Urban Forest Management Plan

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# Table of Contents

**Section 1:** Mission Statement and Goals ................................................................. 3-9
**Section 2:** Definitions .......................................................................................... 10-15
**Section 3:** Personnel and Equipment ................................................................. 16-20
**Section 4:** State of the Urban Forest ................................................................... 21-38

- Basic Statistics .......... 21-26
- Diversity Analysis .......... 26-33
- Tree Canopy Assessment .......... 33-38

**Section 5:** Future of the Urban Forest ................................................................. 38-45

**Section 6:** Tree Removal ................................................................................... 46-53

**Section 7:** Tree Planting ................................................................................... 53-61

**Section 8:** Tree Pruning ................................................................................... 61-66

**Section 9:** General Maintenance ...................................................................... 66-68

**Section 10:** Tree Preservation and Management During Construction ........ 68-72

**Section 11:** Tree Risk Assessment ................................................................... 72-75

**Section 12:** Strategic Partnerships ................................................................... 75-77

**Section 13:** Additional Goals .......................................................................... 78-81

**Section 14:** Projected Budget ........................................................................... 82

**Section 15:** Summary / Conclusion ................................................................... 83

**Appendix A:** Acceptable/Unacceptable Species List

**Appendix B:** Balled and Burlapped Planting Detail

**Appendix C:** Containerized Planting Detail

**Appendix D:** Tree Pruning Detail

**Appendix E:** Tree Protection Detail

**Appendix F:** ISA Tree Risk Assessment (TRAQ) Form

**Appendix G:** Contract Formulation

**Appendix H:** Urban Timber Harvesting

**Appendix I:** Plant Health Care
OVERVIEW OF CLPD’S URBAN FOREST MANAGEMENT PLAN

Crystal Lake Park District, in McHenry County, Illinois currently manages over 4,100 trees throughout its park system. Detailed tree data was collected for Crystal Lake Park District’s managed trees as part of a comprehensive tree inventory during 2016 and continues to be managed by in-house staff. Since the time of the initial inventory over 400 Ash and other poor condition trees have been removed from the park system and another nearly 250 have been planted. The inventory and tree maintenance efforts are culminating in this Urban Forest Management Plan. The plan will begin by detailing how Crystal Lake Park District’s urban forest resources will be managed in the short term for the benefit of its residents during the next 5 years. Additionally, the plan establishes a long term vision for the period ranging from 2020-2050.

In terms of the condition of the urban forest in the Crystal Lake Park District (CLPD), there are certainly many strengths, along with a few opportunities for improvement and updating. CLPD has a fairly average sized tree population for a park district of its size, providing many benefits, and there is evidence of a relatively high level of maintenance. The diversity of tree species in CLPD is fairly high overall, though species of Maple trees make up a significant percentage, as is the case in nearly every other tree population in the state of Illinois. This greater overall diversity of the urban forest resource puts it at a lower risk of future mass tree loss due to introduced insects and diseases.

To enhance the existing diversity as well as meet some of the challenges listed above, 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 2020-2050 period. Further detail is given in the body of the report, with separate sections detailing specific tree-related activities and how they should be achieved, along with standards and Best Management Practices for each.

A proposed forestry program has been created that will achieve the greatest benefit for the community, based on the available data, as well as input from the partner committees and residents of CLPD. However, all plans are subject to change based on new information, budgets, or other unforeseen circumstances. For this reason, readers should consider that this plan to be a living, breathing document, and goals and strategies will be updated to fit circumstances as needed. This plan will be reviewed periodically with input from staff, residents, and other stakeholders.

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 Crystal Lake Park District. This will be done to provide the following benefits, among others, to the residents of CLPD: Increase canopy cover, filter and reduce stormwater runoff, 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. This plan also seeks to outline both the short and long term management of this urban forest resource to maximize the environmental and aesthetic benefits of CLPD’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 CLPD, both now and in the future. A note about formatting: Throughout the document, concepts that are considered Key Points are indicated in **highlighted boxes**. These Key Points are central to the mission and goals of the plan. Items requiring action by the park district staff to achieve the goals are considered Action Items and are indicated in **bold typeface**.

**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 the goals shall be met. These goals are meant to be realistic and attainable, so that they do not place an undue burden on CLPD, its residents, or its resources. The goals of this UFMP are to save money and provide greater benefits over time through proactive management. 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 and managed. The goals of this document are subject to change based on the discovery of new knowledge, shifting budgets, or other circumstances.

The plan will be reviewed periodically by staff, residents and any other interested stakeholders acting in the best interests of the park district. The review process will include evaluation of progress made towards these goals. Goals may be altered after the review, as conditions warrant. 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.

**Goal 1: Inventory, Document, Analyze Existing Conditions**

**A. Document Tree Policies and Procedures**

Unlike municipalities that operate by codes and ordinances, a park district operates via policies and procedures. This UFMP will work with the City of Crystal Lake and the Village of Lakewood regulations for management of the urban forest. This will serve to provide guidance for all future park boards, forestry employees, and residents, so that a general level of understanding is reached that can be interpreted going forward.

**B. Create a Needs Analysis for the Current Tree Population**

Every tree population is the result of decades of past management decisions. As time goes on, the tree care industry increases its overall level of knowledge, skill, and efficiency in managing trees for maximum benefit. Based on that new knowledge, decisions made 20 or more years ago may appear in retrospect to have been incorrect, even though they might have seemed like a good idea at the time. For CLPD’s trees, it is the goal of this plan to assess the current state of CLPD’s Urban Forest and examine its overall strengths and benefits, as well as look for opportunities for improvement.

Each aspect of the CLPD tree inventory data has been analyzed: How many trees, their condition, their age, their needs, and more were all examined to create strategic goals to improve the tree population for the benefit. 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. The plan shall also attempt to leave room for adaptive management when given new information.

C. Maintain an Accurate Tree Inventory
Managing an urban forest requires a clear understanding of the existing trees, their ages, conditions, and locations, so that crews and contractors can perform maintenance work. With this concept in mind, a stem-by-stem tree inventory was completed in 2016. This inventory and subsequent consulting resulted in an unbiased assessment of all of the trees in the Crystal Lake Park District system and will serve as the data which will guide the forestry program throughout the next 30 years.

The tree inventory should be maintained at a high level of accuracy so that it does not become out of date. To accomplish this, CLPD 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. Additionally, a staff member handles arboricultural operations, including basic updates to the tree inventory. It is recommended that the inventory be updated periodically by a professional, non-volunteer forestry consultant, to keep the information at its most current. This will ensure that all trees are periodically assessed for DBH, risk, and maintenance needs in a manner consistent with professional standards. Maintaining tree data at a high level is vital in the execution of this management plan.

Goal 2: Increase Urban Tree Canopy from 27% to 30%

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 parks are more attractive to homebuyers looking for neighborhoods with parks and green space, which increases home values, home ownership, and tax revenue. Currently, the community has an impressive 26.55% tree canopy coverage overall (public and private land), compared to other land cover types such as grass, buildings, paved surfaces, and water.

Based on preliminary data from the Chicago Region Trees Initiative’s research, it is recommended that the Crystal Lake Park District, the City of Crystal Lake, and the Village of Lakewood cooperatively set a 30% urban tree canopy goal for 2050. A Memorandum of Understanding between the park district, city, and village should be developed to work jointly toward an increase in total urban canopy cover. Currently, the CLPD tree population alone provides over $262,500 in annual benefits to the community. This value will increase as the overall tree canopy increases and trees live longer.
The increase will be accomplished by increasing the number of trees, with an emphasis on native species, as well as improving tree care to allow trees to live longer, become larger, and create more canopy cover. Tree planting on private property will also be encouraged through educational information distributed to the public via the park district newsletter, website, and social media opportunities. For more information on Urban Tree Canopy, tree benefits, and other such information, turn to sections 4 and 5.

Goal 3: Increase Overall Diversity by 2050 Through Tree Planting

Tree species diversity is one of the most important concepts in Urban Forestry. The reason pests and diseases like Emerald Ash Borer (EAB) and Dutch Elm Disease were so devastating is that there were simply too many Ash and Elm trees. When EAB arrived, many communities had an Ash population of 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, only small amounts of specific tree species are lost. Great diversity leads to great stability, and stability leads to reduced costs and increased benefits over time.

An achievable “Diversity Vision” with an emphasis on native tree selection has been created for 2050 which ensures that the tree population will become more diverse over time. With an above average diversity of existing tree species, this will present a challenge, as enhancing diversity of an already diverse tree population can be a challenge. Creating a long term tree planting plan is an integral part of this process. Currently, several species are overplanted in CLPD and a primary focus of this plan is to reduce those numbers overall. For this long term planting 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 via targeted tree planting. Ideas such as establishing an in-house liner nursery, exploration of participating in the Suburban Tree Consortium buying program with the City and Village, and planting smaller stock will all be explored. To learn more about tree planting and reforestation, turn to Section 7.

Goal 4: Increase the Effectiveness of Current Tree Care Operations

Currently, the Crystal Lake Park District handles tree care operations with a combination of in-house staff and contractor labor. To more proactively manage tree care operations an assessment of in-house staff capabilities will be made with recommendations for increased manpower and equipment if warranted. Standards will be developed to determine in-house vs contractor labor and budgeting needs for the future. For more on projected needs of manpower and materials, and the budgets required to perform them, please turn to section 14.
A. Enhance the Annual Maintenance/Tree Care Program

Properly maintained trees establish faster, grow quicker, and live much longer lives than trees that are not maintained, or improperly maintained. Since large trees provide the greatest benefits to the community (as will be demonstrated later), maintenance is a critical part of the proposed Urban Forestry program. Annual maintenance for trees will include critical tasks such as cyclical pruning of all trees. Pruning and other maintenance will be accomplished with a combination of in-house staff and contracted labor, determined by the situation.

As CLPD begins to increase its budgets and capacity for tree pruning, a cyclical pruning program can be achieved. This program has been designed to ensure that all trees on park district property are pruned on a regular basis in order to maintain public safety and good aesthetics. Cycle prune programs are the hallmark of a sustainable Urban Forestry program for municipalities and street trees. Park districts should be no different, especially given the higher occupancy rates underneath trees. Street trees may occasionally have pedestrians, cars, or homes within the target zone, but parks specifically attract people to them where people are nearly always in the target zone during daylight hours. For more information on tree pruning and maintenance, turn to sections 8 and 9.

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 chances of survival. Mulch helps to conserve water during the summer months by limiting evaporation. It also helps prevent weeds from growing around the tree and competing for water and nutrients, and keeps lawn equipment such as mowers and weed whips away from the trunk where they can damage the tree. All new plantings will be properly mulched at the time of planting by the planting contractor. Staff will be educated about proper mulching techniques. 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.

B. Incorporate Best Management Practices in Tree Care Operations

"Best Management Practices" is a term that means being on the cutting edge of an industry. All contractors working for the park district 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. Full text of all referenced standards will be made available to all CLPD employees and contractors performing tree care operations. Public outreach and education will be performed by the park district 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.
C. Invasive Species Management
The district should seek to remove harmful invasive species from public land and encourage the removal of invasive species from private land. Ongoing monitoring of new invasive plants as well as pathogens shall guide the District in its decision making as new information becomes available.

D. Incorporate Natural Areas Stewardship into Tree Care Operations
As is often the case with park districts, CLPD manages 1,000 acres of natural areas including woodlands, wetlands, prairie, and open bodies of water. The management techniques of natural areas are unique and differ from the management of mowed and manicured park properties. This plan is meant to work in cooperation with the CLPD Natural Areas Management Plan, overlapping recommendations in some areas, and providing distinctly different recommendations in other areas.

E. Maintain an Acceptable / Unacceptable Species List
The urban environment is a difficult place for a tree to thrive but parks represent a better opportunity for urban trees vs the street tree environment. Parks generally do not suffer from the same lack of soil, road pollutants, and homeowner stress that affect street trees. This more tree-friendly environment provides the ability to plant tree species which are less urban tolerant with a higher degree of success. This makes increasing diversity a slightly easier task. That said, there are also trees that should be limited or eliminated. Trees with very weak wood or are known invasive species or produce messy or foul-smelling fruits or create a public nuisance should 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, which will detail specific trees which may be planted in CLPD parks. CLPD 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 this, see the Acceptable/Unacceptable Species list in Appendix A.

F. Tree Protection and Preservation
Trees can become damaged by construction activities, costing the park district money, and eliminating the benefit the tree had to the community. A tree protection zone must be established and maintained during construction and maintenance activities. See Appendix E for more details.

Goal 5. 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 effects on people or property. Trees need to be well-managed and healthy to avoid that risk. This is particularly pronounced in a park setting vs a street tree setting. A risk assessment policy has been created for CLPD as part of this plan. This policy will aid in identifying, documenting, and designating for removal or mitigation those 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.
Goal 6. Manage Tree Removals
For public safety or to prevent the spread of disease tree removal is an unavoidable part of Urban Forestry. The tree population of CLPD contains a large number of both Maple species as well as undesirable species (Cottonwood, Buckthorn, Black Cherry, etc). Many of these trees will begin to decline and require removal over the next 20 years or are undesirable due to being weak-wooded, aggressive, or invasive. To keep the park patrons safe, a tree removal program has been created in this plan which budgets for the safe removal of all underperforming or undesirable trees.

Cost projections for tree removals have been made based on the number, age, and condition of trees in CLPD for the next 30 years. Also included are ANSI and ISA safety standards, as well as suggested bid specifications to ensure the park district is hiring qualified contractors who will be held to the highest industry standards. For more information on CLPD's proposed tree removal program, turn to section 6.

Goal 7. Public Outreach and Education

A. Partnerships
The park district will seek partnerships in the community to provide support for this program and continue to communicate the goals of the program throughout the community. For more on these innovative programs turn to sections 12 and 13.

B. Communication
The park district will use social media outlets, its website, and other online platforms, as well as traditional print fliers, to inform the public about the urban forest of the Crystal Lake Park District. The public will be urged to participate in best management practices and tree planting goals to increase the size and diversity of the urban forest canopy.
Section 2 – Definitions

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

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

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

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

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

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

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

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

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

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

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

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

**Collected Plants:** Trees or shrubs which have been sourced from private property for the intent of transplanting elsewhere.
**Compacted Soil**: A high-density soil lacking structure and porosity, characterized by restricted water infiltration and percolation (drainage), and limited root penetration

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

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

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

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

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

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

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

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

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

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

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

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

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

**Diseased**: The status of a tree which has been negatively impacted by a pathogen, bacterial, fungal, viral, or similar lower life forms
Drip Line: The soil surface delineated by the branch spread of a single plant or group of plants

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

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

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

EAB: Emerald Ash Borer; an invasive beetle pest which affects all Ash trees

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

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

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

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

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

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

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

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

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

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

Hazard: A known and documented state of imperiling public safety
**Healthy Tree:** Any tree which is successfully adapting to its environment, and shows no signs of disease, pests, pathogens, or other such maladies, as determined by the park district

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

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

**In-House Staff:** Staff directly employed by Crystal Lake Park District, on either a full-time or Part-Time Basis

**Invasive:** A floral or faunal organism which is not native (endemic) to the United States or northeastern Illinois

**Job Site:** Any geographic location where a person or persons will be performing activities related to the care and maintenance of Crystal Lake Park District property

**J.U.L.I.E.:** The Illinois acronym for the underground utility locating service

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

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

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

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

**Mitigation:** The process of diminishing risk

**Monoculture:** A population of trees in close proximity to one another (a single park, here) which is comprised of 3 species or less of trees and shrubs which is prone to pest or pathogen outbreak

**Natural Resources:** Flora, fauna, and other such living and non-living parts of the environment which Crystal Lake Park District maintains

**Nursery Stock:** Woody Perennials which are of a “Tree Form” growth habit and are supplied by a nursery contractor for planting; not established trees

**Park District Property:** Land which, by deed or title, belongs to Crystal Lake Park District
**Parkway Tree:** Any woody plant within a publicly-owned right-of-way, or any other property owned or managed by a municipality

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

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

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

**Private Property:** Land which, by deed or title, does not belong to Crystal Lake Park District

**Public Safety:** The welfare and protection of the general public

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

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

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

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

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

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

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

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

**Shrub:** Any woody perennial which has a multi-stemmed growth habit not consistent with being considered a tree; can be subject to interpretation by park district Staff

**Sound Wood:** Structurally sound, non-decayed, non-compromised wood in the trunk or scaffold branches

**Staff:** Those employees retained by the park district on a full-time basis with benefits provided
Structural Root: Any portion of the below ground portions of the tree whose purpose is to stabilize the plant against the forces of wind and gravity

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

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

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

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

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

Undesirable: A tree which is not desired in the landscape due to ecological, aesthetic, or public safety reasons, as determined by the park district staff

Unmanaged: A tree or shrub which is in an area of the park district which is not routinely mowed and managed; a wild forest grown tree or shrub, or area containing such trees and shrubs

Urban Wood: Any tree or other woody perennial material which has been harvested for the sole purpose of long term storage in the form of furniture, recreational material, etc. Differentiated from “Reclaimed Wood” which is dimensional lumber reclaimed from a structure such as a barn

Utility Arborist: A person explicitly trained in the management of trees and other plants in relation to energized power lines; someone who is licensed to work with conflicts between trees and such energized power lines
Section 3 – Personnel and Equipment

Urban Forestry tasks will be assigned to the appropriate staff or outside contractor. Below is a description of personnel responsible for Urban Forestry operations.

