

Village of Michiana Urban Forestry Management Plan



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OVERVIEW OF MICHIANA'S URBAN FORESTRY MANAGEMENT PLAN

The Village of Michiana currently manages a total of 461 publicly owned trees, of which 275 are located in parkways (Rights of Way / ROW) and 186 are located in Parks or other land owned and directly managed by the Village. Based on our data collection, we also anticipate that the Village has approximately 11,000 trees on private property within Village limits. Michiana is also a very unique community given that it is partially in Critical Dune Habitat as defined by the Michigan Department of Natural Resources, and requires special care be exercised to preserve the ecology of the area.

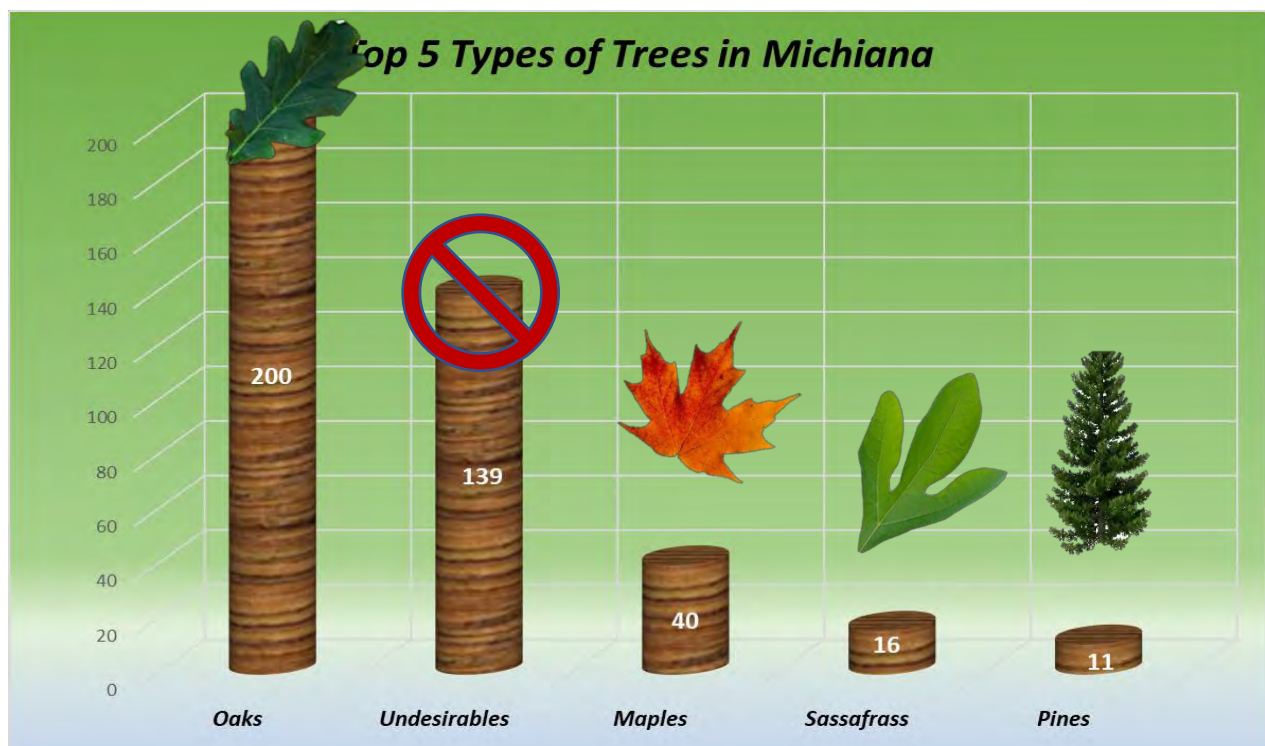
In terms of the condition of the Urban Forest in Michiana, there are both strengths and opportunities for improvement. In terms of strengths, the Michiana has a sizable tree population that is in overall good condition. Michiana has been managing that resource satisfactorily in the past, however there is some work to do in terms of near-term maintenance. Once the necessary maintenance is complete, Michiana will be able to focus on enhancements rather than remedial action. Tree protection in Michiana is also strong, per our ordinance, which we are continually updating to provide a high level of care. It is also prevented by ordinance for private residents to prune trees in the public Right of Way. All of this combined helps preserve these resources for the benefit of the community, and shows a strong commitment to forestry.

