficient watering and may prevent a young tree dying from drought stress.

Challenges of Urban Plantings

Urban planting sites are a difficult environment for a tree to thrive in, and based on long term data, it is expected that 5-10% of new plantings fail each planting cycle. The Village's contracts for tree planting should include a one to two-year replacement warranty for any new trees that fail to thrive in their new environment. Urban tree plantings can pose an uphill battle in many ways, due to limited soil volume, salt runoff, airborne pollutants, and other factors. New planting mortality is to be expected, despite best efforts to prevent such an outcome, but the planning measures outlined above will help to mitigate annual new planting mortality.

<u>Tree Planting Requirements and Standards</u>

Village of Carol Stream

1. Planting sites shall be determined and monitored using the Village's tree inventory, in conjunction with staff and Forestry Consultant input.
2. Tree spacing should be in accordance with Carol Stream Municipal Ordinance 12-3-16 which is cited in the "Tree Spacing and Visibility Requirements" section above.
3. Choice of species for planting should be done so according to the Village's taxonomic, spatial, and age-class diversity goals. A diverse and resilient urban forest minimizes exposure to financial, environmental, and health risks while maximizing aesthetics, environmental benefits, and ecosystem services to its residents.
4. All planting stock shall be grown- within 150 miles of the Village/planting site.
5. Acceptable nursery stock shall conform to the following standards:
   - **A.** Minimum of 2-inch caliper, measured at six inches from the trunk flare-
   - **B.** Root ball conforms to ANSI Z60.1 Standards for Nursery Stock
   - **C.** Less than 10% deadwood in the crown
   - **D.** Architecture consistent for the species, cultivar, or variety in question

E. No included bark or other such narrow branch attachments, unless consistent with species or variety

F. Free of pests or pathogens

G. Approved species list for the Village of Carol Stream

6. Planting and digging of certain species shall only occur at certain times of year, in accordance with nursery industry best management practices and professional judgement. These times are subject to the professional opinions of both the Village of Carol Stream and its approved contractors.
7. Residents requesting to plant trees on the Village-owned right-of-way will be required to obtain approval from the Director of Public Works via an on-line application. Such trees will need to conform to all species, spacing, and proper planting requirements as specified by the Village.
8. JULIE, or another similar utility locating service shall be contacted, and all utilities located at least a day prior to planting.
9. A minimum of a one-year replacement guarantee shall be extended from approved nurseries and plantsmen for all new plantings.

Tree Pruning

When maintaining a tree population for its greatest benefits and lowest risk, tree pruning is one of the most cost-effective maintenance activities which can be performed. Pruning provides several important services for a tree: it reduces the risk of failure, provides clearance for utilities or other structures, reduces wind resistance and wind damage, maintains overall tree health, and improves overall aesthetics.

Currently, the Village maintains a 6-year pruning cycle, supplemented with intermediate pruning on an as-needed basis to remove sight obstruction and hazards to pedestrians, bicyclists, and vehicles. This program ensures that all trees on public property are pruned at a minimum every 6 years, increasing tree health and vigor while helping to reduce costs associated with storm damage and tree failure. It should be mentioned that the Village has been very proactive in its maintenance of their long-time implementation of a cycle pruning program and this should be commended. The Village pruning zone map can be found in Appendix L.

For budget projections associated with these activities, an average of $50 per tree was used based on the current age class diversity of the Village's tree population. As the population matures, an updated age class analysis will help to project future budgets.

Currently, Carol Stream prunes between approximately 750-1700 trees per year, that number varying significantly depending on the zone being pruned that particular year. These pruning zone statistics and estimated budget projections are illustrated in the table below.

	Milestones	2022 Zone 3	2023 Zone 4	2024 Zone 5	2025 Zone 6	2026 Zone 1	2027 Zone 2
PRUNING	Trees Pruned	746	1505	1145	1674	1616	1551
	Notes	Cycle Prunes Zone 3	Cycle Prunes Zone 4	Cycle Prunes Zone 5	Cycle Prunes Zone 6	Cycle Prunes Zone 1	Cycle Prunes Zone 2
	Cost (2022)	$37,300	$75,250	$57,250	$83,700	$80,800	$77,550
	Cost (CPI)	$37,300	$75,250	$57,250	$83,700	$80,800	Varies by Year

Pruning Activities

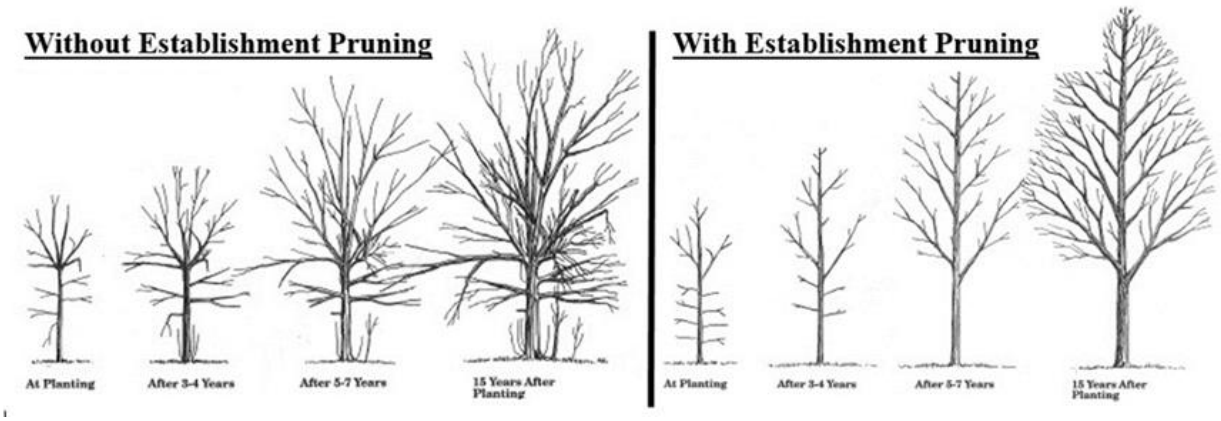
Maintenance of a 6 Year Pruning Cycle

As previously mentioned, the Village maintains a 6-year pruning cycle, supplemented with intermediate pruning on an as-needed basis to remove sight obstruction and hazards to pedestrians, bicyclists, and vehicles. This program ensures that all trees on public property are pruned at a minimum every 6 years, increasing tree health and vigor while reducing costs associated with storm damage and tree failure. With approximately 9,000 parkway trees total by 2032, this would mean that over a 6-year period, depending on the zone being pruned, anywhere from roughly 750-1700 trees would require pruning each year.

Though tree pruning may seem expensive, the cost of maintaining trees is significantly less than the costs associated with trees damaging property or injuring residents. The benefits trees provide when healthy and well maintained can be prolonged and significantly increased, as shown in the projections above. A cycle pruning program is the hallmark of an effective forestry program and the Village should be applauded for its log-time commitment to this proactive endeavor.

Pruning of Young Trees

For the purposes for this Plan, a young tree is considered to be under 12" DBH. Young trees are still trying to acclimate to their sites. The pruning of young trees has different goals and outcomes than the pruning of larger, mature trees. Standard nursery stock has been meticulously pruned for four to ten years to have a single trunk, and the specific branching patterns which are considered common to the various tree species. Without proper establishment pruning, these trees might have multiple trunks, poor branch structure, and overall poor form and architecture. Pruning of young trees to establish proper form is one of the most cost-effective maintenance activities which can be performed. It is an inexpensive task that does not require a great time commitment, and can save thousands of dollars in pruning and maintenance costs later in the tree's life. As mentioned above, due to not having to climb trees or use dangerous equipment, young trees may be pruned by Village staff.



Pruning of Mature Trees

A mature tree, for the purposes of this Plan, is considered to be greater than 12" in diameter. Mature trees are established in and acclimated to their sites. The pressure these trees face from their environment generally comes from above-ground factors such as pests, pathogens, man-made structures, other trees, windstorms or lightning strikes, as well as some below ground factors like girdling roots, limited soil volume, or poor soil quality. Pruning is performed to mitigate the above-ground issues, as well as balance out any below ground issues when possible. Natural aging and limb dieback are additional reasons these trees are pruned.

Pruning of mature trees may mitigate a short-term risk, such as after a storm, or pruning may be done to maintain a tree's long-term health and structure. In the wild, trees loose limbs frequently. This is called self-pruning. Allowing trees to self-prune over time is not advisable in an urban setting. Safety factors may arise, and the process of self-pruning may bring up aesthetic issues in an urban environment. Mature public trees should only be pruned by professional Certified Arborists, and done in accordance with industry Best Management Practices and accepted ISA and ANSI standards.

Private Property Trees

The Village shall not be responsible for the pruning of trees located on private property. The Village reserves the right to prune portions of trees overhanging public property, but is under no legal obligation to do so, and will perform such pruning at the discretion of qualified, responsible personnel in the Public Works Department, or in some cases the Forestry Consultant

Reasons for Pruning

Establishment Pruning

Establishment pruning of newly planted trees is the single most cost-saving measure in tree care, as it establishes good form and branch structure for the life of the tree. Establishment pruning should be performed a minimum of one time prior to the tree reaching six inches in diameter. Once established, the tree will only require periodic cycle pruning to maintain an appropriate form for the urban forest and to maintain health and keep the tree free of dead limbs.

Cycle Pruning

A Best Management Practice in Urban Forestry is that trees should be pruned on a cyclical basis as preventative maintenance. No tree should go more than seven years without proper pruning. Cycle pruning ensures that dead branches, storm damaged limbs, or unsightly growth are removed before becoming hazardous or bad for the health of the tree. Cyclical pruning also ensures the proper leaf to stem ratio, which provides structural support for the tree. It also ensures that pruning stays relatively inexpensive, as severe issues do not have time to develop. Cycle pruning is a maintenance activity which if performed regularly, actually needs to be performed less often.

Emergency / Storm Damage Pruning

Emergency pruning is nearly always necessary to mitigate severe risk after storm events, such as limbs which have fallen and are blocking traffic, have impacted a structure, are interfering with a utility, or are hanging and in imminent danger of doing any of the above. Emergency and storm damage pruning should be conducted at the discretion of the Village, with the best interests of the public in mind. This is one of the few occasions on which the recommendations of this Plan may be temporarily suspended. When life or property are in imminent danger due to conditions associated with a downed tree or tree part, the Village may take whatever remedial action is practical and reasonable to mitigate such imminent risk.

Sanitation Pruning

When a tree has been diagnosed as having been diseased or infested with a pest or disease, sanitation pruning may be employed to maintain the tree while removing the diseased or infested portions. This technique is only effective when the host tree is infected/infested with certain pests and pathogens, and only in a localized area of the tree. With more widespread cases of disease or insect infestation, removal will be the most cost-effective and safest option to avoid endangering other nearby trees, as these pests and diseases tend to spread, particularly when there is more of the same species nearby.

Removal of High-Risk Limbs

At times, a tree as a whole may not pose a high risk, but a single limb may have defects that make it hazardous. At these times, the removal of such limbs or parts may render the tree to be low risk again, without causing permanent damage to the tree.