**Board of Commissioners**
As the elected officials responsible for setting policy and approving the financial plan, the Park Board of Commissioners is the ultimate steward of the Urban Forestry Management Plan. The Board will rely on the expertise of staff as well as input from the public when establishing policies and budgets for tree care and maintenance.

**Park Services Grounds Supervisor**
The Park Services Ground Supervisor is responsible for implementing forestry programs with the cooperation of the various partner organizations as outlined in the Urban Forestry Management Plan. This position directs the work of in-house staff including the park district arborist. This position will seek bids from qualified tree care contractors to complete the work as outlined, as well as maintain the tree inventory when possible, and act as a representative for public concerns.

**Manager of Natural Resources**
The Manager of Natural Resources is responsible for implementing the Natural Areas Management Plan and coordinating with the Park Services Ground Supervisor. This position is responsible for contracted and in-house management activities and will act as a representative for public concerns.

**Director of Park Development and Interpretive Services**
The Director of Park Development and Interpretive Services coordinates the development of the Urban Forestry Management Plan and serves as the liaison between staff and board. The position is responsible for coordinating public outreach and communication.

**Tree Care Contractors**
Tree care contractors are responsible for performing work identified by staff and/or the forestry consultant in a timely, safe, and expeditious manner. The tree care contractor must have at least one International Society of Arboriculture Certified Arborist on site when work is being performed, 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 park district staff. The forestry consultant communicates the needs of the trees to the staff so that individual needs in terms of tree planting, removal, and maintenance can be performed. The forestry consultant may also function as the park district arborist when required.
Landscape Architect
The landscape architect is responsible for the design layout of new parks including trees. The landscape architect works with all the above positions during the master planning process and is responsible for ensuring that new plantings are specified and installed in a professional and industry approved manner. The landscape architect weighs all factors such as diversity, aesthetics, maintenance requirements and site conditions when specifying plant material.

Current Status of CLPD Forestry Crew Equipment and Production
CLPD has one full time Grounds Supervisor and two full time Grounds Crew Leaders. Each crew leader has a staff of 1-2 full time employees. The seasonal staff grows to 15 each summer. The year-round staff performs forestry related work approximately 25% of the year. The remaining 75% is spent on grounds maintenance, restoration ecology, mowing, and other general grounds maintenance duties. The Forestry crew is equipped with 1 Chipper, 1 Stump Grinder attachment for a skid steer, 2 walk behind brush mowers, 1 tractor mounted brush mower, 1 dump truck chip box and 3 additional dump trucks without boxes, 2 powered pole pruners, 3 polesaws, and 12 chainsaws. A review of the past years budget indicates the following:

<table>
<thead>
<tr>
<th></th>
<th>CLPD Trimmed</th>
<th>Contractor Trimmed</th>
<th>CLPD Removed</th>
<th>Contractor Removed</th>
<th>CLPD Planted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 Budget</td>
<td>$4,000.00</td>
<td>$8,000.00</td>
<td>$5,200.00</td>
<td>$84,000.00</td>
<td>$10,400.00</td>
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<tr>
<td>Avg / Tree</td>
<td>$14.55</td>
<td>$114.29</td>
<td>$104.00</td>
<td>$1,200.00</td>
<td>$173.33</td>
</tr>
</tbody>
</table>

Objectives for Improvements to Capacity
The current capacity is very good overall for a rather small crew. That said, due to the nature of being a park district, the year to year production can vary quite a bit. Therefore, one of the first objectives will be to set specific guidelines as to how many trees are expected to be pruned, removed, planted, etc so that there is at least a minimum threshold. In addition, minimizing the contracted work and increasing staff capacity would be positive as well. With slight increases in manpower and equipment, CLPD could be more proactive and cost-effective at maintenance. The general goal of CLPD is to have a relatively even split between work contracted and in house work. The policy for current employees is to not prune any tree that is over 25 feet tall. Trees above this size are currently contracted out, and we expect this to continue in the future. Trees of any size can be removed by in-house staff, so long as the tree can be cleanly dropped without interference.

Pruning
With a tree population of approximately 4,161 trees, approximately 350 trees are getting trimmed each year between in house and contracted staff. This figure varies greatly and is the equivalent of a 12-year pruning cycle, which is far greater than should be expected for cycle pruning. CLPD already has a pruning program, which is based primarily on the needs of the trees in most dire need of maintenance. It would be beneficial to make this program more consistent and comprehensive, so that all trees, regardless of condition, are pruned on a 7 year cycle.
The best way to accomplish this is by a hybrid approach. Trees which are in the most need of pruning will get pruned each year, as determined through an up to date tree inventory. In addition, the park system should be broken down by tree population, based on the inventory, into 7 zones or regions, as spelled out in the appendices, and each region should be pruned each year regardless of tree condition. This hybrid approach will ensure that the tree population is maintained in a way that maximizes public safety and respects arboricultural best management practices.

Increasing staff capacity and equipment capabilities will ensure that such a program is possible. At current, with existing staff and equipment, CLPD staff believe they are capable of pruning approximately 400 trees per year, which would represent a 10-year pruning cycle. While this is a significant improvement, in order to get to the 7-year cycle, increases in manpower and equipment will be necessary. This has been factored into the budget calculations below as long-term goals.

Removal
The data above shows that approximately 120 trees are being removed annually, with approximately 60% removed in house and 40% contracted. This number has been vastly skewed over the past several years due to removal of Ash trees resulting from Emerald Ash Borer, as well as the smaller Crab Apples and Serviceberries which have reached their end of life. As time goes on removals should decrease significantly. Trees to be removed in the short term will be mostly overgrown and underperforming Maples, as well as Pine and Spruce trees which have been falling victim to a changing climate and increases in insect and fungal disease issues. Long term removals will mostly be associated with natural aging, storms, and future pest and pathogen issues.

Planting
As of this writing, CLPD plants approximately 60 trees and large shrubs per year. There has also been a program facilitated by the Land Conservancy of McHenry County called Project Quercus in which local school districts work with park district natural resources staff to plant a variety of oak seedlings. Over the past 10 years the program has resulted in nearly 1000 seedling trees planted in district properties. That said, it would be ideal to see the number of trees and large shrubs planted per year go to approximately 175 over the next 30 years. This should maintain a good pace with the levels of removals that are suggested throughout the remainder of this plan. The district is considering starting a liner nursery in-house, which should help tremendously with maintaining both diversity standards as well as plant availability.

As with the items mentioned above, it should be noted that this a small leap to make for a currently successful planting program. Particularly if the in-house liner nursery is started, and the district maintains relationships with partner organizations who can assist in both donating and planting trees in the parks.
Once again, Living Lands and Waters, as well as the Open Lands Tree Keepers programs would both be welcome partners in this endeavor. We also believe a long term tree planting plan should be considered for the district which assesses planting sites and uses this data to select proper trees for the sites in question. This will ensure the best chances of establishment and long-term survival for the trees in question, as they will not be fighting against the site they are planted in and are well suited to their conditions.

Goals 2 and 3 of this management plan set objectives for increasing the number and diversity of trees in the Crystal Lake Park District. It should also be noted here that another project recommended as part of this Management Plan is to do a Comprehensive Reforestation Plan. A Comprehensive Reforestation Plan should be developed. This planting program will bring the total number of trees in CLPD to around a population of 6,100 trees which turns over almost completely every 75 years or so.

**In House Vs Contracted Labor**
As shown in the above table, contracted rates are significantly higher for pruning and removal than in-house rates. As mentioned, CLPD currently splits workload evenly between in-house and contracted labor. However, there are two distinct advantages to performing the work using in-house staff. The first is that CLPD will have direct control over the quality of the work performed and can ensure it is always done according to specifications. This quality control issue is of utmost importance to managing the trees and land. The second is that market rates for contracted work are currently at an all-time low due to the tree pruning and removal market being saturated from the impact of Emerald Ash Borer. Rates had dropped over 200% during the EAB era, and they are slowly back on the rise.
## Objectives and Goals

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestone</th>
<th>Administrative</th>
<th>Pruning</th>
<th>Removals</th>
<th>Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025</td>
<td>Milestone 1</td>
<td>Hire additional forestry staff, either part time or full time</td>
<td>Increase trim capacity to 600 trees/year by using forestry interns</td>
<td>Increase removals to 120 per year.</td>
<td>Change nursery stock standard to 1.75&quot; and begin training crew on proper planting and care practice</td>
</tr>
<tr>
<td>2030</td>
<td>Milestone 2</td>
<td>Train full time staff member to work 25% in forestry alongside forester and seasonal staff</td>
<td>Maintain trim capacity at 600 trees/year using in-house and contract labor</td>
<td>Maintain 100 removals per year</td>
<td>Plant 160 1.75&quot; trees/year using 75% in house labor</td>
</tr>
<tr>
<td>2035</td>
<td>Milestone 3</td>
<td>Increase full time staff member’s % of time worked in forestry</td>
<td>Maintain trim capacity at 600 trees/year using in-house and contract labor</td>
<td>Maintain 100 removals per year</td>
<td>Plant 175 1.75&quot; trees/year with using 80% in house labor</td>
</tr>
<tr>
<td>2040</td>
<td>Milestone 4</td>
<td>Increase capacity via increased staff time and additional equipment purchase</td>
<td>Maintain trim capacity at 600 trees/year using in-house and contract labor</td>
<td>Maintain 100 removals per year</td>
<td>Plant 185 1.75&quot; trees/year with using 85% in house labor</td>
</tr>
<tr>
<td>2045</td>
<td>Milestone 5</td>
<td>Increase capacity via increased staff time and additional equipment purchase</td>
<td>Maintain trim capacity at 600 trees/year using in-house and contract labor</td>
<td>Maintain 100 removals per year</td>
<td>Plant 185 1.75&quot; trees/year with using 90% in house labor</td>
</tr>
<tr>
<td>2050</td>
<td>Final Goals</td>
<td>Goal: Maintain 2 full time forestry staff, 1 part time forestry person, and seasonal staff</td>
<td>Goal: Maintain 600 tree/year pruning capacity using in-house and contract labor</td>
<td>Goal: Maintain capacity to remove 100 trees per year.</td>
<td>Goal: Maintain the ability to plant and care for 185 1.75&quot; trees per year using 95% in house labor</td>
</tr>
</tbody>
</table>

### Administraive Goals
- Hire additional forestry staff, either part time or full time
- Train full time staff member to work 25% in forestry alongside forester and seasonal staff
- Increase full time staff member’s % of time worked in forestry
- Increase capacity via increased staff time and additional equipment purchase

### Pruning Goals
- Increase trim capacity to 600 trees/year by using forestry interns
- Maintain trim capacity at 600 trees/year using in-house and contract labor
- Increase trim capacity to 600 trees/year by using in-house and contract labor
- Maintain trim capacity at 600 trees/year using in-house and contract labor
- Maintain trim capacity at 600 trees/year using in-house and contract labor

### Removals Goals
- Increase removals to 120 per year.
- Maintain 100 removals per year
- Maintain 100 removals per year
- Maintain 100 removals per year
- Maintain 100 removals per year

### Planting Goals
- Change nursery stock standard to 1.75" and begin training crew on proper planting and care practice
- Plant 160 1.75" trees/year using 75% in house labor
- Plant 175 1.75" trees/year with using 80% in house labor
- Plant 185 1.75" trees/year with using 85% in house labor
- Plant 185 1.75" trees/year with using 90% in house labor
Section 4 – State of the Urban Forest

According to the 2016 Tree Inventory, the population stands at more than 4,000 established trees. Average tree condition is “3-average” and some 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. This is examined in greater detail below and a specific plan is provided to change the species composition over time.

Basic Statistics – Managed Trees

| Total Number of Managed Trees | 4,161 |
| Total Number of Species      | 98    |
| Total Diameter Inches       | 45,374" |
| Average Tree Diameter      | 10.90" |
| Average Tree Condition     | 3.02 (Average) |
| Average Mature (8" and up) Tree Condition | 2.99 (Average) |

Condition Curve

During the tree inventory, each tree was rated 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 nontreathening 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 of 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. The green line represents what was observed in the field, and the grey line represents a "normal" or average expected tree population.

The number of “specimen" trees is less than predicted by statistics, but this is not surprising. As noted above, specimen trees must be 16” DBH or greater and in perfect form with no defects to be considered for this status, and as such are fairly rare. The "above average" tree count is slightly below average, but the reason for this is simple. Trees must be 8” DBH or larger to be eligible for “above average status” and a significant portion of CLPD’s trees are smaller than this threshold, leading to fewer trees in above average condition. As these trees age and are appropriately cared for, they can move into the higher condition categories.

The number of “average" condition trees is significantly higher than predicted. Given the younger tree population, this is expected due to the criteria for the higher tree ratings. As these trees age and are properly cared for it is common for some to move into the higher condition rating categories.

The number of “below average" trees is significantly below what the bell curve would predict which indicates a high level of care. Since the 2016 inventory CLPD staff have been diligently removing not only poor condition Ash trees, but also other trees which were identified as being in poor condition during the inventory. This illustrates the importance of an updated tree inventory and assessment.

The number of “very poor" condition trees is higher than expected by a significant amount, however 65 of these 74 trees are located in Lippold Park bordering a natural area, and are not in manicured areas of the park. This reduces the number of trees in the “very poor" category to only 5 in the main park areas, which creates a significant difference. It is recommended that the “very poor" trees be addressed with in house labor first, and then moving on to contract the larger and more hazardous removals.
Going forward, CLPD 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 will aid in achieving this goal. In the future, as the tree inventory data is updated, the average condition rating of 2.99 can serve as a metric by which CLPD 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, corresponding to an increase in overall tree condition.

**Age Class Analysis**

In terms of the ages of trees in CLPD, the tree population is divided into eight “classes” of 6” diameter increments. This illustrates the number of trees in each age class. Since trees are measured by diameter at breast height (DBH), this breakdown can help show where trees are in their life cycles. Some trees like Cottonwood and Silver Maple grow in diameter quite 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.

The Crystal Lake Park District has a much younger age class distribution than a typical park district. Crystal Lake is a younger community than many with serious expansion beginning after 1960 (see population chart at right). The geographical boundaries have expanded, and the park district has annexed more land during that time. The oldest trees from some of those original parks from 1960 or so may only be about 30” DBH right now.
The vast majority of CLPD’s trees have been planted during the expansion era of the 1980’s until present, and therefore are significantly younger. It is important to note that although this predominantly younger population is providing fewer ecological benefits currently, as the population matures and continues to be well cared for, the benefits it provides will increase dramatically.

Additionally, many of the larger Elm and Ash trees which were among the earlier planted trees are likely now gone, resulting in a vacuum of larger trees. It has very little to do with level of care. A significant increase in the tree planting budget is recommended so that CLPD can not only continue to replace trees as fast as they are lost, but also to achieve Goals 2 and 3 of the UFMP. As shown in a series of maps of several parks in the appendices there is ample opportunity for planting of new trees in many areas and which is why CLPD can easily increase its overall tree population by nearly 50%. This CLPD population increase will be an integral part of Goal 2 of this UFMP which aims to increase the total urban forest canopy in the Crystal Lake/Lakewood area (on both public and private land) from 27% to 30%.

This situation presents management opportunities. An increased number of trees in the older age classes will benefit the community because larger trees provide greater benefits including shade, air quality improvements, and storm water absorption. With proper care of the large number of trees in the younger age classes, CLPD can expect an increase of trees in the 25" DBH and greater ranges within the lifetime of this UFMP. This is illustrated in a projected DBH range table above.

Trees in the 13-25" age range can often be the most difficult to provide better care for to allow them a longer life. By this stage, they are either well established and bound for a long life or already in decline. Trees in the younger classes respond much better to pruning, soil amendments and chemical treatments which can aid in a longer life.

As older trees die and new trees are planted, it will take many years for the new plantings to equal the impact of the larger age classes. As will be discussed below, many new trees need to be planted which requires manpower and financial resources. The Tree Planting recommendations of the UFMP will account for a large share of the overall tree care budget for years to come.
Maintenance Needs Status

During the 2016 inventory, field staff recorded a basic maintenance status for each tree which broadly outlines what work needs to be performed in the coming years. These generalizations supply enough data to begin creating work orders. During the inventory, 3,354 trees (81%) were identified as “cyclical prune” meaning these trees have no immediate maintenance needs, but need to be pruned on the park district’s TBD pruning cycle as detailed below.

430 trees (10.4%) fell into the “monitor” category meaning 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 but not yet requiring removal, or trees with inconclusive symptoms of Dutch Elm Disease are examples. These trees do not need to be physically monitored constantly, but just checked on periodically. Essentially, they were trees that did not rightfully belong in any other category.

There were 189 (4.6%) trees listed as “priority prune”. These trees either had excessive deadwood, were overgrown, or required more immediate pruning, typically defined as within 1-3 years. There were also 3 trees listed as “hazard prune”, and CLPD has already pruned these trees. In the Pruning section below, trees have been prioritized for pruning.

The trees in the “remove” category were those beyond retaining, but do not pose a high risk. These trees should be removed within 1-5 years. Additionally, there were 9 “hazard remove” trees. Most of these trees have been removed already but have not been updated in the inventory.

