City of Geneva Urban Forest Management Plan

City of Geneva

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OVERVIEW OF GENEVA'S URBAN FOREST MANAGEMENT PLAN

Geneva, Illinois currently manages 12,433 trees throughout its city parkways (street trees) and municipal properties. In addition, there are also 1,960 open planting spaces on its parkways. Detailed tree data was collected for Geneva's managed trees as part of a comprehensive inventory during the Spring of 2018. This large project is culminating in this Urban Forest Management Plan which will detail how Geneva's urban forest resources will be managed for the benefit of the City of Geneva over the next 32 years, with a focus which begins in 2018, and projects out to 2050.

In terms of the condition of the Urban Forest in Geneva, there are certainly many strengths, along with a few opportunities for improvement and updating. Geneva has a fairly large tree population, providing many benefits, and there is evidence of a relatively high level of maintenance. The diversity of tree species in Geneva is moderately low overall, with species of Maple trees making up a significant percentage. This lower overall diversity of the urban forest resource puts it at a higher risk of future mass tree loss due to introduced insects and diseases. Even if those pests and pathogens do not materialize, it is a generally middle-aged to older tree population, and necessary tree removals from simple aging, senescence, and dieback will begin to materialize during the time scale of this Urban Forestry Management Plan.

In order to overcome these challenges and produce an Urban Forestry program which will create long term benefits to the community while reducing costs, the following Urban Forest Management Plan will address each one of these challenges and create goals and milestones for each. Below is a broad view of the activities to come in the 2018-2050 period. Much further detail is given in the body of the report, with separate sections detailing specific tree-related activities, and how we propose they are achieved, along with standards and Best Management Practices for each.

We have created a proposed forestry program which will achieve the greatest benefit for the community, based on the available data we have from the inventory, as well as input from the partner committees and residents of the City of Geneva. However, all plans are subject to change based on new information, budgets, or other unforeseen circumstances. For this reason, we ask all readers to consider that this plan is to be a living, breathing document, and goals and strategies will be updated to fit circumstances as needed. This Plan will be reviewed every year, and residents, business owners, and other stakeholders will have an opportunity to provide input, and help make it better during those annual reviews. These strategies and goals are not absolute, but rather serve as guideposts to mark the road to success.

STATEMENT OF MISSION

It shall be the mission of this Urban Forest Management Plan to outline goals, budgets, and Arboricultural Best Management Practices for the Urban Forest in the City of Geneva. This will be done to provide benefits to the residents of Geneva, in order to increase canopy cover, filter and reduce storm water runoff that flows to the Fox River, create shade and energy savings, promote general health and wellbeing, provide a source of enjoyment and aesthetics, uptake carbon dioxide and filter pollutants, and increase property values, among many other benefits of trees in our communities. Trees that make up this Urban Forest consist of trees on City parkway and publicly-owned properties. This plan also seeks to outline both the shorter and longer term management of this urban forest resource in order to maximize the environmental and aesthetic benefits of Geneva's Urban Forest, while minimizing risks and costs. These goals and practices are designed to be financially and programmatically sustainable, as well as flexible for the City, both now and in the future as residents, Councils, and Administrations change with time.

OVERVIEW OF GOALS

Listed below are the strategic goals of this Urban Forest Management Plan (herein referred to as "UFMP", or "the Plan"), as well as a brief discussion of how they shall be met. Every attempt was made to make these goals realistic and achievable, such that they do not place an undue burden on the City of Geneva, its residents, or its resources. Instead, the 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, the introduction of new pests or pathogens, or changing climate (both social and meteorological) may all change the way the Urban Forest is viewed. The goals of this document are subject to change based on the discovery of new knowledge, shifting budgets, or other circumstances.

The Plan is intended to be, and should be, reviewed periodically by City Staff. The review process will 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 Government agencies, Administrations, and residents change over time, and therefore it's goals and milestones require a large degree of flexibility. Since trees represent a long term (50-80 year) commitment, this Urban Forest Management Plan is intended to provide guidance and continuity through those changes, while also adapting to them as the need arises.

Create a Needs Analysis for the Current Tree Population Based on Strengths and Opportunities
Every tree population we see today is the result of decades of past management decisions. As time goes on, we as an industry increase our overall level of knowledge, skill, and efficiency in managing trees for maximum benefit. Based on that new knowledge, we sometimes discover that decisions made 20 or more years ago may appear in retrospect to have been inappropriate, even though they might have seemed like a good idea at the time. For Geneva's trees, it was the goal of this Plan to assess the current state of the City of Geneva's Urban Forest and examine its overall strengths and benefits, as well as look for opportunities for improvement.

Each aspect of the tree inventory data which was taken for the City of Geneva 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 strategic goals to improve the tree population for the benefit of the residents. Specific goals in terms of planting, removals, budgets, personnel, and maintenance were all addressed by acknowledging both strengths and opportunities / challenges, and suggesting how they might be used to our advantage. These strengths and opportunities will be the guiding principles for the management strategies and specific goals outlined in each section below. In order to avoid repeating mistakes made in the past, the Plan shall also attempt to leave room for adaptive management when given new information.

Establish Goals in Order to Enhance Strengths and Realize Opportunities
In order to accomplish anything, goals are needed along the way to guide you through the process. Enhancing and altering a long-standing forestry program such as Geneva's will require a series of realistic goals to in order to be achieved. This Plan seeks to accomplish those goals within a realistic budget and achievable timespan. Allowing these goals to be attainable is a hallmark of this plan. It should be understood that goals are intended to change over time as the city's capacity to manage the resource may increase or be reduced. The ability to adapt along the way is of great importance to this Plan.

In each section of the Plan, we shall include goals which incorporate both a budget and a time frame in which those goals can be accomplished. The goals will be to have Geneva have a sustainable forestry program within a 5-10 year period. This program will include tree planting, tree maintenance, and tree removal for Geneva's Urban Forest, so that the tree population will be healthy, and provide the greatest benefits and least risk to the residents at a very efficient price point. As a Forestry program driven by a strong set of union forestry employees, the City of Geneva relies on it's own in house labor to perform most tasks for the forestry program, with only minimal tasks being contracted out to private industry. Therefore, increasing manpower and machinery available to the City will be the focus on attaining these goals, instead of a traditional budget for contracted services. To learn more about the budgeting and staff capacity, see the individual goals in each section below, or turn to the budget table in section 14.

Update City Ordinances for Enforcement of Tree Policies
As experts in the field of Arboriculture having worked with many communities over the past decade, we have reviewed and made some suggestions to Geneva staff concerning their existing Tree and Landscaping ordinances. These measures will result in a tree population which is diverse, healthy, and improving, providing the greatest benefit to the City and its residents over the long term. To learn more about ordinances, turn to Appendix G.

Increase Overall Diversity by 2050 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 are 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 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. Great diversity leads to great stability, and stability leads to reduced costs and increased benefits over time.

An achievable "Diversity Vision" has been created for 2050 which will see the tree population become far more diverse than it is at present. Currently Maples are highly overplanted in Geneva, however there is evidence that the City has put effort into improving diversity. For this plan, trees will be planted which are underrepresented in the current population, and planted in such a manner that selects the right tree for the right site. Ideas such as establishing a local tree buyers cooperative for Geneva and other municipalities will be explored, as well as partnering with nurseries so that trees can be grown specially for Geneva. To learn more about tree planting and reforestation, turn to Section 7, and Appendices B and C

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, poor soil, and other challenges, not all trees will thrive in the urban environment. Trees which have very weak wood, are known invasive species, produce messy or foul-smelling fruits, or 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 an "unacceptable" species list as specified by the City's Tree Ordinance, which will detail specific trees which may be planted on City streets and on City owned properties. The City will review the list periodically in response to changes in species composition of the urban forest, weather events, and availability of new tree species. For more information on what species can and cannot be planted in Geneva, see the Acceptable Species list in Appendix A.

Manage Tree Removals
Whether for public safety, or to prevent the spread of disease, sometimes tree removal is unavoidable. During the inventory, 182 trees were identified as requiring removal, and of these, 12 were listed as being potentially hazardous. In addition, the tree population of Geneva is largely older Maple and Honeylocust trees, many of which will begin to decline and require removal of the next 20 years. To keep the residents of Geneva safe, a tree removal program has been created in this Plan which budgets for the safe removal of all of these trees over the next years and decades in order to maintain public safety. Beginning this year, the 12 hazardous trees will be removed, progressively removing more at-risk trees annually, until no high-risk trees remain in public spaces. Cost projections for tree removals have been made based on the number, age, and condition of trees in Geneva for the next 32 years, so that long term budgeting projections can begin as soon as possible for the City. Also included are ANSI and ISA safety standards, as well as suggested bid specifications to ensure the City is hiring qualified contractors who will be held to the highest industry standards. For more information on Geneva's proposed tree removal program, turn to section 6.

Increase the Capacity of Public Services Forestry Crew
We will look at the details of this goal in greater detail below, but the City of Geneva has expressed an interest in contracting less tree work out, and handling more with in-house resources. Based on our analysis of manpower and budgets, the City actually has very little need to increase capacity, and as a Union organization, handles all but a small fraction of it's tree work using in house staff and equipment. That said, there is some opportunity for improvement, and we will detail these areas for improvement in all facets of tree care operations such as pruning, removal, and planting in further sections.

Enhance the Annual Maintenance Program
Properly maintained trees establish faster, grow quicker, and live much longer lives than trees which are not maintained, or improperly maintained. Since large trees provide the greatest benefits to the community (as we will show later), maintenance is a critical part of the proposed Urban Forestry program in Geneva. Annual maintenance for trees will include critical tasks such as pruning of all trees. Pruning will be done in large part by Geneva staff, with some outside assistance as needed from Certified Arborist contractors, and for some of the newer trees to be planted, by local, well-trained volunteers. 246 trees were identified in the inventory as requiring priority pruning, with 28 trees identified as hazards, and these must be addressed first. Our first-year goal will be to prune all 274 trees which were identified as priority or hazard prunes.

As Geneva begins to increase its budgets and capacity for tree pruning, we can begin to realize the cyclical pruning program in Geneva. This program has been designed to ensure that all trees on public property are pruned every 5 years in a proactive fashion, increasing tree health and vigor while reducing costs associated with storm damage and tree failure. We believe that revisiting this cycle and making adjustments based on the new number of trees discovered in the inventory may be appropriate. We have also proposed that a volunteer group of Geneva Tree Stewards be trained in proper pruning and maintenance of young trees, so that the community can assist in caring for this important forest resource, and reduce the burden on the City staff. This group may assist in other tasks as well, such as watering, and monitoring for new insects and diseases. For more information on tree pruning and maintenance, turn to sections 8 and 9.

Maintain an Accurate Tree Inventory on an Annual Basis
Managing an urban forest requires a clear understanding of the existing trees, their ages, conditions, and locations, so that City crews and contractors can perform maintenance work on these trees. With this concept in mind, a stem-by-stem tree inventory was completed in April, 2018, with funding supplied from the City of Geneva. This inventory and consulting resulted in an unbiased assessment of all of the trees on public property in the City, and will serve as the data which will guide the forestry program throughout the next 30 years.

All inventories are a snapshot in time. With 12,433 trees on City property, the tree inventory should be maintained at a high level of accuracy so that it doesn't become out of date. To accomplish this, Geneva has been supplied with a GIS-based tool which can be used by its public employees to manage the tree population from any computer, smartphone, tablet, or other mobile device. However, we also recommend that the inventory be updated periodically by a Forestry Consultant, in order to keep the information at its most current on a City-wide scale. Maintaining this tree 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 months 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 City plantings will be properly mulched at the time of planting by the planting contractor. 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 actually kill a tree over time. For more information on proper mulching, turn to section 9.

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 City will be in compliance 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 in-house tree care operations or Request for Proposal (RFP) or bid documents when seeking qualified contractors. Full text of all referenced standards shall be made available to all City employees and contractors performing tree care operations. Public outreach and education shall be performed by the City of Geneva Staff, ensuring that residents understand these practices as well. 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 during a storm or other weather event, they may also pose a great risk. Tree limb failure can have catastrophic effect on people or property, and trees need to be well-managed and healthy to avoid that risk. A risk assessment policy has been created for the City of Geneva 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 by reducing the frequency of those incidents. Basic risk assessment language and parameters are included in this document, and a basic Tree Risk Assessment Policy has been created in Section 11, and Appendix F.

Increase Urban Tree Canopy from 29% to 35%

The tree canopy is important to the community because more trees provide greater benefits such as decreased heating and cooling costs, pollution reduction, and storm water uptake. Tree lined streets are more attractive to homebuyers and potential new businesses, which increases home values, home ownership, and tax revenue. All of these factors benefit the community, so we want to increase tree canopy in the City of Geneva. Currently, Geneva contains a very respectable 29.76% tree canopy coverage, compared to other land cover types, such as grass, buildings, paved surfaces, and water. However, much of this is in natural areas, and there is significant potential for increases in street and private tree coverage in residential and commercial areas within the city limits. Increases in tree canopy also come with increases in total benefits provided to the community. Currently, the tree population in Geneva provides over $1.3 Million in annual benefits to the community, and we aim to demonstrate that this number will be significantly higher with increases in Urban Tree Canopy.

Based on preliminary data from the Chicago Region Trees Initiatives research, we believe that 35% canopy cover is a realistic goal for Geneva by 2050. This will be accomplished by increasing the number of trees in on Geneva streets and in Geneva parks, as well as improving tree care allowing trees to live longer, become larger, and create more canopy cover. Tree planting on private property will also be encouraged through public-private partnerships with local organizations and businesses. If this goal can be achieved, the possible increase to the value of the benefits provided by the trees to Geneva's residents amount to over $1,300,000 per year. As we will show in the detailed portions of this Plan, these are real benefits that will help Geneva Residents save money. For more information on Urban Tree Canopy, tree benefits, and other such information, turn to sections 4 and 5.

Tree Preservation / Invasive Species Management
Many times, trees can become damaged by construction activities, costing homeowners or developers money, and eliminating the benefit the tree had to the community. As is common in many other municipalities, a basic tree survey should be conducted prior to the issuance of a permit for construction activities. A tree protection zone must be established and enforced during construction. Finally, tree removal, for trees of a certain size on the approved species list, should require a permit from the City to remove. Likewise, the city should encourage the removal of invasive species from private land, either through incentive programs, or by utilizing volunteer workdays for City-Owned property. A strategic goal of this Urban Forestry Management plan is to preserve quality trees during construction, and reduce the amount of invasive species within City limits.

Increase Awareness of the Urban Forest in the City of Geneva, and Engage Stakeholders
The entire reason for the enhancement of the urban forestry program in Geneva is to improve the lives of the residents, business owners, and other stakeholders who want to see the City be a healthier, happier community. In order to make this happen, we will be looking for partners in the community to provide support for this program. Geneva staff will be reaching out to local garden clubs, philanthropic organization, residents, and business owners in order to make the forestry program as innovative and hands-on as possible. In this manner, residents and business owners in Geneva can take ownership of this important and beneficial resource, and allow it to work for them, their families, businesses, and the good of the whole city. For more on these innovative programs, and how you can get involved, turn to sections 12 and 13.

Section 2 – Definitions

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

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.

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

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

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

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 City of Geneva

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

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.

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

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

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

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.

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

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

Mitigation: The process of diminishing risk

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

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

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

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.

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

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

Section 3 – Personnel

Below is a representation of tasks, and which of the above parties is responsible for these tasks.

Director of Public Works / City Arborist
The Director of Public Works / City Arborist is responsible for top down implementation of all Public Works projects, including the forestry program. These programs occur with the approval and cooperation of the various governmental jurisdictions in Geneva as identified by the Tree Advisory Board, Forestry Consultant, City Council, and the Park and Recreation Department. This position will seek bids from qualified Tree Care Contractors to complete the work approved by the various agencies, as well as maintain the tree inventory when possible, and act as a representative for public concerns. At the request and/or approval of the Council(s) and Board(s) the duties of the City Arborist may be performed by the Forestry Consultant, however, the Board(s) and the Tree Advisory Board will be tasked with ensuring that no conflict of interest exists in doing so.

Superintendent of Streets, Fleets, and Facilities
The Superintendent of Streets, Fleets and Facilities is responsible for directing the Forestry Crew Leads and taking direction from the Director of Public Works. They function as the prime point of contact between the various Crew leads in general and provide coordination in response to resident requests.

Forestry Crew Leader
An ISA Certified Arborist, responsible for leading the daily activities of the Forestry Crew. Reports directly to Superintendent of Streets, Fleets, and Facilities on a daily basis with performance updates and daily production. Responsible for maintaining safe job site and compliance of Forestry Crew with all Best Management Practices and applicable ANSI/ISA/OSHA guidelines. Responsible for Crew member's daily activities and schedule. Directs public inquiries to appropriate administrative personnel.

Forestry Crew Member
Performs forestry-related activities such as tree trimming, removal, stump grinding, chemical applications, and planting in a safe and efficient manner. Reports directly to the Forestry Crew Leader. Maintains high personal standards of behavior and public relations as work is performed throughout the City, and directs public inquiries to the Public Services Forestry Crew Leader.

Tree Advisory Board
Currently, there is no formal Tree Advisory Board in Geneva, but rather these duties lie with the abovementioned City staff, acting in tandem with the City Council. These groups combined are the steward of this Urban Forestry Management Plan. As the representatives of the residents of Geneva, this group is tasked with ensuring the proper functioning of the Urban Forest so that all residents can realize it's benefits. The group may seek guidance from the Forestry Consultant or other residents who have knowledge in the field of Arboriculture, and uses their opinions and independent research to make decisions that other members may not have specific knowledge in. This group is responsible for annually updating and approving the Urban Forestry Management Plan based on new information. The group is also responsible for a review of issues associated with public property trees, and perform a more detailed assessment of finances and operations.

Tree Care Contractors
Tree Care Contractors are responsible for performing work identified by the Tree Advisory Board, Forestry Consultant, and City Arborist in a timely, safe, and expeditious manner. Tree Care Contractors must have at least one International Society of Arboriculture Certified Arborist on site when work is being performed, and 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
The Forestry Consultant is responsible for impartially assessing the tree population as to its various needs on an annual or biannual basis, at the discretion of the Board and the City Arborist. The Forestry Consultant communicates the needs of the trees to the Board(s) and the City Arborist so that individual needs in terms of tree planting, removal, and maintenance can be performed. The Forestry Consultant may also function as the City Arborist during periods of the City Arborist's absence at the request of the City.

Current Status (2018) of Geneva Public Services Forestry Crew Equipment and Production

As of this writing, the City of St. Geneva has a 4-man crew, which performs forestry-related work approximately 80% of the working year. The other 20% is devoted to other Public Works activities, such as plowing, salting, or other such activities. The Forestry crew is equipped with 2 bucket trucks (40' and 60' booms), 2 chippers, 2 loaders, 3 high capacity dump trucks, and 1 backhoe/skid steer. There are up to 12 dump trucks available for emergency situations. A review of the past 2 years' worth of Forestry Crew production data indicates the following:

	Forestry Crew Trimmed	Contractor Trimmed	Forestry Crew Removed	Contractor Removed	Electric Department Pruned	Electric Contract Pruned	Forestry Crew Planted	Contractor Planted
2017	2,000	<50	110	<15	<100	900	<10	50

Strategic Goals

The above current capacity is very good overall for a rather small crew, and is aided very much by the fact that the electric department hires a contractor to prune a very large number of trees each year where wire conflicts exist (within 15 feet of energized conductors). Geneva is already on a 5 year cycle pruning program, and manages to accomplish most of it in-house and has budgeted the correct resources. As the Forestry Program expands in Geneva, there should be a series of Strategic Goals for the Forestry program overall. We will detail each, and establish Milestones from 2018-2040 below.

Pruning

With a tree population of approximately 12,433 trees, approximately 24% (3,000) are getting trimmed each year according the records above. This number would lend itself towards being able to shrink the time frame down even further and attempt to put the City on a 4 year program. However, this number is misleading, as a fair portion of the trees which the electric department prunes are not street trees such as those in the inventory, and many are in dense hedgerows where utility lines cut through. We believe that bringing more of the electric pruning work in house, hiring additional forestry employees, and moving the pruning cycle down to 4 years should be strategic goals of the forestry program in Geneva.

Studies have shown that the fewer years between cycle prunings, the less cost a municipality incurs for "out of cycle" pruning, such as that associated with storm or ice damage. The idea being that the more consistently a tree is maintained, the fewer weak points there are which are prone to failure. In many cases, the increased cost of production in reducing the years between cycle pruning is completely offset by the decrease in out of cycle and emergency pruning costs. In order to do this, bringing the utility pruning more in-house, and increasing the capacity of the forestry crew through manpower and equipment should be considered.

Removal

The data above shows that approximately 110 trees are being removed annually by the forestry crew, with some help from contractors. This number has been vastly skewed over the past several years due to removal of Ash trees resulting from Emerald Ash Boer. That being said, in our species composition projections, we are projecting the removal of nearly 275 dead, dying, or underperforming trees every year after EAB is gone, based on the age of the tree population and our diversity goals. This represents a nearly 3-fold increase above what was performed over the past several years. Once again, the Forestry Crew will not be removing trees from under Utility lines, so a portion of the removals will still be contracted. The goal over the next 25 years should be to have the capacity to remove all trees within City limits, with minimal involvement from contractors, including under utility lines, as Geneva strives to bring more utility pruning in house.

Planting

As of this writing, the Public Services Forestry Crew does not plant any trees on its own parkways, except under rare circumstances. We will discuss tree planting, growing, and diversity more below. That said however, it does stand to reason that this is a service which the Forestry Crew should become more involved with, particularly if smaller nursery stock were employed, as has been proposed below. The goal over the next 25 years should be to have the Forestry Crew plant approximately 67% of all new trees per year.

Though contractors can generally perform tree planting at lower expense and with less equipment than in house labor, that is only true when planting large and cumbersome 2.5" balled and burlapped trees. With even a slight reduction in the size of acceptable stock, forestry crews could easily plant trees. This becomes particularly interesting since the in-house capacity for pruning and removal is already very high. For the forestry program to expand, additional services such as planting in-house should be considered. This is especially true given the nearly 2,000 open planting sites on village parkways. As the stocking density is increased from it's currently level of 85% up to nearly 100%, significant increases in the number of trees planted each year for both replacements and enhancements become more important.