In terms of opportunities, the diversity level and overall number of species is quite good, and this UFMP will aim to improve upon this even further. This will be examined in further detail below, but diversifying new plantings based on our recommendations will be an immediate long-term goal, as is removal of woody brush from the ROW, managing dead tree limbs on both private and public land within the ROW, and managing invasive and aggressive species on public lands.

In order to build an Urban Forestry program so it will maximize long term benefits to the community while reducing costs, the UFMP will address each one of these strengths and opportunities and more to create goals and milestones for each. In the Plan, separate sections detailing specific Urban Forestry activities, and how we propose they are achieved, as well as standards and Best Management Practices for each area addressed.

An urban forestry program has been created in this Plan which attempts to achieve the greatest benefit for the community. However, all plans are subject to change based on new information, budgets, or other unforeseen circumstances or new data. For this reason, it is asked that readers consider this plan to be an evolving document, and goals and strategies will be updated to fit new circumstances as needed. This Urban Forestry Management Plan should be reviewed periodically, at which point Village residents and other stakeholders will have an opportunity to provide input and help improve the Plan during those annual reviews. This document was primarily authored by Great Lakes Urban Forestry Management working in tandem with Michiana's Village Council, Tree Board, and staff.

MICHIANA'S URBAN FOREST: AT A GLANCE (ROW TRESS ONLY)...



DIRECT GOALS

Listed below are the direct goals of this Urban Forest Management Plan as well as a brief discussion of how they shall be met. Direct goals are those which this plan addresses very explicitly in describing pruning, removal, planting, and other activities. Every attempt was made to make these goals realistic and achievable, so they do not place an undue burden on Village staff. Instead, the direct goals of this UFMP are to save money and provide greater benefits over time through proactive management. The Plan is also meant to be adaptive so it can change over time.

The Plan is intended to be reviewed periodically by the Michiana Village Council, and any additional stakeholders. The review process should include evaluation of progress made towards these goals. Goals may be altered after the review as conditions warrant. This UFMP is written with the understanding that organizations, stakeholders, and residents change over time, and therefore its goals require a degree of flexibility. Since trees represent a long term (50-80 year) commitment, this UFMP is intended to provide guidance and continuity through those changes, while also adapting to them as the need arises. The goals presented in this Plan are summarized in the table below.

Create a Needs Analysis for the Current Trees	Establish Goals and Milestones	Climate and Stormwater Abatement
Create 5 Year Cyclical Tree Pruning Program	Increase Overall Diversity by 2033 and Beyond	Begin the Process of Updating Policies and Procedures
Manage Tree Removals, Both Public and Private	Maintain Accurate Tree Inventory	Properly Mulch New Plantings
Raise Awareness of Utility Issues	Create Tree Risk Management Policy	Engage the Community & Promote Awareness of Trees and Dune Ecology
Create Strategic Partnerships	Managing Invasive Species	Create Acceptable & Unacceptable Species List

Create a Needs Analysis for the Current Tree Population

It is the goal of this Plan to assess the current state of the Urban Forest and examine its overall strengths and benefits, as well as look for opportunities for improvement to inform future decisions.

Each aspect of Michiana's comprehensive tree data has been analyzed: How many trees, who owns the trees, what condition they are in, how old they are, what needs do they have, and more were all examined to create goals to improve the tree population for the benefit of Michiana, its residents, and other stakeholders. Specific goals in terms of planting, removals, pruning, budgets, personnel, and maintenance are all addressed.

Establish Goals in Order to Enhance Strengths and Realize Opportunities

Establishing an urban forestry program will require a series of attainable goals to be effectively achieved. This UFMP seeks to accomplish those goals within a realistic budget and attainable timespan.