There were no trees listed as needing a formal risk assessment at the time of the original inventory. Risk assessment will be addressed later in greater detail.
Finally, the 52 trees in the “priority maintenance” category are those which require cabling or bracing, chemical treatment, or other non-pruning or removal-related care. A large number of trees were identified during the inventory that were planted within the past 5 years and still had staking materials attached to them. These materials should be removed as soon as possible, as they were beginning to girdle the tree.

In summary, there are many trees in the cyclical prune category, and a low number in the hazard remove and risk assessment categories. This indicates that a majority of park district trees are in good to fair condition and will not require immediate budget allocation. Also encouraging is the relatively low number of trees in the removal and priority prune categories. These trees will require budget allocation in the short term. Cost projections and procedures are provided below so that CLPD can start the process of budgeting for care and maintenance as soon as possible.

**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, the more similar things become. A graphic illustration of this is given here.

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 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 variety of trees are planted.
A “20-10-5” rule for CLPD’s future tree plantings is recommended, meaning that no more than 20% of any one family, 10% of any one genus, and 5% of any one species shall be planted during any one planting cycle. It is a long-term goal of the forestry program to also have the tree population as a whole in compliance with the 20-10-5 rule. This level of taxonomic diversity is consistent with 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. Although this obtained a symmetrical and uniform appearance, urban foresters have now learned that once a pest or pathogen is introduced into a monoculture planting, 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: taxonomic, spatial age class. These are examined in detail below.

**Diversity of Current Tree Population**

The current breakdown of the CLPD tree population, including species, average condition rating, average size (DBH), average height and spread (in feet) is supplied below:

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>COUNT</th>
<th>% OF TOTAL</th>
<th>AVG DBH</th>
<th>AVG HEIGHT</th>
<th>AVG SPREAD</th>
<th>AVG COND</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALDER-SPP</td>
<td>13</td>
<td>0.31%</td>
<td>13.54</td>
<td>27.69</td>
<td>16.92</td>
<td>3.00</td>
</tr>
<tr>
<td>AMERICAN HORNBEAM</td>
<td>31</td>
<td>0.75%</td>
<td>4.16</td>
<td>11.13</td>
<td>9.03</td>
<td>3.03</td>
</tr>
<tr>
<td>AMERICAN REDBUD</td>
<td>43</td>
<td>1.03%</td>
<td>3.87</td>
<td>8.95</td>
<td>7.79</td>
<td>3.09</td>
</tr>
<tr>
<td>APPLE-CRAB SPP</td>
<td>306</td>
<td>7.35%</td>
<td>8.21</td>
<td>13.37</td>
<td>14.23</td>
<td>3.00</td>
</tr>
<tr>
<td>APPLE-EDIBLE</td>
<td>14</td>
<td>0.34%</td>
<td>7.21</td>
<td>11.07</td>
<td>11.43</td>
<td>3.14</td>
</tr>
<tr>
<td>ARBOR VITAE</td>
<td>46</td>
<td>1.11%</td>
<td>5.61</td>
<td>9.88</td>
<td>6.55</td>
<td>3.07</td>
</tr>
<tr>
<td>ASH-GREEN</td>
<td>76</td>
<td>1.83%</td>
<td>10.21</td>
<td>34.61</td>
<td>25.99</td>
<td>4.57</td>
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<tr>
<td>ASH-WHITE</td>
<td>42</td>
<td>1.01%</td>
<td>11.33</td>
<td>30.95</td>
<td>22.98</td>
<td>3.10</td>
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<tr>
<td>BALDCYPRESS</td>
<td>8</td>
<td>0.19%</td>
<td>5.13</td>
<td>13.13</td>
<td>8.13</td>
<td>2.88</td>
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<tr>
<td>BEECH-AMERICAN</td>
<td>2</td>
<td>0.05%</td>
<td>1.00</td>
<td>7.50</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>BIRCH-RIVER</td>
<td>54</td>
<td>1.30%</td>
<td>15.44</td>
<td>27.22</td>
<td>22.31</td>
<td>2.76</td>
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<tr>
<td>BIRCH-SPP</td>
<td>3</td>
<td>0.07%</td>
<td>3.67</td>
<td>13.33</td>
<td>10.00</td>
<td>3.00</td>
</tr>
<tr>
<td>BIRCH-WHITE</td>
<td>16</td>
<td>0.38%</td>
<td>10.69</td>
<td>23.75</td>
<td>18.44</td>
<td>3.13</td>
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<tr>
<td>BLACK LOCUST</td>
<td>1</td>
<td>0.02%</td>
<td>24.00</td>
<td>40.00</td>
<td>30.00</td>
<td>4.00</td>
</tr>
<tr>
<td>BOXELDER</td>
<td>53</td>
<td>1.27%</td>
<td>16.23</td>
<td>31.15</td>
<td>22.60</td>
<td>3.32</td>
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<tr>
<td>BUCKEYE-OHIO</td>
<td>10</td>
<td>0.24%</td>
<td>4.40</td>
<td>13.50</td>
<td>10.50</td>
<td>3.30</td>
</tr>
<tr>
<td>BUCKEYE-YELLOW</td>
<td>2</td>
<td>0.05%</td>
<td>5.00</td>
<td>15.00</td>
<td>10.00</td>
<td>3.00</td>
</tr>
<tr>
<td>BUCKTHORN</td>
<td>1</td>
<td>0.02%</td>
<td>12.00</td>
<td>10.00</td>
<td>15.00</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>------</td>
<td></td>
</tr>
<tr>
<td>CATALPA</td>
<td>5</td>
<td>0.12%</td>
<td>15.20</td>
<td>32.00</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>CHERRY-BLACK</td>
<td>63</td>
<td>1.51%</td>
<td>16.46</td>
<td>35.00</td>
<td>25.16</td>
<td></td>
</tr>
<tr>
<td>CHERRY-SPP</td>
<td>4</td>
<td>0.10%</td>
<td>5.25</td>
<td>13.75</td>
<td>10.00</td>
<td></td>
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<tr>
<td>COTTONWOOD</td>
<td>41</td>
<td>0.99%</td>
<td>26.88</td>
<td>59.27</td>
<td>36.95</td>
<td></td>
</tr>
<tr>
<td>DOGWOOD-CORNELIAN</td>
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<tr>
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<td>45</td>
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<td>ELM-SIBERIAN</td>
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<td>14.61</td>
<td>43.24</td>
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<tr>
<td>OAK-SHINGLE</td>
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<td>10.00</td>
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<tr>
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<tr>
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As previously noted, the CLPD tree population consists of 98 distinct tree species in managed areas with a total of 4,161 trees. The above table shows a breakdown of species, average condition, trunk diameter and height. Trees with a condition rating of less than 3 and with a relatively large DBH and/or height and spread, are considered to be performing well. This population is shown graphically below:
**Taxonomic (Species) Diversity**

As shown in the bar chart above, the CLPD tree population is fairly diverse. The chart shows all tree genera with over 1% of the population. There are also many unexpected species in the breakdown table which are illustrated as the “remaining 40 spp” bar on the far right of the bar chart. The existence of 98 different species is commendable, meaning that the Crystal Lake Park District is only 2 species away from being able to apply for Level 2 Arboretum status through the ArbNet Program. That said, there are a few key issues towards the left hand side of the chart which need addressing.

Maples, which are universally overplanted in the Midwest, make up for 16.25% of the overall tree population, which is far above the 10% Genus threshold. One of the goals of the UFMP’s Diversity Vision is to begin targeting older and poor condition Maples for removal now that EAB has ebbed. Going forward, as the overmature and underperforming Maples are removed, CLPD may opt to select species such as Paperbark Maple, Miyabei Maple, Three Flowered Maple, and other less common species or cultivars, to be planted in limited numbers.

Pines and Spruces are also overplanted in the Crystal Lake Park District. These two evergreen genera account for 24% of the total tree population. This is not uncommon for park districts, where evergreen trees are often used as screening. Some of the older, diseased, and underperforming Pine and Spruce trees should be removed and replaced with Douglas Fir, Concolor Fir, Eastern Redcedar, and other conifers. Pine and Spruce in particular are prone to many foliar fungal diseases in our area, particularly in the cool, wet springs. It is recommended that CLPD review these Pine and Spruce trees and begin a program to remove, treat, and ultimately diversify the evergreen population. This will be discussed more below.

Although Oaks are overrepresented, this is not cause for concern. 60% of the Oak population is in only four parks, and most of them are in large, mature stands in or near natural areas. Planting of additional Oaks in all parks is still encouraged, with emphasis on diversification beyond Bur, Red, and White Oaks with less common species such as Chinquapin Oak, Shingle Oak, and Black Oak. Because Oak is on a general population decline in Illinois and the Midwest, continued planting of Oaks is an integral part of the UFMP’s Diversity Vision. That said, a slight decrease in Oak plantings in the short term is recommended going forward, particularly in parks where their numbers are already high.

The number of Crab Apples is also high, which is a common occurrence in public parks. Small ornamental trees are attractive and flowery and provide park patrons with enjoyment. However, Crab Apples are very prone to apple scab, a fungal pathogen which can entirely defoliate these trees by July each year. A wide variety of trees is recommended to begin replacing these Crab Apples, including Tree Lilac, Dogwood, Tree Form Hydrangea, Red Buckeye, Magnolias, and Smoketree.
Finally, there are a large number of undesirable species in the parks (Boxelder, Buckthorn, Black Cherry, Siberian Elm, Cottonwood, Mulberry, Willow, etc). These trees are undesirable because they are ecologically threatening, have extremely weak wood or poor architecture, have very messy fruits, or are otherwise undesirable in our urban forest. While these trees do provide benefits, they generally present more of a liability than they do a benefit. Siberian Elm and Cottonwood can grow to be 80 feet tall, with extremely weak wood that is prone to failure and can cause public safety concerns. Species such as Black Cherry and Mulberry may be native trees, but they are very aggressive, produce messy fruits, and have very poor architecture making them unsightly and potentially hazardous. Undesirable species should be a focus for future removal and replacement efforts, as detailed further below.

In contrast to these fairly common problem areas, there are significant numbers of Birch, Hawthorn, Serviceberry, Hackberry, Hybrid Elm, and Redbud, which is a positive trait of a robust park district tree population. These trees are excellent choices for public parks and are within diversity thresholds. Although not specifically illustrated in the bar chart above due to their lower numbers, the “remaining 40 spp” are an excellent starting point for selecting future species to plant in order to achieve even greater diversity.

Species recommended for new plantings will be discussed further below. Examples such as Yellowwood, Hickory, Blackgum, Sweetgum, Concolor Fir, London Planetree, Eastern Redcedar, Ironwood, Catalpa, and Ginkgo are all very desirable choices. These trees number less than 30 in the total population, and can be planted without fear of surpassing diversity standards.

In summary, the overall species diversity in the Crystal Lake Park District is strong. As discussed above, the genera and species that exceed the “20-10-5 Rule” limit are quite common in park district populations. As will be examined in the UFMP’s Diversity Vision, opportunities exist for reducing the overall number of Maples, Pines, Spruces, Crab Apples, and undesirable species, while planting more native species and underrepresented species, and therefore increasing the urban tree canopy. This detailed plan is included later in this report.

Spatial Diversity

Spatial diversity is the concept of mixing tree species evenly 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), has a limited area in which it can spread. The more difficult it is to get to the next host tree, the less of a problem the pest or pathogen becomes.

In addition to the functional benefits provided by increasing spatial diversity, communities and neighborhoods that have implemented diverse planting have demonstrated that such diversity yields an arboretum-like landscape that is both functional and aesthetically pleasing. A long-term tree planting plan based on this UFMP would be a valuable tool to 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 (monocultures) will be avoided.
Age-Class Diversity

Age-class diversity is important for a healthy urban forest. A mixture of tree species, locations, and ages lead to the greatest diversity, which insulates the urban forest against pest and pathogen outbreaks. The current approach in forestry is to strategically plant trees in parks over a longer timeframe. With this strategy, trees will grow to maturity in different stages and decline at different times. When declining mature trees are removed, semi-mature and young trees will continue to grow and move into higher age classes, and very young trees will be planted, therefore there will always be a variety of age classes in a park. This reduces the pressure to reforest a particular area immediately after removals occur, helping to manage costs and maintain budget cycles. A mixed age-class stand planting will also help to ensure that mature trees are always present in a park.

Some trees have a longer lifespan than others. Crab Apples, Serviceberries, and Tree Lilacs (most of the smaller ornamentals) are examples of short lived trees. Oaks and Hickories with lifespans of 100 years or more should be planted to balance the shorter lived trees. A long term planting strategy has been developed to accommodate the planting of shorter and longer lived trees.

A benefit of mixed-age plantings is the ability to plant shade-loving trees as well as sun-loving trees. When a park 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. With mixed-age stands, shade-tolerant, medium height trees may be planted underneath the canopy of larger, mature trees. This calculated approach should be utilized for future tree removal and replacement, and will help to create a more “staggered” urban forest; one that has mature trees, middle aged trees, and young trees in similar quantities.

iTree Report / Urban Tree Canopy Assessment
Total Standing Value of Crystal Lake Park District Trees (Per 9th Guide to Plant Appraisal)

$3,958,602

iTree Eco Analysis Results

- Number of trees: 4,116
- Tree Cover: 36.1 acres
- Most common species of trees: Bur oak, apple spp, Silver maple
- Percentage of trees less than 6" (15.2 cm) diameter: 33.2%
- Pollution Removal: 2065 pounds/year ($6.5 thousand/year)
- Carbon Storage: 1.719 thousand tons ($293 thousand)
- Carbon Sequestration: 27.66 tons ($4.72 thousand/year)
- Oxygen Production: 73.76 tons/year
- Avoided Runoff: 87.74 thousand cubic feet/year ($5.87 thousand/year)
- Building energy savings: N/A – data not collected
- Avoided carbon emissions: N/A – data not collected
- Structural values: $4.99 million

Summary of iTree Streets and Eco Values:

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**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 residents 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 and the absorption of urban pollutants. Trees also absorb water, which reduces demand on stormwater infrastructure, and saves money in replacement costs or drains and stormwater 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 for CLPD. The table above summarizes the net annual benefits of the tree population. These are also included in long form in Appendix. Park districts differ from a municipality since trees in parks do not directly benefit homes in the same way as street trees. For this reason, an iTree Eco report is also included which takes into account these variables.

As shown above, the tree population in CLPD currently provides its residents with approximately $262,499 in benefits per year. These benefits can be viewed as free income to the CLPD’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, their benefits also grow. For example, a 3” diameter tree provides less than $50/year in benefits, whereas a 20” tree can provide up to $500 per year. The CLPD tree population provides enough benefits to entirely offset its annual costs associated with tree care.

The replacement value of trees was also calculated. Currently, the standing value of all trees in the CLPD population is $3,958,602. 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. A goal of this Urban Forestry Management Plan is to create a tree population which maximizes all of these ecological services to the community by increasing the number of trees in the parks, 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 the appendices.

**Urban Tree Canopy Assessment**

Based on data from the University of Vermont, US Forest Service Northeast Research Station and Morton Arboretum, the Urban Tree Canopy of the CLPD geographical area can be calculated. This is expressed as the percent of the geographical area covered by tree canopy from an aerial assessment (2 dimensions). This assessment included six additional land cover types, including grass and shrub, bare soil, water, buildings, roads and railroads, and other miscellaneous paved surfaces. Since the 2016 inventory only recorded trees located on CLPD property, aerial images were used to estimate tree cover on all private property and other public lands. The result of this tree canopy assessment is that the Crystal Lake Park District geographical area contains 26.55% total tree canopy. The map of the canopy assessment appears at the end of this section.
Goal 2 of the Urban Forest Management Plan is to increase the total tree canopy in the Crystal Lake Park District geographical area to 30% by 2050, working in partnership with municipalities within the park district boundaries, the public, and other stakeholders. This goal was established by analyzing data from a variety of 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. This is an attainable goal and can 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 continuing to maintain the existing tree population in a proactive fashion. 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 educational campaigns and outreach through social media and events such as Arbor Day and Earth Day celebrations. The urban tree canopy will continue being monitored using aerial imagery analysis.

<table>
<thead>
<tr>
<th>Land Cover Type</th>
<th>Percent Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass/Shrub</td>
<td>40.81%</td>
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<tr>
<td>Tree Canopy</td>
<td>26.55%</td>
</tr>
<tr>
<td>Other Paved</td>
<td>12.38%</td>
</tr>
<tr>
<td>Buildings</td>
<td>8.50%</td>
</tr>
<tr>
<td>Open Water</td>
<td>5.66%</td>
</tr>
<tr>
<td>Roads/Rails</td>
<td>4.73%</td>
</tr>
<tr>
<td>Bare Soil</td>
<td>1.37%</td>
</tr>
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</table>
Current Budget Table

Below is the current forestry budget for major activities in CLPD forestry. This table serves as the basis for the financial analysis in all future sections the Urban Forest Management Plan.