Objectives and Goals

	2025 Milestone 1	2030 Milestone 2	2035 Milestone 3	2040 Milestone 4	2045 Milestone 5	2050 Final Goals
Administrative	Get one employee certified as a Utility Arborist	Purchase new 60' bucket truck or larger and additional chip truck	Add one additional Utility Arborist and one more Forestry Employee	Create additional full-time Crew Leader position	Replace aging bucket and chipper truck	Goal: Maintain 2 forestry and 1 utility in house crew + equipment
Pruning	Increase in house Utility pruning capacity to 25%	Increase in house Utility Pruning to 50%	Reduce pruning cycle to 4 years	Increase In house capacity to 3,500 trees/year	Maintain in house trim capacity at 3,500 trees/year	Goal: Maintain in house trim capacity at 3,500 trees/year
Removals	Have all removals and hazard removals identified in inventory removed	Focus on aging Maple populations, increase removal capacity to 125 trees/year	Increase removal capacity to 150 trees/year using new manpower and equipment	Increase removal capacity to 200 trees/year using new manpower	Maintain capacity to remove 250 trees/year	Goal: Maintain capacity to remove 250 trees/year
Planting	Change nursery stock standard to 1.75" and begin training crew on proper planting and care practice	Plant 50 1.75" trees/year with Forestry Crew, increase stocking density to 90%	Plant 100 1.75" trees/year with Forestry Crew	Plant 150 1.75" trees/year with Forestry Crew, increase stocking density to 95%	Plant 200 1.75" trees/year with Forestry Crew	Goal: Maintain the ability to plant and care for 200 new trees/year, and maintain 98% stocking density

Section 4 – State of the Urban Forest

According to the recently completed Tree Inventory, the tree population stands at 12,433 established trees, 1,960 plantable spaces, and 28 stumps. Average tree condition is above average, and a number trees require maintenance within the next 5 years, including pruning and removal. Species Diversity is also moderate overall, with a significant number of trees concentrated in Maple genus, and in Norway Maple specifically. We shall examine this in greater detail below, as well as provide a specific plan to change the species composition over time

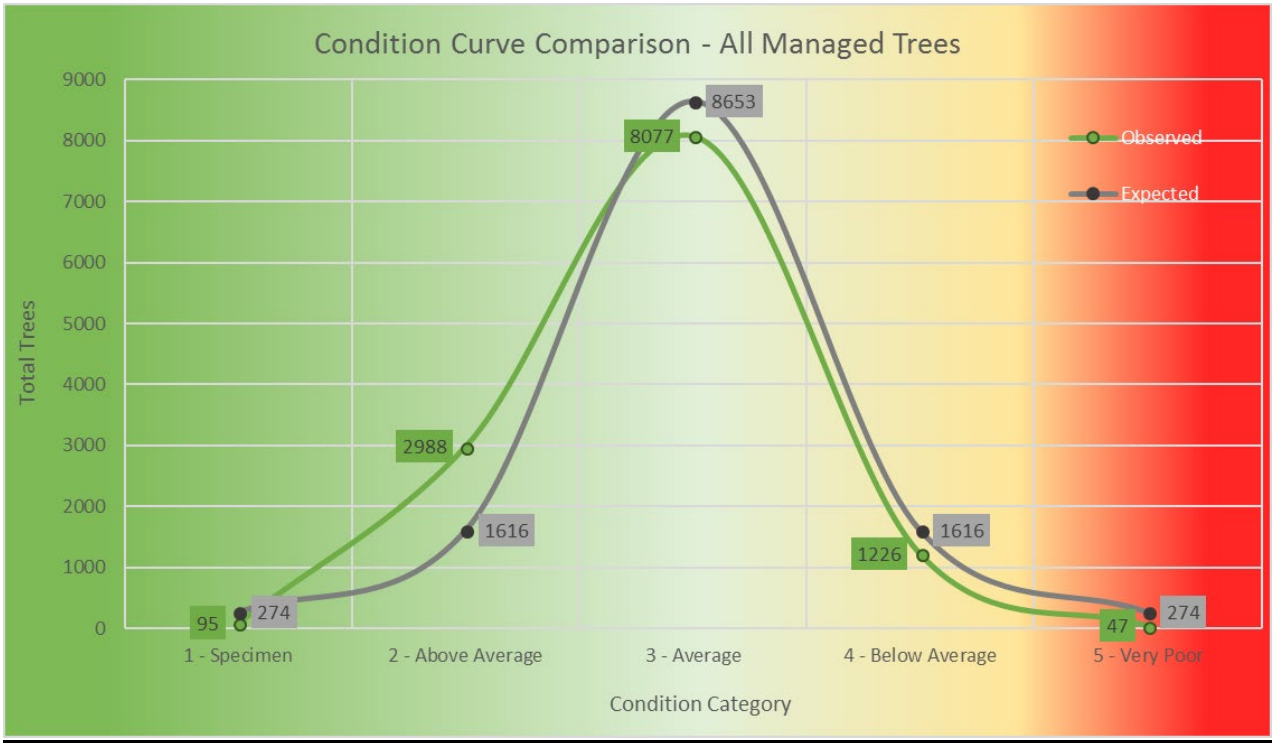
Basic Statistics – Managed Trees

Total Number of Managed Trees	12,433
Total Number of Plantable Spaces	1,960
Total Number of Stumps	28
Total Number of Species	106
Total Diameter Inches	161,990"
Average Tree Diameter	13.03"
Average Tree Height (ft)	28.8'
Average Tree Condition	2.85 (Well Above Average)
Average Mature (8" and up) Tree Condition	2.77 (Well Above Average)

Condition Curve

During the time of the tree inventory, we rated the condition of each tree using a 1-5 rating system. The rating criteria is as follows:

Condition 1	**Specimen** – Tree has no observable defects, wounds, diseases, and has textbook perfect form for the species. In addition, since young trees have a tendency to be trouble free, a condition 1 tree must by definition be greater than 16" DBH. These are legacy trees, and as such are rare.
Condition 2	**Above Average** – Tree may have a small amount of deadwood, or a very limited number of nonthreatening defects. The overall form of the tree must be good, and consistent for the species in question. These trees must be larger than 8" DBH for the reason listed above. Often the difference between condition 2 and 3 is growth habit.
Condition 3	**Average** – Tree has moderate amounts if deadwood, wounds, or other deficiencies, 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 and identified.
Condition 4	**Below Average** – Tree has defects, deadwood, wounds, disease, etc. that are in imminent danger of causing a need for removal. Very poor form or architecture can put an otherwise healthy tree in this category as well, though generally it is reserved for health defects.
Condition 5	**Very Poor** – Tree must be removed. Physical or Health defects are too far advanced for the tree to be reasonably saved. Like condition 1 trees, these are relatively rare, as generally trees approaching this level are removed before they can get there.



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 a "normal" or average expected tree population.

The number of Specimen trees was less than predicted by statistics, but this is typical. As noted above, specimen trees must be 16" DBH or greater to be considered for this status, and as such are fairly rare. Nonetheless, 95 specimen trees in a population of this size is very commendable, and these trees should be well maintained going forward.

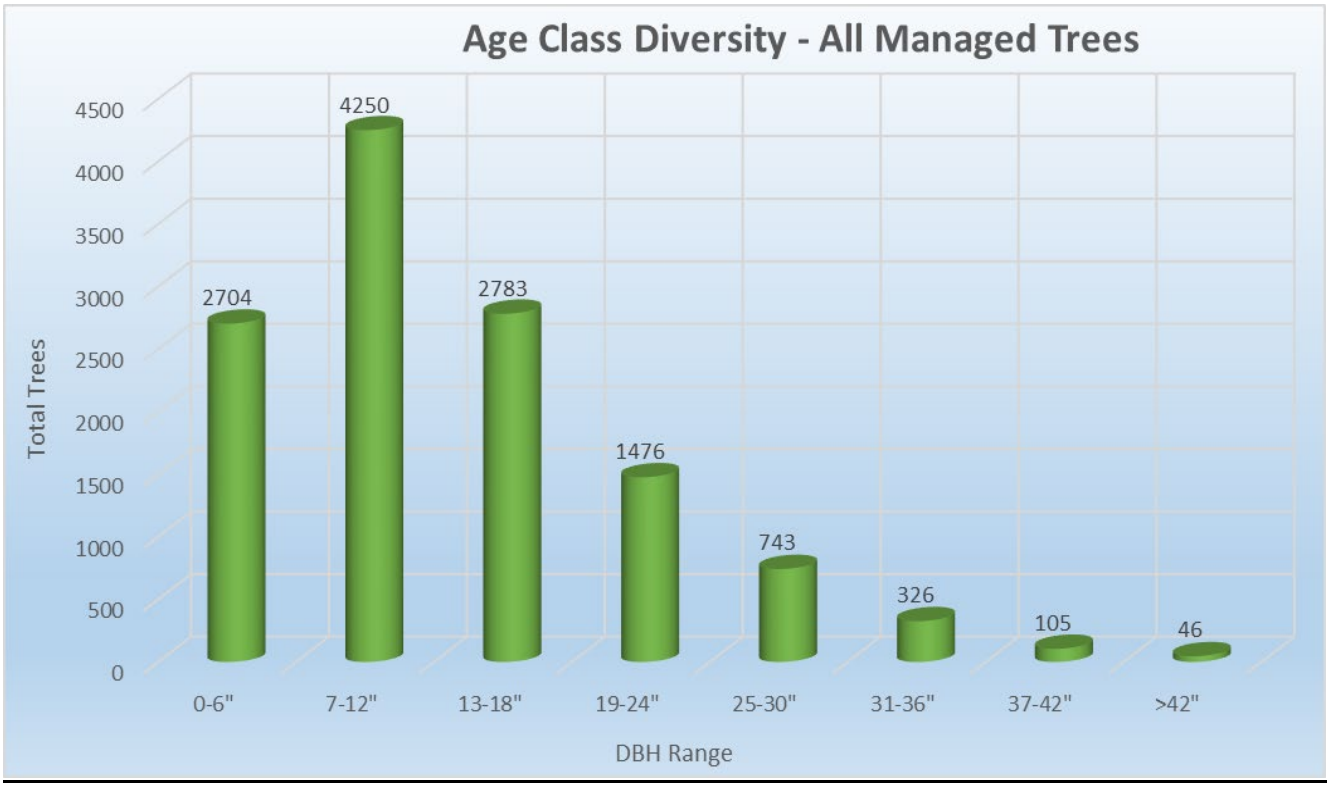
The above average (Condition 2) tree count was nearly double what is normally expected, which is an indicator of a well-maintained, middle-aged tree population. Trees must be 8" DBH or larger to be eligible for Above Average status, and as will be further discussed in the age-class analysis below, a significant portion of Geneva's trees fall into this category. This indicates that trees have been well cared for, and will require less maintenance as they become mature trees, which saves the City money and reduces risk overall.

The average condition (Condition 3) trees were lower in number than a typical tree population, primarily because there are so many more Above Average condition trees than what would be expected that it skewed the results. It should be remembered here that the number of average condition tree usually comes in the highest due to trees below 8" DBH not being eligible for "above average" status, so most new plantings get a default ranking of Condition 3. These trees are also not "worse" condition than those in the Above Average categories. They are just like most trees, which have some deadwood, or maybe have some minor wounding.

Both the Below Average (Condition 4) and Very Poor Condition (Condition 5) trees are lower than what would be expected, which is typical in a well-maintained urban environment because trees are often pruned or removed before they begin to reach these Conditions. That said, these trees should be the focus of future inspections, pruning, and removals, so that they can be remediated when possible, or removed if their health and vigor has been compromised beyond repair. Using the tree inventory will allow Geneva to monitor and track these trees, so that their chances of remediation, and increases in Condition ranking are greatest over the long term.

The Geneva tree population Condition Curve above indicates that Geneva's trees are in overall Above Average Condition. Going forward, Geneva has an opportunity to even further improve the overall condition of its tree population. The identification and pruning or removal of existing poor condition or high risk trees, while planting a diverse group of species in open planting spaces or to replace removed trees. In the future, as the tree inventory data is updated, the average condition rating of 2.85 can serve as a metric by which the City can benchmark its success in the maintenance strategies that result from the implementation of its Urban Forest Management Plan. As poor condition trees are removed and higher quality trees grow and are planted, this number will continue to decrease.

Age Class Analysis



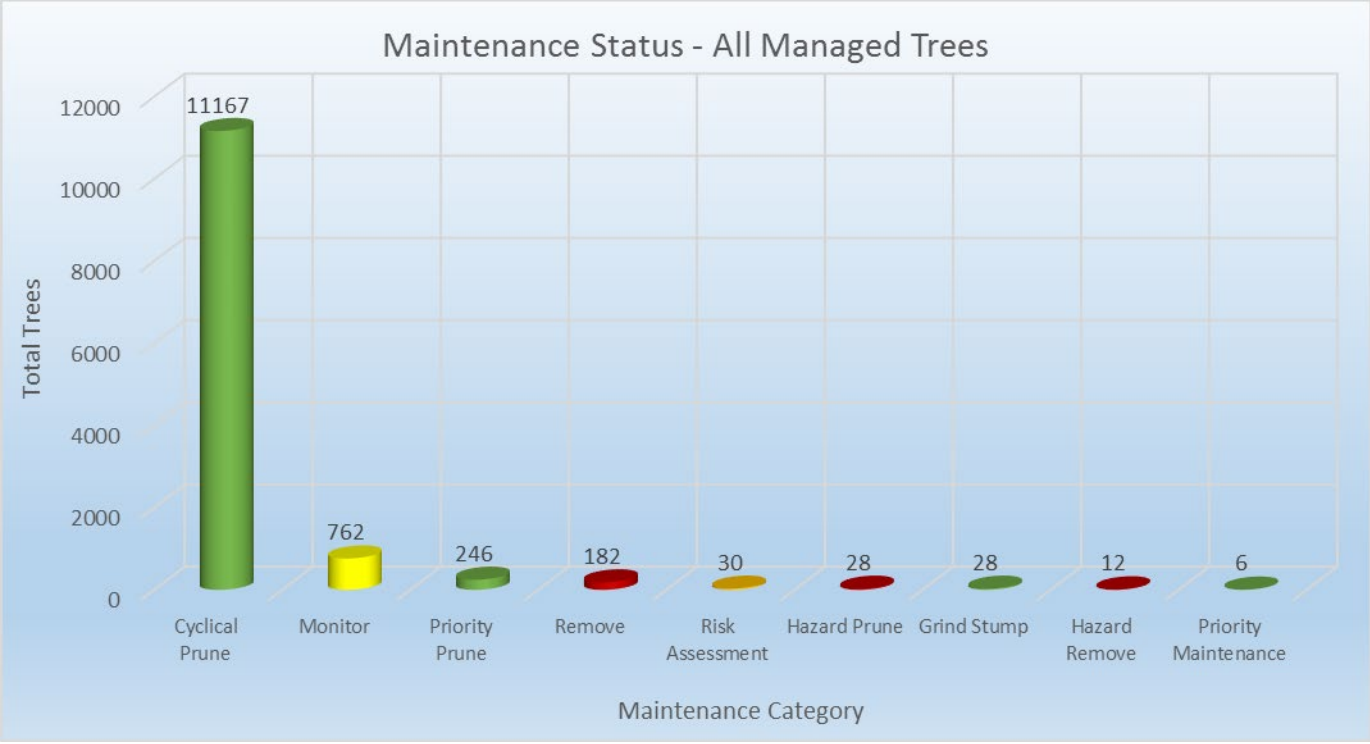
In terms of the ages of trees in Geneva, we have split the tree population into 8 "classes" of 6" diameter increments. This tells us how many trees are in each "Age Class". Since trees are measured by Diameter at Breast Height (DBH) as a standard measure, this breakdown can help show where trees are 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. However, this is the reason we use DBH as a measurement instead of "years old", because there is such great variation.

The broad trend here is that Geneva has a fairly typical age class breakdown to similarly sized municipalities. Typically, most tree populations have elevated numbers of trees in the 0-6" and 7-12" age classes, and then begin to decline in number until reaching very low levels at the highest DBH ranges. Because parkways tree plantings (street trees) typically face very difficult growth conditions, many trees do not survive well past the 13-18" range, as is illustrated in the chart above.

One discrepancy that is immediately apparent with these number is the large difference in the numbers of trees in the 0-6" age class versus the 7-12" age class. This would seem to indicate that Geneva planted many more trees each year between approximately 10 and 20 years ago than they have over the past 10 years. It would benefit the forestry program greatly to figure out why that is, and possibly identify why Geneva is planting fewer trees, and what the obstacles are that must be overcome in order to get back to that level of planting. With Emerald Ash Borer having caused the removal of hundreds of ash trees over the past several years, we would expect to see tree planting significantly higher than current levels. In addition, there are 1,960 plantable spaces on Geneva's parkways, so there is ample space to plant. We would recommend that Geneva consider increasing its planting budget in the coming years in order to increase its overall stocking density and tree canopy cover.

Other than the above, the age distribution chart appears relatively normal. We will say that trees provide the greatest benefits to the community when they are large, and have large canopies and extensive root systems. Such large trees provide greater energy savings though shading homes and providing windbreaks against winter winds, and absorb more stormwater as well as sequester more atmospheric Carbon Dioxide. To that end, a goal of this UFMP is to plant and care for trees in such a way that we get trees living on the parkways longer. We will discuss this in further detail in later sections of the plan, but suffice it to say for now that we would like to see increases in the older age class categories as an outcome of this plan

Maintenance Status



During the inventory, a basic Maintenance status was recorded for each tree which broadly outlines what work needs to be performed in the coming years. These are broad generalizations, but supply enough data to begin creating work orders. During the inventory, 11,167 trees (90%) were identified as "Cyclical Prune". This means these trees have no immediate maintenance needs, and instead will simply need to be pruned on the City's proposed 5 or 6-year pruning cycle. Having the most trees in this category is ideal, and is again indicative of a high level of care.

There were 246 trees which were listed as "Priority Prune". These trees either had excessive deadwood, were overgrown, or require pruning on a more immediate scale, typically defined as within 1-3 years. In the Pruning section below, we have prioritized these trees such that they can be pruned within the next 3 years.

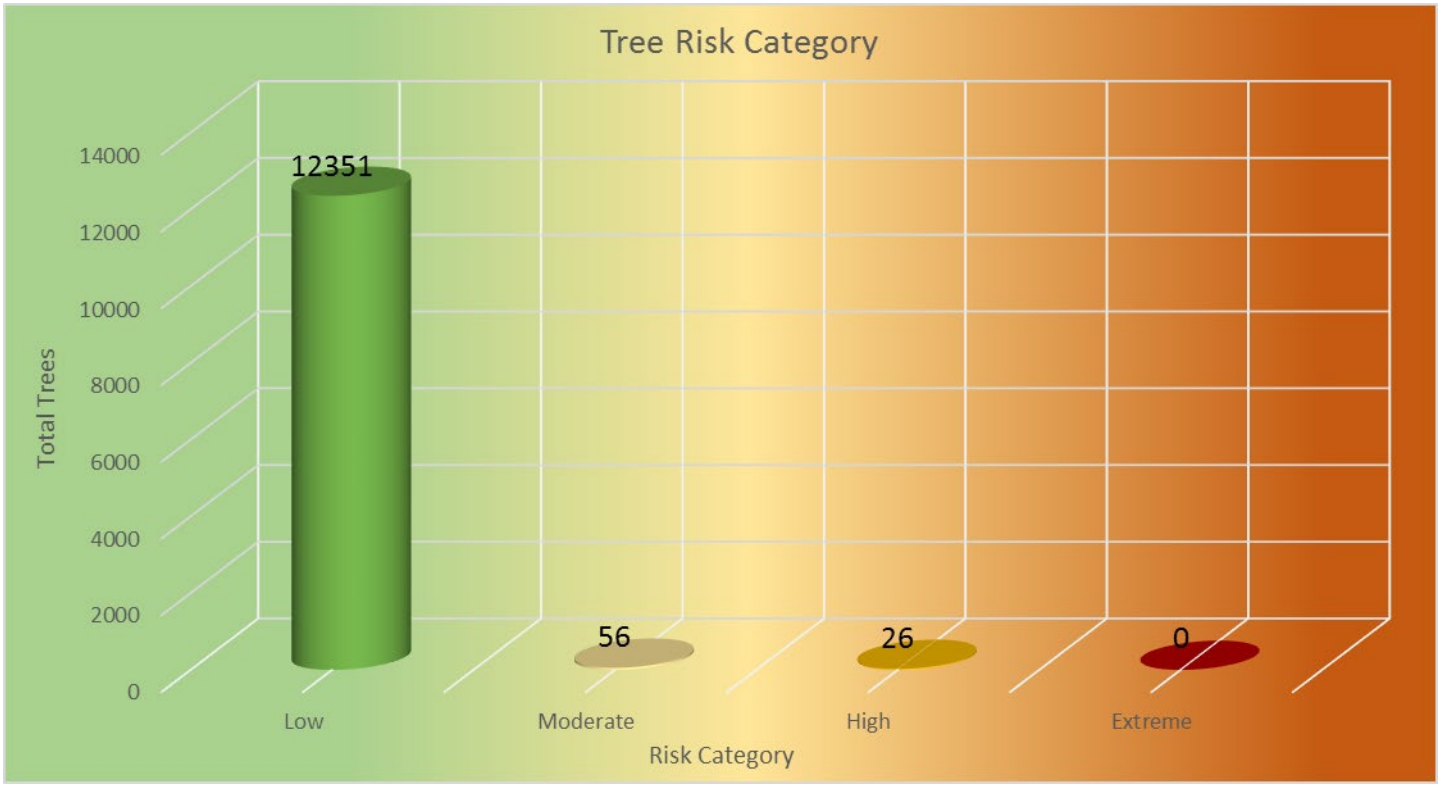
Additionally, there were 28 "Hazard Remove" trees. These trees should be removed within 1 calendar year of this Plan's adoption. These trees have deadwood or defects which are correctable, but may pose a hazard to passersby.

762 trees fell into the "Monitor" category. Monitor essentially means that the tree had some defect or emerging condition that needs further observation before it could be categorized elsewhere. Ash trees with some EAB damage not yet requiring removal, or trees with inconclusive symptoms of Dutch Elm Disease would be 2 examples of such trees. These trees do not need to be physically monitored constantly, but just checked on periodically. There were an additional 30 trees which were listed as needing a formal Risk Assessment. Risk assessment will be addressed later in greater detail, suffice it to say that these trees are of higher quality and provide excellent benefits, but have some difficult-to-diagnose defects. A more thorough inspection would be recommended for these trees before a final decision is made as to whether to retain or remove them.

The trees in the "Remove" category are those which are beyond reasonably retaining, but do not necessarily pose a high risk. These trees should generally be removed within 1-5 years. Those in the "Hazard Remove" category do in fact pose some risk, and should be removed within 1 calendar year of the adoption of this plan. In the Removals section below, we have laid out a plan and budgets for the removal of all trees requiring removal during the inventory. Finally, the 6 trees in the "Priority Maintenance" category were those which required cabling or bracing, chemical treatment, or other such non-pruning or removal-related care.