In each section of the Plan related to direct goals, included are a budget and time frame in which those goals can be accomplished. The goal will be to have Michiana have a sustainable, ecologically sound, and adaptable forestry program within a 10-year period. This program will include tree planting, tree maintenance, and tree removal for Michiana's Urban Forest, so that the tree population will be healthy, and provide the greatest benefits to the community while maximizing benefits and minimizing risk.

Begin the Process of Updating Policies and Procedures

As opposed to many similar small communities throughout the Midwest, Michiana has a relatively robust set of ordinances (Part II / Chapter 323 and others) which govern its tree population. While many larger communities which have the staff and time to devote to forestry may have such ordinances and guiding documents, many smaller communities do not, and Michiana is exemplary in that regard. While a full or even partial rewrite of the existing code is outside of the purview of this project and document, a strategic goal is that we begin the process of identifying areas of the code which may need to be reinforced or edited moving forward.

Increase Overall Diversity by 2033 and Beyond Through Tree Planting

Tree species diversity is one of the most important concepts in Urban Forestry today. Devastating pest damage such as that from Emerald Ash Borer or Oak Wilt can be mitigated by planting a greater diversity of tree species, so that when new pests or pathogens are introduced, we only lose small amounts of specific tree species. Diversity leads to stability of the tree population, and stability leads to reduced costs and increased benefits over time.

Using the species list provided by the state's Environment, Great Lakes, and Energy department (EGLE), coupled with some additional suggestions from the Great Lakes Urban Forestry team, we plan on increasing that diversity. Currently, the Michiana tree population is composed overwhelmingly of Oaks, but also many undesirable species as well, such as Mulberry, Tree of Heaven (*Ailanthus*), Siberian Elm, and others. A key to building enough planting capacity to realize this Diversity Vision will be the removal and replacement of these poor-quality species with trees more fitting to the Dune Ecosystem.

Trees should be planted which are underrepresented or not present in the current population, native to the area, non-invasive, and planted in a manner that selects the right tree for the right site. A direct goal will be to create a tree planting program where trees are matched to existing sites for the next 10+ years.

A goal will be to gradually increase plantings to 40 trees per year, to both be able to replace older declining trees, as well as to grow the tree population by a net over 200 publicly owned trees overall by 2033. This will be achieved by plantings outpacing removals by a ratio of 1.5 : 1, which not only meets, but exceeds the 1:1 standard set forth in the State of Michigan's Environment, Great Lakes, and Energy (EGLE) documents. While Michiana is limited in the space available for such a planting effort on its Right of Ways, increased canopy can be built in many other ways, such as establishing native understory trees under full sized shade trees, as well as planting in parks or other publicly owned land, or planting trees where nuisance brush had once grown in the ROW. To learn more about tree planting and reforestation, turn to page 39.

Maintain a Desirable and Undesirable Species List

The urban environment is a difficult place for a tree to live, even when that environment is as natural as Michiana's. Between road salts, urban pollutants, limited soil, and other challenges, not all trees will thrive in the urban environment. Trees that have very weak wood, are known to be an invasive or aggressive species, produce messy or foul-smelling fruits, or create a public nuisance that should also be avoided. In addition, trees which are not native to the area must be avoided at all costs, to preserve the ecological character of the dune ecosystem. This suits the needs of the community, and is encouraged by regulatory agencies such as Michigan Department of Environment, Great lakes, and Energy, as well as the Michigan Department of Natural Resources.

Acceptable species are those which are adapted to our Midwest climate, are not invasive, are likely to be found in Critical Dune Ecosystems or neighboring environments and meet diversity goals. Included in this Plan is an "acceptable and unacceptable" species list which will detail specific trees which may be planted in the Village. Michiana and their Tree Board will review the list periodically to ensure that it is maintained in accordance with the latest information on specific trees. For more information on what species can and cannot be planted, see the list in Appendix A.

Manage Tree Removals, Public and Private

To preserve public safety, or to prevent the spread of tree pests and pathogens, sometimes tree removal is unavoidable. During the inventory, 73 trees were recommended for removal: 2 as priority removal, 40 as standard removal, and 31 as low priority removal. To keep the residents of Michiana safe, a tree removal program has been created in this Plan which budgets for the safe removal of all these trees over 5 years after adoption of this plan in order to maintain public safety.