<table>
<thead>
<tr>
<th></th>
<th>CLPD Trimmed</th>
<th>Contractor Trimmed</th>
<th>CLPD Removed</th>
<th>Contractor Removed</th>
<th>CLPD Planted</th>
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</thead>
<tbody>
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<td>2019</td>
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<td>70</td>
<td>50</td>
<td>70</td>
<td>60</td>
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<td>$5,200.00</td>
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<tr>
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<td>$114.29</td>
<td>$104.00</td>
<td>$1,200.00</td>
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</table>

Section 5– The Future of the Urban Forest

A vision of the 2050 tree population of the Crystal Lake Park District is presented below. Using the existing data and a long-term vision based on best management practices and tree biology, a custom forestry program has been created to guide the park district forward.

Change in Diversity Projections 2020-2050

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>COUNT 2020</th>
<th>COUNT 2050</th>
<th>SPECIES</th>
<th>COUNT 2020</th>
<th>COUNT 2050</th>
<th>SPECIES</th>
<th>COUNT 2020</th>
<th>COUNT 2050</th>
</tr>
</thead>
<tbody>
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<td>OAK-BURR</td>
<td>412</td>
<td>300</td>
<td>DOUGLAS FIR</td>
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<td>100</td>
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<td>APPLE-CRAB SPF</td>
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<td>150</td>
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<td>100</td>
<td>MAPLE-KOREAN</td>
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<td>10</td>
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<tr>
<td>PINE-AUSTRIAN</td>
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<td>100</td>
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<tr>
<td>MAPLE-NORWAY</td>
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<td>KENTUCKY COFFEETREE</td>
<td>22</td>
<td>175</td>
<td>OTHER</td>
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<td>PINE-SOOTH</td>
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<tr>
<td>MAPLE-SILVER</td>
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<tr>
<td>HONEY LOCUST</td>
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<td>ASH-GREEN</td>
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<td>DOUGLAS-CORNELIAN</td>
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<td>30</td>
</tr>
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<td>WILLOW-SPP</td>
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<td>42</td>
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<td>DOUGLAS-SPP</td>
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<td>MAGNOLIA-COLUMBI</td>
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<td>MAGNOLIA-SAUCER</td>
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<td>SEVENTH-SON FLOWER</td>
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<td>15</td>
<td>MAPLE HEDGE</td>
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<td>15</td>
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<td>60</td>
<td>SMOKE TREE</td>
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<td>15</td>
<td>PAGODA TREE</td>
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<td>15</td>
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<tr>
<td>HAWTHORN-SPP</td>
<td>31</td>
<td>75</td>
<td>SWEET GUM</td>
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<td>50</td>
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<td>50</td>
<td>BEECH-AMERICAN</td>
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<td>25</td>
<td>PINE-LIMBER</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

Key

- Actively Remove
- Maintain Current Population
- Plant in Limited Quantities
- Plant in Abundance
Change in Species Composition 2020 - 2050

Species Diversity 2020 - 4,160 Trees

Species Diversity 2050 - 6,125 Trees
The tree population information presented above in a variety of graphs and charts depicts how the 2050 tree population will be more diverse and balanced than currently. The Maple population will be reduced from 750 to 675, a reduction of only 75 maples. The number of Oak plantings will be increased over the same time period, although it should be noted that as Oaks are disappearing in native Illinois communities, the effort to plant more has more to do with balancing the Oaks across the taxonomic, age class, and spatial diversity as a whole. This will push the number of Oaks even further above the 20-10-5 Rule limit, but they will be planted in parks deficient in Oaks now and lesser common species will be selected. A majority of undesirable species such as Cottonwood, Box Elder, Mulberry and Black Cherry will be removed by 2050.
Increases in nearly every other species across the population are recommended. Among the largest increases in number are Hybrid Elm, Hackberries, Kentucky Coffeetree, London Planetree, Blackgum, Catalpa, and Tree Lilac. These are all very hardy, inexpensive, and common trees which are proven performers in parks, and tolerant of urban conditions. In addition, significant increases are recommended in species such as Ginkgo, Dogwood, Tuliptree, Buckeye, Horsechestnut, Hawthorn, and a variety of evergreens. These are also proven urban performers, but less commonly available in high quantities form the nurseries. Finally, many more species have been recommended such as Larch, Pagodatree, Zelkova, and Golden Raintree. These species are also proven performers in parks when properly selected for the proper sites.

To arrive at these recommendations the existing tree population was analyzed first for how many of each tree species would require removal based on the 2016 inventory, plus natural aging and decline over the coming 30 years. The quantity of each species required to replace the removed trees and fill planting spaces was then estimated. A 15% new planting failure rate (standard) was factored into the projections for accuracy.

The managed tree population of CLPD will increase from the current number of 4,161 trees to approximately 6,125 trees by 2050. This is an attainable goal and represents a nearly 50% increase in the total numbers of trees in the Crystal Lake Park system. The stocking density of the tree population is examined below.

For the 2050 vision of the Crystal Lake Park District tree population, a variety of factors were studied to arrive at the proper age-class distribution:

- Projected survival rates of the existing tree population
- Projected growth, survival, and tree losses of current population
- Projected new plantings following the reforestation recommendations in this plan

Using this data, a GIS file was created to display the projected tree population in 2050 and to generate the chart and iTree Benefits summary below.

**The Benefits of Larger, Healthier Trees**
As previously discussed, larger trees provide greater benefits to the community. They create more shade to reduce cooling costs, absorb more storm water for infrastructure cost savings, create greater buffers against cool winter winds to reduce heating costs, and absorb and sequester more carbon than smaller trees.

As shown in the DBH Breakdown Change chart above and table to the right, the Crystal Lake Park District has many trees in the smaller ranges, and few trees in the larger diameter ranges. As previously mentioned, this is likely due to the relative youth of the park district system and the “newness” of its parks. The recommendations in this plan involve not only replacing trees being lost to old age or disease, but also increasing age and species diversity and tree canopy coverage.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6&quot;</td>
<td>1396</td>
<td>1500</td>
<td>1700</td>
<td>1800</td>
</tr>
<tr>
<td>7-12&quot;</td>
<td>1448</td>
<td>1150</td>
<td>1300</td>
<td>1500</td>
</tr>
<tr>
<td>13-18&quot;</td>
<td>761</td>
<td>1200</td>
<td>900</td>
<td>1050</td>
</tr>
<tr>
<td>19-24&quot;</td>
<td>252</td>
<td>550</td>
<td>950</td>
<td>700</td>
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</tr>
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<td>31-36&quot;</td>
<td>86</td>
<td>100</td>
<td>100</td>
<td>225</td>
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<tr>
<td>37-42&quot;</td>
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<tr>
<td>&gt;42&quot;</td>
<td>32</td>
<td>25</td>
<td>30</td>
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<tr>
<td>TOTALS</td>
<td>4161</td>
<td>4725</td>
<td>5405</td>
<td>6125</td>
</tr>
</tbody>
</table>

As the level of tree care increases over time, the survival rates of trees will increase. There will be a steep drop in the 13-18" age class as shorter-lived trees die. Newly planted trees will show decreased mortality due to improved planting and care techniques. These numbers are projected based on experience of the forestry consultant preparing this plan.

To project the future age classes of trees, a ½" per year growth rate was estimated by assuming that it will take an average tree 10 years to go from one age class to the next (6" = appx 10 years growth). The tree projections also reflect the number of trees to be planted and removed annually, as calculated below in the Tree Planting and Tree Removal sections. These projections can be updated over time as new data becomes available.

### Value Benefit Projections 2020-2050

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2050 (2019 Dollars)</th>
<th>% Change</th>
<th>In 2050 Dollars (Projected)</th>
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</thead>
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<td>Annual Benefits</td>
<td>$279,589</td>
<td>$410,995</td>
<td>+47 %</td>
<td>$625,075</td>
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<tr>
<td>Replacement Value</td>
<td>$9,241,602</td>
<td>$13,585,154</td>
<td>+47 %</td>
<td>$20,661,320</td>
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</tbody>
</table>

Currently, the tree population provides $279,589 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 $131,000 with only minimal additional investment, and simple attention to tree maintenance. This gain of $131,000 per year (in 2019 dollars) will be come with substantially increased benefits for residents and businesses. Adjusting for Consumer Price Index (3% per year increase), it can be seen that this broadly translates into approximately $625,070 in 2050 dollars.
In the budgets that are discussed below, it will be shown that this increase will cover over 100% of the costs associated with trees in most budget years, many times over. In this case, the tree population will actually become a net “provider” of “income” to the community, covering its own cost of care, and then providing additional benefits in terms of ecological services. The replacement value of the tree population will nearly double, increasing 47% to approximately $20 Million dollars in 2050 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 where temperatures are cooler. Cooler temperatures cause air conditioners to have to work less, reducing the amount of energy a household utilizes. During the winter when temperatures are cold, winter winds cool a home resulting in a need for increased interior heat. Trees block winter winds by up to 30%, causing heating systems to use less natural gas, saving energy and money. Open park areas do not benefit from wind breaks but park recreation buildings can take advantage of energy savings.

**Carbon Dioxide (CO₂)**
The amount of CO₂ put into the atmosphere each year has a direct correlation with global climate change. More severe storms, greater droughts, loss of species, and many other costly outcomes are directly related to climate change. Reducing CO₂ from the atmosphere can lessen these effects. Trees uptake CO₂ and act as a sink, putting carbon into long term storage in its woody tissues. The reduction of CO₂ creates a financial benefit to society.

**Air Quality**
Many industrial processes and vehicle emissions put harmful chemicals into the 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.

**Storm Water**
Municipal water systems are often taken for granted. The cost of delivering fresh water to homes, as well as removing and treating wastewater and storm water is immense. Costs increase greatly when these systems are overwhelmed. Flooding can cause millions of dollars of damage to homes and vehicles. Replacing municipal systems to increase capacity costs millions of dollars. Trees take water from the soil and return it to the atmosphere through transpiration. Tree canopy slows down rainfall’s effects on flooding by intercepting water through its leaves and branches. The more trees and other green infrastructure elements within a community, the less strain is put on infrastructure.
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 values and increased property tax revenue. This increased revenue can be returned to the community by improving quality of life amenities like parks, schools, and businesses.

Return on Investment
It should also be mentioned here that the Return On Investment (ROI) for an individual tree is strongly favorable over the life of a tree in terms of investment in planting, care, and removal vs the benefits the tree provides. On the following page, we have provided an ROI calculation sheet. This sheet breaks the tree’s lifetime down into three phases, based on the anticipated costs of pruning in the budgets section(s) below. These phases are the young (3-12” DBH), mature (13-24” DBH), and full grown (25-36”) ranges shown below.

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

<table>
<thead>
<tr>
<th>Total Investment</th>
<th>$4,150.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Return</td>
<td>$8,585.00</td>
</tr>
<tr>
<td>Total ROI Over 60 Years</td>
<td>106.87%</td>
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</table>
### Return on Investment: Years 1-20 (3-12" Diameter)

<table>
<thead>
<tr>
<th>Costs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Purchase and Installation</td>
<td>$250.00</td>
<td></td>
</tr>
<tr>
<td>Watering for 2 Years</td>
<td>$100.00</td>
<td></td>
</tr>
<tr>
<td>Pruning - 6x @ $25/prune</td>
<td>$150.00</td>
<td>$500.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Avg/Year</th>
<th>Over 20 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$5.72</td>
<td>$114.40</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>$11.87</td>
<td>$237.40</td>
</tr>
<tr>
<td>Property Value</td>
<td>$21.94</td>
<td>$438.80</td>
</tr>
<tr>
<td>Stormwater</td>
<td>$10.78</td>
<td>$215.60</td>
</tr>
<tr>
<td>Air Quality</td>
<td>$2.51</td>
<td>$50.20</td>
</tr>
<tr>
<td>CO2 Reduction</td>
<td>$2.16</td>
<td>$43.20</td>
</tr>
</tbody>
</table>

**ROI Years 1-20 = 120%**

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

<table>
<thead>
<tr>
<th>Costs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pruning - 6x @ $100/prune</td>
<td>$600.00</td>
<td></td>
</tr>
<tr>
<td>Emergency Maintenance (2x)</td>
<td>$500.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Avg/Year</th>
<th>Over 20 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$18.89</td>
<td>$377.80</td>
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<tr>
<td>Natural Gas</td>
<td>$33.84</td>
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<tr>
<td>Property Value</td>
<td>$44.44</td>
<td>$888.80</td>
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<tr>
<td>Stormwater</td>
<td>$52.69</td>
<td>$1,053.80</td>
</tr>
<tr>
<td>Air Quality</td>
<td>$9.34</td>
<td>$186.80</td>
</tr>
<tr>
<td>CO2 Reduction</td>
<td>$6.10</td>
<td>$122.00</td>
</tr>
</tbody>
</table>

**ROI Years 21-40 = 200%**

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

<table>
<thead>
<tr>
<th>Costs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pruning - 6x @ $150/prune</td>
<td>$900.00</td>
<td></td>
</tr>
<tr>
<td>Emergency Maintenance (2x)</td>
<td>$650.00</td>
<td></td>
</tr>
<tr>
<td>Eventual Cost of Removal</td>
<td>$1,000.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Avg/Year</th>
<th>Over 20 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$24.37</td>
<td>$487.40</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>$46.47</td>
<td>$929.40</td>
</tr>
<tr>
<td>Property Value</td>
<td>$17.01</td>
<td>$340.20</td>
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<tr>
<td>Stormwater</td>
<td>$102.01</td>
<td>$2,040.20</td>
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<tr>
<td>Air Quality</td>
<td>$14.28</td>
<td>$285.60</td>
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<tr>
<td>CO2 Reduction</td>
<td>$4.87</td>
<td>$97.40</td>
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</tbody>
</table>

**ROI Years 41-60 = 63%**
Section 6 - Tree Removals

Tree Removal Needs and Projections

Projected Removal Budget 2020-2050

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2021</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees Removed</td>
<td>120</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100/year</td>
<td>100/year</td>
<td>100/year</td>
</tr>
</tbody>
</table>

Notes
- 14 Hazard Remova + Removals from Inv
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals

Removal Cost (2019) $89,200 $74,300 $74,300 $74,300 $74,300 $74,300 $74,300
Removal Cost (CPI) $89,200 $74,300 $74,300 $74,300 $74,300 $85,445 $98,262 $113,001

The first step toward attaining CLPD’s forestry goals is to remove diseased, dying, and hazardous trees. The inventory currently identifies 100 trees for removal. Nine of these are hazard removals and are recommended to be taken down in 2020 if they have not already been removed by the time this plan is adopted. It is recommended that all trees identified as removals be removed by 2021 or within two years of the adoption of this plan.

After the initial 2-year period focusing on very poor condition or hazardous trees, it will be necessary to increase the number of trees removed each year to attain the diversity recommendation. This is due to remaining Ash trees, underperforming Maples, Pine, and Spruce suffering from fungal and disease issues, undesirable trees, and the poor condition of short lived ornamentals. Starting around 2024/2025, it is anticipated that the tree removal rate will steady out at 100-115 or less per year. Continual reevaluation of the tree population on an annual or semiannual basis by the park district Arborist or Forestry Consultant will specify which trees require removal. These numbers, detailed above, are meant to be placeholders for budget calculations and diversity standards.

Costs have been estimated using real time rates of in house and contracted services for tree removal and stump grinding, based on current market pricing and in house record keeping. No cost increase is assumed for the first 5 years, and a 3% annual cost increase is assumed thereafter. This is an estimate based loosely on the Consumer Price Index, but actual costs may likely be lower than projected. These numbers were calculated for budget forecasting only and may vary significantly, especially in the later years of this plan as variables change.

Tree Removal Activity Descriptions

Safe Removal of a Tree to an Appropriate Flush Cut
Tree removal can be a very dangerous activity putting people, property, and workers in harm’s way. Thus, all tree removal activities on CLPD’s public property shall be performed under the guidance of a Certified Arborist or Arborist Trainee whether in house or contracted. 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 so 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, so 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 CLPD depending on individual management needs for specific circumstances or contracts. If the area of removal is not to be immediately restored with new landscaping, the stump hole must be filled and compacted to ground level using the debris resulting from the stump removal.

**Planting Site Restoration**

Once the tree has been safely removed and the stump has been ground out, the open planting space must be fully restored if a tree is not scheduled to be planted in or adjacent to the old hole 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 park, and prevent tripping hazards from the removal scar. It should be noted here that given the nature of parks, it is not always recommended nor feasible to put a tree back where one was removed, and often a better site can be selected for a new plant than one which was removed. That said, restoration of the removal site to either turfgrass or native vegetation cover is of great importance.
**Reasons for Tree Removal**

Removal of trees in public parks is never taken lightly, but it is an unavoidable reality when managing large tree populations. When the trunk, branches or roots fail, a standing tree can cause personal injury or even fatality. Even small dead trees can be an eyesore and increase risk to park patrons. Old trees can hold great sentimental value and many people become attached to these neighborhood icons. When an iconic tree has become a hazard, action must be taken to ensure public safety. The public can be reminded that the removal of a tree today is the promise of a new tree for tomorrow!

Removal of trees on CLPD property shall always be at the discretion of the park district Arborist, Director of Park Development and Interpretive Services, Superintendent of Park Services and/or Forestry Consultant. Trees will never be removed without sound reason and 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 assessed by park district staff and/or forestry consultants. Requests will be evaluated based on tree condition, safety implications, nuisance factors and budget. The Crystal Lake Park District will not remove trees on private property. Determination of tree ownership will be made by property boundary lines. The park district can cut back nuisance branches that overhang park district property of trees on private property.