The strengths of the tree population in terms of maintenance include the very high number of trees in the Cyclical Prune category, as well as the relatively low numbers in the Hazard Remove and Risk Assessment categories. This implies that the majority of Geneva's trees are in good to fair condition, and will not require immediate budget allocation. Also indicating a population in overall good are the relatively low number of trees in the Removal and Priority Prune classes. These trees will require budget allocation in the short term, but we have provided cost projections and procedures below so that Geneva can start the process of budgeting for their care and maintenance as soon as possible.

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. This is detailed further in the Risk section below, and this information has been collected on each tree, but not in as detailed a fashion as a full TRAQ assessment. Such rapid assessments are used frequently 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. Instead, trees rated as anything above "Low" risk are simply meant to indicate a need for further study.

When evaluating risk, there are 3 pieces of information recorded in the field, and then the risk level is calculated based on these 3 pieces of information. Those pieces of information are the Likelihood of Failure, the Likelihood of Impact, and the Consequences of Failure. Essentially, if a tree or part of a tree were to fail (break) and fall, the probability of those things happening are recorded, and the consequence of that failure should a target be impacted under the tree. Based on this information, it can be determined whether a tree poses a Low, Moderate, High, or Extreme risk to property or people.

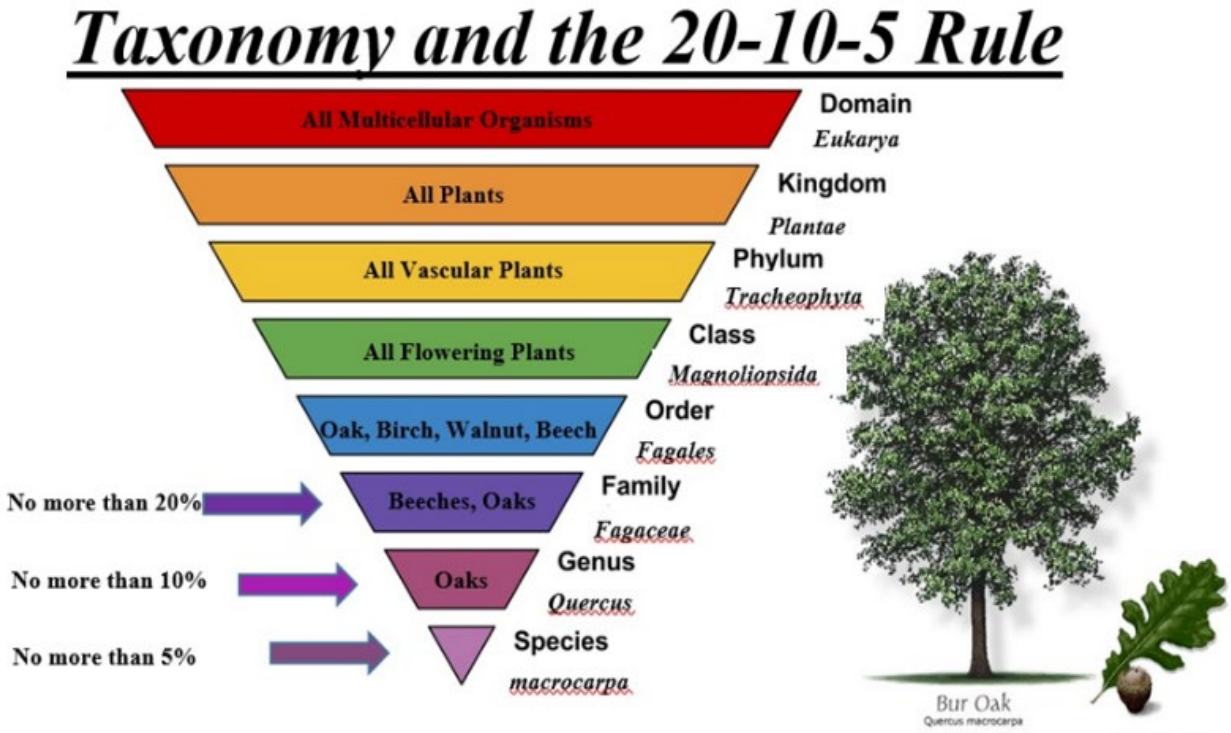
Geneva's tree population fell overwhelmingly into the "Low" risk category, with 99.3% of its trees being rated as Low risk. These are either small trees for which failure would not present any danger, or larger trees with a low probability of failure. Only 56 trees were keyed out as Moderate risk, and we must be clear about the fact that Moderate risk typically implies there is no immediate hazard present, only that the tree poses a slightly elevated risk of failure and impact than a tree rated at Low risk.

There were, however, 26 trees rated as High Risk, but no trees rated as being Extreme Risk. These 26 High Risk trees should be inspected and mitigated as soon as budgets allow. It should be noted here that most trees in these categories should be removed, and even though the Risk rating is arrived at in an entirely separate fashion from how we arrive at the Maintenance rating, there are 26 trees in high or above, and 12 hazard removal trees and 28 hazard prune trees, many of which keyed out as moderate or high risk. This consistency stands a testament to the quality of data collected on these trees.

In terms of strength, it is obvious here that Geneva has been vigilant in removing or mitigating trees which have become very high risk, and that responsiveness is highly commendable. Though there are some trees in below average or poor condition throughout city for various reasons, they are generally not hazardous, which is of the utmost importance when managing trees for public safety. For opportunities and challenges, aside from the trees identified as being at elevated risk levels, Geneva must also be vigilant about monitoring those trees which may become high or extreme risk. Using the tree inventory data to stay current on these situations will be very important.

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 Burr 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 is able to exploit every species of that genus. EAB is a classic example of this, as it affected every tree species in the ash genus. The best prevention of tree loss we have is to limit the number of trees that a new pest or pathogen can affect. While diversity of species is important (such as white oak, red oak, bur oak, and pin oak), it is also important to achieve diversity on the genus and family level, so that Oaks, Hackberries, Hybrid Elm, and a large election of trees are planted. A "20-10-5" rule for Geneva's future tree plantings is recommended, which stipulates 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 goal of the forestry program to have the tree population as a whole in compliance with the 20-10-5 Rule, although it may not be possible by the 2050 date we have utilized. This level of taxonomic diversity is consistent with today's arboricultural industry standards (see above graphic).

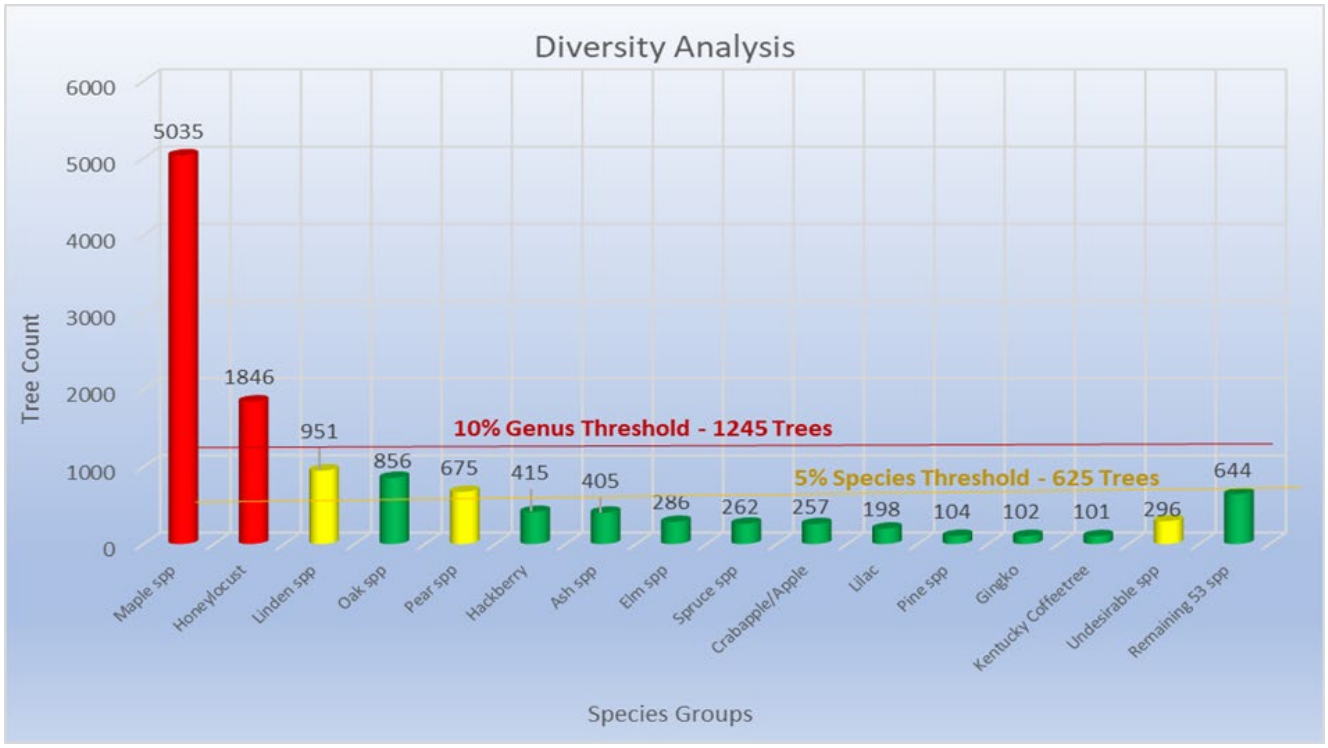
The old paradigm of urban forestry was to create tree lined streets and parks in which every tree was the same type, shape, age, and height. This was thought to produce a symmetrical and uniform appearance. Urban foresters have now learned that once a pest or pathogen is introduced into a monoculture 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.

Current Tree Population

SPECIES	COUNT	% OF TOTAL	AVG DBH (IN)	AVG HEIGHT (FT)	AVG COND
MAPLE-NORWAY	2035	16.37%	14.33	28.95	2.91
HONEYLOCUST	1846	14.85%	14.71	31.75	2.65
MAPLE-AUTUMN BLAZE	884	7.11%	10.24	31.70	2.64
MAPLE-RED	756	6.08%	8.96	21.51	2.88
MAPLE-SUGAR	712	5.73%	14.36	33.02	2.91
PEAR-CALLERY	671	5.40%	8.70	23.24	3.00
MAPLE-SILVER	584	4.70%	26.79	46.55	2.73
LINDEN-LITTLELEAF	504	4.05%	12.83	30.52	2.88
OAK-RED	465	3.74%	10.59	25.71	2.74
LINDEN-AMERICAN	446	3.59%	14.98	32.26	2.84
HACKBERRY	417	3.35%	14.32	31.04	2.78
ASH-WHITE	332	2.67%	12.28	26.67	3.20
APPLE-CRAB SPP	246	1.98%	10.39	14.86	2.94
ELM-HYBRID	228	1.83%	7.46	23.46	2.87
LILAC-TREE	193	1.55%	3.75	11.19	2.98
OAK-BURR	142	1.14%	10.11	23.87	2.72
SPRUCE-BLUE	132	1.06%	9.77	28.48	2.89
MULBERRY-SPP	106	0.85%	16.82	32.50	3.42
GINKGO	102	0.82%	7.86	19.51	2.90
KENTUCKY COFFEETREE	101	0.81%	7.49	20.69	2.72
SPRUCE-NORWAY	68	0.55%	11.85	35.07	2.65
ASH-GREEN	67	0.54%	12.85	26.64	3.46
OAK-SWAMP WHITE	63	0.51%	6.19	17.30	2.87
OAK-PIN	62	0.50%	16.73	35.16	2.32
SPRUCE-SPP	62	0.50%	8.92	33.55	3.48
ELM-AMERICAN	56	0.45%	19.00	38.57	2.93
ARBOR VITAE	50	0.40%	7.84	14.50	2.96
PINE-WHITE	48	0.39%	13.19	34.90	2.67
MAPLE-MIYABEI	46	0.37%	4.93	16.74	2.89
OAK-ENGLISH	45	0.36%	14.93	33.33	2.69
AMERICAN HORNBEAM	44	0.35%	2.64	10.00	3.02
SYCAMORE	43	0.35%	28.07	55.35	2.09
BOXELDER	42	0.34%	14.95	29.52	3.60
OAK-WHITE	42	0.34%	20.76	38.10	2.55
PINE-AUSTRIAN	42	0.34%	12.02	26.43	3.38
HAWTHORN-SPP	41	0.33%	11.29	17.44	3.27
WALNUT-BLACK	41	0.33%	15.41	37.80	2.66
BUCKTHORN	40	0.32%	8.00	15.75	3.25
ELM-SIBERIAN	38	0.31%	21.84	43.16	3.37
AMERICAN REDBUD	29	0.23%	8.76	13.45	3.10
IRONWOOD	29	0.23%	9.31	23.45	3.07
OAK-SHINGLE	23	0.18%	4.91	15.65	2.96
BLACK LOCUST	22	0.18%	16.23	40.00	3.32
CHERRY-SPP	22	0.18%	7.05	14.32	3.09
BURNING BUSH	20	0.16%	7.30	8.50	2.85
CHERRY-BLACK	20	0.16%	17.70	36.00	3.60
MAGNOLIA-SAUCER	18	0.14%	14.11	20.83	3.28
SERVICEBERRY-SPP	17	0.14%	9.53	9.41	2.94
EASTERN REDCEDAR	16	0.13%	10.38	21.25	3.19
BIRCH-WHITE	15	0.12%	13.47	26.67	3.07
HAWTHORN-COCKSPUR	15	0.12%	11.53	20.67	3.00
OAK-SPP	15	0.12%	2.53	12.33	3.07
BEECH-SPP	14	0.11%	2.57	10.71	3.14

BUCKEYE-OHIO	14	0.11%	12.14	23.57	3.29
HONEYSUCKLE	14	0.11%	8.93	21.07	3.00
OSAGE ORANGE	14	0.11%	32.57	40.00	3.43
YEW	14	0.11%	12.93	15.71	2.71
APPLE-EDIBLE	13	0.10%	8.77	13.85	3.15
MAPLE-AMUR	13	0.10%	15.23	16.15	3.00
ROSE OF SHARON	13	0.10%	5.38	8.85	3.00
DOGWOOD-SPP	12	0.10%	6.58	10.42	3.00
SWEETGUM	12	0.10%	22.33	45.00	2.25
MAGNOLIA-STAR	10	0.08%	8.10	10.50	3.00
VIBURNUM	10	0.08%	7.20	12.00	3.10
CATALPA	9	0.07%	27.67	50.00	3.22
DOUGLAS FIR	9	0.07%	13.00	40.00	3.00
LONDON PLANETREE	9	0.07%	5.00	21.11	3.11
BIRCH-RIVER	8	0.06%	15.13	24.38	2.88
FIR-SPP	8	0.06%	9.25	27.50	3.00
PINE-SCOTCH	8	0.06%	12.38	25.63	2.88
SUMAC	8	0.06%	2.00	5.00	3.13
PLUM-SPP	7	0.06%	8.14	15.71	3.00
ASH-BLUE	6	0.05%	26.00	38.33	1.50
COTTONWOOD	6	0.05%	42.83	63.33	2.67
HICKORY-SHAGBARK	6	0.05%	18.50	50.00	1.67
HICKORY-BITTERNUT	5	0.04%	10.40	46.00	3.00
LILAC-SHRUB	5	0.04%	8.40	9.00	3.00
TULIPTREE	5	0.04%	11.60	32.00	2.80
YELLOWWOOD	5	0.04%	19.00	30.00	3.40
AILANTHUS	4	0.03%	11.50	22.50	3.00
BEECH-AMERICAN	4	0.03%	2.50	10.00	3.00
HEMLOCK-EASTERN	4	0.03%	5.00	12.50	3.25
KATSURA	4	0.03%	9.75	20.00	2.75
PEAR-EDIBLE	4	0.03%	3.50	12.50	3.00
WILLOW-SPP	4	0.03%	17.75	21.25	3.75
FIR-CONCOLOR	3	0.02%	4.33	13.33	3.00
HORSECHESTNUT	3	0.02%	19.33	30.00	3.33
LINDEN-SILVER	3	0.02%	6.00	10.00	3.00
MAPLE-HEDGE	3	0.02%	8.00	10.00	3.00
MAPLE-PAPERBARK	3	0.02%	5.00	8.33	3.00
PINE-MUGO	3	0.02%	10.00	10.00	3.00
PINE-RED	3	0.02%	12.67	40.00	2.67
ALDER-SPP	2	0.02%	21.50	45.00	2.00
APRICOT	2	0.02%	2.00	15.00	3.00
ELM-RED	2	0.02%	18.50	40.00	2.50
MAPLE-JAPANESE	2	0.02%	2.50	10.00	3.50
PUSSYWILLOW	2	0.02%	2.50	7.50	3.00
RUSSIAN QUINCE	2	0.02%	1.00	7.50	3.00
SMOKETREE	2	0.02%	5.50	15.00	3.00
AMUR CORKTREE	1	0.01%	10.00	20.00	3.00
ASPEN	1	0.01%	36.00	50.00	2.00
BIRCH-SPP	1	0.01%	10.00	30.00	3.00
BLACKGUM	1	0.01%	1.00	5.00	3.00
ELM-CHINESE	1	0.01%	45.00	50.00	4.00
EUONYMUS	1	0.01%	14.00	10.00	2.00
MAPLE-SPP	1	0.01%	4.00	20.00	3.00
MOUNTAIN ASH-AMERICAN	1	0.01%	4.00	10.00	3.00
PERSIMMON	1	0.01%	3.00	10.00	3.00
POPLAR-SPP	1	0.01%	28.00	50.00	3.00
POPLAR-WHITE	1	0.01%	49.00	60.00	4.00
SEVENTH SON FLOWER	1	0.01%	7.00	20.00	3.00
SUGARBERRY	1	0.01%	3.00	10.00	3.00
WITCH HAZEL	1	0.01%	7.00	10.00	3.00

As noted above, the City of Geneva Tree population consists of 114 distinct tree species in it's managed areas (not including private property), accounting for 12,433 total trees. The above table shows the percent of the total population each species makes up, as well as the average Condition, Trunk Diameter, and Height. To see which trees are performing well, we would look for trees with a Condition rating of less than 3, with a large DBH, and/or Height and Spread. This population is shown graphically 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 the high economic and environmental costs of mass tree loss from pests and pathogens in the future. The reason Emerald Ash Borer was such a devastating expense for many municipalities was because their tree populations were composed of over 20% Ash trees. When these trees died and had to be removed, those cities lost 20% of their 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 possibly large 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 open to losing more than 5-10% of our trees at any given time.

As can be seen above, Geneva's tree population has room for improvement with regard to diversity. At the species level, the Norway Maple alone accounts for 16% of Geneva's tree population. At the genus level (Silver Maple, Red Maple, Norway Maple, etc. taken as a whole), Maples account for over 40% of the entire tree population. This means that if a pest or pathogen like Emerald Ash Borer or Dutch Elm Disease were to be introduced into the area that affected all Maples, Geneva would stand to lose 40% of their trees. As already noted repeatedly, the Norway Maple is by far and away the biggest offender here. A long-standing favorite street and park tree, it does grow quickly and tolerate urban conditions quite well. However, it does have many structural issues as noted above, and any tree planted in this quantity is at a very high risk of mass tree loss from pest or pathogen introductions.

Honeylocust trees, at almost 15% of the population, are also over represented in the Geneva population. Honeylocust is another hardy urban tree species which we often see over-planted on parkways, however we again caution that this species has exceeded the recommended threshold. Going forward, we encourage Geneva to gradually reduce this number in order to work toward achieving diversity goals.

Also worthy of note in the tree population is the relatively large number of ornamental Pear trees. Another favorite of urban planners, these pear trees are very cold-hardy and adaptable to the urban environment, as well as showy in both the spring and fall, with flowers in the spring and bright red foliage in the fall. However, there are many problems associated with them, such as having weak wood with notorious branch failures during heavy snows or winds, as well as becoming invasive. These pear trees have now begun to spread from bird droppings and other mechanisms, and are crowding out native Midwest forests in the same way that European Buckthorn and Asian Honeysuckle have. For this reason, many states have added them to their "do not plant" lists, and in some states they may become listed on noxious weed lists.

In terms of strengths, the diversity of the tree population is moderate at the moment, but this comes with the benefit that it presents an excellent opportunity for improvement. Geneva can plant almost any recommended tree species, excluding Maple species and Honeylocust, without much concern about exceeding those limits. There is tremendous room for growth, which just by itself is an opportunity. As we will discuss below in great detail, Geneva has over 1,900 planting spaces, all of which are recommended for planting in the coming 30 years. We do recommend that a formal tree planting / reforestation plan be created for the City so that species choices can be projected into the future, though we will discuss this in greater detail below.

When it comes to opportunities and challenges, they are abundant. First, we do not believe at this time that that achieving compliance with the 20-10-5 Rule by 2050 may be possible as there are too many Maple trees in the population to accomplish this. Due to the age and condition of many existing Maples, we have planned for a significant reduction in Maples by 2050, and the tree population will be well on its way to achieving the 20-10-5 goal. There is also a great deal of plantable space, and filling those spots will take significant financial commitment. Fortunately, we believe that through some innovative strategies, volunteerism, and public involvement, Geneva can overcome the issue of moderate taxonomic diversity. But taxonomic diversity is not the only type of diversity there is, and there are additional challenges.

Spatial Diversity

Spatial diversity is the concept of mixing tree species evenly over the whole population to increase distance between potential host organisms. 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, communities and neighborhoods that 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 Geneva is also poor given the overabundance of Maple trees in the population. A robust reforestation / tree planting plan planning phase would ensure that new plantings would be designed in a manner that a highly spatially diverse tree population will be created, and the creation of areas of low spatial diversity will be avoided (monocultures).

Age-Class Diversity

Age-class diversity is also an important consideration. A healthy 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 the greatest diversity, which will insulate the 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 almost simultaneously. This can leave an entire street segment or neighborhood without shade and aesthetics for nearly a decade.

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 the dead trees are eventually removed, there will always be a variety of age classes on a block or in a neighborhood. This reduces the pressure to reforest an area immediately after removal, helping to manage costs and maintain budget cycles. A mixed age-class stand planting ensures that mature trees are always present in a neighborhood. It also will allow for strategic planting of trees based on the existing canopy.

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 precludes the ability to plant shade loving trees, as they have a tendency to dry out in the summer sun. With mixed-age stands, shade-tolerant, medium height trees may be planted underneath the canopy of larger, mature trees. This calculated approach will be utilized for future tree removal and replacement, and help to create a more "staggered" urban forest, one that has mature trees, middle aged trees, and young trees in similar quantities.