We should note that some woody material ("Brush" hereafter) which could not rightfully be considered a "Tree" exists in the public Right of Ways in Michiana. While this brush was not included in the inventory because it was so rampant and did not fit the proper definition of a "Tree", its removal will be critical to increasing the amount of plantable space in Michiana's Rights of Way. This work has been included in budget projections.

In addition, survey work was done on private property to identify trees and tree parts which have the potential to fail over the ROW. While these trees are not included in the public tree numbers listed above, we will explore strategies to deal with them later in this plan, and coming up with a strategy to deal with private property tree removals will be integral to this plan as well. It should be noted here once again that the ordinances governing tree removal and pruning on private property are under review, and we may alter them in the future based on the needs of the Council, residents and best management practices.

Cost projections for public tree removals have been made based on the number, age, and condition of trees in Michiana for the next 10 years, so that long term budgeting projections can be made. Also included are ANSI and ISA safety standards, as well as suggested staff and contractor qualifications to ensure Michiana is hiring staff and contractors who will be held to the highest industry standards. For more information on Michiana's proposed tree removal program, turn to page 37.

Create a Cycle Pruning Program

Currently, pruning is only practiced sporadically and reactively. A direct goal of this management plan will be to create a 5-year pruning cycle for Michiana's trees so that they are maintained in a healthy condition. This will also be done in concert with utility pruning performed by AEP, our local electric utility provider who is responsible for keeping the utility lines free of obstructions.

With a slight budget increase over the next 10 years, we hope to help develop a cyclical pruning program. This program will ensure that all trees on in on Village ROWs as well as Village parks and facilities are pruned at a minimum every five (5) years, increasing tree health, structure, and vigor while reducing costs associated with storm damage and tree failure. For more information on tree pruning and maintenance, turn to page 42.

Maintain an Accurate Tree Inventory on an Annual Basis

A stem-by-stem inventory of ROW and Park trees was completed in March of 2023. This resulted in an unbiased assessment of all public trees and will serve as the data which will guide the forestry program throughout the next 10 years.

All inventories are a snapshot in time. With 461 inventoried trees on Village parkways and in managed parks, the tree inventory should be maintained at a high level of accuracy so that it does not become out of date. At present, we have yet to decide how the inventory will be maintained, but it is anticipated the Village staff can be responsible for at least a portion of the updating. It is also recommended that it be updated periodically by a Forestry Consultant, to keep the information at its most current. Maintaining this tree data at a high level is vital in the execution of this Plan.

Proper Mulching of All New Plantings

Proper mulching can significantly increase a tree's ability to thrive. Mulch helps to conserve water during the summer by preventing it from evaporating from the soil. It also helps prevent weeds from growing around the tree and keeps lawn equipment such as weed whips away from the trunk where they can damage the tree. All new Michiana plantings will be properly mulched at the time of planting by a qualified planting contractor.

Another intended outcome of this initiative will be to educate neighboring residents about proper mulching care and notify them when poor mulching techniques are being used. Of particular concern is the practice known as "Volcano Mulching" which has the opposite effect of proper mulching and can severely damage a tree over time. For more information on proper mulching, turn to page 45.

Incorporation of Best Management Practices in Tree Care Operations

"Best Management Practices" is a term which means being on the cutting edge of your industry. All contractors working for Michiana should be compliant with the latest industry Best Management Practices, many of which are located in the appendices of this Plan.

The ANSI and ISA Best Management Practices shall be integral parts of any Request for Proposal (RFP) or bid documents when seeking qualified contractors. Full text of all referenced standards shall be made available to all Michiana employees and contractors performing tree care operations. Public outreach and education shall be performed by Michiana's Village Council, Tree Board, and other partner organizations as noted below. These will include website-based communication providing literature, public service announcements, and other documentation to keep residents informed. This UFMP will be in the public domain for residents to use as a reference.