Tree Pruning Requirements and Standards

Village of Carol Stream

1. All activities directly related to the operation of a chainsaw, bucket truck, limb rigging, or tree climbing shall be performed by a qualified Village employee or designated contractor, and under the supervision of a Certified Arborist or arborist trainee.
2. No pruning or maintenance activity that takes place within ten feet of a power transmission line shall be accomplished by a Carol Stream employee.

3. No cabling, bracing, or other such support systems shall be installed in Village-owned trees. Exceptions may be made by obtaining prior written approval of the Village.
4. No heading, pollarding or espalier pruning shall be conducted on Village-owned trees, and no wound dressings shall be used under any circumstances, without prior written approval from the Village.
5. The need for pruning and maintenance of individual trees and parkways shall be at the discretion of the Village and its designated contractors.
6. No more than 25% of a tree's crown shall be removed during pruning operations to preserve the health of the tree. Any more than 25% of the crown being removed put the tree in danger of severe dieback, and removal should be considered at that point.

Other General Maintenance

Maintenance Activities

Retaining a Consultant

A Forestry Consultant may be utilized for impartially assessing the tree population on a periodic basis, at the discretion of the Public Works Director. A Forestry Consultant will generate reports as requested by the Village so that needs in terms of tree planting, removal, and maintenance can be assessed and planned. A Forestry Consultant may also provide services otherwise performed by a staff Certified Arborist at the discretion of the Public Works Director.

Chemical Applications

Trees, like people, sometimes contract pests and pathogens. Often these pests and pathogens can be controlled with a simple chemical application just as illnesses in humans can be controlled with medication. This practice is called Plant Health Care. When financially practical, chemical control for common pests or pathogens may be utilized as a preventative or curative method, and increase the aesthetics and benefits of the tree population.

At present, the Village does no chemical applications and has very limited history of such. However, the department will evaluate if and when chemical applications are necessary and appropriate.

Residents of Carol Stream, with written approval of, and at the discretion of, the Director of Public Works may perform chemical applications on the parkway trees, such as treatment for Emerald Ash Borer, Dutch Elm Disease, Apple Scab, or other common disorders.

The Village will not bear any financial responsibility, nor liability, associated with the costs of such treatments, and treatments must be performed by a Certified Arborist who holds a valid Pesticide Applicators license.

Such work may be denied or revoked for utilizing unqualified contractors, potentially hazardous chemicals, or any other reason at the discretion of the Village. Additionally, trees being treated by residents may still be removed at the discretion of the Village for any of the reasons listed above.

Water Management

The importance of water in the establishment, growth, and survivorship of trees cannot be overstated. Most trees adapted to our climate zone (USDA Zone 5b) are also adapted to the amount of moisture we have in an average year. However, younger trees with less expansive root systems are susceptible to prolonged drought. Young trees need supplemental watering, which is an essential maintenance activity and can prevent newly planted tree mortality.

As we anticipate approximately 1,100 additional trees being planted over the course of the next 10 years, this concept becomes very important. Currently, the initial watering of new trees is done by the contractor during planting. However, watering beyond that is done by the Streets Division and possibly the resident. The option to more frequently rely on well-informed residents to water trees may be a possible option. Upon receiving a newly planted tree on the parkway in front of their homes, residents should be supplied with an informational pamphlet which explains how often to water their new tree during the first 2-3 years. It is also suggested that the Village, possibly acting in conjunction with the Forestry Consultant, hold basic tree maintenance classes open to all residents.

Mulch

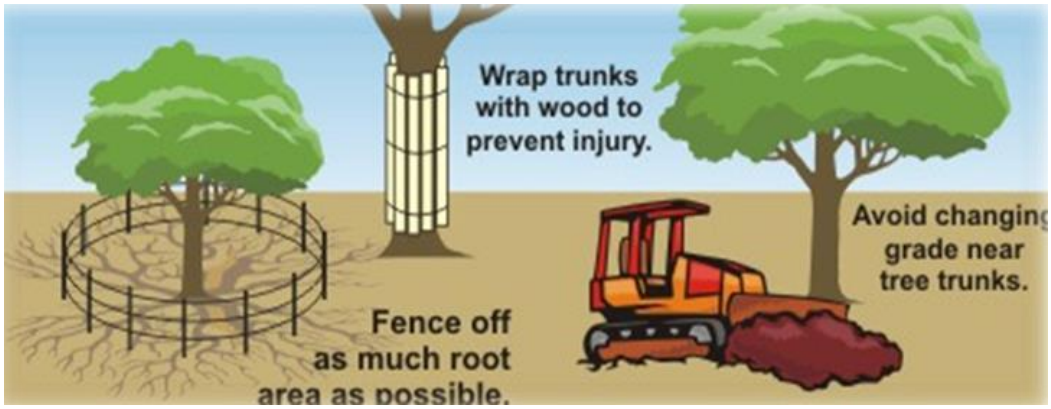
Proper application of mulch is a necessary and cost-effective maintenance activity. Mulch has many benefits, including reducing weed growth in the root zone, protecting the tree trunk and root flare from lawn maintenance equipment, allowing water to move into the soil, reducing evaporation and drought stress, and creating a naturally fertile soil environment. Turf grass typical of parkways competes for water and nutrients, and mulch reduces this competition.

But not all mulching is beneficial. The practice known as "Volcano Mulching" is the practice of piling mulch against the trunk in excess of 3" deep. This causes moisture build up against the trunk, and can cause decay of the trunk tissue, and possibly death. Material such as crushed limestone, red volcanic rock, or rubber pellets can alter the soil chemistry in an undesirable way, and cause dieback or tree death.

The Village maintains a mulch site at the WRC from internal tree operations and contractor pruning and tree removal. These chips are used for mulching newly planted trees and other planting beds. A goal for the Village is to mulch for all newly planted trees, as well as preventing volcano mulching, should be a primary concern. Residents will be provided educational materials to encourage mulching beyond the first year.

Tree Preservation and Management During Construction

In many municipalities, ordinances exist to protect public trees and shrubs from construction activities. The intent of these ordinances is to protect the benefits those tree and shrubs provide to the community. Therefore, tree and shrub protection and preservation during construction represents an investment in the community. Ensuring the protection and preservation of these public trees while minimizing burdens to businesses, developers, and residents is essential to a healthy urban forest. The Village of Carol Stream Community Development Department and Village Arborist may assist private developers with creating a Tree Preservation Plan for trees located on private property. (See § 16-5-6 LANDSCAPE (E) Tree preservation)



Tree protection and preservation during periods of construction involves protecting trees from damage caused by construction activities. This damage includes physical and chemical damage to the trunk, branches, and roots. Damage may be caused by equipment such as backhoes, skid steers, or other appendage-type equipment. Effects of damage to the visible above ground portions of the tree can be obvious, as when branches are broken. But hidden effects such as root compaction or improper grading may not become evident for years until the tree begins to die back. The standards set forth below are industry standards with a proven record of success should individual property owners choose to pursue them.

Tree Preservation Requirements and Standards

Village of Carol Stream

1. A tree survey shall be performed by a qualified individual prior to the beginning of any development activities that may affect public trees. The survey shall detail the size, species, and condition of each tree six inches DBH and greater OR managed landscape tree (intentionally planted, non-volunteer tree) of any size.
2. The Tree Survey and a Tree Protection Plan shall be submitted to the Village of Carol Stream and all relevant architects, engineers, and workers, detailing the following:
   - **A.** Trees to be removed
   - **B.** Trees to be preserved
   - **C.** Location and size of the Tree Protection Zone (TPZ) for each tree
3. The Tree Protection Zones for each tree shall be visibly delineated by the site engineer, using orange snow fencing or other high visibility exclusion material. When such a delineation is not possible, all workers on site shall be made aware of the TPZ verbally.

Tree Risk Assessment Policy

Trees provide ecosystem and aesthetic benefits, but all trees also pose some degree of risk. Determining the acceptable level of risk, along with effectively managing that risk, is a key priority for urban forestry operations. As a tree manager, the Village assumes some degree of risk. It is up to the Village to track that risk to ultimately decide how to take steps to mitigate trees which pose such risk in a manner which is responsible both economically as well as in the interest of public safety.

Levels of Risk Assessment – An Overview

These Risk Assessment Levels are based on the International Society of Arboriculture's (ISA) Tree Risk Assessment Qualification (TRAQ) protocols, as well as the ANSI A300 Part 9 (Tree Risk Assessment) Standards. The TRAQ forms can be found in Appendix H at the end of this report. All trees in Carol Stream were assessed for a basic level of risk during the inventory. These assessments were rapid assessments, and do not represent any formal level of TRAQ risk assessment and are not legally binding. They are solely intended to provide Carol Stream with data showing a need for a more detailed assessment of individual trees such as those listed below.

Level 1 Assessment

Also called a "limited visual assessment", whereby a tree has a basic analysis of obvious physical defects and condition. The assessor walks or drives by the tree, assesses it quickly for defects, evaluates the risk posed by the subject tree, and reports the results of the assessment to the tree owner. Often, prior to a recommendation, a more detailed (Level 2 or Level 3) assessment will be required to gather additional data.

Level 2 Assessment

A Level 2 Assessment, also called a "basic assessment", is a report detailing the information collected during a detailed visual inspection of the tree and the surrounding site. Such an inspection requires a 360 degree walk around, and may include the use of simple tools, such as binoculars, magnifying lenses, mallets, probes, and trowels or shovels. The goal is to get a more complete picture of the tree in its environment, as well as previous histories of failures, and a root to branch evaluation of not only the tree but also potential "targets" which falling tree limbs may impact. Targets are things such as structures, people, vehicles, or other things which may be damaged or injured by trees.

Level 3 Assessment

A Level 3 Assessment, also called an "advanced assessment", provides detailed information about specific tree parts, targets, and risk associated with each potential interaction. By definition, it requires specialized equipment known as "advanced tools", such as bucket trucks, resistance drills, sonic tomographs, and other such equipment. This is the most detailed and time-intensive type of assessment, and is typically only performed when a decision to retain or remove a tree is very difficult, as would be the case for a high quality tree near a potential target that has significant defects, the extent of which are not known, but must become known before making a decision.

<u>Considerations in Assessing Risk</u>

The following are meant for the reader to gain additional insight into the TRAQ process. Once again, TRAQ inspections were not performed on Village trees during the inventory data collection, but this information will help the reader understand the terminology better, and help inform staff and residents as to how and why these inspections are performed.

Likelihood of Tree Part Failure

Like it sounds, this is a process of determining how likely a tree part is to fail, and then how likely that failure is to impact a target. Likelihood of failure is an assessment of the tree's defects, and the load on those defects, like weight, gravity, ice, or wind. The parts impacted are generally the roots, root plate, trunk, branches, or potentially whole tree failure at multiple points.