Non-Parkway Trees on Village Owned Properties

There were approximately 350 trees inventories which were not on City Parkways, but rather on the interior of City owned properties. These included Police and Fire stations, water treatment plants, the public works main facility, and others. These tree were in a variety of states, and since they are not in the cycle of care per se, they may have dropped the condition rating of the overall population slightly. We do highly recommend that the City review these trees for those which have not like been in the regular cycle of care, and either prune or remove them as necessary and replant as necessary to maintain tree cover at these areas. Many times, the importance of trees in the situations is not accounted for, and we believe this is a small step that can be taken to keep these trees in the cycle of care.

iTree Report / Urban Tree Canopy Assessment

iTree Report

i-Tree 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 i-Tree 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 save homeowners money, such as in heating and cooling costs, where large trees help shade houses in the summer, saving on air conditioning related electricity bills, and provide windbreaks during the winter, saving on heating costs. They also provide CO2 uptake, reducing the effects of climate change, as well as air quality improvements the absorption of urban pollutants. Trees also absorb water, which reduces demand on storm water infrastructure, and saves money in replacement costs or drains and storm water lines. Finally, trees contribute up to 15% of the total value of a property, so they have monetary aesthetic benefits as well.

Using the data from the tree inventory, an i-Tree report has been prepared the City of Geneva. Below you will find reports on the Net annual benefits of the tree population, replacement values, and breakdown of benefits per species.

Geneva

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

5/16/2018

Benefits	Total ($)	Standard Error	$/tree	Standard Error	$/capita	Standard Error
Energy	87,315	(N/A)	7.02	(N/A)	3.99	(N/A)
CO2	10,996	(N/A)	0.88	(N/A)	0.50	(N/A)
Air Quality	26,502	(N/A)	2.13	(N/A)	1.21	(N/A)
Stormwater	237,371	(N/A)	19.09	(N/A)	10.85	(N/A)
Aesthetic/Other	938,502	(N/A)	75.48	(N/A)	42.89	(N/A)
Total Benefits	1,300,686	(N/A)	104.62	(N/A)	59.45	(N/A)

REPLACEMENT VALUE - 9TH GUIDE TO PLANT APPRAISAL

DBH CLASS

0-3	3-6	6-12	12-18	18-24	24-30	30-36	36-42	>42	CITYWIDE TOTAL
$172,446.00	$594,830.00	$2,367,872.00	$3,506,227.00	$3,325,921.00	$2,554,886.00	$1,552,905.00	$680,353.00	$274,595.00	**$ 15,030,034.00**

As can be seen from the above tables, the tree population in the City of Geneva currently provides its residents with approximately $1,300,000 in benefits per year. These benefits are measured as the Ecological Services these trees provide to Geneva residents, as listed above. These benefits can be viewed as free income to the Geneva's residents, and so long as the trees are maintained well, they will continue to provide these benefits, and more. As trees grow in size, they also increase their benefits. For example, a 3" diameter tree provides less than $50/year in benefits, whereas as 20" tree can provide up to $500 per year. At present, as discussed in the budget section below, the Geneva tree population provides enough benefits to entirely offset its annual costs associated with tree care. The goal is to increase benefits even more, where the tree population pays for itself and even yields "profits".

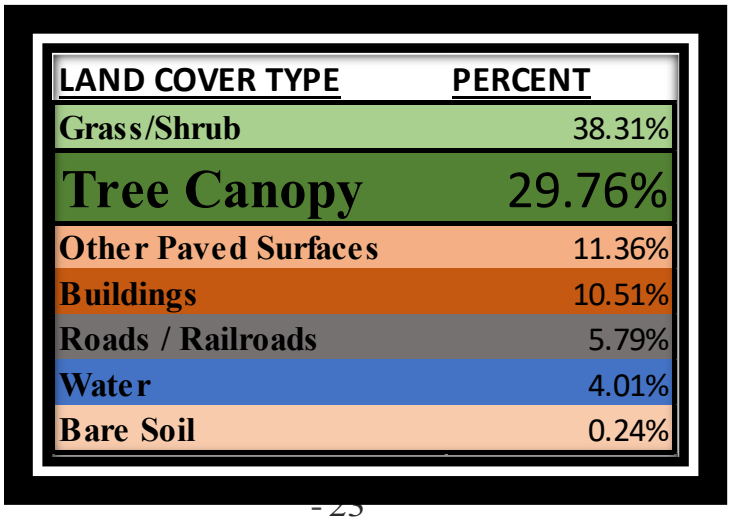
The replacement value of trees was also calculated. Currently, the standing value of all trees in the City of Geneva population is $15,030,034. This value is calculated using the industry standard reference, the *9th Edition Guide to Tree and Landscape Appraisal*, which is published by the Council of Tree and Landscape Appraisers. The goal in this Urban Forestry Management Plan is to create a tree population which maximizes all of these ecological services to Geneva residents by increasing the number of trees in city, and how long they live, while minimizing costs in order to create a healthy, well maintained, and beneficial tree population. The complete i-Tree Reports can be found in Appendix G at the end of this report.

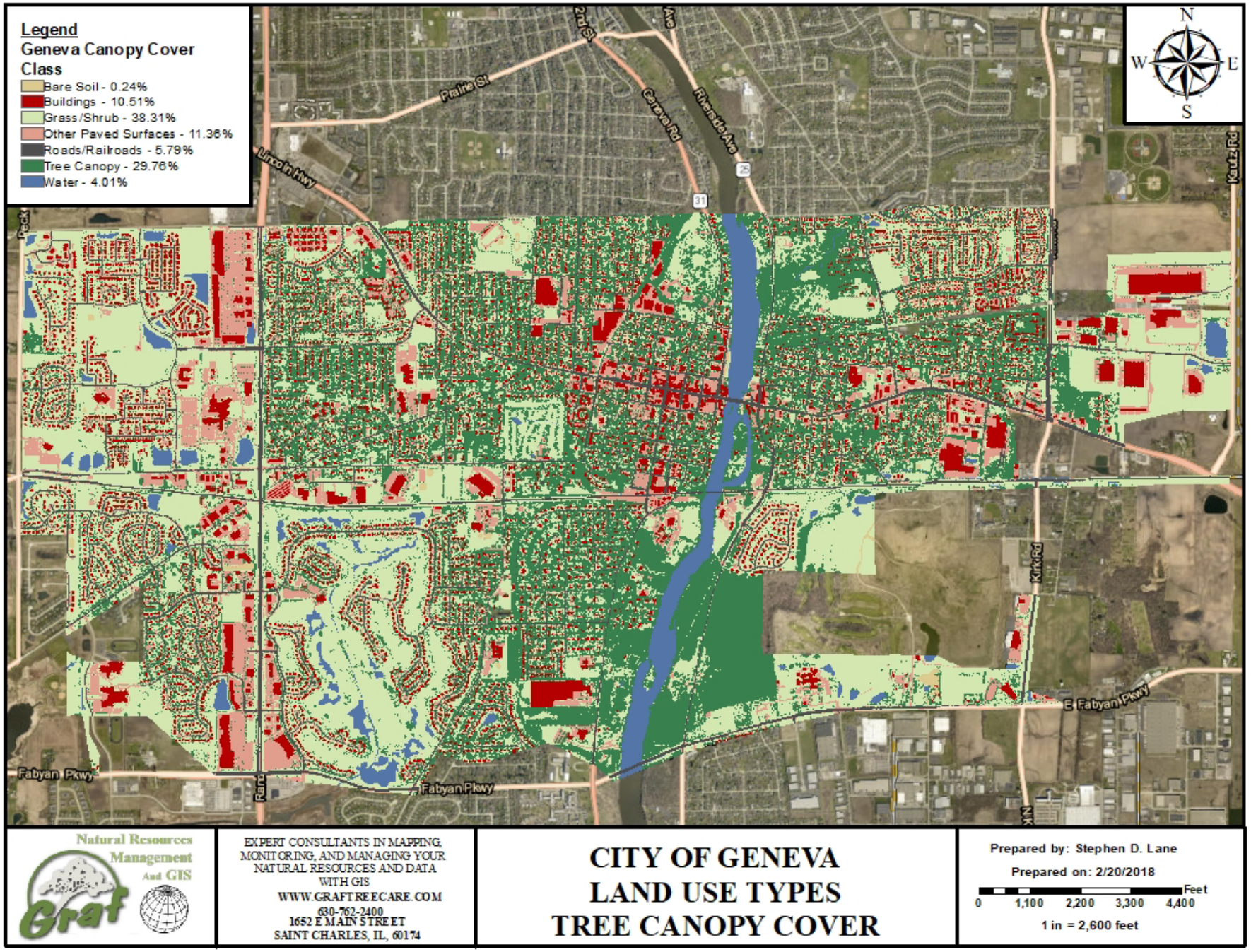
Urban Tree Canopy Assessment

Based on Data available from the University of Vermont, US Forest Service Northeast Research Station, and Morton Arboretum, a determination can be made as to what the total Urban Tree Canopy of Geneva is. This is expressed as the percent of the city covered by tree canopy, from an aerial assessment (2 dimensions). This assessment included 6 additional land cover types, including grass and shrub, bare soil, water, buildings, roads and railroads, and other miscellaneous paved surfaces. The result of this tree canopy assessment was that Geneva contains 29.76% total tree canopy. The map of the canopy assessment appears on the following page.

It should be noted here that the tree inventory itself was only conducted on publicly owned property such as schools, streets, municipal campuses, etc. Detailed tree information was not recorded for trees on private property. However, this Urban Tree Canopy Assessment does in fact include canopy cover on private property. Aerial images were used to estimate how much tree and other land cover types were in the city using a software which is similar to Google Earth.

The goal is to increase the total tree canopy in Geneva to 35% by 2050. This goal has been estimated by analyzing data from many different urban tree populations in the Chicago and Northwest Illinois regions, 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. This will be accomplished through increasing the number of trees in the parks, municipal campuses, schools, and on the parkways and boulevards. It will also be accomplished by maintaining the existing tree population in a more proactive fashion than is currently being practiced. This will ensure that existing trees will live longer and provide greater benefits. Tree planting and maintenance will also be encouraged on private property, by incentivizing residents and business owners to plant trees through public private partnerships, as well as attempting to provide outreach and education to residents through events such as Arbor Day and Earth Day celebrations. This goal will be monitored by using aerial imagery analysis. Every 10 years, the imagery will be assessed, and a new canopy cover percentage will be calculated for Geneva.




Legend
Geneva Canopy Cover Class
Bare Soil - 0.24%
Buildings - 10.51%
Grass/Shrub - 38.31%
Other Paved Surfaces - 11.36%
Roads/Railroads - 5.79%
Tree Canopy - 29.76%
Water - 4.01%
N
W
E
S
Prairie St
Geneva Rd
Riverside Ave
2nd St
Ave
Lincoln Hwy
Peck
Kautz Rd
Kirk Rd
E Fabyan Pkwy
Fabyan Pkwy
Randall
Natural Resources Management And GIS
Graf
EXPERT CONSULTANTS IN MAPPING, MONITORING, AND MANAGING YOUR NATURAL RESOURCES AND DATA WITH GIS
WWW.GRAFTREECARE.COM
630-762-2400
1652 E MAIN STREET
SAINT CHARLES, IL, 60174
CITY OF GENEVA
LAND USE TYPES
TREE CANOPY COVER
Prepared by: Stephen D. Lane
Prepared on: 2/20/2018
Feet
0 1,100 2,200 3,300 4,400
1 in = 2,600 feet

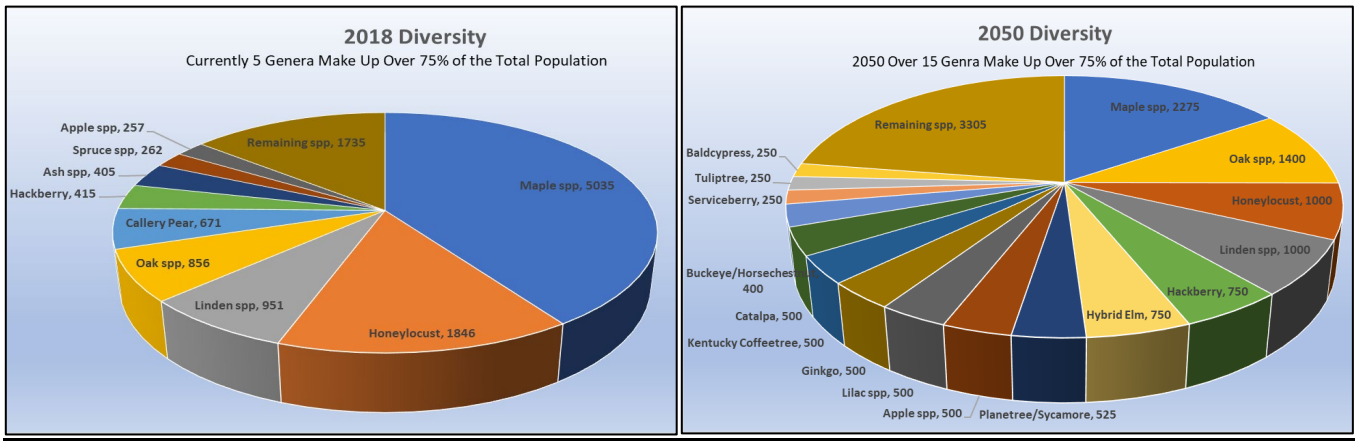
Section 5– The Future of the Urban Forest

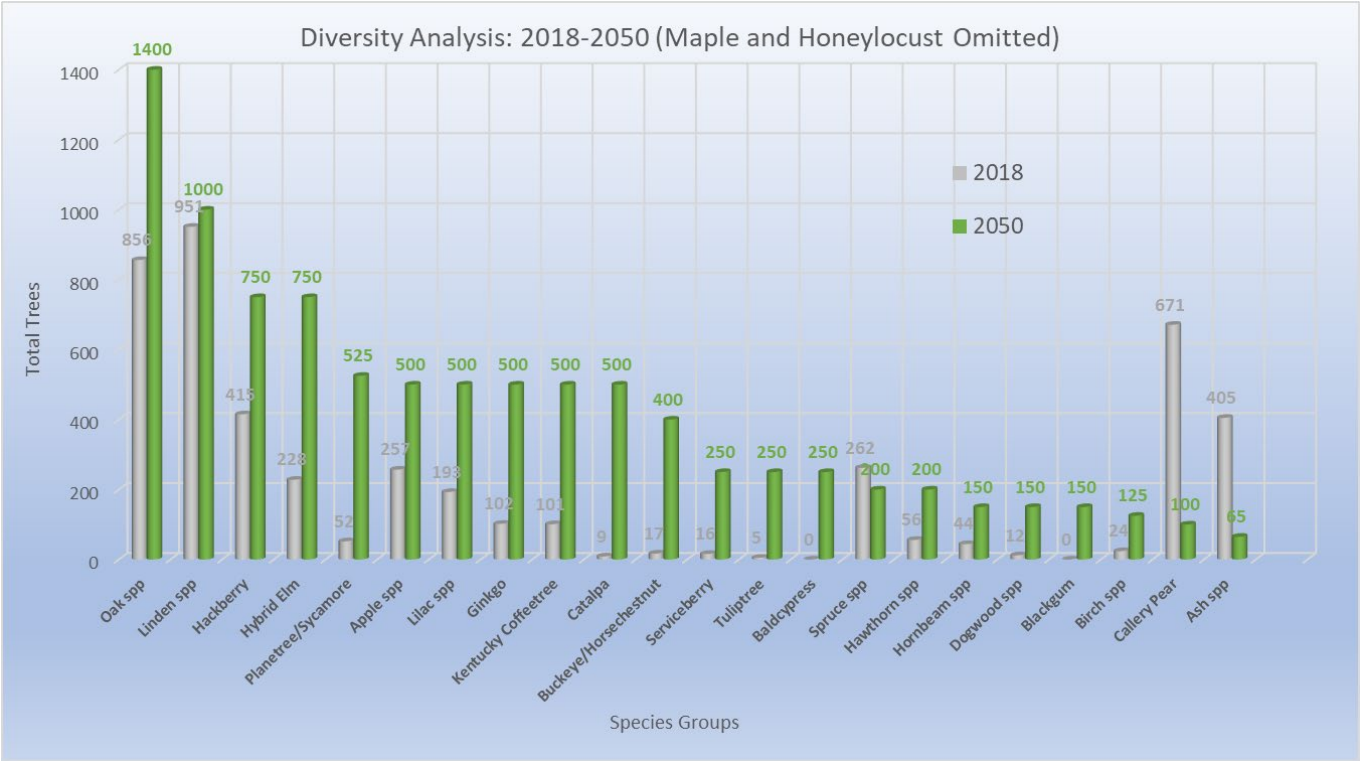
In this next section, a vision of what the tree population of Geneva could become by 2050 was created, and compared and contrasted with the current population. Using the existing data, and then long-term vision, we will then define exactly how Geneva can move from where it is now to where it should be, by creating a customized Forestry program.

Change in Species Composition 2017 - 2050

SPECIES	COUNT 2018	COUNT 2050
MAPLE-NORWAY	2032	500
HONEYLOCUST	1846	1000
MAPLE-AUTUMN BLAZE	884	500
MAPLE-RED	756	500
MAPLE-SUGAR	712	400
PEAR-CALLERY	671	100
MAPLE-SILVER	584	100
LINDEN-LITTLELEAF	502	500
OAK-RED	464	500
LINDEN-AMERICAN	446	500
HACKBERRY	415	750
ASH-WHITE	332	50
APPLE-CRAB SPP	244	500
ELM-HYBRID	228	750
LILAC-TREE	193	500
OAK-BURR	142	150
SPRUCE-BLUE	132	100
MULBERRY-SPP	106	0
GINKGO	102	500
KENTUCKY COFFEETREE	101	500
SPRUCE-NORWAY	68	50
ASH-GREEN	67	10
OAK-SWAMP WHITE	63	250
OAK-PIN	62	100
SPRUCE-SPP	62	50
ELM-AMERICAN	56	25
ARBOR VITAE	50	50
PINE-WHITE	48	50
MAPLE-MIYABEI	45	200
OAK-ENGLISH	45	100
AMERICAN HORNBEAM	44	100
SYCAMORE	43	25
BOXELDER	42	50
OAK-WHITE	42	100
PINE-AUSTRIAN	42	15
HAWTHORN-SPP	41	100
WALNUT-BLACK	41	5
BUCKTHORN	40	0
ELM-SIBERIAN	38	0
IRONWOOD	29	100
AMERICAN REDBUD	27	100
OAK-SHINGLE	23	100
BLACK LOCUST	22	100
CHERRY-SPP	21	50
BURNING BUSH	20	20
CHERRY-BLACK	20	0
MAGNOLIA-TREE	18	50
SERVICEBERRY-SPP	16	250
BIRCH-WHITE	15	25
EASTERN REDCEDAR	15	25
HAWTHORN-COCKSPUR	15	100
OAK-SPP	15	50
BEECH-SPP	14	75
BUCKEYE-OHIO	14	150
HONEYSUCKLE	14	0
OSAGE ORANGE	14	50
YEW	14	10
APPLE-EDIBLE	13	0
MAPLE-AMUR	13	0
ROSE OF SHARON	13	25
DOGWOOD-SPP	12	150
SWEETGUM	12	100
MAGNOLIA-SHRUB	10	10
CATALPA	9	500
DOUGLAS FIR	9	20
LONDON PLANETREE	9	500
BIRCH-RIVER	8	100
FIR-SPP	8	25
PINE-SCOTCH	8	5
SUMAC	8	25
PLUM-SPP	7	0
ASH-BLUE	6	5
COTTONWOOD	6	0
HICKORY-SHAGBARK	6	25
VIBURNUM	6	10
HICKORY-BITTERNUT	5	25
LILAC-SHRUB	5	10
TULIPTREE	5	250
YELLOWWOOD	5	100
AILANTHUS	4	0
BEECH-AMERICAN	4	25
HEMLOCK-EASTERN	4	10
KATSURA	4	25
PEAR-EDIBLE	4	0
FIR-CONCOLOR	3	25
HORSECHESTNUT	3	150
LINDEN-SPP	3	0
MAPLE-HEDGE	3	50
MAPLE-PAPERBARK	3	25
NANNYBERRY	3	0
PINE-MUGO	3	5
PINE-RED	3	5
ALDER-SPP	2	100
APRICOT	2	0
MAPLE-JAPANESE	2	0
PUSSYWILLOW	2	0
RUSSIAN QUINCE	2	0
WILLOW-SPP	2	0
AMUR CORKTREE	1	0
ASPEN	1	10
BIRCH-SPP	1	0
ELM-CHINESE	1	0
ELM-RED	1	0
EUONYMUS	1	0
JUNIPER-COMMON	1	10
MAPLE-SPP	1	0
MOUNTAIN ASH	1	10
POPLAR-SPP	1	10
POPLAR-WHITE	1	0
SEVENTH SON FLOWER	1	25
SMOKETREE	1	25
AMUR MAACKIA	0	50
BALDCYPRESS	0	250
BLACKGUM	0	150
BUCKEYE-RED	0	50
BUCKEYE-YELLOW	0	50
MAGNOLIA-CUCUMBER	0	25
DAWN REDWOOD	0	50
EUROPEAN HORNBEAM	0	50
GOLDEN RAINTREE	0	50
HARDY RUBBERTREE	0	50
LARCH	0	50
OAK-CHINQUAPIN	0	50
PAGODATREE	0	50
PERSIAN IRONWOOD	0	25
PERSIMMON	0	25
ZELKOVA	0	100

	Reduce Current Population
	Maintain Current Population
	Plant in Moderate Number
	Plant iin Abundance





As can be seen from the above tables and chart, compared with the current species breakdown, the 2050 population will be much more diverse, and far more balanced than the current population. The Maple and Honeylocust populations are shown in the pie charts above, but have been omitted from the Diversity Analysis chart so that changes in other species can be seen more readily. The Maple population will be reduced from 5,035 to 2,275 which represents a reduction of over 2,750 Maple trees during this time span. Once again, the Maple issue cannot be solved over a 30-year timespan, but significant strides can be made towards balance. As Maple, Honeylocust, and Pear were the only overrepresented species in Geneva's 2018 tree population, we will see significant reductions in all of their numbers, the importance of which cannot be overstated. This may not move Maples into compliance with the 20-10-5 Rule, but it will improve the situation significantly. We also have recommended the elimination of undesirable species from the population. These include weak wooded species such as Mulberry, Buckthorn, Siberian Elm, Cottonwood, and Ailanthus.