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

Trees create great benefits, but they may also pose various degrees of risk. Tree or tree part failure can have catastrophic effects on people or property, and trees need to be well-managed and healthy to avoid that risk. Currently, the Village is working through the creation of such a policy, and though it will not be complete upon completion of this UFMP, we recognize it as a very important next step in the process of enhancing our forestry program here in the Village. This policy, when formalized and adopted, will aid in identifying, documenting, and designating for removal or mitigation trees which may pose a threat to public safety in a timely manner. This will reduce the overall level of risk posed by trees, as well as exposure to liability from tree-related incidents.

Tree Preservation / Invasive Species Management

Sometimes trees can become damaged or destroyed by construction activities, costing Michiana money, and eliminating the benefit the tree had to the community. A basic tree survey and assessment should be conducted prior to any construction activities on Village owned land. A tree protection zone should be established and maintained during construction. The removal of low quality or invasive species is also strongly encouraged on not only public but private property as well. Removal of invasive or aggressive species not only increases the amount of planting space or usable land, but also increases public safety. A direct goal of this Urban Forestry Management plan is to preserve trees during construction and reduce the number of undesirable species in the Village on both public and private property through awareness.

Create Strategic Partnerships

Ultimately, the establishment of an Urban Forestry program is to improve the lives of the residents and other stakeholders to create a healthier, happier community and reduce costs while increasing benefits. To make this happen, Michiana is looking for partners to provide support for this program. Michiana plans to reach out to local garden clubs, philanthropic organizations, and residents to make the forestry program innovative and community based.

It is also proposed that Michiana hold supervised events where residents can be trained in proper tree care and inventory maintenance. Trained residents might also assist in other basic tasks such as watering, mulching, etc. In this manner, Michiana residents can take ownership of this important and beneficial resource, and allow it to work for them, their families, and the good of the whole Village.

Engage the Community & Promote Awareness of Trees and Dune Ecology

To many residents of Michiana, the importance of being stewards of the Dune Ecosystem is well known, and treated with respect. However, there may certainly be some residents who simply aren't aware of just how special this rare ecosystem is, or just how they should be considering it when they plan landscapes. Similarly, developers and landscape architects working in Michiana may not be fully educated on these matters either. This plan seeks to engage the community through knowledge, such as providing valuable information on what tree species to plant and those to avoid, and more importantly, why certain species should be avoided and what the consequences of introducing those species could be.

Mitigate Climate Change Effects

An proactive and effective strategy to mitigate a changing climate is to plant more trees, and in fact the United States Environmental Protection Agency lists tree planting as one of the more effective solutions to mitigate climate change through absorption of carbon dioxide

(<https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands>).

Trees have a great variety of environmental benefits, such as offsetting climate change by producing a cooling effect in urban heat islands, and flood abatement by absorbing stormwater that otherwise would run off. Trees also act as long-term sinks for carbon dioxide, where carbon from the atmosphere becomes “sequestered” in the tree’s woody parts like the trunk and limbs. Increasing tree canopy increases the benefits provided. It also provides habitat for birds, pollinators, and wildlife.

Addressing Utility Issues

During the inventory, several issues were identified with trees and utility conflicts. The following standards are from the local utility company (AEP), and discuss trees and utilities:

<https://www.indianamichiganpower.com/lib/docs/community/projects/TreeTrimmingBrochureMar06.pdf>. We will address these utility issues throughout the plan.

Additional Goals

There are no strategic timelines set forth here for these programs. As the direct goals of the Urban Forestry program in the Public Works Department are met or exceeded, these are goals to be discussed by the Public Works Department and its Tree Board as time and budgets become available, per the Council. We believe that many of these programs represent some of the most progressive Urban Forestry policies currently, and that they should all be considered for implementation.

Creation of a Volunteer Stewardship Group

As mentioned previously, with education provided by a professional Certified Arborist, a group of local Michiana residents could be trained sufficiently to handle basic tree care operations such as pruning of young trees, watering, mulching, monitoring for pests and diseases, and updating the Village’s tree inventory. Efforts such as this have been very effective in similar small communities where budgets and manpower are limited, and a stewardship group can accomplish many of these tasks at a reduced cost to the Village, while building a sense of community around the trees.