Likelihood of Tree Failure Impacting a Target

Determining the likelihood of impacting a target is figuring out the occupancy rate, or the amount of time that targets (particularly people or high value property) are within the fall zone. A large tree in the middle of a field could fail with little impact, but that same tree in a playground might have serious consequences. In many roadways, motor traffic is present day and night. All of the Village's inventoried 8,237 trees are in rights-of-way adjacent to roads, as well as on village owned properties. where failure of a tree not only impacts motorists, but it also has a potential effect on pedestrian traffic, private property, and utilities within rights-of-way also.

Consequences of a Tree Failure Impacting a Target

The potential consequences of the tree failure impacting a target are a cumulative function of both the "value" of the target (person vs car) and the consequences to that target if the tree fails. Whereas the previous step was concerned with occupancy rates, this step looks at the consequences of the impact, and assumes that the target is always present. To follow with the above example, it is assumed that if a parkway tree were to fail, that a car, utility line, and person are all underneath it at the time of failure, and the consequences to those targets is evaluated. Consequences are generally considered to be "minor" for targets that can be easily replaced or repaired, and step up through 4 levels with the highest level being "severe", which would constitute severe injury to a person, or even a fatality (see the table below).

Weather

Every tree, no matter how healthy, can fail from wind, lightning strikes, ice loading or soil saturation. "Normal" weather can cause tree or tree part failures for trees which have existing defects, like deadwood, cavities, or poor architecture. Extreme weather events, by contrast, can cause the failure of perfectly healthy trees. For all Tree Risk Assessments, Risk should be assessed assuming "normal" weather conditions. Though it should be noted that "normal" weather conditions for northeastern Illinois do include gusty winds, thunderstorms, snow, and even an occasional ice storm. It is the extremes of these events that should be considered abnormal.

SAMPLE Tree Risk Assessment Policy

The Village of Carol Stream has created this SAMPLE policy to show what a final policy to maintain an acceptable level of risk from its tree population(s) might look like. In order to maintain a high level of public safety, while mitigating undue burden, the Village shall adopt a policy which appears similar in nature to the following risk assessment protocols, pending review by our staff.

1. The Village maintains a tree inventory detailing the species, size, and condition of all trees on Village Parkways, as well as a basic level of risk posed by each tree. This UFMP recommends that the trees listed as being in elevated risk categories during the initial inventory be audited on an ad hoc basis. During these audits, qualified, responsible personnel in the Department of Public Works should inspect these trees and identify trees potentially posing an unacceptable level of risk. Such trees identified shall either be scheduled for a more detailed risk assessment (Level 2 or 3), or shall be mitigated, either by pruning or removal, as soon as practical following the assessment.
2. During normal course of work, or following storm events, employees will take note of trees, when possible, which may appear to present an elevated risk level shall be scheduled for a more detailed risk assessment (Level 2 or 3), or shall be mitigated, either by pruning, or removal, as soon as practical following the assessment.
3. Upon notification from a resident of a concern about a potentially high-risk tree, a qualified personnel from the Department of Public Works will respond as soon as practicable to perform a Level 1 Assessment. If a Level 2 or Level 3 Risk Assessment is required based on that inspection, it shall be performed within an additional ten (10) business days. A decision shall be made by qualified, responsible personnel in the Department of Public Works as to what the appropriate mitigation measures are, if any.
4. All trees determined to be in need of mitigating actions (removal, pruning, etc.) should be documented by qualified, responsible personnel in the Department of Public Works. The documentation shall include the date the assessment was performed, the species, size, and condition of the tree, and a brief narrative detailing which parts of the tree are likely to fail, the likelihood of failure, the likelihood of impacting a target, the consequences of tree or tree part failure, and the overall tree risk rating, per the ISA's TRAQ system of risk assessment.
5. A minimum branch diameter of three (3) inches, by ocular estimate, shall be the standard to which this risk assessment policy applies. Assessing all branches smaller than three inches represents an undue burden to the Village.

TRAQ Forms can be found in Appendix H at the end of this report.

TRAQ Tree Risk Assessment Matrices

Likelihood of Tree Failure Impacting Target

Likelihood of Tree Failure	Likelihood of Impacting Target			
	Very Low	**Low**	**Medium**	**High**
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Risk Rating Matrix

Likelihood of Failure and Impact	Consequences			
	Negligible	**Minor**	**Significant**	**Severe**
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Projected Budget

The budget numbers below, as mentioned several times through this Urban Forest Management Plan, are conservative figures based on current industry rates for the services listed. Based on input from Village staff, the budget begins this year with a dollar amount that is within their current annual budget for tree related expenses. From there, the budgets will vary each year depending on the cycle pruning zone, and projects through 2032 with costs ranging from approximately $144,000-$195,000. This 2027-2032 projection ranges include CPI, which is an annual 3% increase after the first 5 years. All these budget projections represent a necessary budget expense for such an increase in value of the urban forest.

	Milestones	2022	2023	2024	2025	2026	2027-2032
REMOVALS	Avg Trees Removed	100	100	100	100	100	100/year avg
	Avg Diameter Inches	1,000"	1,000"	1,000"	1,000"	1,000"	1,000"
	Removal Cost (2022)	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
	Removal Cost (CPI)	$25,000	$25,000	$25,000	$25,000	$25,000	$25,750 - $28,980

	Milestones	2022	2023	2024	2025	2026	2027-2032
PLANTINGS	Avg Trees Planted	175	175	175	175	175	175/year avg
	Planting Cost (2022)	$61,250	$61,250	$61,250	$61,250	$61,250	$61,250
	Planting Cost (CPI)	$61,250	$61,250	$61,250	$61,250	$61,250	$63,090 - $71,005

	Milestones	2022 Zone 3	2023 Zone 4	2024 Zone 5	2025 Zone 6	2026 Zone 1	2027 Zone 2
PRUNING	Trees Pruned	746	1505	1145	1674	1616	1551
	Notes	Cycle Prunes Zone 3	Cycle Prunes Zone 4	Cycle Prunes Zone 5	Cycle Prunes Zone 6	Cycle Prunes Zone 1	Cycle Prunes Zone 2
	Cost (2022)	$37,300	$75,250	$57,250	$83,700	$80,800	$77,550
	Cost (CPI)	$37,300	$75,250	$57,250	$83,700	$80,800	Varies by Year

TOTALS	**TOTALS - 2022 $**	**$123,550**	**$161,500**	**$143,500**	**$169,950**	**$167,050**	**$163,800**
	TOTALS - CPI 3%	**$123,550**	**$161,500**	**$143,500**	**$169,950**	**$167,050**	**Varies by Year**

Summary / Conclusion

The Village of Carol Stream has a long history of maintaining a top-tier urban forest. The current status of the urban forest resource in Carol Stream is that it is extraordinarily well cared for, and a highly diverse tree population overall, which provides its residents with nearly $1.2 million in benefits each year, or approximately 8 times the money invested in it on an annual basis.

That said, there are always areas where enhancements can be made, and this Urban Forest Management Plan has attempted to do so. Such goals as reducing the number of Maples and other overplanted species, attempting to grow some nursery stock on Village-owned land, and increasing overall tree canopy, among many others, are areas where the Village could make a great program even better.

And it is worth mentioning as we conclude this plan that urban forestry and care and maintenance of trees is a journey, and not a destination. It is of the utmost importance that this plan and its goals be reviewed every year or every other year so that evaluation of goals can be made, and the urban forestry program can be adaptively managed. Trees are long-lived organisms, and must fight through many circumstances, both known and unforeseen. Therefore, this document is meant to be a starting point, and not an ending point. Now with goals established, those goals can continually be reevaluated for success or failure and altered as necessary.

We hope that the value of trees to the community has been shown here, both in terms of hard dollars as well as some of the intangible services such as pollution reduction and carbon sequestration. These are things that many people do not consider in their daily lives, and we hope that reading this document has helped to establish a sense of wonder about trees and the benefits they provide society.

We also hope that this document helps to advance the field and science of Arboriculture, and the culture of safety that it thrives on. All too often, we see people looking at the urban forest as “just a bunch of trees”, when in reality, and as hopefully this document has shown, the situation is far more complex than that. There are excellent careers to be had in the green industry and specifically in Arboriculture, and it is hoped that maybe this document has inspired or will at some point inspire people to consider this as a career option.

We thank the Village of Carol Stream and its staff and local stakeholders for their partnership in writing this plan, as well as the funding streams from the US Forest Service and Illinois Department of Natural Resources. The Village of Carol Stream has a bright future ahead if it in terms of Urban Forestry, and it has been a pleasure being part of that process.

Glossary of Terms

Aerial Device: Any piece of equipment expressly intended to elevate a human worker above the level at which they typically stand with their feet on the ground surface. Can include but is not limited to bucket trucks, scissor lifts, etc

Aggressive: A floral or faunal organism which is native (endemic) to the United States or northern Indiana, but which is known to outcompete other more desirable organisms

Arborist: An individual engaged in the profession of arboriculture who is educated, trained and licensed to provide for or supervise the management of trees and other woody plants

Arborist Trainee: Any person working under the direct supervision of an Arborist or Certified Arborist

Balled and Burlapped: A tree, shrub, or other plant prepared for transplanting by allowing the roots to remain covered by a ball of soil around which canvas or burlap is tied and secured with a basket.

Bare Root: Harvested plants from which the soil or growing medium has been removed

Best Management Practices (BMP): Methods or techniques found to be the most effective and practical means in achieving an objective while making the optimum use of resources.

Caliper: Standard nurseryman's measure of tree diameter (size). Caliper measurement of the trunk shall be taken six inches above the ground up to and including four-inch caliper size. If the caliper at six inches above the ground exceeds four inches, the caliper should be measured at 12 inches above the ground.

Certified Arborist: An individual who has sufficient experience in the field of Arboriculture, and has been certified by the International Society of Arboriculture as being a Certified Arborist

Border Trees: Trees whose trunks, when measured at DBH, are situated on both Public and private property

Branch Collar: The branch collar is the point where a branch joins the trunk or another branch. This is the area the arborist chooses to make a proper cut.

Climbing Line: Any rope or other such material explicitly intended for bearing the weight of a human being

Collected Plants: Trees or shrubs which have been sourced from private property for the intent of transplanting elsewhere

Compacted Soil: A high-density soil lacking structure and porosity, characterized by restricted water infiltration and percolation (drainage), and limited root penetration

Consumer Price Index: an index of the variation in prices paid by typical consumers for retail goods and other items

Containerized: A tree, shrub, or other plant prepared for transplanting, or grown in, a solid-walled container such as a plastic pots or wooden boxes

Contracted Staff: People working for the Village as part of an independently owned and operated private company which performs work for the Village, but who are not directly employed by the Village

Controlling Authority: An agency, organization, or corporate entity with the legal authority and/or obligation to manage individual trees or tree populations

Crew Leader: Any personal who has by direction or implication been chosen to lead a team of In-House or Contracted Staff

Crown: The upper part of a tree, measured from the lowest branch, including all branches and foliage

Critical Root Zone (CRZ): The minimum volume of roots necessary for a tree to have health and stability

Cycle Pruning: The process of routine maintenance pruning of trees, not related to storm damage or other hazard or emergency related-pruning, that occurs on a set and predictable time scale set forth by the Village

Deadwood: Wood on a tree or shrub which is no longer biologically living and becomes brittle or prone to failure

Decline/Declining: Trees or shrubs which are experiencing symptoms of a general decline on health due to age, pest, or pathogen related issues

Desirable: A Tree or other plant whose characteristics are sought after due to ecology, aesthetics, or public safety

Diameter or DBH: Diameter at Breast Height. A standard forestry measure of tree diameter (size), measured at 4.5’ above ground level on the uphill side of a tree using a Diameter Tape or Biltmore Stick

Digging Machine(s): Any piece of mechanical equipment whose express purpose is to remove soil and plants from their current locations

Diseased: The status of a tree which has been negatively impacted by a pathogen, bacterial, fungal, viral, or similar lower life forms

Drip Line: The soil surface delineated by the branch spread of a single plant or group of plants

Drought: A period of two weeks or greater, during which there is less than one inch of rainfall, when the average daytime temperature during that same period exceeds 75 degrees Fahrenheit.