**Dead or Dying**

Trees that are standing dead, have approximately 70 percent dead crown or greater, 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 Park District Arborist or Forestry Consultant.

**Diseased or Infested**

Diseases are caused by viral, fungal, or bacterial pathogens such as Dutch Elm Disease and Oak Wilt. Infestations are caused by insects or other small animals such as Emerald Ash Borer. 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 park district staff or Forestry Consultant shall be removed as expediently as possible in order to slow the spread of 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 the insurance industry is becoming increasingly involved in assessing and managing the risk posed by trees. Litigation involving trees is also on the rise. Trees identified as being in elevated risk categories will be subject to removal to maintain public safety.
The park district staff, 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. Risk can often be mitigated by removing a portion of the tree, restricting access to 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 that 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 park district staff or Forestry Consultant shall determine the need for removal of a tree based on storm damage, although in an emergency situation when a tree impacting a person, vehicle, home, power lines, or other emergency, CLPD reserves the right to 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 park district staff or forestry consultant shall assess trees that have been impacted by a vehicle 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 proper park district authority for approval before being scheduled for removal.

**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 inquire about the removal of the tree. Such requests will be reviewed by the park district 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, CLPD may agree to the removal within a reasonable time frame. 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.

**Overplanted and Underperforming**
No healthy tree shall be removed for the sole reason of having been overplanted. Upon adoption of this Urban Forest Management Plan, CLPD will adopt 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 park district staff 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

The following requirements and standards shall be met during tree removal activities:

1. All personnel directly involved with chainsaw operation, both in house and contracted staff, shall be provided sufficient training and experience to perform such duties while employed by CLPD.

2. Only qualified utility arborists may perform tree removal operations within ten feet of an electric utility line. CLPD 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. When higher voltage lines are encountered, the ANSI Z133 standard for minimum approach distance shall be referenced.

3. The park district will not remove healthy trees in order to meet diversity goals unless the tree poses a risk to persons or property, or deemed necessary by our staff or arborist.

4. CLPD shall not perform or assist, programmatically or financially, with the removal of trees on private property. Public ownership is defined as having 51% or greater of the trunk diameter on public property. CLPD reserves the right to prune overhanging limbs from private property back to the property line.

ANSI Z133.1 Arboriculture Safety Standards

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 CLPD 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 park district 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 approach distances shall be maintained in accordance with the ANSI/Z133.1 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 ANSI Z133.1 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

Projected Planting/Reforestation Budget 2020-2050

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees Planted</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>160/year</td>
<td>175/year</td>
</tr>
<tr>
<td>Planting Cost (2019)</td>
<td>$28,000</td>
<td>$32,000</td>
<td>$36,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Planting Cost (CPI)</td>
<td>$28,000</td>
<td>$32,000</td>
<td>$36,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$46,000</td>
<td>$52,900</td>
</tr>
</tbody>
</table>

Planting of new trees will increase diversity and canopy cover. CLPD currently has ample space for new plantings in its parks. To help achieve the Crystal Lake geographical area urban forest tree canopy goal of 30% and to increase overall diversity in CLPD, this plan calls for the addition of over 1,950 trees over the coming 30 years. Many of these will be replacements for existing trees which are expected to be removed during that time period. Others will fill sites never occupied by trees before. As mentioned earlier, a 15% failure rate or 750 trees was projected. These trees will be planted by park district staff, contractors, and even volunteers who have been properly trained. Below, the UFMP will discuss a Master Reforestation/Planting Plan which is specifically designed to plant trees where they will have the best chances to establish based on their planting sites and species requirements.

For the goals and milestones shown above, the program began with planting the 70 trees, similar to the park district’s current operations. Each year thereafter, a gradual increase in new plantings is recommended, until by 2025 the park district is planting nearly 160 trees per year. This strategy will offset the number of removals suggested each year while also growing the total tree population. $400 per installed tree has been used which is a conservative cost estimate. The actual cost will vary with the type and size of tree, where it is purchased, and labor rates.
The number of trees planted will also vary depending on the number of trees removed. Conservative estimates have been used to determine projections. Money saving proposals, including the establishment of an in-house tree nursery will be examined later in this UFMP.

Reforestation/Planting Planning

A Master Reforestation Plan for Crystal Lake Park District will make a noteworthy investment in the future so that wise decisions regarding manpower and budget can be made. Each park will be visited and assessed. GPS locations will be added where forestry consultants see a need for a tree. First priority will be given to areas that need shade, such as near seating areas, playgrounds, and sports fields. Secondary recommendations will be for aesthetic purposes, such as near park entrances or other highly visible areas. After that, screening from nearby residences should be considered, and finally, strictly ornamental trees are placed. The goal of the Reforestation/Planting Planning project is to select the right tree for the right location and increase diversity while achieving the overall goal of increasing the urban canopy.

Reforestation Data Collection

The following data is collected during the reforestation planning process:

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

| Small   | Soil volume less than approximately 25 ft$^3$ |
| 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 is 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 is based on the amount of sun or shade that a planting site is currently experiencing or is 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

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**Soil Moisture**
Soils will be evaluated by use of GIS data layers of hydric soils, FEMA floodplain, and NWI Wetlands data, as well as in person observation.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>Soils are in a high elevation area on the landscape or far from water sources</td>
</tr>
<tr>
<td>Mesic</td>
<td>Soils are of moderate moisture during an average growing season</td>
</tr>
<tr>
<td>Hydric</td>
<td>Soils are wetter throughout most of the year during an average growing season</td>
</tr>
<tr>
<td>Poor</td>
<td>Soils are rocky, compacted, or otherwise of very low quality</td>
</tr>
<tr>
<td>Prohibitive</td>
<td>Soils are not adequate to support a viable root system</td>
</tr>
</tbody>
</table>

---

**Loading**
Loading of either salt pollutants or nutrients is assessed. High salt areas are 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 are generally near facilities such as sports fields that require frequent fertilization, stormwater retention ponds, or near floodplains.

<table>
<thead>
<tr>
<th>Loading Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No significant salt or nutrient loading was observed</td>
</tr>
<tr>
<td>High Salt</td>
<td>Significant amount of road salt (or similar) was observed or inferred</td>
</tr>
<tr>
<td>High Nutrient</td>
<td>Significant amounts of Nitrogen, Phosphate, etc were inferred</td>
</tr>
<tr>
<td>High Salt and Nutrient</td>
<td>Significant Salt and Nutrient loads were observed or inferred</td>
</tr>
<tr>
<td>Low Nutrient</td>
<td>Site was in a location where access to nutrient would be very limited</td>
</tr>
</tbody>
</table>

---

**Shelter**
The degree of which a tree is protected from prevailing winds, snow, and other cold-weather elements.

<table>
<thead>
<tr>
<th>Shelter Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Planting site is 0-10% sheltered</td>
</tr>
<tr>
<td>Low</td>
<td>Planting site is 10-25% sheltered</td>
</tr>
<tr>
<td>Moderate</td>
<td>Planting site is 25-50% sheltered</td>
</tr>
<tr>
<td>High</td>
<td>Planting site is 50-75% sheltered</td>
</tr>
<tr>
<td>Very High</td>
<td>Planting site is 75-100% sheltered</td>
</tr>
</tbody>
</table>

---

**Recommended Form**
Recommended form is based upon general terms describing the shape and habit of mature tree’s canopy. Often there are 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.
### Tree Form Characteristics

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

### Planting Site Assessment

The Park District Arborist, Landscape Architect, or Director of Park Development shall assess planting sites not included in a Reforestation/Planting Plan before trees are purchased and installed, to ensure the correct tree is being planted at the correct site. Each tree planted represents a 25 – 75-year commitment or more, 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. Species diversity, spatial diversity, and age-class diversity should all be taken into account when conducting planting site assessment. Diversity standards should also be reviewed annually to determine how much closer CLPD 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. Most importantly, the success of a tree depends on where and how it is planted.

### Nursery Stock Procurement

Nursery stock quality is a key to a tree’s long-term success. No amount of planning can help a tree which was purchased in poor health. Every tree to be planted on park district property should be visually inspected prior to planting. 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 from growers due to the high numbers of trees being sought to replace Ash trees lost to Emerald Ash Borer. For this reason, inspection of all nursery stock prior to planting is recommended.

Development of an in-house liner nursery is recommended to provide the park district with high quality stock that meets the established diversity needs. Several Illinois communities and park districts have successful nursery operations. Although there are start-up costs and manpower needs, a well-established nursery will decrease costs in the long run.

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.
**Tree Transport and Planting**
Proper transport and planting procedures are factors affecting a tree’s success after planting. Trees with leaves shall be transported with a fabric tarp to minimize desiccation and have had their root balls wetted prior to transport. 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.

**Tree Spacing and Visibility Requirements**
Minimum tree spacing between deciduous shade trees 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 and crown growth with neighboring trees. 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 above ground power lines but must be from the “Small” selections listed in the Acceptable Species list below. Evergreens are acceptable for parks, schools, municipal campuses, and waterways, but should be avoided when adjacent to a road due to visibility issues. In certain circumstances tree spacing guidelines may vary depending on the specific circumstances, such as an area where an immediate screen is needed.

**Watering**
Proper watering of trees is essential to their establishment, growth, and survival, particularly during the first 2 years of their lives. The cost of watering a new tree for two years is included in the $400 per tree budget discussed in the reforestation section. It is recommended that when a tree site is selected for planting, that it is also planned for a 2 year watering program to avoid the tree desiccating before it is able to properly establish. CLPD might opt to have watering performed by in-house crews, but contracting this work out could also be considered.

**Challenges of Urban Plantings**
Urban planting sites are a difficult environment for a tree to thrive. Therefore, it can be expected that approximately 10%-15% of new plantings fail each planting cycle. Contracts for tree planting should include a one or two-year replacement warranty for any new trees that fail to thrive in their new environment. For trees grown in-house at a liner nursery, the same failure rate should also be expected. Although trees planted in parks stand a better chance of survival than street trees or other urban plantings, new planting mortality is to be expected.
Tree Planting Requirements and Standards

1. Planting sites shall be determined and monitored using the park district’s tree inventory, in conjunction with an assessment of needs including shade, aesthetics, screening, windbreaks, etc.

2. New planting sites shall be 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 30 years shall be done so according to the park district’s taxonomic, spatial, and age-class diversity goals. A diverse and resilient urban forest shall be created, to minimize 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 planting site. As much stock as possible should be sourced from the park district’s in-house nursery once it is established and productive.

5. Acceptable nursery stock shall conform to the following standards:
   A. Minimum of 1.75-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 CLPD

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 CLPD and its approved contractors.

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

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

9. All donated plant material shall conform to all aspects of the UFMP.
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 park district, 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 Park District 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 root ball, 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 root ball 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 three inches, near - but not touching - the trunk of the tree and extending to the perimeter of the planting.

11. Support systems such as guywires or stakes shall not be installed except where needed and shall be removed when no longer required for stability in the hole.

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 CLPD.

2. All employees and contractors employed by or working for the park district of CLPD 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. Balled and Burlapped: 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 1/3 to 1/4 of the wire basket and burlap from the top of the ball. For all types, ensure any encircling (girdling) roots are removed, and the 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

Average Cost of Eventual Seven Year Cycle Prune – Drives Second table

<table>
<thead>
<tr>
<th>Total Trees</th>
<th>Avg %</th>
<th>Cost/Tree</th>
<th>Pruned/year</th>
<th>Cost/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evergreen</td>
<td>1128</td>
<td>27.11%</td>
<td>$25</td>
<td>163</td>
</tr>
<tr>
<td>Large (&gt;24&quot;)</td>
<td>298</td>
<td>7.16%</td>
<td>$150</td>
<td>43</td>
</tr>
<tr>
<td>Medium (13-24&quot;)</td>
<td>704</td>
<td>16.92%</td>
<td>$100</td>
<td>102</td>
</tr>
<tr>
<td>Small (1-12&quot;)</td>
<td>2031</td>
<td>48.81%</td>
<td>$50</td>
<td>293</td>
</tr>
</tbody>
</table>

This table depicts what an average cost per year will be to prune CLPD’s trees based on a 7-year cycle. It depicts the differing cost to prune different tree types, and what the number of the expected tree types will be in 2050.

Projected Pruning Budget 2020-2050 – Based on Above Projection Table

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2021</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees Pruned</td>
<td>350</td>
<td>400</td>
<td>450</td>
<td>500</td>
<td>550</td>
<td>600/year avg</td>
<td>600/year avg</td>
<td>600/year avg</td>
</tr>
<tr>
<td>Notes</td>
<td>Hazard and Priority Prunes + Standard Prunes</td>
<td>Priority Prune identified in inventory + Standard Prunes</td>
<td>Increase pruning capacity based on manpower</td>
<td>Increase pruning capacity based on manpower</td>
<td>Increase pruning capacity based on manpower</td>
<td>Cycle pruning based on inventory updates</td>
<td>Cycle pruning based on inventory updates</td>
<td>Cycle pruning based on inventory updates</td>
</tr>
<tr>
<td>Cost (2019)</td>
<td>$12,000</td>
<td>$13,700</td>
<td>$15,400</td>
<td>$17,150</td>
<td>$18,850</td>
<td>$20,575</td>
<td>$20,575</td>
<td>$20,575</td>
</tr>
<tr>
<td>Cost (CPI)</td>
<td>$12,000</td>
<td>$13,700</td>
<td>$15,400</td>
<td>$17,150</td>
<td>$18,850</td>
<td>$23,661</td>
<td>$27,210</td>
<td>$31,292</td>
</tr>
</tbody>
</table>

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.
As discussed in Section 3, trees identified as hazard prunes and priority prunes should be of highest priority. It is anticipated that all trees in these two categories can be pruned over the next four years, with an eventual goal of pruning 600 trees per year on a regular seven year cycle.

To forecast the costs associated with future pruning activities as shown above, the following values were used and a seven year pruning cycle was assumed. For small trees (<12" diameter), $50 per tree is estimated, which covers basic staff time to make a few pruning cuts on younger trees. For medium (12"-24") and large (24" +) trees, actual Illinois bid results were used to determine average costs of $100 and $150 per tree (see table above). These are conservative estimates and no cost increase was factored in for the first 5 years. A 3% annual increase was added for every year thereafter.

As stated in the Goal 4 of the Urban Forest Management Plan, it is recommended that the Crystal Lake Park District employ two full time and one part time staff members devoted to forestry and have an internship program for seasonal laborers who focus on forestry. It is also recommended to make a small investment in additional equipment. This will improve capacity to prune, remove, and plant trees using almost entirely in house labor, where quality is maintained, and costs are not subject to market forces.

**Pruning Activities**

**Refining of Pruning Cycle**
Currently, the Crystal Lake Park District is behind schedule on its cycle pruning program due to Emerald Ash Borer related activities absorbing a disproportionate amount of time and resources in recent years. In the last year, the park district has been working to catch up and return to its cycle pruning program. Currently the park district prunes 170 mature trees per year, on a needs-based basis.

**It is recommended to move away from a strictly zone-based approach to cycle pruning, and instead pursue a hybrid approach.** In a zone based pruning program, trees that do not need pruning may end up being pruned. This is not only a waste of funds but is not in the best interests of the trees. By keeping the tree inventory up to date, the costs for pruning can be controlled and efficiently dedicated. The hybrid approach where we update the inventory periodically to locate trees in any park in need of pruning, combined with some cyclical 7-year approaches, will help maintain public safety as well as a more manageable bottom line for costs.

**Pruning of Young Trees**
For the purposes for this plan, a young tree will be considered to be 12" DBH or smaller. 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 amount of time and saves thousands of dollars in pruning and maintenance costs later in the tree’s life. Because of size and equipment requirements, young trees may be pruned economically by park district staff.

**Pruning of Mature Trees**
For the purposes of this Plan a mature tree is considered to be greater than 12" in diameter. Mature trees are established in and acclimated to their sites. The pressure these trees face from their environment generally comes from above-ground factors such as pests, pathogens, man-made structures, other trees, windstorms, or lightning strikes. 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. Allowing trees to self-prune over time is not advisable in a managed park district setting. Safety factors may arise, and the process of self-pruning may bring up aesthetic issues in a park district environment. Mature public trees should only be pruned by Certified Arborists.

**Private Property Trees**
The Crystal Lake Park District is not responsible for pruning of trees located on private property. Per the proposed policy, this would mean that trees with 51% or greater of their trunk diameter on private property are privately owned trees. The park district reserves the right to prune portions of trees overhanging public property but is under no obligation to do so.

**Reasons for Pruning**

**Establishment Pruning**
Establishment pruning is the single most cost-saving measure in tree care as it establishes good form and branch structure for the life of the tree. Establishment pruning 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. Because establishment pruning can be done without the use of dangerous equipment, this can be efficiently handled by in-house staff.
Cycle Pruning
As noted above, trees should be pruned on a cyclical basis as preventative maintenance. The tree inventory should be updated regularly to identify specific trees to be pruned. To estimate costs, a hybrid 7-year geographic zone based approach was used, but trees are to also be evaluated yearly in “out of cycle” parks.