Establishment of a Village Propagation Nursery

Finding a plot of land on which the Village could grow even 10 trees per year to plantable size would significantly reduce the cost of tree planting shown in this plan. Members of the community such as the Volunteer Stewardship group above could tend to these trees until such time as they are prepared to be dug and planted on Right of Ways, Parks, or other publicly owned land. Programs such as this have been effective in other similar communities and can be done on a plot of land as small as 20’x20’, or no larger than a small community garden.

Contract Growing Program

Whether Michiana chooses to grow a share of its own trees or not, creating a Contract Growing agreement with a local (within 50 miles) nursery is an effective way to get the specific tree species you want while avoiding market uncertainty and competition.

Simply stated, a contract growing agreement is one where Michiana would tell the nursery what species they were looking to plant and in generally what years, and the nursery would source the small plants (“whips”, as they are known in the nursery trade) and then grow them to plantable size for Michiana on the nursery’s land. Michiana would agree to purchase the trees when they are ready to be planted. This arrangement has been highly beneficial in maintaining tree diversity standards and forming long term relationships with nurseries, reducing costs, and avoiding shortages of certain species in the nursery trade.

Create a Memorial Tree Planting Program

Memorializing a loved one or group with tree planting has been a popular program for many public organizations over the years. Generally, this works as a cost share program whereby residents can share the cost of a new tree planting with the Village and their tree gets a memorial placard or other similar marker noting who the tree is planted in memorial of. This reduces costs and gives people a sense of ownership about the forestry program through their tree.

Establishment of Marshalling Yard for Woodchips

Michiana Village Park was once a dump site for various materials including wood chips. While that may no longer be possible at this site, we recommend that the Village look for an alternate site where contractors performing tree work in the Village can dump their woodchips and make them available to residents for free. As mentioned above, woodchips (mulch) have many benefits for trees when applied properly, and can be used as a natural landscape bedding material. Additionally, tree care contractors generally must pay to haul and dispose of the woodchips they generate. Letting them dump for free in the Village can reduce costs associated with trimming and removal operations as well as provide a free resource to residents.

Establish a Community Operating Fund for Trees

Municipal budgets are almost always not sufficient to cover the needs of their trees. When this is the case, private capital can be brought in to make up the shortfall by means of a nonprofit group that takes such private capital and directs it to tree care operations and public outreach. While we understand that setting up and running a nonprofit takes a significant amount of effort, it is certainly something worth considering as a funding stream.

Private Property Tree Planting Incentive Programs

There are a variety of ways to explore this opportunity. Some examples from other communities include holding a tree and native plant sale where the Village can use its purchasing power as a tax-exempt organization to purchase plants wholesale from a nursery, and then resell them to the residents at a slight markup, but below retail costs. This gets plants into the hands of residents at a reduced rate and generates both income and visibility of the importance of trees and environmental stewardship in the dunes. Another successful example would be creating a cost share program for planting in private property, where the Village has no jurisdiction, but can encourage planting through a simple free permit and cost share with the Village.

Wood Utilization Program

While trees sequester carbon for their lifetime (40-100 years generally), once they are removed and ground into mulch or burned, a large portion of that carbon is returned to the atmosphere. Using the wood that our urban trees provide to make furniture, flooring, art, or other durable goods ensures that the carbon stays sequestered for much longer. The state of Michigan has a vibrant chapter of the Urban Wood Network (<https://urbanwoodnetwork.org/chapter/michigan-state-chapter/>) which can help make this a reality, whereby wood generated from local tree removals can be made into durable goods and used or sold by residents. Not only does this do good for the climate, but products made with wood generated from resident homes and rights of way has a certain story and “cool” factor to it that can’t be made up with lumber from the hardware store. We highly recommend that Michiana reach out to the Urban Wood network to discuss possibilities with them.

Strategic Partnerships

Strategic partnerships are a very effective means of getting forestry projects funded when budgets may present a challenge. These typically involve either public-private partnerships or partnering with other public entities. Typically, the organizations seen participating in these programs include local garden clubs, scout groups, rotary clubs, businesses, state departments of natural resources, and other such groups. This will be an ongoing goal, and continuing partnerships with new organizations shall always be sought.