Dutch Elm Disease: A fungal pathogen which causes the decline and death of specific species of Elm trees.

Dying: A tree which is in the process of biological death due to senescence, disease, infestation, or other such malady from which there is very little to no hope of long-term survival

EAB: Emerald Ash Borer. An invasive beetle pest which affects all Ash trees.

Establishment Pruning: The pruning of a young tree in order to establish proper form and branching habit.

Established Trees: Those trees which have been permanently planted for a period of no less than 6 months, and which have permanent roots established in the soil

Failure (tree failure): Breakage of stem or branches, or loss of mechanical support in the root system

Feeder Root: Any portion of the below ground portions of the tree whose purpose is to absorb water and nutrients

Floodplain: Land which has been determined to be periodically inundated with water from a nearby moving or static water body, such as a lake or river. Determined by the Federal Emergency Management Agency

Flush Cut: Either a pruning cut or final cut to remove a stump, for which the maximum acceptable distance from the ground or the branch bark ridge shall be no greater than 2 inches.

Full-Time: An employee who has regular employment through the Village and whose work hours exceed 36 hours in a week, and who is employed year-round.

Fungal: Any of a group of spore-producing organisms feeding on organic matter, including molds, yeast, mushrooms, and toadstools.

Grade: The level or pitch of a certain piece of land, as defined by the trees or shrubs which inhabit it

Hardscape: The nonliving or man-made fixtures of a planned outdoor area, such as sidewalks, retaining walls, street lamps, etc.

Hazard: A known and documented state of imperiling public safety

Healthy Tree: Any tree which is successfully adapting to it's environment, and shows no signs of disease, pests, pathogens, or other such maladies, as determined by the Village or Forestry Consultant(s)

Host: An organism which is susceptible to a known pest or pathogen

Infested: The status of a tree which has been negatively impacted by pests

In-House Staff: Staff directly employed by the Village of Carol Stream, on either a full-time or Part-Time Basis

Invasive: A floral or faunal organism which is not native (endemic) to the United States or northern Indiana

Job Site: Any geographic location where a person or persons will be performing activities related to the care and maintenance of Village of Carol Stream property

J.U.L.I.E. (811): The Illinois underground utility locating service

Liner Nursery: A privately owned plant propagation facility which specializes in the growth of small trees which are intended to be planted for growth into a full form

Managed: A tree or shrub which is in an area of the Village which is routinely mowed and managed. Not a wild forest grown tree or shrub, or area containing such trees and shrubs

Manufacturer's Recommendations: Any expressly written instruction manual for a given piece of equipment that details how said equipment is supposed to be managed or maintained

Mineral Soil: Any substrate which is composed of a variety of rocks and minerals in various states of decomposition, leading to the development of a substance on which living plants may live

Mitigation: The process of diminishing risk

Monoculture: A population of trees in close proximity to one another which is comprised of 3 species or less of trees and shrubs which is prone to pest or pathogen outbreak

Natural Resources: Flora, fauna, and other such living and non-living parts of the environment which the Village of Carol Stream maintains

Nursery Stock: Woody Perennials which are of a "Tree Form" growth habit and are supplied by a nursery contractor for planting. Not established trees.

Park District Property: Land which, by deed or title, belongs to the Village of Carol Stream

Parkway Tree: Any woody plant within a Publicly-Owned right-of-way, or any other property owned or managed by the Village of Carol Stream

Part-Time: An employee who has regular employment through the Village and whose work hours are less than 36 hours in a week, and who is employed year-round.

Pathogen: A fungus, virus, or other such microscopic organism which causes decline or death of trees

Pest: An insect or other macrofaunal organism which causes decline or death of trees

Private Property: Land which, by deed or title, does not belong to the Village of Carol Stream

Public Safety: The welfare and protection of the general public

Reforestation: The process by which trees are planted to replace trees which have been removed

Rigging Line: Any rope or other such material explicitly intended for bearing the weight of a tree limb. Not to be used for supporting a human being.

Right-of-Way (ROW): The publicly-owned land on which a road, drainage ditch, trail, or other public access is built

Risk: A situation involving potential exposure to danger or endangering public safety

Root Protection Zone (RPZ): The area on the ground surrounding a tree in which excavation, compaction, and other construction-related activities should be avoided or mitigated

Saddle: A piece of equipment expressly intended to hold a human being above ground level with the assistance of a rope or other such device

Sanitation Pruning: The removal of tree limbs that have become diseased or infested, in order to prevent the spread of disease or infestation from spreading throughout the rest of the tree e.g., Dutch Elm Disease, Black Knot Fungus, etc.

Seasonal Employees: Those employees retained by the Village for less than 6 months out of the calendar or budget year

Shrub: Any woody perennial which has a multi-stemmed growth habit not consistent with being considered a tree. Can be subject to interpretation by Carol Stream Staff.

Sound Wood: Structurally sound, non-decayed, non-compromised wood in the trunk or Scaffold Branches

Staff: Those employees retained by the Village on a full-time basis with benefits provided

Structural Root: Any portion of the below ground portions of the tree whose purpose is to stabilize the plant against the forces of wind and gravity

TRAQ: Tree Risk Assessment Qualification. The International Society of Arboriculture's formal status of an individual who is qualified to assess the risk that trees may bring to the general public

Tree Protection Zone (TPZ): The area surrounding a tree in which excavation and other construction-related activities should be avoided

Tree Risk: The likelihood and consequences of failure of a tree or tree parts

Tree Risk Assessment: A systematic process used to identify, analyze, and evaluate tree risk

Underperforming: Trees which have systematic health and vigor issues resulting in poor health, architecture, or other such maladies as determined by Village staff

Undesirable: A tree which is not desired in the landscape due to ecological, aesthetic, or public safety reasons, as determined by Carol Stream Staff

Unmanaged: A tree or shrub which is in an area of the Village of Carol Stream which is not routinely mowed and managed. A wild forest grown tree or shrub, or area containing such trees and shrubs.

Urban Wood: Any tree or other woody perennial material which has been harvested for the sole purpose of long term storage in the form of furniture, recreational material, etc. Differentiated from "Reclaimed Wood"

Utility Arborist: A person explicitly trained in the management of trees and other plants in relation to energized power lines. Someone who is licensed to work with conflicts between trees and such energized power lines

Appendix A: Acceptable and Unacceptable Species

Species not appearing on this list can be approved or disallowed by consensus of the Tree Commission, acting under the supervision of the Village Arborist and/or Forestry Consultant

NOT APPROVED	APPROVED SPECIES			
Any Size	Large Trees	Medium Trees	Small Trees	Evergreens-Non-Parkway
AILANTHUS	BALDCYPRESS	ALDER	AMERICAN REDBUD	ARBOR VITAE
AMUR CORKTREE	BEECH-AMERICAN	AMUR MAACKIA	APPLE-CRAB	DOUGLAS FIR
ASH-EUROPEAN	BEECH-EUROPEAN	BIRCH-RIVER	APPLE-EDIBLE	EASTERN REDCEDAR
ASH-GREEN	BLACK LOCUST	BLACKGUM	BUCKEYE-RED	FIR-CONCOLOR
ASH-WHITE	BUCKEYE-OHIO	ELM-CHINESE	CHERRY-ORNAMENTAL	HEMLOCK-SPP
BOXELDER	BUCKEYE-YELLOW	HARDY RUBBER TREE	DOGWOOD-SPP	JUNIPER-COMMON
BUCKTHORN	CATALPA	HAZELNUT-TURKISH	HAWTHORN-COCKSPUR	PINE-AUSTRIAN
BURNING BUSH	CHESTNUT-CHINESE	HORNBEAM-AMERICAN	HAWTHORN-SPP	PINE-MUGO
CHERRY-BLACK/PIN	DAWN REDWOOD	HORNBEAM-EUROPEAN	HYDRANGEA-PEEGEE	PINE-WHITE
COTTONWOOD	ELM-HYBRID	IRONWOOD	LILAC-SHRUB	SPRUCE-BLUE
ELM-AMERICAN	GINKGO*	KATSURA	LILAC-TREE	SPRUCE-NORWAY
ELM-SIBERIAN	HACKBERRY	MAPLE-HEDGE	MAGNOLIA-SAUCER	SPRUCE-SPP
HONEYSUCKLE	HICKORY-SPP	MAPLE-MIYABEI	MAPLE-JAPANESE	YEW
MAPLE-NORWAY	HONEYLOCUST	MAPLE-PAPERBARK	PEACH/NECTARINE	
MAPLE-SILVER	HORSECHESTNUT	MAPLE-SHANTUNG	PLUM-SPP	
MULBERRY-SPP	KENTUCKY COFFEETREE*	MAPLE-TRIFLORUM	ROSE OF SHARON	
PEAR-CALLERY	LARCH	OAK-CHINKQUAPIN	SERVICEBERRY-SPP	
POPLAR-SPP	LINDEN-AMERICAN	OAK-ENGLISH	SMOKETREE	
POPLAR-WHITE	LINDEN-LITTLELEAF	OAK-SHINGLE	WITCH HAZEL	
PRINCESS TREE	LONDON PLANETREE	PERSIAN IRONWOOD		
RUSSIAN OLIVE	MAGNOLIA-CUCUMBER	YELLOWWOOD		
WALNUT-ANY	MAPLE-AUTUMN BLAZE	GOLDEN RAINTREE		
	MAPLE-SUGAR	MOUNTAIN ASH		
	OAK-BLACK	PEAR-EDIBLE		
	OAK-BURR	SASSAFRASS		
	OAK-PIN	SEVENTH SON FLOWER		
	OAK-RED			
	OAK-SWAMP WHITE			
	OAK-WHITE			
	PAGODATREE			
	PERSIMMON	* - Male Only		
	SYCAMORE			
	TULIPTREE			
	ZELKOVA			