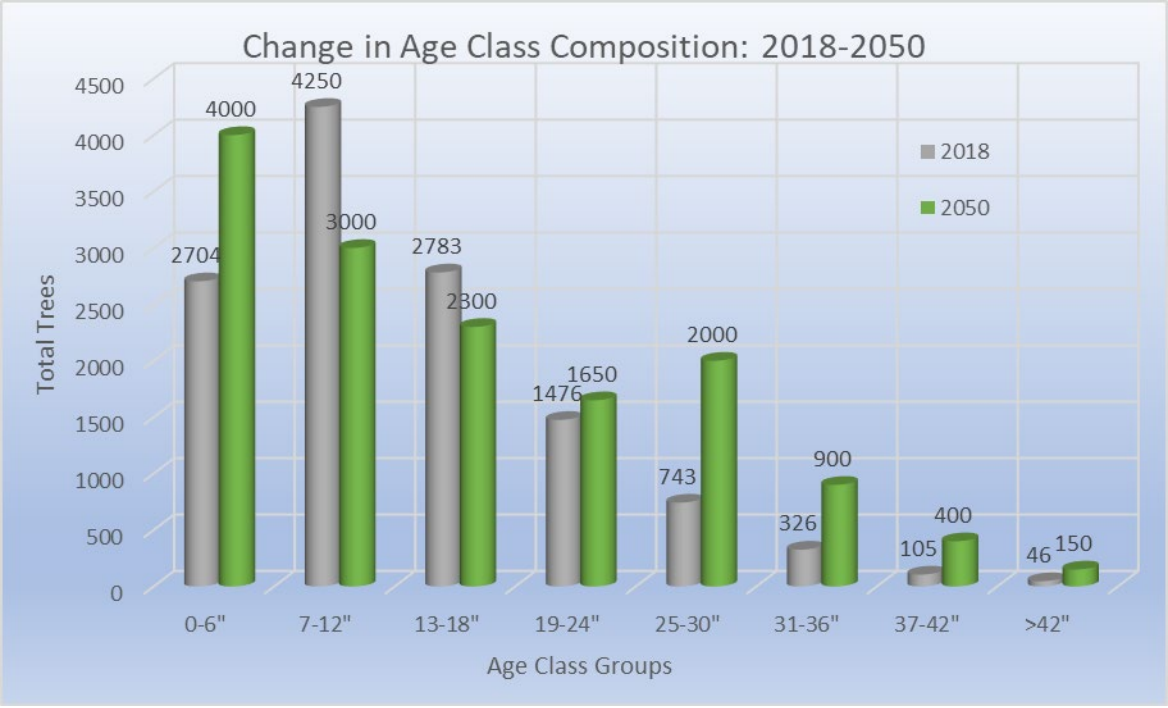
Increases in every other species across the population have also been projected. Among the largest increases in number will be in the Hybrid Elms, Hackberries, Kentucky Coffeetrees, London Planetrees, Serviceberries, Catalpas, and Tree Lilacs. These are all very hardy, inexpensive, and common trees which are proven performers on urban parkways, and quite tolerant of urban conditions. The fact that they are very low in number right now becomes of immense benefit when trying to diversify a tree population. In addition, significant increases will also be seen in species such as Ginkgo, Dogwood, Tuliptrees, Buckeyes Horsechestnuts, Hawthorns, and Oaks. These are also proven urban performers, but less commonly available in high quantities form the nurseries. Finally, many more species have been added to the City's inventory such as Baldcypress, Larch, Pagodatree, Zelkova, and Golden Raintree. These species are also proven performers when properly selected for certain sites.

In order to arrive at these figures, the existing tree population was analyzed first for how many of each tree species would require removal based on the inventory, plus natural ageing and decline over the coming 30 years. From there, using the species composition created by hand by our Forestry Consultants, we estimated how many of each species would be required to replace these removed trees, fill open planting spaces, and even factored a 15% new planting failure rate (standard) into our projections, so that our species composition projections and tree removal estimates account for failure of new plantings

All things told, we expect the managed (non-waterway) tree population of Geneva to increase form its current number of 12,433 trees to approximately 14,400 trees by 2050. We believe this is an attainable goal. We will further examine the stocking density of the tree population below.

The Benefits of Larger, Healthier Trees

As expressed above, larger trees provide greater benefits to the community. They create more shade for cooling costs, absorb more storm water for infrastructure improvement costs, create greater buffers against cool winter winds for heating costs, and absorb and sequester more carbon than smaller trees do. For the 2050 vision of the tree population, we utilized a variety of methods to arrive at the proper age-class distribution. We utilized the current population structure, as listed above, and then anticipated high rates of survival based on new planting practices which would involve a "right tree/right site" approach (as detailed in the Reforestation section below), as well as increased survivorship of existing trees due to better management and care practices. Predicted growth, survivorship, and eventual tree losses were based on current species composition and future plantings and removals. This allowed the creation of a GIS File of what the tree population, including species and size, will look like 30 years from now, and generated the below chart of predicted age class distribution, as well as a projected iTree Benefits summary further below.



One can readily see form the above chart that the existing tree population (pale bars) has the unusual trait of having many trees in some of the larger age classes where we don't typically see as many trees. As described earlier in the Plan, this is almost entirely due to the extremely high number of Maples in the Geneva tree population. These trees grow relatively quickly, and are extremely tolerant of Urban conditions. The projected age class chart shows approximately the same numbers of trees in the younger age classes, but retaining trees far longer into the older age classes.

This was done based on the assumption that increased levels of care for existing trees would enable them to survive longer. Many of these trees are Maples, as mentioned above, and are certainly capable of living to these sizes if they are cared for properly in terms of pruning. Newly planted trees are also predicted to show decreased mortality, as they will be planted using detailed information matching planting site condition to specific species requirements. The numbers themselves were projected by hand, based on our prior experience, and them methods detailed below.

	2018	2030	2040	2050
0-6"	2704	3000	3500	4000
7-12"	4250	2500	2750	3000
13-18"	2783	3500	2000	2300
19-24"	1476	2000	2900	1650
25-30"	743	1000	1250	2000
31-36"	326	500	750	900
37-42"	105	175	250	400
>42"	46	75	100	150
TOTAL	**12433**	**12750**	**13500**	**14400**

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 (6" = appx 10 years growth). Also utilized were the number of trees to be planted and removed annually, as calculated below in the Tree Planting and Tree Removal sections below. Based on all of this, as well as our best professional opinion, these were the numbers arrived at. It should be mentioned as well that as time goes by, these projections will change. These are simply rough estimates for the purposes of this Plan.

	2017	2050 (2017 Dollars)	% Change	In 2050 Dollars (Projected)
Annual Benefits	$1,300,686	$1,508,795	+15.8 %	$3,314,800
Replacement Value	$15,030,034	$18,371,134	+22.2%	$40,361,400

As of current, the tree population provides $1.3 Million in annual benefits. With simple changes introduced in this plan in terms of proper reforestation planning for new trees, mulching, proper water management, and pruning, benefits can be increased by 15.8% with only minimal additional investment, and a simple change in maintenance. This gain of nearly $200,000 annually (in 2017 dollars) will be come with substantially increased benefits for residents and businesses. Adjusting for Consumer Price Index (3% per year increase), we can see that this broadly translates into approximately $3,341,800 in 2050 dollars. The replacement value of the tree population will more than double, increasing 22.2% to approximately $40.4 Million dollars.

It is often easy to view the ecological services provided by trees as being strictly theoretical, and not a provider of actual hard dollars. However, the value provided by trees is concrete and actually very easy to conceptualize:

Energy Savings: During the summertime when temperatures are warm, large trees create shade. As we all know, temperatures are cooler in the shade. Cooler temperatures cause air conditioners to have to work less, which reduces the amount of energy a household utilizes. During the winter when temperatures are cold, winter winds cool your home and rob it of heat. Trees act as windbreaks and reduce winds by up to 30%, 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, loss of species, and many other costly outcomes. In short, reducing CO2 from our atmosphere lessens these effects. Since trees uptake CO2 and act as a sink, putting carbon into long term storage in its woody tissues, they remove it from our atmosphere, creating a net benefit to society, and saving money.

Air Quality: Many industrial processes and vehicle emissions put harmful chemicals into our air. These chemicals can cause or worsen poor health conditions such as heart disease, asthma, and lung disease. In addition, these airborne 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 ambient in the atmosphere. Reductions in these chemicals results in overall better health, reducing the cost of healthcare to society, and saving communities money.

Storm water: We often take our water systems in our municipalities for granted. The cost of delivering fresh water to homes, as well as removing and treating wastewater and storm water is immense. One of the greatest costs comes when either 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 from years of handling large volumes of water. Fortunately, trees take water from the soil and put it back into the atmosphere through the process of Transpiration, so the more trees we have, the less flooding we see, and the less strain is put on our storm water infrastructure, resulting in fewer repairs and replacements. In addition, tree canopy slows down rainfall's effects on flooding by "intercepting" it with leaves and branches, delaying how quickly rainfall can become runoff and floodwater. All of this adds up to massive savings for a community.

Aesthetic/Other: up to 15% of the value of a property can be attributed to its trees and other landscaping. Tree lined streets are much more appealing to homebuyers than streets devoid of trees, resulting in increased home sales, and therefore increased tax revenue, or increased tax revenue with which to fund initiatives relating to trees, attract new businesses, etc.

Section 6 - Tree Removals

The first step towards attaining Geneva's forestry goals will be to remove trees which are diseased, dying, or present a hazard. At present, there are 194 trees which have been called for removal during the inventory. Of these, 12 are listed as Hazard Removals, and are recommended to be taken down during the remainder of 2018 to prevent potential public safety issues from arising. Once the Hazard Remove trees have been removed, there are an additional 182 trees which were marked as removals in the 2018 tree inventory data. A goal of this Urban Forestry Management Plan is to have all identified trees marked as Removals be removed by 2022, or within 5 years. Since Geneva has already completed many removals so far in 2018, and budgets for approximately 100 removals per year, we have decided to only add the 12 hazard removal trees to this years list to allow for extra time and budget to begin adding more trees to the removal sets. After this, each year following will have the number of removals steadily increased through 2022, at which point all trees marked for removal in the original inventory should be removed.

After this initial 5-year period, in order to attain the goals set forth in the Diversity Standards, the background rate of tree removal will be approximately 275 trees per year. From 2022 forward, continual reevaluation of the tree population on an annual or semiannual basis by the City Forester or Forestry Consultant will specify which trees require removal. These numbers, detailed below, are meant to be placeholders for budget calculations and diversity standards. It cannot be stressed enough that this does not require that 275 trees be removed each year, and in fact removal totals will vary from year to year, and we anticipate they will likely be lower than 275 in most years. Each year, as Geneva builds its program, trees should be evaluated on a case by case basis.

For purposes of projection, costs have been estimated using a rate of $400/tree for tree removal and stump grinding, which is a very conservative estimate based on current market pricing. Rates could certainly be found lower than this in a competitive bid process or by 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. Once again, this is a very conservative estimate based loosely on Consumer Price Index, and actual costs are likely to be lower than projected. In addition, for trees in 2023 and beyond, these are anticipated averages of trees to be removed. Exact numbers of trees to be removed may significantly more or less. These numbers were calculated for budget forecasting only. We find these figures to largely be reflective of in-house labor as well, so no retooling is necessary.

Milestones	2018	2019	2020	2021	2022	2022-2030 (Avg/Yr)	2030-2040 (Avg/Yr)	2040-2050 (Avg/Yr)
Trees Removed	112	125	157	200	250	275 (Projected)	275 (Projected)	275 (Projected)
Notes	100 annual removals + 12 hazard removals from inventory	100 annual removals + 25 removals from inventory	100 annual removals + 57 removals from inventory	100 annual removals + 50 removals from inventory	250 annual removals + remaining Ash trees	250 annual removals	250 annual removals	250 annual removals
Diameter Inches	1451	1620	2034	2591	3239	3563	3563	3563
Removal Cost (2018)	$44,800	$50,000	$62,800	$80,000	$100,000	$110,000	$110,000	$110,000
Removal Cost (CPI)	$44,800	$51,500	$64,684	$90,400	$115,000	$143,000	$185,900	$241,670

Tree Removal Activities

Safe Removal of a Tree to an Appropriate Flush Cut

Tree removal can be a very dangerous activity which puts people, property, and workers in harm's way. Thus, all tree removal activities on Geneva's public property shall be performed under the guidance of a Certified Arborist or Arborist Trainee. This may be the supervision of the City Arborist, or a Certified Arborist with the contractor who has been hired to remove the tree. The safe removal of a tree involves the removal and safe lowering of all portions of the secondary branches, scaffold branches, and finally the trunk of a tree by either a tree climber or a bucket truck operator. 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 roots shall 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 to the naked eye. If the site is to be planted with a new tree, that depth shall be increased to 12 inches below the soil surface. This will ensure that a new tree may be successfully planted near the site of the removed tree, 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 City of Geneva depending on individual management needs for specific circumstances or contracts. Until such time as the planting space be fully restored, the stump hole will be filled and compacted to ground level using the debris resulting from the stump removal

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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 within six weeks. Site restoration consists of removing a portion of the stump chips from the hole, mixing with a quality mineral topsoil, tamping down to match the surrounding grade, spreading grass seed over the top of the topsoil, and securing green turf 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 never taken lightly, but it is an unavoidable reality of managing large tree populations. When the trunk, branches or roots fail, a standing tree can cause personal injury or even fatality, 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 these neighborhood icons. 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. It's also important to remember that with the forestry program, the removal of a tree today is the promise of a new tree for tomorrow!

Removal of trees on City of Geneva pubic property (as identified in the definitions above) shall always be at the discretion of the City Arborist and/or Forestry Consultant. Trees will never be removed without sound reason from the City or Forestry Consultant, and likewise will never be removed based solely upon the request of a resident with no evidence of a need for removal. Residents may request a tree to be removed for reasons NOT covered below, and such a request will be reviewed by the City Arborist, Public Works Director, or Forestry Consultant. Such requests may be granted and paid for under the annual forestry budget if sufficiently funded. However, trees with higher programmatic need for removal based on public safety will always hold a higher priority. Under no circumstances will the City of Geneva be responsible for maintenance or removal of trees which are not on the public right of way. Trees with over 51% of their trunk diameter in the property owner's land are the sole responsibility of such property owner.

Dead or Dying
If a tree is biologically dead or nearly dead, it will require removal. Trees which are standing dead, have approximately 70 percent dead crown or greater (as determined by ocular estimate), or have less than approximately 40 percent sound wood in the cross-section of the trunk shall be removed as expediently as practical. The exact determinations of these quantities shall be at the discretion of the City Arborist or Forestry Consultant.

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 one tree may save dozens of others. Trees deemed to be diseased or infested by the City Arborist or Forestry Consultant shall be removed as expediently as possible in order to slow the spread of such insects and diseases.

High or Extreme Risk
"Tree risk" is the potential of a tree or tree part to impact a nearby person or piece of property and cause damage, injury, or fatality. This topic is of great interest in Arboriculture today, and insurance companies are becoming increasingly involved in the business of assessing and managing the risk posed by trees. Litigation involving trees is also on the rise. All trees in Geneva were assessed for risk during the initial inventory, and as stated above, several trees were found to be at elevated 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 high risk trees expose the public or property to potential harm.

The City Arborist, Forestry Consultant or any other TRAQ Qualified Risk Assessor must assess the tree and prepare a Tree Risk Assessment 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 another such natural disaster. "Severely storm-damaged" shall be generally defined as a tree which has lost 33% or more of its crown due to wind

damage, has a large crack or other wound in the trunk resulting from high winds, has a lean of greater than ten degrees from vertical, or has sustained a lightning strike. The City Arborist or Forestry Consultant shall determine the need for removal of a tree based on storm damage, although in an emergency situation such as a tree impacting a person, vehicle, home, power lines, or other such emergency, the City 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
The City Arborist or Forestry Consultant shall assess trees that have been impacted by a vehicle strike or large 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 brought to the attention of the Tree Advisory Board for approval before being scheduled for removal. The decision will be based on the best professional judgement of the Forestry Consultant. If the resident wishes to petition the decision, they may do so.

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 the City Arborist and/or 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 City may agree to the removal within the next five years. 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. It should be noted that such trees may be subject to an additional fee for removal, dependent on an appraisal of the tree in question.

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 negatively impacted above or belowground utilities in a manner that cannot be mitigated by pruning or other cost-effective measures.

Overplanted and Underperforming
No healthy tree shall be removed for the sole reason of overplanting. With the new Forestry program, Geneva will be adopting 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" during their most recent visual assessment will be reviewed to assess further decline or recovery. Those trees in noticeable decline shall be removed at the discretion of the City Arborist and/or Forestry Consultant. This will only 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.

Tree Removal Requirements and Standards

All of the following requirements and standards shall be met during tree removal activities:

City of Geneva

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 City of Geneva, as either Public Works and Forestry staff, or performing work as a contractor employed by the City.

2. Only qualified utility arborists may perform tree removal operations within ten feet of an electric utility line. City of Geneva 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 City will not remove healthy trees in order to meet diversity goals, unless the tree poses a risk to persons or property.

4. The City of Geneva shall not perform or assist, programmatically or financially, with the removal of trees on private property. Public/Private tree ownership is defined by Ordinance as having 51% or greater of its trunk diameter within the public right of way.

ANSI Z133.1 Arboriculture Safety Standards
All of the ANSI Z133.1 safety standards shall apply to all tree care operations outlined in the remainder of the Urban Forestry Management Plan. A full text of this manual will be made available to all City of Geneva 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 Forestry 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 City 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.

Section 7 – Tree Planting

Simply removing trees will not fulfill our vision, however. Planting of new trees must happen in order to increase our diversity and canopy cover. At present, the City of Geneva has 1,960 open planting spaces on its parkways and boulevards. As a means of attaining the goals of increasing canopy cover to 35%, and increasing overall diversity significantly, this plan calls for the planting of nearly 12,500 trees over the coming 32 years. These trees will be planted by City staff, contractors, and even volunteers who have been properly trained. The Plan has specifically been formulated to plant trees where they will have the best chances to establish based on their planting sites, and species requirements.

Milestones	2018	2019	2020	2021	2022	2022-2030 (Avg/Yr)	2030-2040 (Avg/Yr)	2040-2050 (Avg/Yr)
Trees Planted	80	80	80	80	80	100 (Estimated)	150 (Estimated)	200 (Estimated)
Planting Cost (2018	$32,000	$32,000	$32,000	$32,000	$32,000	$50,000	$75,000	$100,000
Planting Cost (CPI)	$32,000	$32,000	$32,000	$32,000	$32,000	$65,000	$97,500	$130,000

For the goals and milestones shown below, the program began with being able to at least replace the 80 trees which Geneva typically plants each year as part of its normal operations. Each year thereafter, a gradual increase is called for in new plantings, until by 2022 the city is planting nearly 390 trees per year. For the costs of planting, we have used $400 per tree, installed. This is a very conservative estimate, and likely the City will be able to find much less expensive material. Particularly if volunteer labor is employed, and smaller trees planted, these costs could reduce by nearly 50%. However, in order to present a fully contracted, maximum price figure, it was decided to use a standard street tree price for purchase and installation. The number of trees planted will also hinge greatly on the number of trees removed. We once again anticipate that the actual number of trees removed and planted will be significantly lower than our projections, however we still wanted to use very conservative estimates. We will examine money saving proposals for tree planting in further detail in the section below.

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Reforestation Planning

The following explains why planning for tree planting is important in the Urban Forest too often, we ignore the principle of putting the right tree in the right site, and we strongly recommend doing planting site assessments prior to planting that examine the following data:

Soil Volume

Soil volume is an approximate measure of the below ground growing space at the planting site.

Small	Soil volume less than approximately 25ft^3
Medium	Soil volume between approximately 25 ft^3 and 500 ft^3
Large	Soil volume greater than approximately 500 ft^3
Prohibitive	Soil volume is insufficient to support tree planting

Growspace

Growspace was evaluated based on the proximity of the planting site to structures, other trees, power lines, and other such potential obstacles. An attempt was made to determine what the site conditions might be as the tree matures.

Small	Tree has (or will have) 40 feet or less of available growspace
Medium	Tree has (or will have) 40 – 60 feet of available growspace
Large	Tree had 60 feet or more (unlimited) growspace
Prohibitive	Site did not have enough growspace to justify a new planting

Light Level

Light level was based on the amount of sun or shade that a planting site was currently experiencing, or was anticipated to experience in the future. Site conditions have to be relatively constant to make this determination, and are subject to future storm damage, construction, tree removals, etc.

Full Sun	Tree has access to abundant sunshine
Partial Shade	Tree is (or will soon be) in shade for at least 25-50% or more of the daylight hours
Full Shade	Tree was in full shade for at least 75% of the daylight hours

Soil Moisture

Soils will be evaluated by use of GIS data layers of Hydric Soils, FEMA Floodplain, and NWI Wetlands data, as well as firsthand observation. In areas where the soils had been heavily modified since the GIS data was last updated, staff ignored GIS data and record the soil type based on best professional judgment, and in rare occasions, basic sampling.

Dry	Soils are in a high elevation area on the landscape or far from water sources
Mesic	Soils are of moderate moisture during an average growing season
Hydric	Soils are wetter throughout most of the year during an average growing season
Poor	Soils are rocky, compacted, or otherwise of very low quality
Prohibitive	Soils are not adequate to support a viable root system

Loading

Loading of either salt pollutants or nutrients was assessed. High salt areas were generally along major roadways, in plowed and salted parking lots, near low spots in the terrain, near retention basins, or near intersections. High nutrient areas were generally near facilities such as sports fields that require frequent fertilization, stormwater retention ponds, or near floodplains.

None	No significant salt or nutrient loading was observed
High Salt	Significant amount of road salt (or similar) was observed or inferred
High Nutrient	Significant amounts of Nitrogen, Phosphate, etc were inferred
High Salt And Nutrient	Significant Salt and Nutrient loads were observed or inferred
Low Nutrient	Site was in a location where access to nutrient would be very limited

Sheltered

The degree of which a tree will be protected from prevailing winds, snow, and other cold-weather elements.

None	Planting site is 0-10% sheltered
Low	Planting site is 10-25% sheltered
Moderate	Planting site is 25-50% sheltered
High	Planting site is 50-75% sheltered
Very High	Planting site is 75-100% sheltered

Recommended Form

Recommended form is based upon general terms describing the shape and habit of mature tree species' canopies. Oftentimes, there are certain situations in which particular tree forms would be better suited to complement the existing landscape and/or hardscape, such as columnar trees in narrow parkways, or spreading trees in wide parkways.