Emergency / Storm Damage Pruning
Emergency pruning is nearly always necessary to mitigate severe risk, such as limbs that have fallen, present an imminent hazard, have impacted a structure, are interfering with a utility, or are hanging. Emergency and storm damage pruning shall be conducted at the discretion of the park district with the best interests of the public in mind. When life or property are in imminent danger due to conditions associated with a downed tree or tree part, the park district 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, depending on the disease or pest, sanitation pruning may be employed to maintain the tree while removing the diseased or infested portions. Complete removal is usually the most cost-effective and safest option, but trees with Black Knot fungus, Apple Scab, and Fire Blight may be aided by sanitation pruning. See the appendices for a more formal discussion of these pests and pathogens.

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. The removal of these limbs or parts may render the tree as low risk again, without causing permanent damage to the tree. This option may also be considered when a privately owned tree is overreaching the park district property. In this circumstance, the at-risk limbs may be pruned back to the property line.

Pest or Pathogen Outbreak
When a tree becomes diseases or infested, complete removal of the tree may be less expensive than sanitation pruning or chemical treatment. The specific scenario should be analyzed before determining a course of treatment or remediation.

Tree Pruning Requirements and Standards

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 park district employee unless certified as a qualified Utility Arborist.
3. No cabling, bracing, or other such support systems should be installed in park district-owned trees, either by the CLPD, its residents, or any contractors. Exception may be made by obtaining prior written approval of the park district, or by park district staff if the tree has historic or ecological value.

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

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

6. The park district shall maintain at all times a Certified Arborist or Certified Arborist Trainee, and preference shall be given to in house, qualified labor for tree pruning activities.

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 in accordance with best management practices for the specific tree species. All pruning work shall be done so at the discretion of CLPD 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 - contracts to negotiate, bids to let, handling resident concerns, and many other experiences which may require the assistance of a professional. It is highly recommended that CLPD retain an Urban Forestry consultant who can assist the park district in navigating this unfamiliar territory and help to advise CLPD staff in their new roles as urban foresters.

The forestry consultant may assist with sourcing contractors and vendors for tree pruning, removal, and planting operations. The consultant may assist in maintaining the tree inventory, coaching staff on tree health and risk assessments and communicating with residents.

Chemical Applications
Pests and pathogens can often be controlled with a simple chemical application, known as Plant Health Care. When financially practical, chemical control for common pests or pathogens may be utilized as a preventative or curative method for certain ailments and increase the aesthetics and benefits of the tree population.

Plant Health Care applications are a very high priority for CLPD and are included as a line item on the budget sheets. Repeated treatments against Emerald Ash Borer have been an annual investment in the tree population. Recent weather events such as drought and prolonged cool and wet temperatures have exacerbated many fungal diseases such as Apple Scab, Diplodia Tip Blight, and Rhizosphaera Needlecast, resulting in tree deaths from these pathogens. Moving forward, it is suggested that the park district be more proactive about the Plant Health Care program, including using
Mycorrhizae and organic materials such as BioChar in order to be giving trees proper access to nutrients and water. Although the best management tool is to select the right tree for the right location, funds must always be allocated toward reactive treatments as well. A Plant Health Care appendix is included in this plan.

Residents are not allowed to chemically treat any trees on park district property. Treatments shall be at the discretion of the Crystal Lake Park District and be performed by a staff member or contractor holding an Illinois Pesticide Applicators license.

**Water Management**

Water is a critical element in the establishment, growth, and survival of trees. Most trees adapted to the climate zone (USDA Zone 4) are also adapted to the amount of precipitation in an average year. However, younger trees with less extensive root systems are susceptible to prolonged drought. Young trees often need additional watering to survive. An increase in the number of trees planted each year will increase the staff time needed to water. As discussed in Section 7, a watering program should be an integral part of the tree planting program. Estimated costs have been factored into the tree planting budget.

**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 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.

**Improper Mulching**

Mulch is piled at the base of a tree trunk in a destructive mulch volcano.

**Proper Mulching**

When a tree is planted, mulch should be kept away from the trunk and lightly cover a ring of soil that feeds water to the root ball. As the tree grows, the mulched area can be enlarged, but the trunk must remain uncovered.
Fortunately, mulch is a commodity most park district entities can get for free so long as they are pruning and removing a fair number of trees each year. It is recommended that CLPD establish a marshalling yard within park district limits where pruning and removal contractors can dump wood chips. These chips can be made available for free to the district. All newly planted trees should have mulch applied appropriately. A longer-term goal for CLPD should be to mulch all trees 12" DBH and smaller but the immediate recommendation is to mulch all newly planted trees and prevent volcano mulching.

Section 10 - Tree Preservation and Management During Construction

Many municipalities have ordinances that protect trees and shrubs from construction activities to protect the benefits that trees and shrubs provide to the community. The Crystal Lake Park District has the power to protect trees and shrubs via approved procedures for in-house staff and specifications for outside contractors. Ensuring the protection and preservation of these assets while minimizing burdens to the park district is essential. The requirements and standards below are consistent with many similar communities in the Midwest.

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

1. A tree survey shall be performed by a qualified individual prior to the beginning of any development activities on park district owned land. The survey shall detail the size, species, and condition of each tree six inches DBH and greater or managed landscape tree of any size.

2. Location of existing trees shall be submitted to the project designer. Designer shall indicate the following on plans:
   A. Trees to be removed
   B. Trees to be preserved
   C. Location and size of the tree protection zone (TPZ) for each tree
   D. Method of tree protection to be used
3. In the absence of a project designer, the project specifications shall include the following:
   A. Trees to be removed
   B. Trees to be preserved
   C. Location and size of the tree protection zone one for each tree
   D. Method of tree protection to be used.

4. The tree protection zones for each tree shall be visibly delineated by the contractor, site engineer, park district project manager or other party as designated by the park district, using orange snow fencing or other material specified by the park district. When such a delineation is not possible, all workers on site shall be made aware of the TPZ verbally.

5. In the absence of a certified arborist, the park district reserves the right to determine the trees to be protected and method of protection.

ANSI A300 – Part 5

1. 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 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 or other qualified individual as determined by the park district. 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 but require the prior approval of the park district.

9. During the construction phase, compliance with tree protection plans shall be monitored by a certified arborist or other qualified individual as determined by the park district. Damage to tree barriers or trees, or non-compliance shall be reported to the project manager or owner’s representative 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 or other approved method of remediation 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 or other qualified individual as determined by the park district. Non-compliance shall be reported to the project manager or owner’s representative.

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 space to ensure future stability and growth. The TPZ is subject to the professional opinion of the certified arborist or other qualified individual as determined by the park district.

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

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 manager of the urban forest, the Crystal Lake Park District must track risk to determine mitigation needs that are responsible and economical and in the interest of public safety.

Levels of Risk Assessment

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. The TRAQ forms can be found in Appendix F.

All trees in CLPD were rapidly assessed for risk during the 2016 inventory and, as such, do not represent any formal level of TRAQ risk assessment. Therefore, the assessments are not legally binding descriptions of risk. They are intended to provide CLPD with data showing a need for a more detailed assessment on trees that were casually observed to be at an elevated risk level.
Level 1 Assessment
Also called a “limited visual assessment”, which is the typical assessment performed during a tree inventory. A basic analysis of obvious physical defects and conditions is performed and recorded. 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. This 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. A complete picture of the tree in its environment is gathered.

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 is ascertaining the occupancy rate, or the amount of time that people or objects are within the target zone with the potential to be impacted by a tree failure. For example, 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. A number of the park district’s 4,161 trees are located in proximity to playground equipment, play fields, benches, picnic areas or other areas where people congregate. This makes the likelihood of a failed tree impacting a person is fairly high. Though parks are generally vacant at night and during the winter months, their level of occupancy is higher during daylight hours in the warmer months.

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. While 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. Occupancy rate is not considered. For 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 are 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 tree failure can cause injury, fatality, power outage, or other similar outcomes, the consequences are considered “severe” (see the table below).

For the consequences of failure to be considered as part of this risk assessment system, the branch must have a minimum of a 3" diameter at the base. A smaller size would present an unrealistic and burdensome standard for inspection.

Weather
Every tree can fail from wind velocity or other impacts such as lightning damage, ice loading or soil saturation. Normal weather events generally cause tree failures or tree part failures for trees that have pre-existing defects. Extreme weather events, by contrast, can cause the failure of healthy trees. In all tree risk assessments, risk shall be assessed assuming “normal” weather conditions which in northeastern Illinois can include gusty winds, thunderstorms, heavy snow, and even ice storms. It is the extremes of these events that should be considered “abnormal”.

Crystal Lake Park District Tree Risk Assessment Plan

Crystal Lake Park District has created this plan in order to maintain an acceptable level of risk from the park district owned tree population. To maintain a high level of public safety, while mitigating undue burden, the park district shall adopt the following risk assessment protocols:

1. Crystal Lake Park District maintains a tree inventory detailing the species, size, and condition of all trees on its 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. During these audits, the park district arborist and/or forestry consultant, or other qualified individual as determined by the park district, 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 possible.

2. During subsequent years, staff shall perform limited visual assessments by inspecting trees during the normal course of daily operations. Trees that 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 park district arborist and/or Urban Forestry consultant shall perform a Level 2 or Level 3 Risk Assessment within ten 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 part 9 Standards), a decision shall be made by the park district arborist and/or forestry consultant, or other qualified individual as determined by the park district, regarding appropriate mitigation measures, if any.

4. All trees deemed to be in need of mitigating actions (removal, pruning, etc.) shall be documented in writing. 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 3”, by ocular estimate, shall be the standard to which this risk assessment policy applies. 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**

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<thead>
<tr>
<th>Likelihood of Tree Failure</th>
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<th>Low</th>
<th>Medium</th>
<th>High</th>
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<td>Very Likely</td>
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<tr>
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<td>Unlikely</td>
<td>Unlikely</td>
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</tr>
<tr>
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<td>Unlikely</td>
<td>Unlikely</td>
<td>Unlikely</td>
<td>Unlikely</td>
</tr>
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</table>

**Risk Rating Matrix**

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<th>Consequences</th>
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</thead>
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<tr>
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</tr>
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<td>Somewhat Likely</td>
<td>Low</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
</tr>
</tbody>
</table>
Section 12 - Strategic Partnerships
Opportunities for partnerships are an 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. The following are groups which will be strategic partners of Crystal Lake Park District in enacting the goals of this plan.

City of Crystal Lake
The City of Crystal Lake has a substantial forestry program and existing set of ordinances regarding forestry operations. The Crystal Lake Park District is subject to these ordinances for all properties located within the city boundaries. Also, after storm events, having a memorandum of understanding between the city and the park district would enable both groups to share resources and staff to efficiently complete clean up after weather events.

Village of Lakewood
The Village of Lakewood has a forestry program and existing set of ordinances regarding forestry operations. The Crystal Lake Park District is subject to these ordinances for all properties located with the village boundaries. A strategic partnership with the village will be beneficial to both agencies. Coordination after storm events, as described above, would be an efficient use of resources.

Crystal Lake Garden Gate Club
The Crystal Lake Garden Gate Club is an existing partner by providing plant material and garden maintenance at the Colonel Palmer House. There are several other garden clubs in Crystal Lake and Lakewood that could also be good partners. Staff is encouraged to reach out to the leaders of these organizations.

Living Lands and Waters
Living Lands and Waters is a nonprofit group based out of Moline, IL with the mission to clean up the Mississippi River and other Illinois waterways. Additionally, they promote large scale tree plantings. With seedlings provided by this group and in partnership with District 47 schools, CLPD has been able to distribute over 800 seedlings to plant on private and public property. Seedlings are generally very small trees, but smaller trees grow and establish faster than larger stock. This partnership will increase the ability to achieve an increased tree population in parks, schools, and on private property.

Openlands TreeKeepers
Openlands is an organization devoted to preservation and enhancement of natural resources in the Chicagoland area and Illinois in general. One of their primary programs is known as “TreeKeepers", where Openlands staff train volunteers on basic tree pruning and maintenance, so that this volunteer pool can be used to assist public organizations in maintaining their trees. Though TreeKeepers generally only operates in the City of Chicago proper, there have been recent talks with them to see if they would be willing to run this course and get a trained pool of volunteers in the western suburbs, including Crystal Lake. This would be a tremendous benefit to CLPD, as trained volunteers could assist in pruning of young trees, which as mentioned above is one of the best cost savings measures in Urban Forestry, as it prevents small issues form becoming larger issues later in a tree’s lifespan. Currently, the process of developing a Memorandum of
Understanding with the TreeKeepers program is occurring, and they are mutually looking forward to educating and developing a local group of volunteers to assist with Urban Forestry endeavors.

**McHenry County Forest Preserve District**
The McHenry County Conservation District owns and maintains 25,500 acres of public land in McHenry County. Several conservation district sites are located near or adjacent to Crystal Lake Park District properties. MCCD and CLPD have been strong partners for many years and supported the conservation and restoration efforts of each other. Both entities would benefit from this continued alliance and the exploration of new partnerships to improve the community and public lands.

**Local Schools**
As mentioned above, CLPD has partnered with Living Lands and Waters as well as Elementary District 47 schools in order to plant 800 seedlings in past years. The continuation of this partnership will help to achieve an increased canopy cover, as well as educate elementary and middle school aged children about the benefits of trees.

**The Environmental Defenders of McHenry County**
EDMC is a non-profit organization dedicated to the protection and stewardship of the natural environment throughout McHenry County. The park district and EDMC have worked together for many years on natural area restoration projects, watershed based planning, and public education. With many overlapping missions and goals, this organization is a valuable partner for the park district now and in the future.

**The Land Conservancy of McHenry County/Project Quercus**
The Land Conservancy has helped protect over 2,500 acres of McHenry County’s prairies, wetlands, and woodlands by working with private landowners, communities, and other partners. This is accomplished by accepting donated conservation easements and direct acquisition of property (through purchase or donation). The Land Conservancy founded Project Quercus to explore options to protect, preserve, and regenerate the Oak woodlands. Project Quercus is a diverse coalition that brings together public and private, government, corporate and non-profit interests, working collaboratively to create solutions to the problem of Oak woodland loss. The park district has worked closely with Project Quercus on Oak tree planting initiatives for many years.
Section 13 - Additional Goals

The following additional goals do not have a specific timeline. They are to be explored as time and budgets permit. Many of these programs represent the most progressive urban policies in the industry and should be considered seriously for implementation.

**CLPD Tree Stewards Program / Resident Education**

Although the park district currently does not use volunteers for tree care activities, well trained citizens are often valuable assets to the existing labor force. Residents interested in becoming forestry volunteers would be required to participate in training exercises. A graduated series of classes would provide training to qualify residents in a variety of activities, from simple plantings to more advanced pruning.

TreeKeepers is a program that has been instituted successfully in several Illinois communities to train and utilize volunteers for tree care activities. As the interest in Urban Forestry spread in northern Illinois, TreeKeepers is a successful model for the development of citizen stewardship programs.

For residents not interested in joining a formal program like TreeKeepers, it is recommended for the park district to hold spring and fall education sessions for the public. These sessions could be taught by the park district arborist, other qualified staff, or the Forestry Consultant, and would cover tree planting, watering, fertilization, pruning, and the basics of insects and diseases.

Additionally, basic tree care pamphlets can be made available at the park district offices and recreation buildings. The park district can utilize its printed newsletter, online platforms, and social media to provide educational tools to residents.

**Establishment of CLPD Propagation Nursery**

Consideration should be given to the establishment of a small propagation nursery on CLPD owned land. The park district can grow a share of its own trees, using seedlings from local nurseries. Small trees (“whips”) can be purchased wholesale and then grown to maturity by the park district. These programs have been successfully instituted in many communities and it represents a quality investment that results in significant cost savings over the long term. It is recommended that a parcel be designated for this purpose and the nursery established in 2020, with a 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 tree, the park district could save a significant amount of money in their tree planting program by pursuing this goal.

**Suburban Tree Consortium / Contract Growing Arrangement**

One of the keys to a successful reforestation plan or tree planting program is the availability of high-quality nursery stock from local sources. The presence of a program does not guarantee the availability of the trees recommended to be planted. Besides developing an in-house nursery, another way to assure availability of high-quality planting stock is to have plants contract grown by local nurseries. Trees are ordered in annual increments, typically following a “fifth year out” model. Initially, trees are reserved for the current year and each subsequent year up to five years in the future.
Each year, trees that were previously ordered are purchased and a new order is placed 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.

**Memorial Program for Tree Purchase**
The Crystal Lake Park District currently provides a tree donation program. An order is placed for a Memorial Tree that is purchased, planted, and maintained by the park district. Park district staff works with the donor to determine the size and exact location of the tree, although the location is usually limited to one or two parks which change from year to year. It is recommended that the program be expanded to encourage more donations that are planted in a wider variety of parks. This can be accomplished through more staff time being devoted to the program.

**Use of Permaculture Guilds and Food Forests in Tree Plantings and Landscape Design**
Permaculture is the concept of using communities of plants that all work well ecologically or chemically together to enhance the overall area. This stands in stark contrast to the view of plants solely from an aesthetic standpoint where each plant contributes to the whole, but is not necessarily functionally related to its fellow plants and trees. These groupings are often referred to as “guilds” and there are several well-established guilds that can be taken advantage of by CLPD. A simple example of a guild would be planting legumes as a soil stabilizer near fruit trees (instead of mulch) so that the legume provides nitrogen to the fruit tree, increasing its yield and making it healthier overall. This very progressive approach to planting communities of plants and trees vs just standalone plants is a very interesting concept, and one that CLPD should take advantage of.