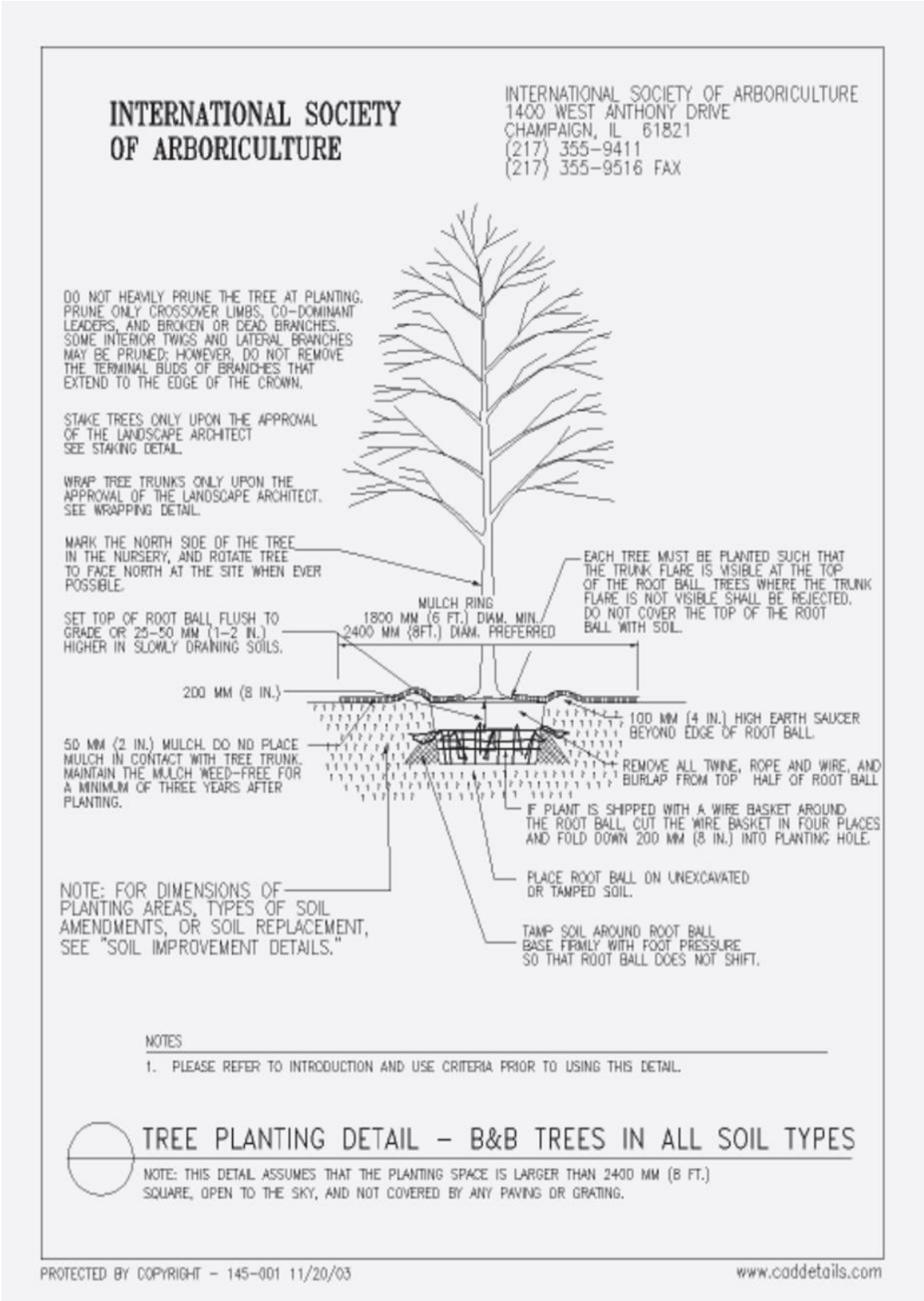
Appendix B: Additional Comments on Species

SPECIES	COMMENTS	SPECIES	COMMENTS
AILANTHUS	NOT APPROVED	LILAC-SHRUB	Parks Only
ALDER-SPP		LILAC-TREE	Improved varieities, tree form only
AMERICAN HORNBEAM		LINDEN-AMERICAN	
AMERICAN REDBUD		LINDEN-LITTLELEAF	
AMUR MAACKIA		LINDEN-SILVER	
APPLE-CRAB SPP	Apple Scab resistant varieties only	LINDEN-SPP	
APPLE-EDIBLE	Parks Only	LONDON PLANETREE	Prefer 'Exclamation!', 'Bloodgood' not allowed
APRICOT	NOT APPROVED	MAGNOLIA-CUCUMBER	
ARBOR VITAE	Parks only	MAGNOLIA-SAUCER	Scale resistant varieties only
ASH-BLUE	NOT APPROVED	MAGNOLIA-SHRUB	tar Magnolia or similar Magnolia pruned to tree form
ASH-GREEN	NOT APPROVED	MAPLE-AUTUMN BLAZE	Or other similar Acer x freemannii
ASH-WHITE	NOT APPROVED	MAPLE-BLACK	
ASPEN	Improved varieties only	MAPLE-HEDGE	
BALDCYPRESS	Prefer 'Shawnee Brave'	MAPLE-JAPANESE	Small growing space only
BEECH-AMERICAN		MAPLE-MIYABEI	Prefer 'State Street'
BEECH-SPP	Prefer 'Tricolor' or 'Riversii'	MAPLE-NORWAY	NOT APPROVED
BIRCH-RIVER	Prefer Single stem only	MAPLE-PAPERBARK	
BIRCH-SPP	Sweet Birch, Yellow Birch, or other newintroductions	MAPLE-RED	Improved varieties only
BLACK LOCUST	Improved varieties only, prefer 'Purple Robe'	MAPLE-SILVER	NOT APPROVED
BLACKGUM		MAPLE-SUGAR	Prefer 'Green Mountain'
BOXELDER	NOT APPROVED	MOUNTAIN ASH	Improved varieties only
BUCKEYE-OHIO		MOUNTAIN ASH-EUROPEAN	Improved varieties only
BUCKEYE-RED	Prefer 'Ft. McNair' or Bottlebush	MULBERRY-SPP	NOT APPROVED
BUCKEYE-YELLOW		OAK-BURR	
BUCKTHORN	NOT APPROVED	OAK-CHESTNUT	
BURNING BUSH	NOT APPROVED	OAK-CHINKQUAPIN	
CAROLINA SILVERBELL	Protected sites only	OAK-ENGLISH	
CATALPA		OAK-PIN	
CHERRY-BLACK	NOT APPROVED	OAK-RED	
CHERRY-PURPLE LEAF		OAK-SWAMP WHITE	
CHERRY-SPP	Ornamental, Black Knot resistant varieties only	OAK-WHITE	
COTTONWOOD	NOT APPROVED	OTHER	Open for new introductions
DAWN REDWOOD		PAGODATREE	
DOGWOOD-SPP	Hardy varieties only	PEACH	Parks only
DOUGLAS FIR	Parks only	PEAR-CALLERY	NOT APPROVED
EASTERN REDCEDAR	Parks only	PEAR-EDIBLE	Parks Only
ELM-AMERICAN	NOT APPROVED	PERSIAN IRONWOOD	Medium growing space only
ELM-HYBRID	Hardy varieties only	PERSIMMON	American variety preferred (Diospyros virginiana)
ELM-RED	NOT APPROVED	PINE-AUSTRIAN	Parks Only
ELM-SIBERIAN	NOT APPROVED	PINE-SCOTCH	Parks only
ELM-SPP	New cultivar introductions	PINE-WHITE	Parks only
EUONYMUS	Eastern Wahoo ONLY no non-native varieties	PLUM-SPP	Parks Only
FIR-SPP	Parks only	PUSSYWILLOW	Parks only
FRINGETREE		ROSE OF SHARON	
GINKGO	Male only	SASSAFRAS	
GOLDEN RAINTREE		SERVICEBERRY-SPP	Prefer 'Autumn Brilliance'
HACKBERRY		SEVENTH SON FLOWER	
HARDY RUBBER TREE		SHRUB-SPP	Parks only, open for new introductions
HAWTHORN-SPP	Thornless varieties only	SMOKETREE	American variety preferred, small growing space only
HICKORY-BITTERNUT		SPRUCE-BLUE	Parks only
HICKORY-SHAGBARK		SPRUCE-NORWAY	Parks only
HONEYLOCUST	Prefer 'shademaster' or 'inermis'	SPRUCE-SPP	Parks only
HONEYSUCKLE	NOT APPROVED	SUMAC	Parks only
HORNBEAM-EUROPEAN		SYCAMORE	In natural areas only, London Planetree preferred
HORSECHESTNUT		TULIPTREE	
HYDRANGEA-PEEGEE		VIBURNUM	Tree form only
IRONWOOD		WALNUT-BLACK	NOT APPROVED
JUNIPER-COMMON	Parks Only	WILLOW-SPP	NOT APPROVED
KATSURA		YELLOWWOOD	
KENTUCKY COFFEETREE	Fruitless varieties only	YEW	Parks Only
LARCH		ZELKOVA	Prefer 'Green Vase'