Any	Any tree form would be suitable for the site
Globose	Large, regular and rounded canopy, resembling a globe
Spreading	Horizontal branching resulting in a large and wide canopy
Columnar	Column shaped canopy where horizontal growspace is less than 20'
Vaselike	Higher branching form where branches grow at sharp angles from the trunk, flaring outward
Pyramidal	Broad, cone-shaped or triangular canopy
Small	Small mature height (<30')

Planting Site Assessment

Species diversity, spatial diversity, and age-class diversity should be taken into account for any street tree Reforestation Plan. But for additional plantings such as parks, schools, etc., diversity standards should be reviewed annually to determine how much closer Geneva is getting to compliance with the "20-10-5" rule. Strategic goals to increase that ability to meet that criteria shall continually be set. These benchmarks can be monitored with each passing season. The success of a tree depends on where and how it is planted. The City Arborist or Urban Forestry Consultant shall assess planting sites not included in the Reforestation Plan before trees are purchased and installed, to ensure the correct tree is being planted for the correct site. Each tree planted represents a 25-75 year commitment, and due diligence shall be performed before making that commitment. A list of acceptable species to be planted for all land use types appears as Appendix A at the end of this report.

Nursery Stock Procurement

Nursery stock quality is also a key to a tree's long-term success. No amount of planning can help a tree which was purchased in poor health. The City Forester or Urban Forestry consultant shall visually inspect and select every tree which is to be planted on City property, in order to minimize the possibility of installing poor quality nursery stock. As a cost saving measure, specifications shall 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, there is a shortage of good nursery stock available form growers due to the high numbers of trees being sought to replace Ash trees lost to Emerald Ash Borer. For this reason, we strongly recommend that Geneva inspect all stock, and not to accept substitutions in their requested species. Additionally, the establishment of a Tree Buyers Consortium as well as the prospect of Contract Growing of trees shall be examined in section 13 below.

Tree Transport and Planting

Proper transport and planting procedures determine a tree's success after planting. 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. Trees may be planted by a local volunteer work force so long as the workers have been adequately trained by the Forestry Consultant prior to planting trees.

Tree Spacing and Visibility Requirements

Minimum tree spacing between Large/Medium/Small sized deciduous shade trees (as detailed in the table of acceptable species) shall be no less than 40 feet on center in any direction. This will allow trees to grow to their full potential without heavy competition for water and nutrients with neighboring trees, and without limited space for crown growth. In addition, no tree shall be planted within 10 feet of a driveway, intersection, traffic control device, or known below ground utility. Trees may be planted under aboveground powerlines, but must be from the "Small" selections listed in the Acceptable Species list below. No evergreen species shall be considered acceptable for street and boulevard trees, as they obscure views of the road and may lead to accidents. Evergreens are acceptable for parks, schools, municipal campuses, and waterways.

Watering
Watering of trees is absolutely essential to their establishment, growth, and survival, particularly during the first 2 years of their lives. Since watering is not included in our budget figures, this responsibility may have to fall on the property owners. We highly recommend that when a tree site is selected for planting, that a basic letter be mailed to property owners describing how much water to give a tree, and when it should be given. Such simple information can make the difference between a tree dying from drought stress, a tree dying form overwatering, and a happy, healthy tree.

Challenges of Urban Plantings
Urban planting sites are a difficult environment for a tree to thrive in, and thus it can be expected that approximately 10% of new plantings fail each planting cycle. The City's contracts for tree planting should generally include a one to two-year replacement warranty for any new trees that fail to thrive in their new environment. In general, it should be understood that 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.

Tree Planting Requirements and Standards

City of Geneva

1. Planting sites shall be determined and monitored using the City's tree inventory, in conjunction with staff input.

2. New planting sites shall be ideally ten feet away from utility structures and a minimum of six feet from manholes and utility structures, driveways and hardscapes.

3. Choice of species for planting over the next 25 years shall be done so according to the City's existing taxonomic, spatial, and age-class diversity goals. A diverse and resilient urban forest shall be created, such that it 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 City/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 City of Geneva

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 City of Geneva and its approved contractors.

7. Residents shall be permitted to plant trees on the City-owned right-of-way, if purchased independently and conform to all species, spacing, and proper planting requirements as specified by the City of Geneva.

8. JULIE shall be contacted, and all utilities located a minimum of three days before planting is scheduled to begin.

9. A minimum of a one-year replacement guarantee shall be extended from approved nurseries and plantsmen for all new plantings rated to hardiness zone five or lower.

10. Geneva also has a cost share program through the City where residents can split the cost of their new tree. Details can be found in the appendices

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 City, 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 City 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 City of Geneva.

2. All employees and contractors employed by or working for the City of Geneva 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.

Section 8 – Tree Pruning

When maintaining a tree for its greatest benefits and lowest risk, tree pruning is one of the most cost-effective maintenance activities to be performed. Pruning accomplishes several very important things 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.

For the goals and Milestones, once again we began with the most critical needs the City of Geneva has right now, those being the trees identified as Hazard Prunes and Priority Prunes in the inventory. For the next 4 years, it is recommended that Geneva slowly increase the number of trees pruned each year through 2022. This will account for all of the trees identified as Priority Prunes in the inventory. After this point, a final increase to the capacity of 3,500 trees per year will allow the City to prune all of its trees on a 4-year cycle. The existing pruning cycle map is included below, and has been divided into 5 areas of more or less equal numbers of trees, though again the goal is to move to a 4 year cycle. For purposes of estimating costs associated with these activities, we have used the following as estimates based on real market values.

For small trees (<12” diameter) we have used only $75 per tree as an estimate for this service, which is just to cover basic staff time to make a few pruning cuts on younger trees. For medium (12”-24”) and large (24”+)trees, we utilized actual bid results to come up with an average figures of $150 and $250 per tree (see table below). These are also fairly conservative estimates. Once again, no cost increase was factored in for the first 5 years, and then a 3% annual increase was added for every year thereafter.

	Total Trees	Avg %	Cost/Tree	Pruned/Cycle	Cost
Evergreen	450	3.25%	75	100	$7,500.00
Large (>24")	2200	15.88%	250	400	$100,000.00
Medium (13-24"	4700	33.94%	150	1000	$150,000.00
Small (1-12")	6500	46.93%	75	1500	$112,500.00
					$370,000.00

Milestones	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
Trees Pruned	3,000	3,000	3,000	3,000	3,000	3,250	3,500	3,500
Notes	Hazard and Priority Prunes from inventory	2019 Pruning Zone	2020 Pruning Zone	2021 Pruning Zone	2022 Pruning Zone	Cycle Pruning 3,250 trees/year	Cycle Pruning 3,500 trees/year	Cycle Pruning 3,500 Trees/year
Cost (2018)	$370,000	$370,000	$370,000	$370,000	$370,000	$400,000	$435,000	$435,000
Cost (CPI)	$370,000	$370,000	$370,000	$370,000	$370,000	$520,000	$565,500	$735,150

Pruning Activities

Refining of Pruning Cycle

Currently, the city is behind schedule on its cycle pruning program due to Emerald Ash Borer related activities absorbing a disproportionate amount of time and resources. However, as of 2016 the City has been attempting to get back to its cycle pruning program. Currently the, the city is split up into 5 zones (see exhibits below), with a relatively large disparity between the smallest and largest zones (1837 trees vs 2931 trees for smallest and largest zones respectively).

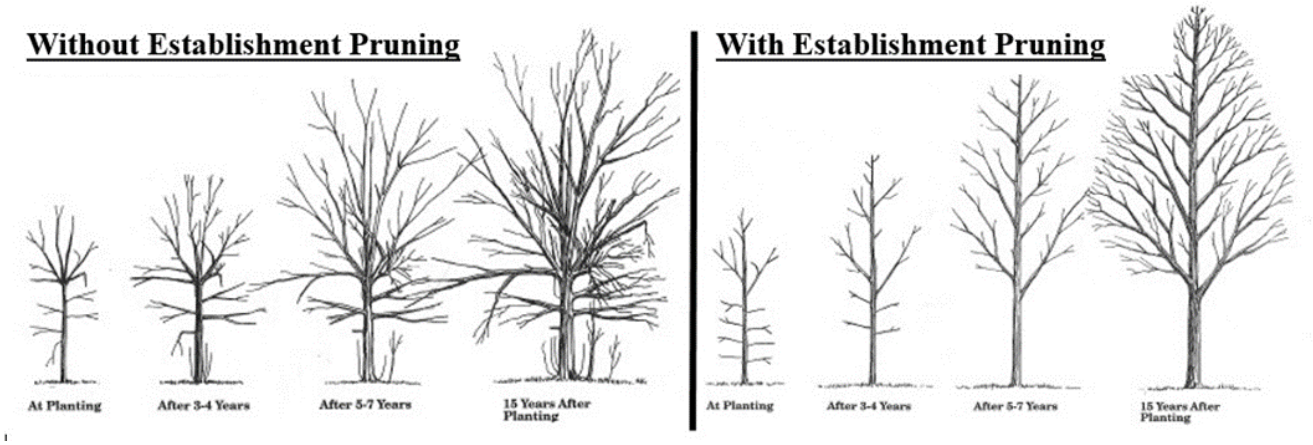
	Active Trees	Planting Spaces	Stocking Density	Years Pruned
Zone 1	2,448	448	84.53%	2018,2023,2028
Zone 2	2,560	485	84.07%	2019,2024,2029
Zone 3	1,837	385	82.67%	2020,2025,2030
Zone 4	2,658	226	92.16%	2021,2026,2031
Zone 5	2,931	421	87.44%	2022,2027,2032

Once again, with the current 5 zone system capable of handling almost all of the current stocking density of 85%, we believe that with small increases in manpower and equipment, that the City could actually increase it's overall capacity to handle a 4-year cycle prune. This would even include the additional nearly 2,000 trees which would be added onto the existing stocking as a result of filling all planting spaces by 2050

Pruning of Young Trees

For the purposes for this Plan, a young tree will be 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. The 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. It is an inexpensive task that does not require a great number of man-hours, and saves 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 City staff, or even well-trained local residents, with proper training from the Forestry Consultant and with the approval of the Tree Advisory Board.



Pruning of Mature Trees
A mature tree, for the purposes of this Plan, is generally considered to be greater than 12 inches 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. Pruning is performed to abate or mitigate these above-ground issues. Natural aging and/or death 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 lose limbs to wind and disease 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.

Private Property Trees
The City of Geneva shall not be responsible for the pruning of trees located on private property. Per the proposed ordinance, this would mean that trees with 51% or greater of their trunk diameter on private property would be considered to be privately owned trees. The City 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 the City Arborist and/or Forestry Consultant

Reasons for Pruning

Establishment Pruning
Establishment pruning is the single most cost-savings measure in tree care as it establishes good form and branch structure for the life of the tree. Establishment pruning of newly planted trees 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. As mentioned above, because establishment pruning can be done without the use of dangerous equipment, the use of well-trained volunteers can be ab effective means of pruning these young trees.

Cycle Pruning
As noted above, trees should be pruned on a cyclical basis as preventative maintenance. No tree should go more than five years without proper pruning. Cycle pruning ensures that dead branches, storm damaged limbs, or unsightly growth are removed before becoming hazardous or unsightly. 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.

Emergency / Storm Damage Pruning
Emergency pruning is nearly always necessary in order to mitigate severe risk, 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 shall be conducted at the discretion of the City, with the best interests of the public in mind. This is the one occasion on which the tenets of this Plan may be abandoned. When life or property are in imminent danger due to conditions associated with a downed tree or tree part, the City 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, sanitation pruning may be employed to maintain the tree while removing the diseased or infested portions. Such a technique is only effective when the host tree is infected/infested with certain pests and pathogens. Generally, removal will be the most cost-effective and safest option to avoid endangering other nearby trees.

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 as low risk again, without causing permanent damage to the tree.

Pest or Pathogen Outbreak
The response to a tree becoming diseased or infested will generally be to remove the tree, or possibly prune the diseased or infested parts of the tree out. These are simply less expensive measures than attempting chemical treatment. Pest or Pathogen outbreak may be a reason for a number of the aforementioned activities, including tree pruning.

Tree Pruning Requirements and Standards

City of Geneva

1. All activities directly related to the operation of a chainsaw, bucket truck, limb rigging, or tree climbing shall be performed by a qualified employee, or 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 City of Geneva employee unless certified as a qualified Utility Arborist.

3. No cabling, bracing, or other such support systems shall be installed in City-owned trees, either by the City of Geneva, its residents, or any contractors. Exception may be made by obtaining prior written approval of the City.

4. No heading, pollarding or espalier pruning shall be conducted on City-owned trees, and no wound dressings shall be used under any circumstances, without a permit and prior written approval of the City of Geneva.

5. The need for pruning and maintenance of individual trees and parkways shall be at the discretion of the City of Geneva and its designated contractors.

6. Pruning shall be done in house by City of Geneva staff, unless either the tree is a) Within 15 feet of an energized conductor or b) Poses an imminent threat that staff believe is beyond their capabilities

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 City of Geneva and its approved contractors.

Section 9 – Other General Maintenance

Maintenance Activities

Retaining a Consultant
The task of updating an urban forestry program presents new challenges and learning curves, contracts to negotiate, bids to put out, resident concerns expressed, and many other experiences which will require the assistance of a professional. It is highly recommended that the City of Geneva retain a professional Urban Forestry consultant who can assist the City in navigating this unfamiliar territory, and help to advise Geneva staff in their new roles as Urban Foresters.

The forestry consultant should ideally be involved in sourcing contractors and vendors for tree pruning, removal, and planting operations, assisting in maintaining the tree inventory, coaching staff on tree health and risk assessments, assisting in explaining policies to homeowners, preparing contract and bid specifications, and teaching residents how to help the City in caring for their trees. The importance of this early relationship cannot be overstated, particularly because of the role that residents will play in caring for new trees.

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 referred to as Plant Health Care. When financially practical, chemical control for common pests or pathogens may be utilized as a preventative or curative method for such ailments, and increase the aesthetics and benefits of the tree population.

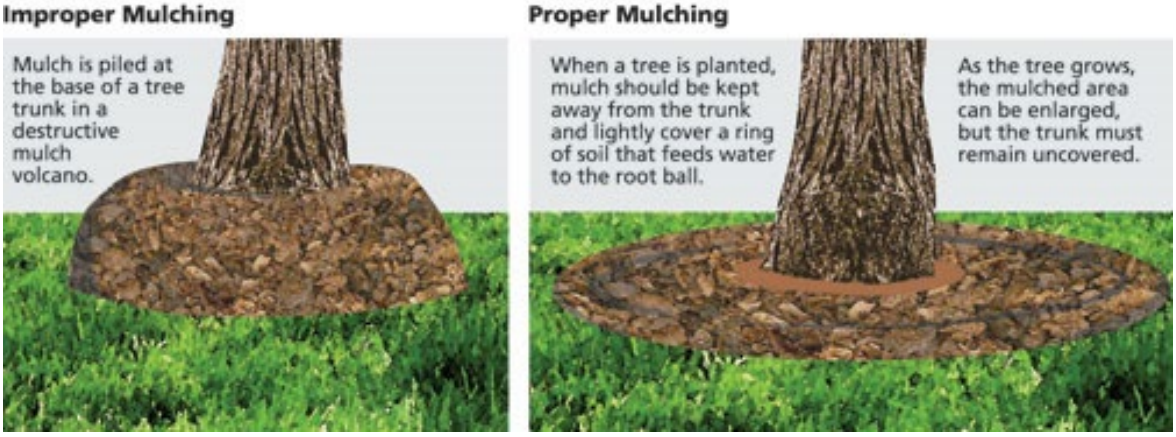
At present, Plant Health Care applications are not very high on the priority list for Geneva's Urban Forest. That said, as the implementation of this forestry program moves forward, considering adding a budget item for Plant Health Care applications might be something to consider during the annual review period of this Management Plan. As new pests and pathogens are introduced, it is conceivable that a new insect or disease may cost less to treat chemically than it would to undergo wholesale removal and replanting of trees in an area.

Residents of Geneva may perform chemical applications on the parkway trees, such as treatment for Emerald Ash Borer, Dutch Elm Disease, Apple Scab, or other common disorders with prior permission from the City. The City will not bear any financial responsibility associated with the costs of such treatments, and treatments must be performed by a Certified Arborist who holds an Illinois Pesticide Applicators license. Additionally, trees being treated by residents may still be removed at the discretion of the City. Such an allowance would be strictly informational, to allow the City to be aware of chemical treatments occurring on trees that it owns. Such work may be denied or revoked for utilizing unqualified contractors, potentially hazardous chemicals, or any other reason at the discretion of the City.

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 4) 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 often need additional watering, which is an essential maintenance activity and can increase the likelihood of the survival of newly planted or younger trees on the parkway. As we anticipate nearly 2,000 additional trees over the course of the next 32 years, this concept becomes very important. As recommended above, a watering program paid for by the City, using contracted labor, is likely beyond the scope of current budgets as this new forestry program becomes established. Instead, Geneva will have to rely on well-informed residents to water trees. Upon receiving a newly planted tree in the parkway in front of their homes, residents should be supplied with an informational pamphlet or letter, which explains how often to water their new tree during the first 2-3 years. It is also suggested that the City, acting in conjunction with the Forestry Consultant, hold basic tree maintenance classes open to all residents.

Mulch

Proper applications of mulch are necessary and cost-effective maintenance activities. Mulch has many benefits, including eliminating weed growth in the root zone, protecting the tree trunk and root flare from lawn maintenance equipment, allowing water to percolate into the soil thereby reducing evaporation rates and drought stress, and creating a naturally acidic and fertile soil environment. Turf grass that we often see competes for resources such as water and nutrients, and mulch eliminates this competition. But not all mulching is beneficial. The practice known as "Volcano Mulching" is the poor practice of piling mulch against the trunk of the tree in excess of 3" deep. This causes moisture build up against the trunk, which is not adapted to wet environments, and can cause severe decay of the trunk tissue, and ultimately 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.



Fortunately, mulch is a commodity most communities can get for free so long as they are pruning and removing a fair number of trees each year. It is recommended that Geneva establish a marshalling yard within City limits where pruning and removal contractors can dump wood chips. These chips can be made available for free to residents as well as planting contractors. This arrangement works very well for all parties involved: Pruning and removal contractors do not have to pay crew time to continually dump chips and pay for disposal, residents get free woodchips, and the planting contractor doesn't have to upcharge the City for mulch when new trees are planted. All newly planted trees should have mulch applied appropriately. A longer term goal for Geneva should be to mulch all trees 12" DBH and smaller, but for now, mulch for all newly planted trees, and preventing volcano mulching should be the 2 primary concerns.

Section 10 - Tree Preservation and Management During Construction

In many municipalities, ordinances exist to protect trees and shrubs prior from construction activities. The intent of such ordinances is to protect the benefits those tree and shrubs provide to the community. Trees and shrubs may be privately owned, but are also community resources that provide many benefits including the enjoyment of nearby property owners, as storm water benefits, energy savings, carbon sequestration and increased property values. Therefore, tree and shrub protection and preservation during construction activities represents an investment in the community. Ensuring the protection and preservation of these assets while minimizing burdens to businesses, developers, and residents is essential. The requirements and standards set forth here come directly or indirectly from the City of Geneva Tree and Landscaping Ordinance, which is appended in this Plan.

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.

Tree Preservation Requirements and Standards

City of Geneva

1. The Ciyt of Geneva has an existing ordinance for Preservation and Priotection, and this Ordinance is appended to this plan.

2. A tree survey shall be performed by a qualified individual prior to the beginning of any development activities. 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.

3. The Tree Survey and a Tree Protection Plan shall be submitted to the City of Geneva 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

4. 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.

ANSI A300 – Part 5

1. Tree management plans and specifications for tree management shall be written and administered by a certified arborist qualified in the management of trees and shrubs during site planning, development, and construction. Such activities may include, but are not limited to: demolition, grading, building construction, walkway or roadway construction, excavation, trenching and boring, or other such activity which has the potential to negatively impact trees.

2. The management of trees and shrubs shall be incorporated into the following phases of the site development process:
   A. Planning
   B. Design
   C. Pre-Construction
   D. Construction
   E. Landscape
   F. Post-Construction

3. During the Planning phase, an assessment of tree and shrub resources on the site shall be performed by a certified arborist. The assessment shall identify the species, condition, and size of each tree and shall be incorporated into the site design. Trees to be retained or protected shall appear on site design maps. Trees on neighboring property which could also be impacted should also be considered.

4. During the design phase, a tree management report shall be developed for trees to be conserved on the site, and shall be included in the construction plans and specifications, which may include, but are not limited to:
   A. Trees to be retained
   B. Tree and Root Protection Zones
   C. Tree Protection Zone barriers
   D. Tree Protection plans
   E. Soil erosion control
   F. Soil compaction controls
   G. Staging and storage areas
   H. Other relevant on-site activities

5. Grading and demolition plans shall include all trees to be retained and removed, as well as the tree protection plans for working around trees to be retained. Plans shall also include equipment routes for avoiding the TPZ. Consequences for non-compliance shall be specified.

6. During the pre-construction phase, all tree protection plans shall be effectively communicated to all parties involved with the site development, and tree protection zone barriers shall be in place prior to the beginning of any construction activities.

7. The TPZ shall be delineated around all trees to be protected during construction, and shall be based on the size, species, and condition of the tree and its root system. Six to 18 times the diameter of the tree is generally considered to be acceptable. Deviations from this diameter may be made at the discretion of a certified arborist. Activities which could damage tree roots or compact soil should be avoided in the TPZ

8. Fencing or other visible barriers to the TPZ shall be installed prior to site clearing, grading, and demolition, and maintained throughout the construction and landscaping phase. When this is not feasible, alternate methods may be considered.

9. During the construction phase, compliance with tree protection plans shall be monitored by a certified arborist, and any damage to tree barriers or trees, or non-compliance shall be reported to the project manager or owner, or other controlling authority.

10. When removing vegetation or pavement during demolition, equipment used adjacent to the TPZ shall be specified to avoid damage to the tree and the surrounding soil, and soil protection measures shall be in place prior to vehicle or heavy traffic in or near the TPZ.

11. Storage or disposal of construction materials or hazardous materials shall not occur in the TPZ.

12. Fill within the TPZ shall not be permitted without mitigation to allow for proper air and water availability to existing roots. If fill cannot be avoided in the TPZ, compaction of fill shall be avoided, and consideration shall be given to a permanent well installation to protect the tree and its roots.

13. During the landscape, irrigation, and lighting phase, levels of compliance shall be documented and reported by a certified arborist. Non-compliance shall be reported to the project manager.

14. During the post-construction phase, a remedial and long-term maintenance plan shall be specified for existing and new landscaping, to ensure success of preservation efforts and newly planted landscaping.