A large part of building permaculture guilds is to have food plants as part of the guild in addition to other types of functional plants. To this end, there has been a small uptick in the planting of Apple, Edible Pear, Peach, and some nut producing species in parks. For a long time, such species were not traditionally planted in parks due to the fruits attracting undesirable insects and being relatively messy. However, as society has become more focused on local food production, the popularity of these “food forests” have flourished, and their popularity with residents has overcome their downsides. Parks are now doubling, in some respects, as mini orchards, and the fruit trees have become an attraction. Again, it is believed that both a part of permaculture guilds, as well as being standalone trees. However, many species of fruit and nut trees are hardy to our area, and will increase overall species diversity, and will make for attraction to the parks.

Though the concept of permaculture and food forests will not work for every park or certainly for every tree planting, there will certainly be areas which can be used as test cases for both of these concepts. Integrating these concepts with community gardens in the parks is another avenue of urban agriculture and permaculture that could be very popular with residents. The use of guilds will become very important as well, where there has been development of native communities. There is a major difference between those concepts. Even without food-producing plants, it should still be the goal of CLPD to try and build multilayered canopies and forest communities to try and emulate the natural order of our native Illinois plant communities.
Increase Diversity of Evergreen Plantings
White and Austrian Pines, as well as several Spruce species, have been overplanted throughout northern Illinois. These trees are inexpensive, grow quickly and provide winter interest. Evergreen trees provide buffering between the park and the neighboring properties. They provide excellent habitat for birds and other wildlife. The 2016 tree inventory shows that diversity in evergreen plantings is needed.

Emphasis on the Planting of Native Species
When possible, native plants should be chosen for new plantings. Native plants are those that occur naturally in northeastern Illinois so the need for intensive management is decreased. They are well suited to the soils, climate and pests that are present locally. Native plants provide shelter and habitat for beneficial insects, birds, and animals. Because they are better suited for their environment than exotic and non-native species, they require less water and chemical treatment. This helps to improve quality and saves on maintenance costs.

Reductions in Use of Small Short Lived Ornamental Trees
The overuse of short-lived ornamental trees such as Crab Apple and Callery Pear is common throughout northeastern Illinois. Although these trees are aesthetically pleasing and fit in smaller spaces, they are prone to diseases such as apple scab and fire blight. Most live 25 years or less and do not grow to their full potential. Callery Pear is overplanted and has aggressive qualities that will soon place it on the Illinois Invasive Plant List.

It is recommended that these trees be replaced with a diverse group of smaller trees that are better suited for the local environment. When appropriate, large shade trees should be specified instead of small, short-lived ornamentals.

Creation of a Small Arboretum and Tree Walk / Obtain Arboretum Status
According to the 2016 tree inventory, the Crystal Lake Park District has 92 different species throughout its parks. This is good variety but the creation of an arboretum would expand the number of species and have an educational component. It is suggested that an area in one park be set aside for planting a wide variety of trees, including some exotic species. Interpretive signage, maps and digital tools can be used to identify and describe each tree.

It is also suggested that the park district become certified through the Morton Arboretum’s ArbNet Certification program as a Level 1 or Level 2 arboretum. Digitally tagging trees and linking the information to web pages provides the user with a great deal of information about each tree. This would be a great achievement and would provide an easy tool to help improve knowledge of the urban forest in the community.

Incorporate More Tree Plantings into Natural Areas, Remove Non-Native and Aggressive Trees
Crystal Lake Park District currently owns and manages approximately 38 acres of land where the dominant species are either invasive species (such as European Buckthorn) or very aggressive natives (such as Cottonwood, Black Cherry, and Black Locust). These areas would be greatly enhanced by the removal of undesirable species and the planting of native grasses, wildflowers, and trees.
As mentioned above in the section on permaculture it is recommended to mimic the natural ecosystem as much as possible. Tree planting plans should include diverse canopies, with herbaceous vegetation, understory trees, and canopy trees. Diverse native plantings attract diverse wildlife, including many pollinator species such as bees and butterflies that have been on the decline in recent years.

**Use Trees as Wildlife Habitat (Pollinators and Birds)**

Evergreen trees are a safe haven for birds and owls during all seasons of the year in Illinois, as are standing dead trees (“snags”). Certain snags can be cut back but retained for bird nesting as elements of a native landscape plan although they must be monitored to prevent hazardous conditions. Tree species such as Apple, Basswood, Cherry, Black Locust, Catalpa, Horsechestnut, Tuliptree, and Willow are all insect pollinated and attract beneficial insects. Installation of bat and owl boxes attract beneficial wildlife.

Attempts should be made to reduce nuisance wildlife, such as deer, possums, and squirrels because of their tendency to harm trees and post health hazards. The planting of deer resistant native species may help achieve this goal.

**Wood Utilization Program**

As undesirable trees are removed, a considerable amount of material will be generated that may be suitable for use as urban timber. Urban timber is defined as sawn 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 the first step in developing a wood utilization program. In addition to logs, wood chips are valuable for use throughout the park district.

Urban timber can be milled into a large variety of products including pallet planks, 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. A sample Urban Timber Harvesting specification in appendix H

**OAKtober Event**

The Chicago Region Trees Initiative has created the OAKtober program, which brings awareness to oak ecosystem recovery. OAKtober events are held in the fall to encourage the planting of oak seedlings and is often held in conjunction with a seedling giveaway or plant sale.

**Fall Plant Sale**

As a prelude to the OAKtober event, it is suggested that the CLPD consider holding a fall native plant sale. Revenue from the sale would be dedicated to the management of the urban forest.
### Section 14 - Projected Budget

**REMOVALS**

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
</tr>
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<tbody>
<tr>
<td>Trees Removed</td>
<td>120</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100/year</td>
<td>100/year</td>
<td>100/year</td>
</tr>
</tbody>
</table>

**Notes**
- 14 Hazard Removals + Removals from Inv
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals
- Update Inventory for New Removals

| Removal Cost (2019) | $89,200 | $74,300 | $74,300 | $74,300 | $74,300 | $74,300 |
| Removal Cost (CPI) | $89,200 | $74,300 | $74,300 | $74,300 | $85,445 | $98,262 |

**PLANTINGS**

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2021</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees Planted</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>160/year</td>
<td>175/year</td>
<td>185/year</td>
</tr>
</tbody>
</table>

**Notes**
- Hazard and Priority Prunes + Standard Prunes
- Increase pruning capacity based on manpower
- Increase pruning capacity based on manpower
- Cycle pruning based on inventory updates
- Cycle pruning based on inventory updates
- Cycle pruning based on inventory updates

| Planting Cost (2019) | $28,000 | $32,000 | $36,000 | $40,000 | $40,000 | $40,000 |
| Planting Cost (CPI) | $28,000 | $32,000 | $36,000 | $40,000 | $46,000 | $52,900 |

**PRUNING**

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2021</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
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<tbody>
<tr>
<td>Trees Pruned</td>
<td>350</td>
<td>400</td>
<td>450</td>
<td>500</td>
<td>550</td>
<td>600/year avg</td>
<td>600/year avg</td>
<td>600/year avg</td>
</tr>
</tbody>
</table>

**Notes**
- Hazard and Priority Prunes + Standard Prunes
- Increase pruning capacity based on manpower
- Cycle pruning based on inventory updates
- Cycle pruning based on inventory updates
- Cycle pruning based on inventory updates

| Cost (2019) | $12,000 | $13,700 | $15,400 | $17,150 | $18,850 | $20,575 |
| Cost (CPI) | $12,000 | $13,700 | $15,400 | $17,150 | $23,661 | $27,210 |

**FORESTRY CONSULTANT**

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025-2030</th>
<th>2031-2040</th>
<th>2041-2050</th>
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<tr>
<td>Inventory Updates / Risk Management</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Updates / Risk Management</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Updates / Risk Management</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>11,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Cost (2019) | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $11,500 |
| Cost (CPI) | $10,000 | $10,000 | $10,000 | $10,000 | $23,000 | $11,500 |

**TOTALS**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
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<td>Removals</td>
<td>$149,200</td>
<td>$130,000</td>
<td>$135,700</td>
<td>$141,450</td>
<td>$143,150</td>
<td>$213,375</td>
<td>$205,375</td>
<td>$207,375</td>
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<tr>
<td>Planings</td>
<td>$89,200</td>
<td>$74,300</td>
<td>$74,300</td>
<td>$74,300</td>
<td>$74,300</td>
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<td>$36,000</td>
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<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$52,900</td>
</tr>
<tr>
<td>Cost (2019)</td>
<td>$135,400</td>
<td>$130,000</td>
<td>$135,700</td>
<td>$141,450</td>
<td>$143,150</td>
<td>$213,375</td>
<td>$205,375</td>
<td>$207,375</td>
</tr>
<tr>
<td>Cost (CPI)</td>
<td>$135,400</td>
<td>$130,000</td>
<td>$135,700</td>
<td>$141,450</td>
<td>$143,150</td>
<td>$236,606</td>
<td>$250,372</td>
<td>$280,818</td>
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**ADMINISTRATIVE (ONE TIME COSTS)**

<table>
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<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Hire more seasonal forestry staff, begin forestry internship program</td>
<td>$10,000</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$40,000</td>
<td>$70,000</td>
<td>$100,000</td>
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<tr>
<td>Purchase additional bucket truck, chipper, and other equipment to increase capacity</td>
<td>$10,000</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$40,000</td>
<td>$70,000</td>
<td>$100,000</td>
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</table>

**Costs (2019)**
- $10,000
- $10,000
- $10,000
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500
- $2,500

**Costs (CPI)**
- $10,000
- $10,000
- $10,000
- $10,000
- $10,000
- $11,500
- $13,225
Section 15- Summary / Conclusion

The mission of this Urban Forestry Management Plan is to create a more robust, diverse, and resilient tree population within the Crystal Lake Park District system over a 30 year time span. Throughout this document, the current status of the park district’s forestry program has been discussed. Goals and milestones, both financial and programmatic have been developed. These goals include high levels of species diversity, maintaining a forestry program which decreases costs and maintains public safety, and involving the public and other partner organizations in higher-level programs which benefit both the urban forest, and the residents and businesses which reside within the park district.

This document is meant to be adaptively managed and will be reviewed and updated as new information becomes available. As new pests and pathogens are introduced, new trees are available for planting, new organizations and partners become available, and staff changeover occurs, the goals will be reevaluated and adapted as needed.

The effort that Crystal Lake Park District has put into community trees over the past 100 years has been considerable. Development, adoption, and implementation of this Urban Forest Management Plan demonstrates a high level of commitment to the urban forest, therefore to the health and welfare of park district residents.
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 Park District Arborist and/or Forestry Consultant.

<table>
<thead>
<tr>
<th>NOT APPROVED</th>
<th>APPROVED SPECIES</th>
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<tbody>
<tr>
<td><strong>Large Trees</strong></td>
<td><strong>Medium Trees</strong></td>
</tr>
<tr>
<td>AILANTHUS</td>
<td>BALD CYPRESS</td>
</tr>
<tr>
<td>AMUR CORISTREE</td>
<td>BEECH-AMERICAN</td>
</tr>
<tr>
<td>ASH-EUROPEAN</td>
<td>BEECH-EUROPEAN</td>
</tr>
<tr>
<td>ASH-GREEN</td>
<td>BLACK LOCUST</td>
</tr>
<tr>
<td>ASH-WHITE</td>
<td>BUCKEYE-OHIO</td>
</tr>
<tr>
<td>BOXELDER</td>
<td>BUCKEYE YELLOW</td>
</tr>
<tr>
<td>BUCKTHORN</td>
<td>CATALPA</td>
</tr>
<tr>
<td>BURNING BUSH</td>
<td>DAWN REDWOOD</td>
</tr>
<tr>
<td>CHERRY-BLACK/PIN</td>
<td>ELM-HYBRID</td>
</tr>
<tr>
<td>COTTONWOOD</td>
<td>ELM-HYBRID*</td>
</tr>
<tr>
<td>ELM-AMERICAN</td>
<td>HACKBERRY</td>
</tr>
<tr>
<td>ELM-SIBERIAN</td>
<td>HICKORY-SPP</td>
</tr>
<tr>
<td>HONEYSUCKLE</td>
<td>HONEY LOCUST</td>
</tr>
<tr>
<td>MAPLE-NORWAY</td>
<td>HORSECHESTNUT</td>
</tr>
<tr>
<td>MAPLE-SILVER</td>
<td>KENTUCKY COFFEETREE*</td>
</tr>
<tr>
<td>MULBERRY-SPP</td>
<td>LARCH</td>
</tr>
<tr>
<td>PEAR-CALLERY</td>
<td>LINDEN-AMERICAN</td>
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<tr>
<td>POPLAR-SPP</td>
<td>LINDEN-LITTLELEAF</td>
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<td>POPLAR-WHITE</td>
<td>LONDON PLANETREE</td>
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<td>PRINCESS TREE</td>
<td>MAPLE-SUGAR</td>
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<td>RUSSIAN OLIVE</td>
<td>OAK-BURR</td>
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<tr>
<td>WALNUT-ANY</td>
<td>OAK-PIN</td>
</tr>
<tr>
<td>WILLOW-SPP</td>
<td>OAK-RED</td>
</tr>
<tr>
<td></td>
<td>OAK-SWAMP WHITE</td>
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<tr>
<td></td>
<td>OAK-WHITE</td>
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<tr>
<td></td>
<td>PAGODATREE</td>
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<tr>
<td></td>
<td>PERSIMMON</td>
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<tr>
<td></td>
<td>SWEETGUM</td>
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<tr>
<td></td>
<td>SYCAMORE</td>
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<td>ZELKOVA</td>
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<td></td>
<td>CHESTNUT-CHINESE</td>
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<td></td>
<td>MAGNOLIA-CUCUMBER</td>
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<tr>
<td><strong>Small Trees</strong></td>
<td><strong>Evergreens</strong></td>
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<tr>
<td>ALDER</td>
<td>AMERICAN REDBUD</td>
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<td>AMUR MAACKIA</td>
<td>ARBOR VITAE</td>
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<td>BIRCH-RIVER</td>
<td>BUCKEYE-RED</td>
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<tr>
<td>BIRCH-WHITE</td>
<td>DOGWOOD-SPP</td>
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<td>HAWTHORN-COCKSPUR</td>
<td>HAWTHORN-SPP</td>
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<td>HORNBEAM-EUROPEAN</td>
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<tr>
<td>HORNBEAM-AMERICAN</td>
<td>IRONWOOD</td>
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<tr>
<td>KATSURA</td>
<td>MAPLE-HEDGE</td>
</tr>
<tr>
<td>MAPLE-MIYABI</td>
<td>MAPLE-PAPERBARK</td>
</tr>
<tr>
<td>MAPLE-SHANTUNG</td>
<td>MAPLE-TRIFLORUM</td>
</tr>
<tr>
<td>OAK-CHINKQUAPIN</td>
<td>OAK-ENGLISH</td>
</tr>
<tr>
<td>OAK-SHINGLE</td>
<td>PERSIAN IRONWOOD</td>
</tr>
<tr>
<td>YELLOWWOOD</td>
<td>GOLDEN RAINTREE</td>
</tr>
<tr>
<td>MOUNTAIN ASH</td>
<td>PEAR EDIBLE</td>
</tr>
<tr>
<td>SASSAFRASS</td>
<td>SEVENTH SON FLOWER</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do Not Plant</th>
<th>Plant limited quantities</th>
<th>Plant in abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* - Male Only
Appendix B: Balled and Burlapped Planting Detail

INTERNATIONAL SOCIETY OF ARBORICULTURE

INTERNATIONAL SOCIETY OF ARBORICULTURE
1400 WEST ANTHONY DRIVE
CHAMPAIGN, IL 61821
(217) 355-9411
(217) 355-9516 FAX

DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.

STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT. SEE STAKING DETAIL.

WRAP TREE TRUNKS ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT. SEE WRAPPING DETAIL.

MARK THE NORTH SIDE OF THE TREE IN THE NURSERY, AND ROTATE TREE TO FACE NORTH AT THE SITE WHEN EVER POSSIBLE.

SET TOP OF ROOT BALL FLUSH TO GRADE OR 20-50 MM (1-2 IN) HIGHER IN SLOWLY DRAINING SOILS.

1800 MM (6 FT.) DIA. MIN./2400 MM (8 FT.) DIA. PREFERRED

200 MM (8 IN.)

50 MM (2 IN.) MULCH, DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK; MAINTAIN THIS DISTANCE FOR A MINIMUM OF THREE YEARS AFTER PLANTING.

NOTE: FOR DIMENSIONS OF PLANTING AREAS, TYPES OF SOIL AMENDMENTS, OR SOIL REPLACEMENT, SEE "SOIL IMPROVEMENT DETAILS."

NOTE: THIS DETAIL ASSUMES THAT THE PLANTING SPACE IS LARGER THAN 2400 MM (8 FT.) SQUARE, OPEN TO THE SKY, AND NOT COVERED BY ANY PAVING OR GRATING.

TAMP SOIL AROUND ROOT BALL BASE Firmly WITH FOOT PRESSURE SO THAT ROOT BALL DOES NOT SHIFT.