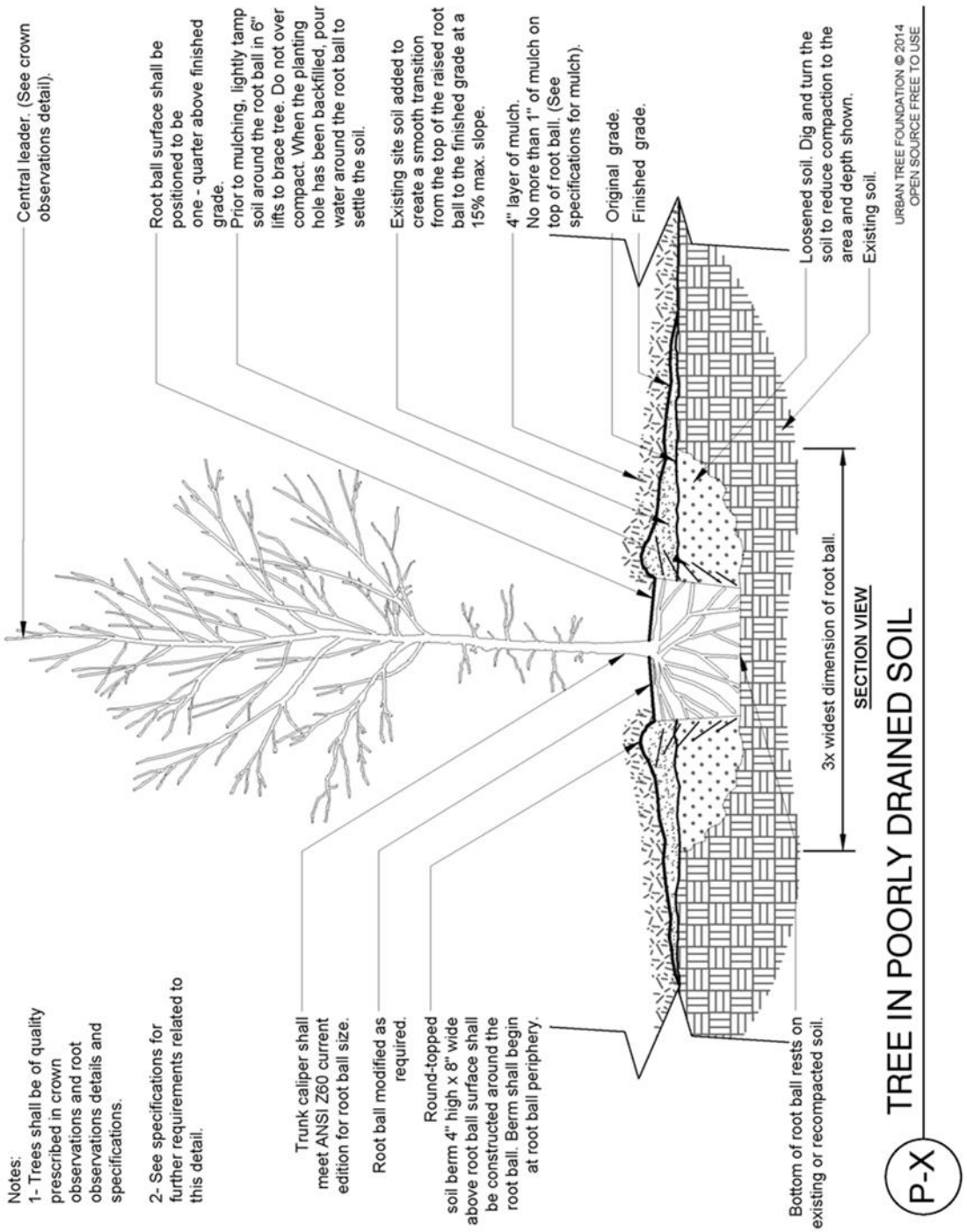
Appendix C: Species Substitutions

Species	Planting Time	Acceptable Substitutes
Alder, Black/Speckled	Spring	River Birch, Planetree
Amur Maackia	Spring	Yellowwood, Shingle Oak
Baldcypress	Spring	Larch, Dawn Redwood
Beech, European	Spring	Red Oak, Buckeye
Birch, River (Multi Stem)	Spring	Alder, Swamp White Oak
Birch, White	Spring	River Birch, Alder
Black Locust (Purple Robe)	Any	Honeylocust, Kentucky Coffeetree
Blackgum	Spring	Sweetgum, Dogwood
Buckeye, Ohio (Autumn Splendor)	Any	Horsechestnut, Catalpa
Buckeye, Red	Spring	Dogwood, Hawthorn
Buckeye, Yellow	Spring	Planetree, Sweetgum
Catalpa	Any	Kentucky Coffeetree, Tuliptree
Cherry, Sargent	Spring	Red Buckeye, Tree Lilac
Chestnut, Chinese	Spring	Turkish Hazelnut, Persimmon
Crabapple (Larger)	Any	Tree Lilac, Hawthorn
Dawn Redwood	Spring	Baldcypress, Larch
Dogwood, Cornelian	Spring	Tree Lilac, Hawthorn
Dogwood, Pagoda	Spring	Sargent Cherry, Smoketree
Douglas Fir	Spring	Concolor Fir, Spruce
Elm, Hybrid (Larger)	Any	Hackberry, Hardy Rubbertree
Fir, Concolor	Spring	Douglas Fir, Spruce
Ginkgo (Standard)	Any	Tuliptree, Catalpa
Golden Raintree	Spring	Katsura, Magnolia
Hackberry, Common	Any	Hybrid Elm, Hardy Rubbertree
Hardy Rubber Tree	Any	Tuliptree, Zelkova
Hawthorn, 'Inermis'	Any	Crab Apple, Dogwood
Hawthorn, Winterking	Any	Tree Lilac, Smoketree
Hazelnut, Turkish	Spring	Persimmon, Catalpa
Hickory, Bitternut	Spring	Oak spp, Beech spp
Hickory, Shagbark	Spring	Oak spp, Beech spp
Hornbeam, American	Spring	Ironwood, Hawthorn
Hornbeam, European (Columnar)	Spring	English Oak (columnar)
Horsechestnut (Baumanii)	Any	Buckeye, Catalpa
Ironwood	Spring	American Hornbeam,Hawthorn
Katsura	Spring	Magnolia, Seventh Son Flower
Kentucky Coffeetree	Any	Honeylocust, Black Locust
Larch	Spring	Baldcypress, Dawn Redwood
Lilac, Japanese Ivory Silk	Any	Hawthorn, Sargent Cherry
Linden, Greenspire	Any	Kentucky Coffeetree, Hybrid Elm
Linden, Redmond	Any	Catalpa, Hackberry
Locust, Skyline	Any	Kentucky Coffeetree,Black locust
London Planetree	Spring	Sweetgum, Blackgum
Magnolia, Cucumber	Spring	Yellow Buckeye, Catalpa
Magnolia, Saucer	Spring	Persian Ironwood, Katsura
Magnolia, Star	Spring	Sargent Cherry, Smoketree
Maple, Autumn Blaze	Any	Black Maple, Shantung Maple
Maple, Black	Any	Shantung Maple, Autumn Blaze
Maple, Paperbark	Spring	Triflorum Maple, Tree Lilac
Maple, Shantung	Any	Sugar Maple, Miyabei Maple
Maple, Sugar	Any	Autumn Blaze, Shanting Maple
Maple, Triflorum	Spring	Paperbark Maple, Tree Lilac
Mountain Ash	Spring	Black Locust, Hawthorn
Oak, Burr	Spring	Shingle Oak, Swamp White Oak
Oak, English (Columnar)	Any	European Hombeam
Oak, English (Standard)	Any	White Oak, Burr Oak
Oak, Red	Spring	Black Oak, Chinquapin Oak
Oak, Shingle	Spring	Chinquapin Oak, English Oak
Oak, Swamp White	Spring	London Planetree, Burr Oak
Oak, White	Spring	Burr Oak, English Oak
Oak,Chinquapin	Spring	Shingle Oak, Red Oak
Persian Ironwood	Spring	Seventh Son Flower, Katsura
Persimmon	Spring	Turkish Hazelnut, Zelkova
Pine, Limber	Spring	Spruce, Concolor Fir
Pine, Red	Spring	Douglas Fir, Eastern Redcedar
Poplar, Hybrid	Any	London Planetree, Baldcypress
Redbud	Any	Serviceberry, Hawthorn
Redcedar, Eastern	Spring	Spruce, Douglas Fir
Serviceberry	Any	Redbud, Tree Lilac
Seventh Son Flower	Spring	Persian Ironwood, Katsura
Smoketree	Spring	Magnolia, Seventh Son Flower
Sourwood	Spring	Blackgum,Sweetgum
Spruce, Black Hills	Spring	Eastern Redcedar, Concolor Fir
Spruce, Blue	Spring	Eastern Redcedar, Douglas Fir
Spruce, Norway	Spring	Eastern Redcedar, Concolor Fir
Spruce, Serbian	Spring	Eastern Redcedar, Douglas Fir
Sweetgum	Spring	Yellow Buckeye, Larch
Tuliptree	Any	Zelkova, Ginkgo
Yellowwood	Spring	Amur Maackia, Shingle Oak
Zelkova	Spring	Tuliptree, Ginkgo

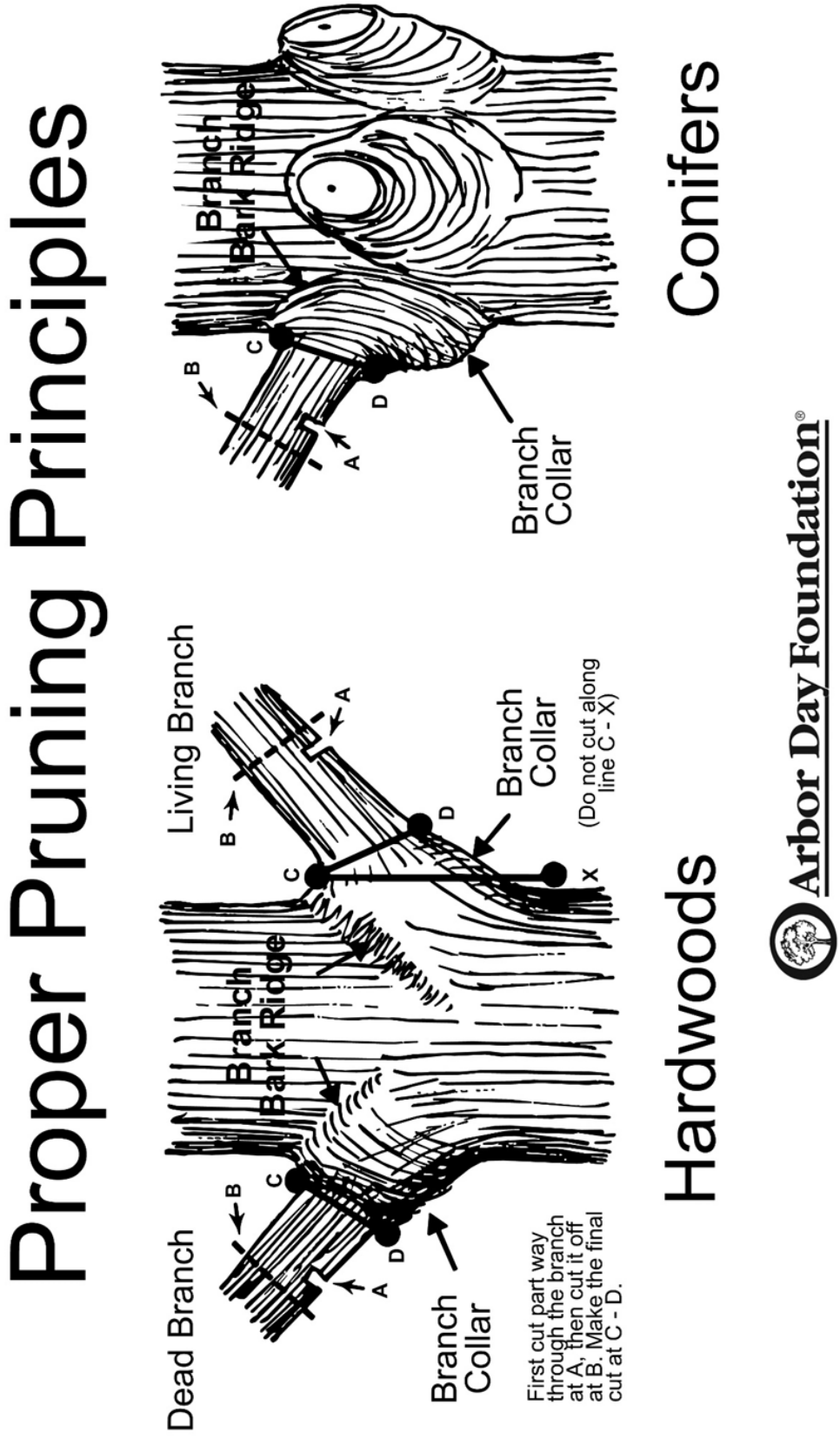
Appendix D: Balled and Burlapped Planting Detail