15. Pruning shall be considered to reduce wind sail when necessary. It should not be considered to compensate for root loss.

16. Mulch shall be applied to as much of the tree protection zone as possible, in order to create a favorable soil environment for root recovery after construction activities.

ISA BMP Manual

1. A cost-benefit analysis shall be conducted during the planning phase. In some cases, money may be better invested in tree planting post-construction.

2. The species and age of tree shall be evaluated by a certified arborist, so that trees in good condition with desirable characteristics are preserved, but those in poor condition or with undesirable characteristics are not.

3. A tree inventory and tree management report shall be conducted during the planning phase, and a certified arborist shall work closely with developers to ensure best management practices are being met for both parties.

4. Effort shall be made to retain groups of trees, such that there is a wind and solar buffer around the highest quality trees if possible.

5. The Critical Root Zone (CRZ) is the area around the tree trunk where roots essential for tree health and stability are located. A Tree Protection Zone (TPZ) is an arborist-defined area around the tree which should include the CRZ, as well as additional area to ensure future stability and growth. The TPZ is subject to the professional opinion of the certified arborist.

6. An attempt shall also be made to preserve native soil for landscape planting as native soil with horizons and development is preferred over fill or black dirt.

7. If a sufficient TPZ cannot be established, a 6-12” layer of hardwood mulch, 3/4-inch plywood mat over a four-inch layer of hardwood mulch, or other such measures shall be temporarily installed over the CRZ in order to prevent root and soil compaction.

8. Trunk protection shall be installed on trees very close to construction activities, and should consist of 2x4 or 2x6 planks, strapped snugly to the tree trunk with wire or other strapping, preferably with a closed-cell foam between the trunk and the planks.

9. When roots over one inch cannot be avoided, they shall be pruned, not left torn or crushed. Acceptable methods of pruning are:
   A. Excavation using supersonic air tools, pressurized water, or hand tools, followed by selective root cutting
   B. Cutting through the soil along a predetermined line with a tool specifically designed to cut roots
   C. Mechanically excavating the soil (backhoe or similar) and selectively pruning remaining roots.

10. Wells, tree islands, retaining walls, and other such structures or strategies shall be considered as alternatives to any cut/fill work in the CRZ or TPZ.

11. Monitoring shall take place during construction and post-construction phases, and any non-compliance should be reported to the proper controlling authority right away, so that timely remediation or mitigation efforts may be undertaken.

Section 11 - Tree Risk Assessment Policy

Trees provide ecosystem and aesthetic benefits. Whether they are healthy, unhealthy, structurally sound, or in imminent danger of failing, all trees pose some degree of risk. Determining the acceptable level of risk, along with effectively managing that risk, is a key priority for forestry operations. As a tree manager, the City of Geneva always must assume some degree of risk. It is up to the City 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

These Risk Assessment Levels are based on the International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ) protocols, as well as the ANSI A300 Part 9 (Tree Risk Assessment) Standards. These levels are general guidelines, and as such, may be open to a certain degree of interpretation. The TRAQ forms can be found in the appendix at the end of this report. All trees in Geneva were assessed for risk during the inventory, however these assessments were rapid assessments based on the TRAQ fields, and as such do not represent any formal level of TRAQ risk assessment, and are not legally binding descriptions of risk. They are instead intended to provide Geneva with data showing a need for a more detailed assessment on trees assessed to have an elevated risk level such as High or Extreme risk.

Level 1 Assessment

Also called a “limited visual assessment”, which is the typical “tree inventory” assessment, whereby a tree has a basic analysis of obvious physical defects and condition. The assessor walks to or drives by the tree, assesses it 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 synthesis of 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.

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. It typically requires specialized training and equipment, such as bucket trucks, resistographs, tomographs, and other equipment. This is the most detailed and time-intensive type of assessment.

Considerations in Assessing Risk

Likelihood of Tree Failure Impacting a Target

A large part of determining the likelihood of a tree failure impacting a target is ascertaining the occupancy rate, or the amount of time that targets are within the Target Zone with the potential to be impacted by a tree failure. A large tree in the middle of a corn field could fail with little impact, but that same tree in a playground will have significant impact. In many roadways, motor traffic is present day and night. Most of the City's 12.433 trees are in rights-of-way adjacent to roads. The failure of a tree located in such a location not only impacts motor traffic, but it also has a potential effect on pedestrian traffic and utilities within right-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 and the characteristics of the tree and the type of failure it is likely to experience. Whereas the previous step was concerned with occupancy rates of an impact area, this step examines the consequences of the impact on a target and assumes that the target is always present, and Occupancy Rate is NOT considered. To follow with the above example, it is assumed that if a parkway tree were to fail, that a car, utility line, and person (anything that likely COULD be there) 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, such as outbuildings, tool sheds, and other similar targets. When a tree failure can cause injury, fatality, power outage, or other such outcomes, the consequences are considered to be "severe" (see the table below).

It should be noted that for the consequences of failure to be considered as part of this risk assessment system, specific to the Association, the branch must have a minimum of a 3-inch diameter at the base. A smaller requirement would present an unrealistic and burdensome standard for inspection.

Weather

Every tree, no matter how healthy, can fail from wind velocity or other impacts such as lightning damage, ice loading or soil saturation. Predictable weather events generally cause tree failures or tree part failures for trees which have preexisting defects. Extreme weather events, by contrast, can cause the failure of healthy trees. For all Tree Risk Assessments, Risk shall 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.

City of Geneva Tree Risk Assessment Policy

The City of Geneva has created this policy in order to maintain an acceptable level of risk from its street and city-owned property tree population. In order to maintain a high level of public safety, while mitigating undue burden, the City shall adopt the following risk assessment protocols:

1. The City of Geneva maintains a tree inventory detailing the species, size, and condition of all trees on the property, as well as the 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, the City Arborist and/or Forestry Consultant shall inspect these trees and shall 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, bracing, or removal, as soon as practical following the assessment.

2. During subsequent years, staff shall perform limited visual assessments on an ad hoc basis by driving by trees during the normal course of daily operations. Trees 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, bracing, or removal, as soon as practical following the assessment.

3. Upon notification from a resident of a concern about a potentially high-risk tree, the City Arborist and/or Urban Forestry Consultant perform a Level 2 or Level 3 Risk Assessment within (10) business days of the notification by the resident. If the tree is determined to have a risk rating above "Moderate" (as determined by TRAQ and ANSI A300 pt 9 Standards), a decision shall be made by the City Arborist and/or Forestry Consultant as to what the appropriate mitigation measures are, if any.

4. All trees deemed to be in need of mitigating actions (removal, pruning, etc.) shall be documented in writing by the City Arborist and/or Urban Forestry Consultant. 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 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 City.

TRAQ Forms can be found in Appendix F 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

Section 12 - Strategic Partnerships

Partnerships have become a very effective means of getting important forestry projects funded when tax funding may present a shortfall, or when additional volunteer labor is needed. 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, state departments of natural resources, and other such groups. At the time of the writing, the partner committee leadership is reaching out to local and state organizations in order to forge these partnerships. At the request of the partner committee, this section shall be left open for right now. However, it shall be very robust at the time this management plan is adopted.

Section 13 - Additional Goals

There are no strategic timelines set forth here for these programs. As the more crucial goals of the Urban Forestry program in Geneva are met or exceeded, these are goals to be discussed by the City of Geneva and its Tree Advisory Board as time and budgets become available. Nonetheless, we do 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.

Geneva Tree Stewards Program / Resident Education

One of the assumption laid out earlier in the Plan was the ability to use well-trained residents as volunteer labor for both pruning of young trees, as well as planting of smaller sized nursery stock during Spring and Fall planting cycles. In order to accomplish this, several training sessions will be required for these volunteers to be confident enough that they can perform these activities with minimum supervision. The Forestry Consultant, working in tandem with the City Arborist, will teach 2 classes of 4 hours each, on the proper way to prune young trees (class 1), as well as how to plant container-grown trees (class 2). Attending both classes will make a resident a member of the Geneva Tree Stewards Program, which will be a formal workforce the community can count on for assistance in maintaining and planting young trees.

A very successful program called TreeKeepers has been instituted in Illinois communities for exactly the same purpose, and the goal would be to pattern this program off of the TreeKeepers model. One of the basic tenets of the TreeKeepers model is that their volunteer groups may work in several different communities. Hopefully, as interest in Urban Forestry spreads in northwest Illinois, this tree stewardship program can be expanded to include residents from neighboring communities as well, so that communities can share resources, and help each other to create the best urban forest possible.

For residents who may not be interested in joining the Tree Stewards program, but still want to know a little bit more about how to take care of their trees, it is recommended that Geneva hold 2 annual tree education sessions, to coincide with annual Spring and Fall planting cycles. These sessions will be taught by the City 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 shall be made available at Public Works and Park District offices.

Establishment of City of Geneva Propagation Nursery
Consideration should be given to the establishment of a small propagation nursery on Geneva-owned land. The City of Geneva can grow a share of its own parkway trees, using much smaller trees obtained from wholesale nurseries at a fraction of the cost of a full-sized tree. Small trees ("whips") can be purchased wholesale, and then grown to maturity in Geneva. Such programs have been successfully instituted in many communities, and it represents a quality investment that results in significant cost savings over the long term. Trees can be purchased when small, or donated from residents (see backyard tree collection program below), and grown to plantable size (minimum of 1.75" diameter) on City-owned land. We would recommend that the City begin to search for a parcel where these trees can be grown by 2020, with the goal of having a functional nursery by 2030. The amount of time required for the care of young trees is minimal, and at an average cost of $250 per parkway tree, the City could save a significant amount of money in their tree planting program by pursuing this goal.

Contract Growing Program
One of the keys to a successful Reforestation Plan or Tree Planting Program is the availability of high-quality nursery stock from local sources. 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 enormous advantage for the City, in that regardless of the length of time it may take to achieve optimum stocking levels, the tree species for each planting site is known ahead of time.

This knowledge, however, does not guarantee the availability of those specific trees when the time arrives to fill a particular site. One way to assure the availability of the high-quality planting stock the City desires year over year is to have trees contract grown by a nursery (or nurseries), and reserved specifically for the City of Geneva. In this manner, the City will not have to compete with the commercial and residential landscape industries, other area agencies responsible for tree planting, or retailers purchasing trees from wholesale nurseries for resale. Trees are ordered in annual increments, typically following a "fifth year out" model. Initially, trees reserved for the current year, and each subsequent year, up to five years in the future. Each year, Geneva would purchase the trees previously ordered for that year, and place an order for the "fifth year out". This gives the supplying nursery time to procure, plant, and bring the agreed upon trees to the size and branching habit specified.

As particular numbers of trees required for planting will vary from year to year base on removal rates, budgets, and other factors, the total planting budget should not be committed to advance purchase, and trees order projections should be made conservatively to avoid the possibility of cancellation of orders. In agreement with the supplying nursery, the City would reserve the right to increase orders when budgets allow, or unusual circumstances such as a major storm event or the introduction of a new pest or disease causes major, unforeseen tree loss. Supplying nurseries should be located within a specified distance from the City of Geneva, to ensure climatic zone compatibility and reduce transportation costs and planting stock exposure. Nurseries should be of sufficient production capacity to furnish all trees ordered in advance by the City, 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 City. The nursery should allow tagging by the City Arborist or his/her representative as well.

A long-term Tree Planting Contract may be developed alongside, and parallel to, the nursery supply contract. This contract would specify all pick-up, transportation, planting, and spoil disposal procedures, as well as establish costs for planting trees based on caliper inch of planting stock. Nursery stock typically is typically sold in one-half inch increments, so a cost for transportation, planting, spoil removal, initial watering, and mulching would be established based on that increment. Trees are evaluated one year after plating and assessed for health and survival. Responsibility for replacement of tees that have not survived the one year "guarantee period" is divided equally between the supplier, the planter, and the City. Trees that dug or balled improperly are replaced by the nursery. Trees improperly handled or planted are replaced by the planter. Tree that do not survive because of lack of maintenance are replaced by the City.

Cost-Sharing Program for Tree Purchase
The Reforestation Plan portion of this project specifies species to be planted in specific planting spaces throughout the City. However, if residents are interested in planting a specific species of tree in front of their homes instead of the species selected for them, a cost-share program could be considered, whereby the resident can pay for half of the cost of the installed tree which they have requested. Species must be approved by the City Arborist or Forestry Consultant, to ensure that the species is not too large for the planting site, or otherwise a very poor fit for the site.

Private Property Tree Planting Incentive Programs

Tree planting on private property is a strategic outcome of this Urban Forestry Management Plan. Though the City 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 City should consider incentivizing residents and business owners to plant trees on their property. Offering a slight reduction in water and sewer bills for each tree planted has been successfully utilized. 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 City purchase trees from a wholesale nursery at wholesale prices, and then have a tree sale to local residents. The City 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.

Wood Utilization Program

As the UFMP recommendations take effect over time, a considerable amount of material will be generated that may be suitable for use as urban timber. Urban timber is generally defined as saw logs generated from urban tree removal operations. Larger and longer logs are suitable for dimensional lumber production (such as 2x4's, etc.), and smaller material may be used to produce many other products. Forming strategic partnerships with local sawmills, woodworkers, and carpenters would be an important early goal of this program, while creating a market for the finished goods will be an ongoing goal.

Urban timber can be utilized to mill suitable wood into a large variety of products including pallet blanks, shipping material, dimensional lumber, fine furniture, and artisan pieces. In order to successfully upcycle urban timber into usable lumber, several steps must be followed in order to produce logs suitable for milling. Optimum urban timber production will include specifications for tree removal operations that will produce saw logs of the proper dimension and quality. Specifications for the construction of public buildings that require a specified amount of upcycled, local urban timber for either interior or exterior applications may qualify for LEED certification points, and raising awareness of the benefits of the urban forest in general, creating a saleable product that can serve as a revenue stream. A sample Urban Timber Harvesting specification is appended.

Section 14 - Projected Budget

These are the combined figured from all above sections, outlining a rough forestry budget over the next 32 years. This budgeted is to be evaluated and updated annually.

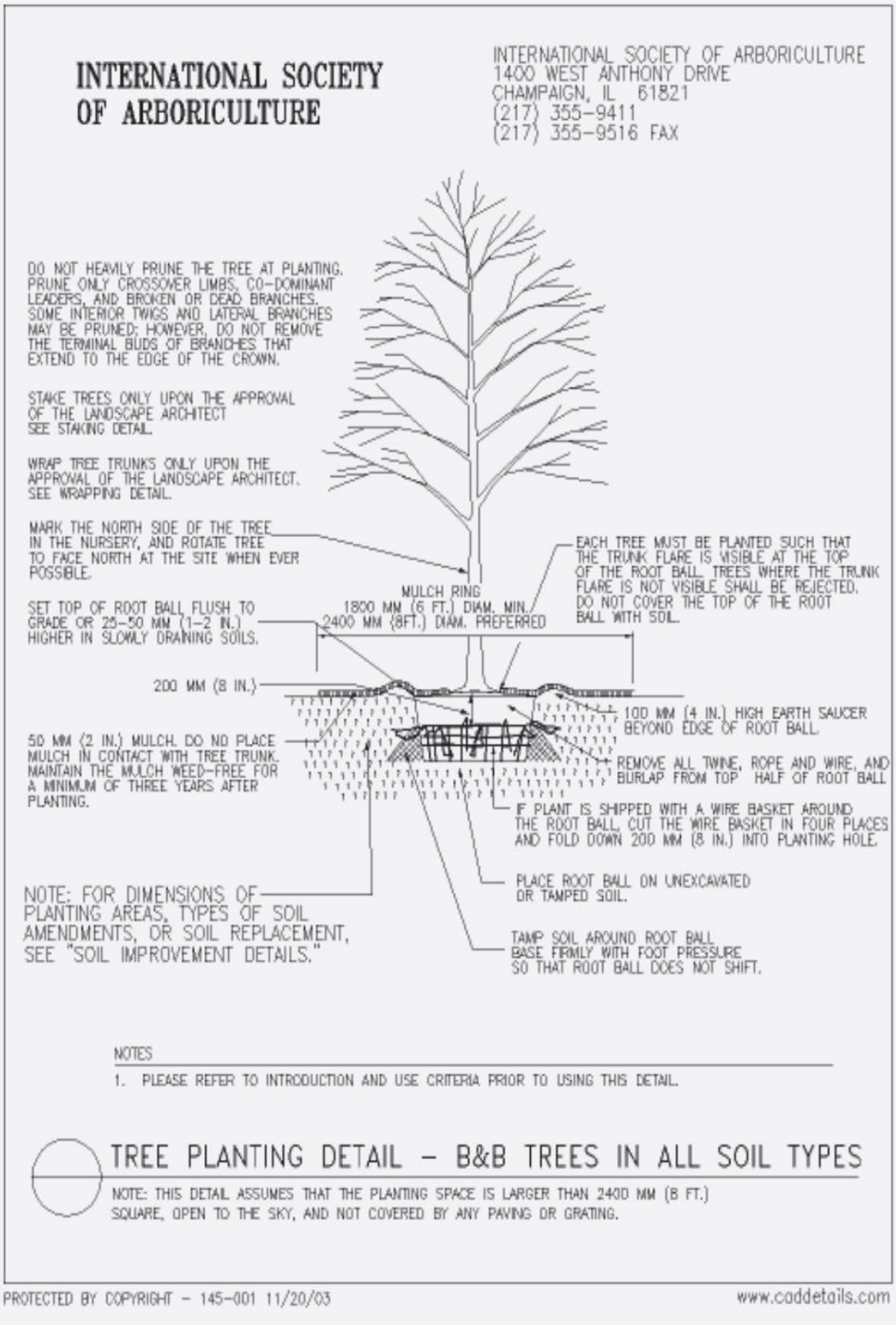
Tree Removals	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
	Trees Removed	112	125	157	200	250	250 (Projected)	250 (Projected)	250 (Projected)
	Removal Cost (2018)	$44,800	$50,000	$62,800	$80,000	$100,000	$110,000	$110,000	$110,000
	Removal Cost (CPI)	$44,800	$51,500	$64,684	$90,400	$115,000	$143,000	$185,900	$241,670
Tree Pruning	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
	Trees Pruned	3,000	3,000	3,000	3,000	3,000	3,250	3,500	3,500
	Cost (2018)	$370,000	$370,000	$370,000	$370,000	$370,000	$400,000	$435,000	$435,000
	Cost (CPI)	$370,000	$370,000	$370,000	$370,000	$370,000	$520,000	$565,500	$735,150
Tree Planting	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
	Trees Planted	80	80	80	80	80	100 (Estimated)	150 (Estimated)	200 (Estimated)
	Planting Cost (2018	$32,000	$32,000	$32,000	$32,000	$32,000	$50,000	$75,000	$100,000
	Planting Cost (CPI)	$32,000	$32,000	$32,000	$32,000	$32,000	$65,000	$97,500	$130,000
Personnel / Equipment	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
	Notes	None	None	Utility Arborist Certification	None	None	Add New Bucket Truck	Add 2 New Employees	Replace Old Equipment
	Cost (2018)	$0	$0	$1,500	$0	$0	$50,000	$100,000	$200,000
	Cost (CPI)	$0	$0	$1,500	$0	$0	$65,000	$130,000	$260,000
Forestry Consultant	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030 (Avg/Yr)**	**2030-2040 (Avg/Yr)**	**2040-2050 (Avg/Yr)**
	Notes	Tree Inventory / Mgmt Plan	Update UFMP	Cyclic Inventory Updates	Cyclic Inventory Updates	Cyclic Inventory Updates	TBA	TBA	TBA
	Cost (2018)	$45,000	$0	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
	Cost (CPI)	$45,000	$0	$10,000	$10,000	$10,000	$13,000	$16,900	$21,970
TOTALS	**Milestones**	**2018**	**2019**	**2020**	**2021**	**2022**	**2022-2030**	**2030-2040**	**2040-2050**
	Cost (2018)	$491,800	$452,000	$476,300	$492,000	$512,000	$620,000	$730,000	$855,000
	Cost (CPI)	$491,800	$453,500	$478,184	$502,400	$527,000	$806,000	$995,800	$1,388,790

Appendix A: Acceptable and Unacceptable Species

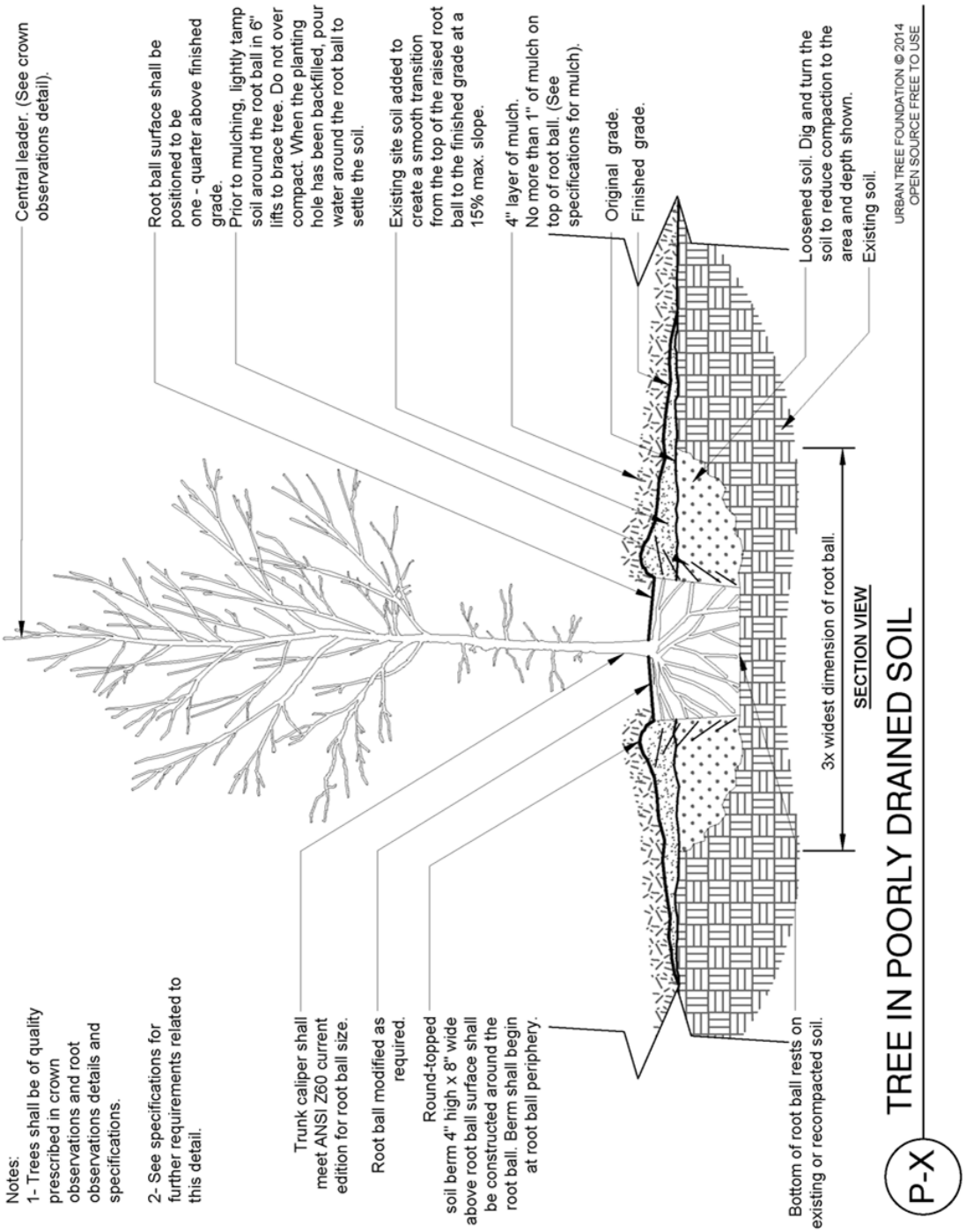
Species not appearing on this list can be approved or disallowed by consensus of the Tree Advisory Board, acting under the supervision of the City Arborist and/or Forestry Consultant