IF PLANT IS SHIPPED WITH A WIRE BASKET AROUND THE ROOT BALL, CUT THE WIRE BASKET IN FOUR PLACES AND FOLD DOWN 200 MM (8 IN.) INTO PLANTING HOLE.

PLACE ROOT BALL ON UNEVELED OR TAMPED SOIL.

NOTE: PLEASE REFER TO INTRODUCTION AND USE CRITERIA PRIOR TO USING THIS DETAIL.

TREE PLANTING DETAIL - B&B TREES IN ALL SOIL TYPES

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Appendix C: Container Planting Tree Detail

Notes:
1. Trees shall be of quality prescribed in crown observations and root observations details and specifications.
2. See specifications for further requirements related to this detail.

Central leader. (See crown observations detail).

Root ball surface shall be positioned to be one-quarter above finished grade.
Prior to mulching, lightly tamp soil around the root ball in 6" lifts to brace tree. Do not over compact. When the planting hole has been backfilled, pour water around the root ball to settle the soil.

Existing site soil added to create a smooth transition from the top of the raised root ball to the finished grade at a 15% max. slope.

4" layer of mulch. No more than 1" of mulch on top of root ball. (See specifications for mulch).

Original grade.
Finished grade.

Loosened soil. Dig and turn the soil to reduce compaction to the area and depth shown.
Existing soil.

Trunk caliper shall meet ANSI Z60 current edition for root ball size.
Root ball modified as required.
Round-topped soil berm 4" high x 8" wide above root ball surface shall be constructed around the root ball. Berm shall begin at root ball periphery.

Bottom of root ball rests on existing or recomposted soil.

SECTION VIEW

TREE IN POORLY DRAINED SOIL

URBAN TREE FOUNDATION © 2014
OPEN SOURCE TREE TO USE
Proper Pruning Principles

Dead Branch
Branch Collar
First cut part way through the branch at A, then cut it off at B. Make the final cut at C - D.

Living Branch
Branch Collar
(Do not cut along line C - X)

Hardwoods

Conifers

Arbor Day Foundation®
Appendix E: Tree Protection Detail

Crown drip line or other limit of Tree Protection area. See tree preservation plan for fence alignment.

Notes:
1- See specifications for additional tree protection requirements.
2- If there is no existing irrigation, see specifications for watering requirements.
3- No pruning shall be performed except by approved arborist.
4- No equipment shall operate inside the protective fencing including during fence installation and removal.
5- See site preparation plan for any modifications with the Tree Protection area.

Tree Protection fence: High density polyethylene fencing with 3.5" x 1.5" openings; Color orange. Steel posts installed at 8' o.c.
2" x 6" steel posts or approved equal.
6" thick layer of mulch.
Maintain existing grade with the tree protection fence unless otherwise indicated on the plans.

8.5" x 11" sign laminated in plastic spaced every 50' along the fence.

SECTION VIEW

S-X TREE PROTECTION

URBAN TREE FOUNDATION © 2014
OPEN SOURCE FREE TO USE
# Appendix F: ISA TRAQ (Tree Risk Assessment Qualification) Form

## Basic Tree Risk Assessment Form

<table>
<thead>
<tr>
<th>Target number</th>
<th>Target description</th>
<th>Target zone</th>
<th>Occupancy rate</th>
<th>Practical to move target?</th>
<th>Restriction present?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Target within 5 ft.</td>
<td>1-10%</td>
<td>2-5%</td>
<td>6-9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target within 15 ft.</td>
<td>1-5%</td>
<td>6-10%</td>
<td>11-15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target within 25 ft.</td>
<td>1-2%</td>
<td>3%</td>
<td>4%</td>
</tr>
</tbody>
</table>

### Site Factors
- **History of failures**: Topography Flat\sqrt{Slope}=\% Aspect
- **Site changes**: None\ \Box \ Grade change\ \Box \ Site clearing\ \Box \ Changed soil hydrology\ \Box \ Root cuts\ \Box \ Describe
- **Soil conditions**: Limited volume\ \Box \ Saturated\ \Box \ Shallow\ \Box \ Compacted\ \Box \ Pavement over roots\ \Box \ Describe
- **Prevailing wind direction**: Common weather\ \Box \ Strong winds\ \Box \ Ice\ \Box \ Snow\ \Box \ Heavy rain\ \Box \ Describe

### Tree Health and Species Profile
- **Vigor**: Low\ \Box \ Normal\ \Box \ High\ \Box \ Foliage None (seasonal)\ \Box \ None (dead)\ \Box \ Normal\ \Box \ Chlorotic\ \Box \ Necrotic\ \Box \ Abiotic
- **Species failure profile**: Branches\ \Box \ Trunk\ \Box \ Roots\ \Box \ Describe

### Load Factors
- **Wind exposure**: Protected\ \Box \ Partial\ \Box \ Full\ \Box \ Wind tunneling\ \Box \ Relative crown size: Small\ \Box \ Medium\ \Box \ Large\ \Box
- **Crown density**: Sparse\ \Box \ Normal\ \Box \ Dense\ \Box \ Interior branches Few\ \Box \ Normal\ \Box \ Dense\ \Box \ Vines/Mistletoe/Moss\ \Box
- **Recent or planned change in load factors**: 

### Tree Defects and Conditions Affecting the Likelihood of Failure

#### Crown and Branches
- Unbalanced crown\ \Box \ LCR\ \% Dead twigs/branches\ \% overall Max. dia. 
- Broken/Slipped\ \Box \ Number\ \Box \ Max. dia. 
- Over-extended branches\ \Box

#### Pruning history
- Crown cleaned\ \Box \ Thinned\ \Box \ Reduced\ \Box 
- Reduced\ \Box \ Topped\ \Box \ Lion tailed\ \Box
- Flush cuts\ \Box \ Other\ \Box

#### Main concern(s)

### Load on defect
- N/A\ \Box \ Minor\ \Box \ Moderate\ \Box \ Significant\ \Box

### Likelihood of failure
- Improbable\ \Box \ Possible\ \Box \ Probable\ \Box \ Imminent\ \Box

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

#### Main concern(s)

### Load on defect
- N/A\ \Box \ Minor\ \Box \ Moderate\ \Box \ Significant\ \Box

### Likelihood of failure
- Improbable\ \Box \ Possible\ \Box \ Probable\ \Box \ Imminent\ \Box

### Roots and Root Collar
- Collar buried/Not visible\ \Box \ Depth\ \Box \ Stem girdling\ \Box
- Dead\ \Box \ Decay\ \Box \ Conks/Mushrooms\ \Box
- Ooze\ \Box \ Cavity\ % circ.
- Cracks\ \Box \ Cut/Damaged roots\ \Box \ Distance from trunk\ \Box
- Root plate lifting\ \Box \ Soil weakness\ \Box

#### Main concern(s)

### Load on defect
- N/A\ \Box \ Minor\ \Box \ Moderate\ \Box \ Significant\ \Box

### Likelihood of failure
- Improbable\ \Box \ Possible\ \Box \ Probable\ \Box \ Imminent\ \Box
**Risk Categorization**

<table>
<thead>
<tr>
<th>Condition number</th>
<th>Condition of concern</th>
<th>Target size</th>
<th>Fall distance</th>
<th>Target protection</th>
<th>Likelihood of Failure</th>
<th>Likelihood of Impacting Target</th>
<th>Consequences of Failure</th>
<th>Risk rating of part</th>
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**Matrix 1. Likelihood matrix.**

<table>
<thead>
<tr>
<th>Likelihood of Failure</th>
<th>Very low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
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<td>Somewhat likely</td>
<td>Likely</td>
<td>Very likely</td>
</tr>
<tr>
<td>Probable</td>
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<td>Unlikely</td>
<td>Somewhat likely</td>
<td>Likely</td>
</tr>
<tr>
<td>Possible</td>
<td>Unlikely</td>
<td>Unlikely</td>
<td>Unlikely</td>
<td>Somewhat likely</td>
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<tr>
<td>Improbable</td>
<td>Unlikely</td>
<td>Unlikely</td>
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<td>Unlikely</td>
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</table>

**Matrix 2. Risk rating matrix.**

<table>
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<tr>
<th>Likelihood of Failure &amp; Impact</th>
<th>Consequences of Failure</th>
<th>Negligible</th>
<th>Minor</th>
<th>Significant</th>
<th>Severe</th>
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<tr>
<td>Very likely</td>
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<td>Moderate</td>
<td>High</td>
<td>Extreme</td>
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</tr>
<tr>
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<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Somewhat likely</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

**Notes, explanations, descriptions**

**Mitigation options**

**Residual risk**

---

**Overall tree risk rating**

**Overall residual risk**

**Work priority**

**Recommended inspection interval**

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

**Inspection limitations** None Visibility Access Vines Root collar buried Describe

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This dataset was produced by the International Society of Arboriculture (ISA) and is intended for use by Tree Risk Assessment Qualified (TRAQ) arborists - 2013.

Page 2 of 2
**Tree Maintenance Contract Formulation**

Large-scale tree maintenance tasks will primarily be performed by a tree care contractor. The following are guidelines to develop efficient and cost-effective contractors for park district-wide tree trimming, tree removal, and stump removal operations. 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 park district 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. Once those situations have been resolved, a cycle-pruning program should be established in order to improve and maintain the urban forest. Updating the inventory regularly will identify trees needing the most maintenance and in what year that maintenance should be performed. This approach is a wise use of park district funds and manpower.

**Contract Timing**

While some trees respond best to pruning in a specific season, 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. Each public agency will have purchasing guidelines and procedures to determine what is allowable. Multi-year contracts tend to provide greater efficiencies and therefore cost savings to the park district. When managing multi-year contracts, the first year is awarded to the lowest responsible bidder and subsequent years are awarded after successful completion of the previous year.

**Contract Specifications**

All pruning shall follow the ANSI A300 (Part 1) - 2008 Pruning Standard and the ISA’s Best Management Practices: Tree Pruning (2008) for 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. 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**

Tree removal contracts are structured in a similar way to tree pruning contracts but will address timing for completion of the work. Trees that pose the highest risk should be addressed as a priority. These trees have been identified earlier in the UFMP.

**Budget**

The budget for tree removal should ensure that sufficient funds are allocated to remove high risk trees. These trees have been identified earlier in the UFMP. If additional funds are available, priorities for removal should be guided by the UFMP.

**Contract Timing**

High risk trees should be removed as soon as possible, providing that the purchasing requirements of the park district have been met and all insurance and signed contracts have been received. Specific time frames for removal will be described in the contract documents.

**Contract Length**

As discussed in the tree pruning section, contracts may be let annually or on a multi-year basis. Purchasing guidelines of the park district will determine the most appropriate contract length.

**Contract Specifications**

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**

Stump removal contracts are structured in a similar manner to tree pruning and tree removal contracts. Stump removal and restoration should occur as close to the date of removal of the tree as possible and are often part of the tree 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 area adjacent to the stump. The area then shall be restored with topsoil to the level of the adjoining grade and seeded.

**Budget**

The budget for stump removal should ensure that sufficient funds are allocated to remove stumps as the trees are removed.
Contract Timing
Existing stumps should be removed as soon as possible, and those generated by the removal contract shall be ground and restored as the removal contract progresses.

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. Park district purchasing guidelines and procedures will dictate the contract details.

Contract Specifications
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 Harvesting

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: PLANT HEALTH CARE APPLICATIONS AND SAFETY

**Pests and Applications**
The Crystal Lake Park District recognizes the following pests and pathogens to be among those which may warrant treatment during the growing season to maintain trees health, aesthetics, and benefits provide to the community.

**Emerald Ash Borer (EAB)**
EAB is an insect pest that affects all species of the Ash tree genus (*Fraxinus*) in the United States. The insects kill the tree by chewing through the tree cambium tissue which effectively girdles the tree, causing it to not be able to get nutrients and water up to its leaves. This results in tree death several years after infestation.

Treatment for Emerald Ash Borer involves either a direct trunk injection of insecticide concentrate or a soil drench (root application) with insecticide and fertilizers or at times a combination of both. This insecticide in combination with fertilizer both kills the larval stage beetles, as well as provides the tree with additional nutrients to be able to heal the beetle damage.

**Zimmerman Pine Moth**
Zimmerman Pine Moth (ZPM) attacks most Pine species, but Austrian and Scotch Pines are particularly susceptible. The female ZPM lays eggs in midsummer near the edges of previous wounds. The larvae overwinter and begin feeding the following spring. They first feed on the bark and then bore into the cambium. The tunneling girdles the branches and causes dieback. After several years of damage, the trunk may weaken and break off. Signs of infestation include large...
masses of frass and resin in the branch whorl area on the trunk. These masses are often off-white or yellowish (see photo).

To control ZPM, apply an insecticide to the trunk and branches in early spring during larval activity and again in midsummer during egg-laying. Remove dead trees promptly, as they can serve as hosts and a center of infestation.

**Diplodia Tip Blight**
Many Pine species can be infected by Diplodia Tip Blight (DTB), but in our region Austrian and Scotch Pine are the most susceptible. DTB is more likely to occur when trees are stressed and near infected susceptible species. The disease first appears as browning of needles at the tips of shoots (see photo). Needles are often shorter than normal, and sometimes droplets exude from infected needles. Small black fruiting bodies of the fungus can be seen at the base of needles. Fruiting bodies also form on scales of seed cones and on bark of infected shoots. Often the damage appears in the lower part of the tree but shoots throughout the tree may show damage. Repeated infection of branch tips results in deformed tree growth and loss of vitality. The fungus can also cause cankers, with excessive and obvious sap exudate.

Management of DTB includes not planting susceptible trees near mature infected Pines. On infected trees, remove any dead or cankered wood and cones. Mulch and water as needed to reduce stress. Fungicide spray requires three timely applications: 1) when buds begin to elongate/swell 2) just before the new needles begin to emerge from the fascicle sheath, and 3) 10 to 14 days later. Lastly, consider avoiding the use of the most susceptible Pines in landscape plantings.

**Apple Scab**
Apple Scab is a complex fungus that affects most species of Crab Apples, as well as some Serviceberries, Hawthorns, and Pears. It is often found alongside a very similar and related fungus called Cedar Apple Rust. This fungus infects the leaves and fruits of these trees and often they lose their leaves and become entirely defoliated by the early summer. Though rarely if ever fatal, CLPD parks contain many of all of these species, resulting in a very poor aesthetic when there are many small ornamental trees that appear nearly dead in the middle of August.
Control of Apple Scab is very similar for control of Diplodia Tip Blight and involves 3 applications of fungicide: 1) When buds begin to break in spring 2) Two weeks later when tree has half of its leaf emerged 3) Two weeks after that just before or during flowering. Cultural treatments are also effective such as raking up dead leaves so spores have nowhere to live.

**Other Potential Pests and Disorders May Include**

<table>
<thead>
<tr>
<th>PEST/PATHOGEN</th>
<th>AFFECTED SPECIES</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch Elm Disease</td>
<td>American Elm</td>
<td>Fungicide infusion at the root flare with large water volume</td>
</tr>
<tr>
<td>Thousand Cankers Disease</td>
<td>Walnut Species</td>
<td>None known yet, possible fungicide injection</td>
</tr>
<tr>
<td>Japanese Beetle</td>
<td>Linden, Birch, Others</td>
<td>Leaf spray of diluted insecticide during flight season</td>
</tr>
<tr>
<td>Iron / Manganese Chlorosis</td>
<td>Maples, Birches, Others</td>
<td>Soil or trunk injection of Iron and Manganese</td>
</tr>
<tr>
<td>Scale Insect</td>
<td>Many</td>
<td>Spray or trunk injection with insecticide</td>
</tr>
<tr>
<td>Bur Oak Blight</td>
<td>Burr Oak</td>
<td>Fungicide injection in trunk</td>
</tr>
<tr>
<td>Oak Wilt</td>
<td>Red Oak Family</td>
<td>Root trenching / fungicide injection</td>
</tr>
</tbody>
</table>

**Pesticide Safety**

When applying any Plant Health Care application to any public site, Crystal Lake Park District shall observe the following:

1. Marking of the site to be sprayed or applied to with white flags or other signage clearly allowing park patrons to know what is being applied.

2. Chemicals shall only be applied by a licensed Illinois Department of Agriculture Operator or Applicator, who is wearing the appropriate personal protective equipment based on the label of what is being applied to the site.

3. Chemicals shall be applied at the label rate for the pest or pathogen being controlled, and in keeping with the manufacturer’s instructions, and shall be stored in accordance with the manufacturer’s instructions.

4. Aerial sprays shall not be applied when the wind speed or wind gusts exceed 15 miles per hour during the day, in order to avoid overspray.

5. No chemical applications shall be performed when temperatures exceed 85 degrees Fahrenheit, in order to avoid volatilization of chemicals resulting in non-target organisms being affected.
6. All personal protective equipment and application equipment shall be maintained in accordance with the manufacturer’s instructions and applicable ANSI standards for such equipment.

7. Tanks shall be triple rinsed when switching between applications and only approved tank mixes shall be acceptable when multiple chemicals are being mixed.

8. Care shall be taken by all employees to wash hands and clothes as needed to avoid unnecessary exposure to any chemicals.

**PPE in Pesticide Application**

- **Goggles**
- **Respirator**
- **Long-sleeved shirt**
- **Sweaters over long rubber gloves**
- **Wide-brimmed hat**
- **Overall**
- **Rubber band around cuff**
- **Rubber boots**