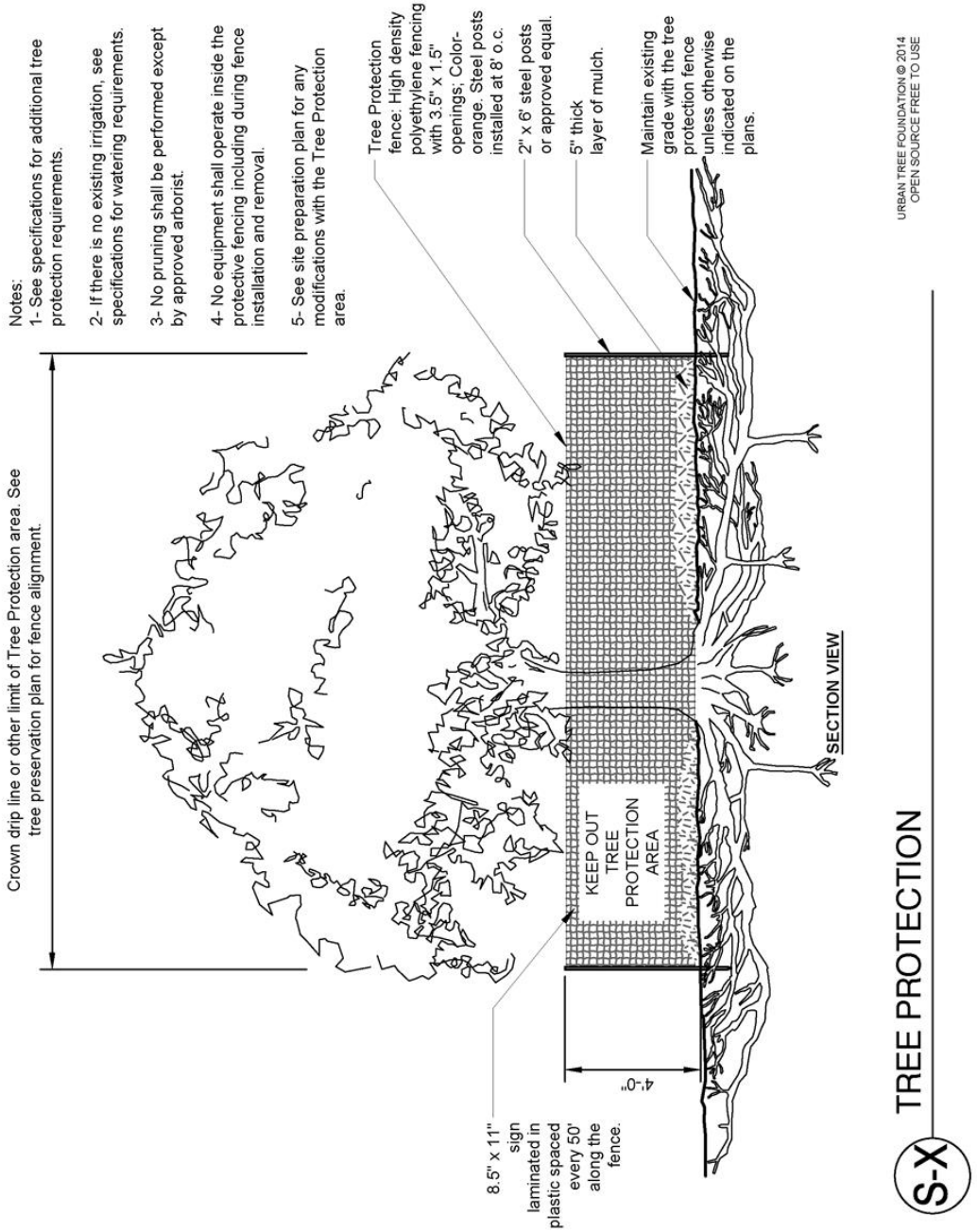
Appendix E: Containerized Planting Detail



Appendix F: Tree Pruning Detail



Appendix G: Tree Protection Detail



Appendix H: ISA Tree Risk Assessment Form (TRAQ Level 2-Basic)

ISA Basic Tree Risk Assessment Form

Client _____ Date _____ Time _____
Address/Tree location _____ Tree no. _____ Sheet _____ of _____
Tree species _____ dbh _____ Height _____ Crown spread dia. _____
Assessor(s) _____ Time frame _____ Tools used _____

Target Assessment

Target number	Target description	Target zone: Target within drip line	Target zone: Target within 1 x Ht.	Target zone: Target within 1.5 x Ht.	Occupancy rate (1 – rare, 2 – occasional, 3 – frequent, 4 – constant)	Practical to move target?	Restriction practical?
1							
2							
3							
4							

Site Factors

History of failures _____ **Topography** Flat ☐ Slope ☐ _____% **Aspect** _____
Site changes None ☐ Grade change ☐ Site clearing ☐ Changed soil hydrology ☐ Root cuts ☐ Describe _____
Soil conditions Limited volume ☐ Saturated ☐ Shallow ☐ Compacted ☐ Pavement over roots ☐ _____% Describe _____
Prevailing wind direction _____ **Common weather** Strong winds ☐ Ice ☐ Snow ☐ Heavy rain ☐ Describe _____

Tree Health and Species Profile

Vigor Low ☐ Normal ☐ High ☐ **Foliage** None (seasonal) ☐ None (dead) ☐ Normal _____% Chlorotic _____% Necrotic _____%
Pests _____ **Abiotic** _____
Species failure profile Branches ☐ Trunk ☐ Roots ☐ Describe _____

Load Factors

Wind exposure Protected ☐ Partial ☐ Full ☐ Wind funneling ☐ _____ **Relative crown size** Small ☐ Medium ☐ Large ☐
Crown density Sparse ☐ Normal ☐ Dense ☐ **Interior branches** Few ☐ Normal ☐ Dense ☐ **Vines/Mistletoe/Moss** ☐ _____
Recent or planned change in load factors _____

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR _____%
Dead twigs/branches ☐ ____% overall Max. dia. _____
Broken/Hangers Number _____ Max. dia. _____
Over-extended branches ☐
Pruning history
Crown cleaned ☐ Thinned ☐ Raised ☐
Reduced ☐ Topped ☐ Lion-tailed ☐
Flush cuts ☐ Other _____

Cracks ☐ _____ Lightning damage ☐
Codominant ☐ _____ Included bark ☐
Weak attachments ☐ _____ Cavity/Nest hole ____% circ.
Previous branch failures ☐ _____ Similar branches present ☐
Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐
Conks ☐ Heartwood decay ☐ _____
Response growth _____

Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐ _____
Likelihood of failure Improbable ☐ Possible ☐ Probable ☐ Imminent ☐ _____

— Trunk —

Dead/Missing bark ☐ Abnormal bark texture/color ☐
Codominant stems ☐ Included bark ☐ Cracks ☐
Sapwood damage/decay ☐ Cankers/Galls/Burls ☐ Sap ooze ☐
Lightning damage ☐ Heartwood decay ☐ Conks/Mushrooms ☐
Cavity/Nest hole _____% circ. Depth _____ Poor taper ☐
Lean _____° Corrected? _____
Response growth _____
Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐
Likelihood of failure
Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

— Roots and Root Collar —

Collar buried/Not visible ☐ Depth _____ Stem girdling ☐
Dead ☐ Decay ☐ Conks/Mushrooms ☐
Ooze ☐ Cavity ☐ _____% circ.
Cracks ☐ Cut/Damaged roots ☐ Distance from trunk _____
Root plate lifting ☐ Soil weakness ☐

Response growth _____
Main concern(s) _____

Load on defect N/A ☐ Minor ☐ Moderate ☐ Significant ☐
Likelihood of failure
Improbable ☐ Possible ☐ Probable ☐ Imminent ☐

Page 1 of 2

Risk Categorization

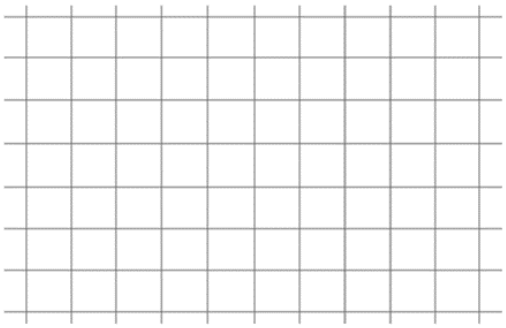
Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood												Consequences				Risk rating of part (from Matrix 2)
							Failure				Impact				Failure & Impact (from Matrix 1)								
							Improbable	Possible	Probable	Imminent	Very low	Low	Medium	High	Unlikely	Somewhat	Likely	Very likely	Negligible	Minor	Significant	Severe	
1																							
2																							
3																							
4																							

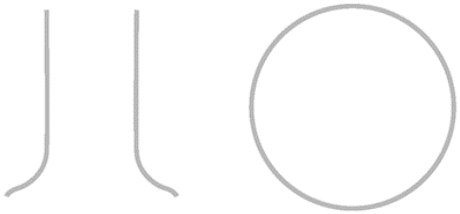
Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impacting Target			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low





Notes, explanations, descriptions _____

Mitigation options _____ **Residual risk** _____

Residual risk _____

Residual risk _____

Residual risk _____

Overall tree risk rating Low ☐ Moderate ☐ High ☐ Extreme ☐ **Work priority** 1 ☐ 2 ☐ 3 ☐ 4 ☐

Overall residual risk Low ☐ Moderate ☐ High ☐ Extreme ☐ **Recommended inspection interval** _____

Data ☐Final ☐Preliminary **Advanced assessment needed** ☐No ☐Yes-Type/Reason _____

Inspection limitations ☐None ☐Visibility ☐Access ☐Vines ☐Root collar buried Describe _____

Appendix I: ANSI Z133.1 Standards – Applies to All Sections

All of the ANSI Z133.1 safety standards shall apply to all tree care operations outlined in the Urban Forest Management Plan. Listed below is a basic overview of the standard, and it is not verbatim. A full text of this manual will be made available to all Village of Carol Stream employees and contractors involved with tree care operations.