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

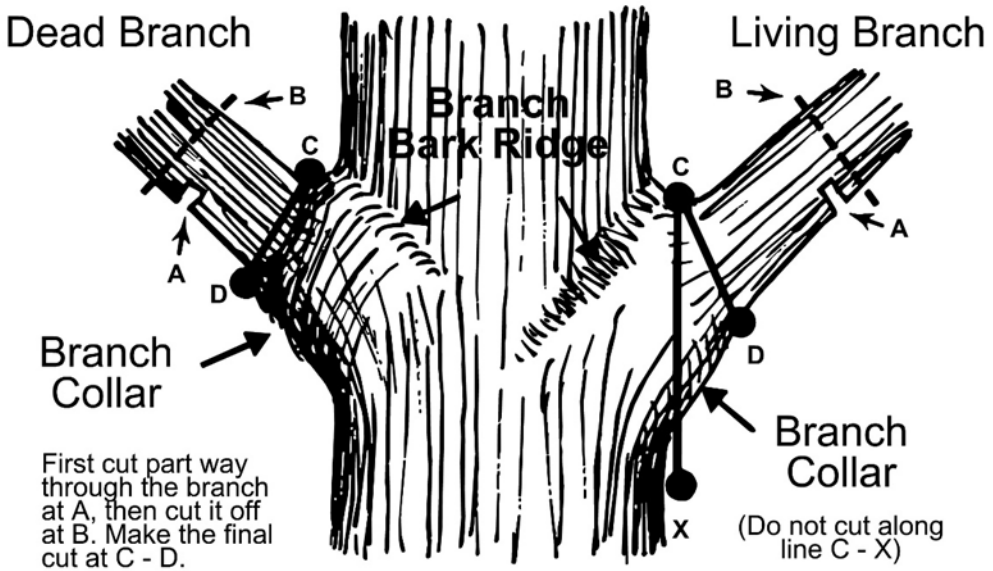
Appendix B: Balled and Burlapped Planting Detail



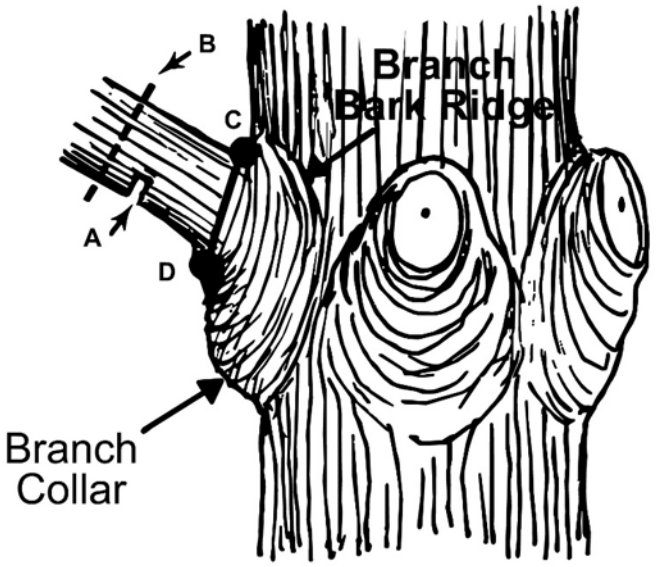
Appendix C: Container Planting Tree Detail



Proper Pruning Principles

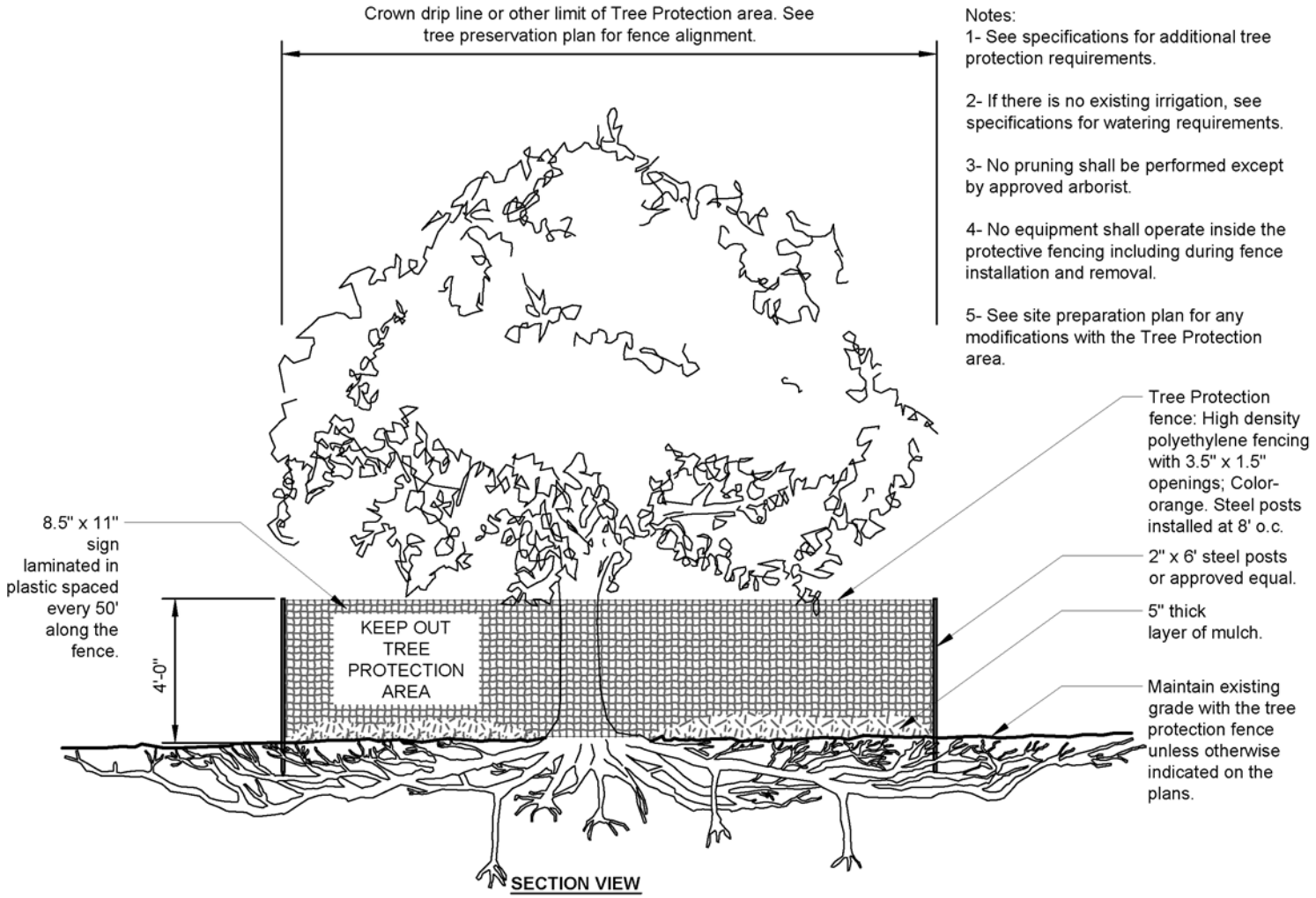


Hardwoods



Conifers

Arbor Day Foundation®



S-X TREE PROTECTION

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 ☐

Risk Categorization

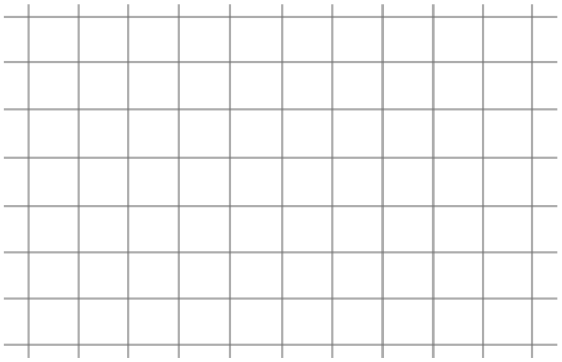
Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood: Failure: Improbable	Likelihood: Failure: Possible	Likelihood: Failure: Probable	Likelihood: Failure: Imminent	Likelihood: Impact: Very low	Likelihood: Impact: Low	Likelihood: Impact: Medium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

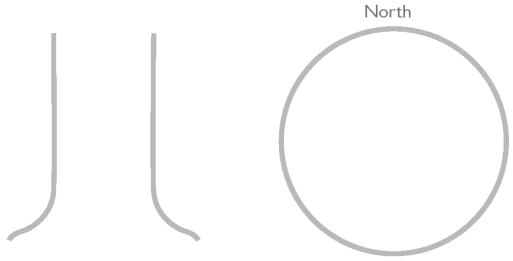
Matrix 1. Likelihood matrix.

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 G: CONTRACT FORMULATION

As large-scale tree maintenance tasks will primarily be accomplished by use of a Tree Care Contractor as defined above, the following are guidelines for developing the most efficient and cost-effective contracts for City-wide tree trimming, tree removal, and stump removal contracts. As part of the bidding process, minimum requirements and capacities for contractors, equipment, and employee qualifications will be established as part of the bid documents for the various tasks, and addressed by specific contract language. Sample contracts are attached.

Tree Pruning

Contracts for pruning municipal tree populations that have not been maintained on a regular basis should concentrate on that segment of the population that poses the most potential risk, and/or that segment that will benefit most from pruning operations. Those populations have been defined as part of this UFMP, and will be addressed as a priority. Once those situations have been resolved, a cycle-pruning program should be established in order to improve and maintain the urban forest as a whole. Most effective municipal pruning cycles range in length from four to seven years. As cycles are completed and critical situations addressed, necessary pruning will become less severe over time, further minimizing cost and maximizing benefits. The following factors should be considered when establishing a tree pruning contract:

Budget – The City of Geneva has been divided into seven sections or zones with approximately the same numbers of trees in each as shown by inventory data. Inventory data will facilitate budgeting for pruning as the overall number of trees, their size class, and their pruning requirements are known in each section or zone. Zones or sections may be adjusted in size or area to conform with existing City zones such as leaf collection of snow plow routes.

Contract Timing – While many tree species may be safely pruned at any time during the year, all trees may be safely pruned during the dormant season. Dormant season pruning is usually defined as December 1st through the end of March. Dormant season pruning reduces the amount of material generated, minimizes the potential spread of communicable disease, and allows superior access to trees by equipment and workers. Contract completion may be extended or reduced depending on weather conditions and response of trees to weather patterns.

Contract Length – Contracts may be let on an annual or multi-year basis. While annual contracts may be able to take advantage of short-term economies, multi-year contracts enable prospective bidders to take advantage of economies of scale, commit resources and manpower over longer periods, and schedule activities far in advance. As such, long-term contracts offer the potential of lower cost, increased efficiency, and allow beneficial relationships to develop over time by eliminating the need to regularly apprise new contractors of standard adherence and performance expectations. When developing multi-year contracts, the first year of the contract is awarded to the lowest responsible bidder, and subsequent year's work awarded based on satisfactory completion of the previous year's work. In this manner, acceptable contracts may be extended, while agreements with contractors who perform poorly are avoided. Typical contact length is three years – the initial year plus two renewal years. The time frame may be extended beyond that point by mutual agreement between the City and the Contractor. Pricing for subsequent year's work will be in accordance with a specific, agreed upon Consumer Price Index (CPI). Increases in unit pricing for subsequent years will be capped at a maximum of 5%, regardless of the CPI increase. If the agreed upon CPI decreases, the previous year's unit prices will be applied to the extension year.

Contract Specifications –As specified elsewhere in the UFMP, all pruning shall follow the *ANSI A300 (Part 1) - 2008 Pruning* Standard and the ISA's *Best Management Practices: Tree Pruning (2008)* for the purpose of crown cleaning, crown thinning, crown raising, and structure development, or as amended. Contractors will be supplied with lists of trees to be pruned based on information generated by the inventory data. Minimum numbers of trees pruned in given time frames, size class definition, and overall completion dates will be addressed by specific contract language.

Tree Removal

Many of the principles that apply to the development of tree pruning contracts apply to tree removal contract preparation as well, with the exception of timing. Trees that pose the highest risk to the community, its residents, and property should be addressed as a priority. Those trees have been identified elsewhere as part of this UFMP.

Budget – As part of the inventory data collection process, trees requiring immediate removal have been identified and quantified. Those trees posing the most potential risk to the community, its residents, and property should be removed as a priority. As those trees are removed, trees requiring removal for other reasons documented as part of this UFMP may be scheduled. At a minimum, sufficient funds should be allocated to accomplish the removal of those trees initially identified as potential high-risk.

Contract Timing – All trees identified as potential high-risk by the inventory data should be removed immediately. A typical time frame for completion of a given list of tree removals usually specifies completion within ten business days of the receipt of the list. Specific time frames for completion of removals will be determined by explicit contract language. Trees that have been identified for removal but do not pose significant potential risk may be scheduled separately as time or budgets allow. Alternatively, lower priority removals may be grouped into a separate contract for dormant-season removal at alternative, off-season pricing.

Contract Length – Contracts may be let on an annual or multi-year basis. While annual contracts may be able to take advantage of short-term economies, multi-year contracts enable prospective bidders to take advantage of economies of scale, commit resources and manpower over longer periods, and schedule activities far in advance. As such, long-term contracts offer the potential of lower cost, increased efficiency, and allow beneficial relationships to develop over time by eliminating the need to regularly apprise new contractors of standard adherence and performance expectations. When developing multi-year contracts, the first year of the contract is awarded to the lowest responsible bidder, and subsequent year's awarded based on satisfactory completion of the previous year's work. In this manner, satisfactory contracts may be extended, while agreements with contractors who perform poorly are avoided. Typical contact length is three years – the initial year plus two renewal years. That time frame may be extended by mutual agreement between the City and the Contractor. Pricing for subsequent year's work will be in accordance with a specific, agreed upon Consumer Price Index(CPI). Increases in unit pricing for subsequent years will be capped at a maximum of 5%, regardless of the CPI increase. If the agreed upon CPI decreases, the previous year's unit prices will be applied to the extension year.

Contract Specifications - As specified elsewhere in this UFMP, all equipment to be used and all work to be performed shall be in full compliance with the most current revision of the *ANSI Z133.1-2012 Safety Requirements for Arboricultural Operations*, or as amended. Minimum numbers of trees to be removed, specific time frames, and overall completion dates will be quantified, and addressed by specific contract language.

Stump Removal

Many of the principles that apply to the development of tree pruning and removal contracts apply to stump removal and restoration contract formulation as well, again with the exception of timing. Stump removal and restoration should occur as close to the date of removal of the tree as possible.

Budget - As part of the inventory data collection process, existing parkway stumps have been identified and quantified. As trees are removed through completion of the Tree Removal Contract, inventory updates will produce a list of stumps to be removed and restored. At a minimum, sufficient funds should be allocated to accomplish the removal and restoration of existing stumps and those resulting from the first year's removal contract. The Contract will specify the removal all tree stumps and buttress roots to a point eight inches (8") below the adjacent ground level. and removal of all surface and sufficient subsurface roots as may be necessary to eliminate "humps" in the parkway adjacent to the stump. The area then shall be restored with topsoil to the level of the adjoining grade and seeded.

Contract Timing – Existing stumps should be removed as soon as possible, and those generated by the removal contract be ground and restored as the removal contract progresses. A typical timeframe for stump removal and restoration is within twenty (20) workdays of receipt of the stump removal list. Specific time frames for removal and restoration completion will be determined by explicit contract language.

Contract Length – Contracts may be let on an annual or multi-year basis. The stump removal and restoration contract may be let in conjunction with, or separate from, the removal contract. If a single contractor submits the low quote on both operations, that contractor may be awarded both contracts. While annual contracts may be able to take advantage of short-term economies, multi-year contracts enable prospective bidders to take advantage of economies of scale, commit resources and manpower over longer periods, and schedule activities far in advance. As such, long-term contracts offer the potential of lower cost, increased efficiency, and allow beneficial relationships to develop over time by eliminating the need to regularly apprise new contractors of standard adherence and performance expectations. When developing multi-year contracts, the first year of the contract is awarded to the lowest responsible bidder, and subsequent year's awarded based on satisfactory completion of the previous year's work. In this manner, satisfactory contracts may be extended, while agreements with contractors who perform poorly are avoided. Typical contact length is three years – the initial year plus two renewal years. That time frame may be extended by mutual agreement between the City and the Contractor. Pricing for subsequent year's work will be in accordance with a specific, agreed upon Consumer Price Index(CPI). Increases in unit pricing for subsequent years will be capped at a maximum of 5%, regardless of the CPI increase. If the agreed upon CPI decreases, the previous year's unit prices will be applied to the extension year.

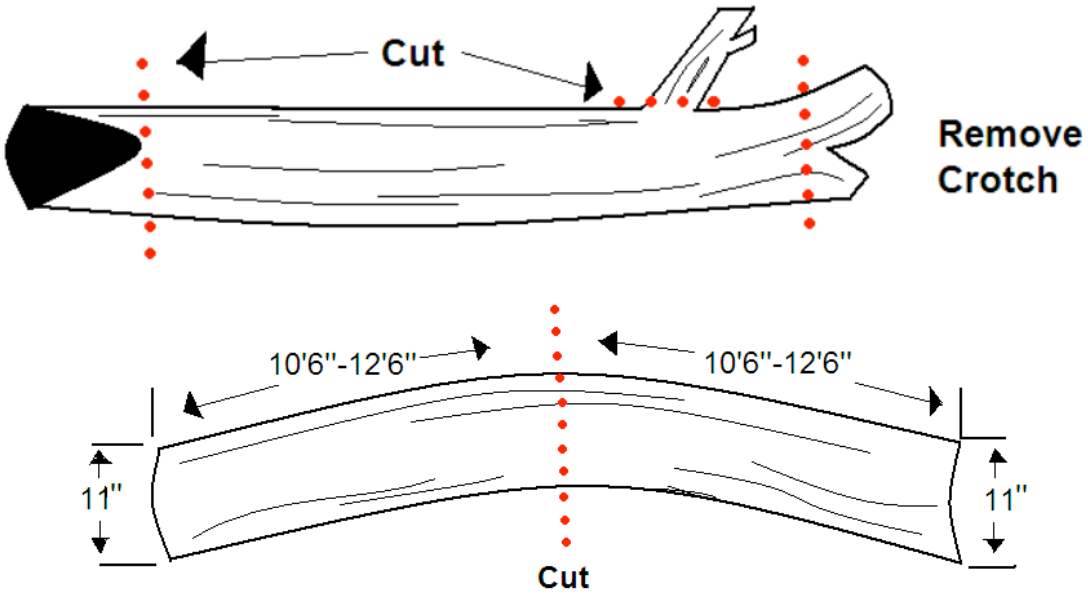
Contract Specifications - As specified elsewhere in this UFMP, all equipment to be used and all work to be performed shall be in full compliance with the most current revision of the *ANSI Z133.1-2012 Safety Requirements for Arboricultural Operations*, or as amended. Site appearance, disposal of grindings, backfilling, and seeding specifications will be addressed by specific contract language.

APPENDIX H: URBAN TIMBER SPECIFICATION

Log Removal Specification for Urban Timber Harvesting

This tree removal standard shall not take precedence over applicable industry safe work practices and shall be implemented by a qualified arborist, urban forest manager, and /or practitioner who, through related training or on-the-job experience, or both, are familiar with the standards, practices and hazards of recovering urban forest products and the equipment used in such operations. Additionally:

- Logs shall be felled to obtain minimum 8', 10', or 12' lengths with an additional 6" of trim on each log to a minimum diameter of 11" inside the bark. Maximum log length shall be 20'6".
-
- If a tree must be removed in sections, every effort should be made to retain the lowest log, at the longest possible length that can be safely felled.
-
- Branches should be trimmed flush with the bole/trunk, root flares should be trimmed flush with the bole/trunk, and the ends of the log should be square.
-
- Logs shall be flush cut with no crotches or splits. All obvious defects such as decay, large holes, and rot shall be removed.
-
- Logs with significant sweep shall be cut in order to eliminate as much sweep as possible while yielding the longest possible straight logs to ensure logs are flush for proper milling.



APPENDIX I: GENEVA NEWLY PLANTED CARE INSTRUCTIONS

CARE FOR NEWLY PLANTED TREES

1. **FERTILIZATION** at time of planting NOT RECOMMENDED. Wait 2 or 3 years before applying fertilizer and then it is recommended to get soil tested first.

2. **WATER** is probably the most important element in caring for new trees. RESIDENTS WILL BE RESPONSIBLE FOR WATERING. Newly planted trees may need to be watered regularly for 2-3 years until their roots systems become established. For the first few months of the growing season after a tree is planted, the tree draws most of its moisture from the root ball. To water a root ball fill the green "Gator Bag" once every 5 – 7 days. The city will remove the bag in the fall.

3. **PRUNING** after planting should be limited to removing dead, rubbing or broken branches only.

4. **MULCHING** 2-4 inches around the tree is okay, however, pull mulch away from the base of tree to create a donut-hole. Do not pile it up against the trunk ("Volcano Mulching"). Excessive mulch on the trunk causes moisture to build up, creating ideal conditions for insect pests, diseases, and decay.

5. See City of Geneva web site or call Public Works 630-232-1502 for questions and concerns.