1. All tools and equipment utilized during tree care operations, including those not specifically mentioned below, shall be inspected and maintained by qualified personnel in accordance with the manufacturer's care instructions.
2. All staff shall be trained in the proper use, inspection, and maintenance of said equipment.
3. Certified arborists or arborist trainees shall conduct job briefings daily prior to tree care operations of any kind and the information shall be communicated to all workers.
4. All activities performed on any job site for any activity outlined in this Urban Forest Management Plan shall comply with all applicable OSHA guidelines and standards.
5. Traffic and pedestrian control shall be established around the job site prior to the beginning of tree care operations.
6. Emergency contact information and a safety kit conforming to the ANSI Z308.1 standards shall be made available to all workers. All employees shall have basic instruction on the use of CPR and First Aid.
7. Personal Protective Equipment (PPE) shall be required when there is a reasonable probability of injury or illness on the job site. Such a determination will be made by the Certified Arborist or Arborist Trainee prior to the beginning of tree care operations each day, and PPE shall be made available. PPE shall be well-maintained in accordance with the manufacturer's requirements.
8. Head protection shall conform to ANSI Z89.1, face and eye protection shall conform to ANSI Z87.1, respiratory protection shall comply with ANSI Z88.2, and leg protection shall always be worn when using a chainsaw.
9. Flammable liquids shall be kept a minimum of ten feet from open sources of flame or high heat and shall be stored in approved containers.
10. All Village staff and contractors working near electrical hazards shall be qualified to do so and shall be educated in the full ANSI standards for Electrical Hazards and Line Clearance.
11. Vehicles and mobile equipment shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements and shall be equipped with all standard safety devices, decals, and instructions, and shall be operated within all federal, state, and local motor vehicle codes and ordinances.

12. Aerial devices shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements, and shall be equipped with all standard safety devices, decals, and instructions.

13. Aerial devices shall be stabilized by wheel chocks, outriggers, or stabilizers as necessary for the device, and shall never be used to lift, hoist, or lower logs or equipment unless specifically designed to do so.

14. Aerial devices shall be equipped with fall protection devices and permanent load ratings, both in accordance with ANSI/SIA 92.2 or 92.5, as applicable to the specific aerial device.

15. No aerial device shall be allowed to make contact with electrical conductors, and minimum safe distances shall be maintained in accordance with the ANSIZ133.1 Standard.

16. All brush chippers shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements, and shall be equipped with all standard safety devices, decals, and instructions.

17. Sprayers and related plant health care equipment shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements, and shall be equipped with all standard safety devices, decals, and instructions

18. Sprayer tanks or other similar enclosed spaces shall not be entered unless performed through a confined-space entry plan in accordance with OSHA 1910.46 Requirements, including air-quality testing, training, and PPE.

19. Chain saws and other similar portable power tools shall not be operated unless the manufacturer's safety devices are in proper working order. Such safety devices shall not be removed or modified.

20. Forestry staff shall have a minimum of two points of attachment to the tree or aerial device while operating a chainsaw at all times, unless the hazard posed by the second point of attachment poses a greater hazard than utilizing one point of attachment.

21. A visual hazard assessment, including a root collar inspection, shall be performed by a certified arborist or arborist trainee prior to climbing, entering, or performing work in or on any tree, and a second crew member shall be within visual or voice communication at all times during arboricultural operations that are in excess of 12 feet from the ground surface.

22. All ropes, saddles, carabiners, and other similar climbing equipment shall be: a) approved for use in the tree care industry by the manufacturer, b) have a minimum breaking strength or load capacity of 5,000 lbs., c) be inspected before each use, d) Equipment shall be removed from service when it shows signs of excessive wear or deterioration.

23. All pruning, removal, and rigging operations shall have a designated drop zone where limbs, trunks, and tools can be dropped from aloft without impacting pedestrians or passersby. A visual or verbal communication system between the employee aloft and the employee(s) on the ground shall be established to determine when the employee aloft will safely drop tree parts or tools.

24. Any tree parts which cannot be safely dropped or controlled from aloft shall have a separate rigging line tied to them to help control their fall. The tree shall be inspected for structural stability prior to the establishment of a rigging system in the tree. When trees appear to have defects that could jeopardize the ability to safely use a rigging system to drop or control a limb, an alternate plan shall be implemented.

25. All equipment utilized in rigging shall meet the load ratings for the limb being rigged, and a qualified employee, trained in proper rigging procedure shall determine the rigging procedure and equipment to be utilized. Any equipment which has been damaged or overloaded shall be removed from service.

26. When felling (removing) a tree, a crew leader shall make the determination of what equipment is necessary, and how many crew members are to be directly involved in drop zone operations. A well-established escape route shall be planned for involved workers prior to the beginning of felling operations. Any non-involved workers shall be beyond twice the height of the trunk or tree being removed during felling operations.

27. Notches shall be used on all trees and trunks greater than five inches in diameter during felling operations, and should conform to the standards set forth in the ANSIZ133.1 Standard.

28. Loose clothing, ropes, lanyards, and saddles shall not be worn during any tree care activity where the risk of entanglement with tools or machinery is possible, particularly with brush chippers.

Appendix J: Tree Planting Standards (ANSI/ISA BMP)

ANSI Z60.1

1. All root ball and container sizes for all balled and burlapped stock shall conform to the Z60.1 standards for width and depth, such that they encompass enough of the fibrous root system as necessary for the full recovery of the plant upon installation.
2. All bare root stock shall conform to ANSI Z60.1 standards for minimum root spread.
3. All containerized stock shall conform to ANSI Z60.1 standards for plant and container size, as specified by the Village, and shall be healthy, vigorous, well-rooted and established in the container in which it is growing. The root system shall reach the sides of the container, but shall not have excessive growth encircling the inside of the container.
4. All collected plants (those grown on unmanaged land) shall be so designated, and shall be considered to be nursery-grown stock when they have been successfully reestablished in a nursery row and grown under regular nursery cultural practices for a minimum of two growing seasons.
5. The trunk or stem of the plant shall be in the center of the ball or container, with a 10% overall variance in location.
6. The use of digging machines in both the packaging and installation of trees is considered an acceptable nursery practice.

ANSI A300 – Part 6

1. Planting sites and work sites shall be inspected for hazards by the Village prior to the beginning of work each day. If portions of the work site are outside of the original scope of work, the controlling authority shall be notified immediately.
2. Location of utilities, obstructions, and other such hazards above and below ground shall be taken into account prior to planting and transplanting operations. These include, but are not limited to, gas, electric, sewer, communication, drainage, and signage.
3. The following shall be taken into consideration prior to transport and planting: Requirements of individual trees, compass orientation of field-grown trees, site feasibility assessments, soil assessment, and drainage assessment.
4. Tools for planting and transplanting shall be properly labelled or purchased for their intended use, and be maintained in accordance with the manufacturer's recommendations
5. The system used to move and store the plant shall minimize desiccation and other damage to the crown, trunk or rootball, and the health and vigor of the plant shall be maintained during these periods.

6. The hole to be dug for all new plantings shall be a minimum of 150% larger than the rootball or container diameter, as deep as the root flare of the tree to be planted, and shall have sides from which soil has been loosened in order to aid in root penetration.
7. For balled and burlapped trees, all rootball supporting materials shall be removed from the upper third of the rootball, and removed from the planting hole prior to final backfilling.
8. Prior to planting, container root balls shall be managed by approved methods such as, shaving the root ball, slicing the root ball, and redirecting or removing encircling roots.
9. Backfill shall comprise of either the same soil created when the hole was excavated, or a similarly amended mixture to meet a specific objective, and shall be applied in a layered fashion to reduce future settling and prevent air pockets.
10. Mulch shall be applied at a depth of two to four inches, near - but not touching - the trunk of the tree, and extending to the perimeter of the planting.
11. Support systems such as guy-wires or stakes shall not be installed except where needed.

ISA BMP Manual – Tree Planting

1. Timing of planting shall be determined based on the species, and the best professional opinion of the employees of or contractors working for the Village.
2. All employees and contractors employed by or working for the Village shall be familiar with the following types of planting types, and when it is appropriate to use each:
   A. **Bare-Root:** Field-grown, and dug without soil during the dormant season
   B. **Ball and Burlap:** Field grown and packaged with a soil ball, using burlap, twine, and a retaining basket of some kind
   C. **Tree Spade:** Transplanted using a mechanical tree spade to hold the soil ball during transport
   D. **In-Ground Fabric Bag:** Field grown with the root mass contained in a semi-permeable fabric bag
   E. **Container Grown:** Grown above ground in containers of various shapes, sizes, and materials
3. Trees packaged with root balls must have their first structural root within two inches of the soil surface. Trees with deeper structural roots will not perform well when transplanted, and should be avoided when selecting nursery stock.

4. Trees with root balls shall be handled by the ball, not the stem, to ensure no damage occurs to the root-soil interface or to the stem itself**.**
5. Trees with leaves shall be transported with a fabric tarp to minimize desiccation, and have had their root balls wetted prior to transport.
6. Sites shall be tested for drainage, nutrient levels, and pH prior to planting (or prior to species selection, if possible).
7. Container stock shall be removed from its container. For balled and burlapped trees, wrappings shall be left on until the tree is in the hole; wrapping shall then be removed from the third to fourth of the wire basket and burlap from the top of the ball. For all types, ensure any encircling (girdling) roots are removed, and root ball is shaved as necessary.
8. As soil is added, wet and tamp each layer down to ensure good moisture and reduction of air bubbles.
9. Do not prune trees at time of planting, unless to remove dead, dying, diseased, or cracked branches, as it may take away from root development to have the tree attempt to heal these above-ground wounds.
10. The use of trunk wrap may be considered in areas with harsh winters, specifically on trees with thin bark, such as London Planetree and certain Maple species.

Appendix K: Tree Pruning Standards (ANSI/ISA BMP)

ANSI A300 - Part 1

1. A designated Arborist or Arborist Trainee shall visually inspect each tree before beginning work. If any condition is observed above and beyond the original scope of work, said condition shall be reported to the controlling authority before any work begins.
2. Pruning cuts which remove a branch at its point of origin shall be made close to the trunk or parent branch without cutting into the branch-bark collar or leaving a stub.
3. Pruning cuts made to reduce the length of a limb or parent stem shall be made at a slight angle relative to the remaining stem, and not damage the remaining stem. If pruning to a lateral branch, the lateral should be large enough to assume the terminal role.
4. Final cuts shall be made such that the result is a flat surface, with the adjacent bark firmly attached.
5. Not more than 25% of the foliage shall be removed during an annual growing season, depending on the tree species, size, age, and condition. If more frequent pruning due to utilities, vistas, or health considerations is necessary, removal of the tree should be considered as an alternative to pruning.

ISA BMP Manual

1. All employees or contractors directly involved with the pruning of trees shall be familiar with the following pruning types and how they are to be used in conjunction with one another:
    1. **Pruning to Clean**: Selective removal of dead, diseased, detached, cracked, and broken branches
    2. **Pruning to Thin:** Selective removal of small live branches to reduce crown density
    3. **Pruning to Raise:** Selective removal of branches to provide vertical clearance
    4. **Pruning to Reduce:** Selective removal of branches and stems to decrease the height or spread of a tree or shrub
    5. **Structural Pruning:** Selective removal of live branches and stems to influence the orientation, spacing, growth rate, strength of attachment, and ultimate size of branches and stems
    6. **Pruning to Restore:** Selective removal of branches, sprouts, and stubs from trees and shrubs which have been topped, severely headed, vandalized, lion-tailed, storm damaged, or otherwise damaged
2. Every effort shall be made to time pruning of individual tree species to be done in accordance with best management practices for the tree species in question. All pruning work shall be done so at the discretion of the Village of Carol Stream and its approved contractors.

Appendix L: Carol Stream Pruning Zone Map