Michigan Department of Natural Resources (MDNR)

The Michigan Department of Natural Resources has many programs geared towards forestry, including the Urban and Community Forestry program. This program brings the benefits of trees to Michigan communities through planning and partnership. They assist with forest management activities, community policy development and education, and act as a pass-through organization for grant funding. MDNR has many resources and grant programs which Michiana can take advantage of to fund and oversee their Urban Forestry program as it develops.



Michigan Department of Environment, Great Lakes, and Energy (EGLE)

EGLE’s mission is to protect Michigan’s environment and public health by managing air, water, land, and energy resources to foster thriving communities throughout Michigan. Several of the standards listed in the plan have come directly from or have been directly influenced by EGLE’s documents, and they will be a critical partner in moving forward with initiatives in the Critical Dune areas in Michiana and respecting the ecological character of the area.



Beach Garden Club

The Beach Garden Club is a joint garden club composed of members of the Communities of Michiana, Michiana Shores, New Buffalo, and other surrounding beachfront communities in southwest Michigan and northern Indiana. This group brings together diverse interests in gardening, ecology, and native landscaping among other things, and provides a rich forum for members to interact and share ideas. They are very active in the area and can help spread ideas about urban forestry and ecology from Michiana to surrounding communities.

Urban Wood Network – Michigan Chapter

As mentioned previously, Michigan has a vibrant chapter of the Urban Wood Network and has thus far been very successful relative to other areas of the country in creating resources and market for urban wood, or wood that came from trees harvested from the built environment. The Michigan Chapter advances sustainability and carbon neutrality in Michigan by supporting urban wood utilization through efforts that salvage valuable resources, improve opportunities for workers, and expand Michigan's wood product's economy. They will be a very valuable partner in trying to put Michiana's trees into long term carbon storage when they need to be removed for whatever reason.



ReLeaf Michigan

ReLeaf Michigan is Michigan's only statewide tree planting non-profit organization, working with communities and organizations throughout Michigan to protect and restore their urban tree canopies. Their mission is to educate the public on the value of trees and how to properly select, plant, and maintain them. They have been a part of efforts in Sawyer, Buchanan, Baroda, and several other communities in the Southwest part of the state and would likely be very excited at the prospect of working in the Dunes with Michiana to help educate residents and assist with sourcing and planting trees.



Michigan State University / MSU Extension

Michigan State University, and specifically the Department of Forestry, is very active in academia as well as practical resources for communities. MSU generates and translates knowledge of trees, forests and associated natural and human systems to advance sustainable solutions for people and ecosystems. The extension office also provides resources and information to residents and decision makers. MSU and their extension offices will be crucial resources when planning and performing forestry tasks in Michiana.



Department of Forestry
MICHIGAN STATE UNIVERSITY

The Nature Conservancy

The Nature Conservancy (TNC) has dedicated staff, scientists and members advancing effective, lasting conservation to make the highest possible impact on the climate and biodiversity crises through breakthrough ideas, amplifying local leaders and influencing policy. They have been very active in regional Dune Ecosystems and communities throughout the Great Lakes region and are also a valuable source of grant funding and programmatic resources for forestry and natural resource-based initiatives.



Personnel

Village Council

The Village Council is responsible for implementing policy decisions, direct oversight of all trees and boards in the Village, and authorizing funds related to tree care and maintenance, and considers recommendations from the Tree Board, Forestry Consultant, and Public Works staff.

Tree Board

The Michiana Tree Board is an advisory board which considers matters concerning trees on both public and private land, and provides direction to the Village Council and Public Works Department. They take information from the Tree Inspector, Forestry Consultant, and residents concerning what policy to advise the Village Board to enact and money to spend on various tree related initiatives.

Public Works Supervisor

The Public Works Supervisor is responsible for the upkeep and maintenance of all public infrastructure in Michiana, including the trees. They take direction from the Village Council, Tree Board, Tree Inspector, and Forestry Consultant, and are responsible for performing the actual work or creating bids and RFPs to get work performed contractually.

Tree Inspector

The Tree Inspector should be designated by the Village per their internal standards. The primary responsibilities of this position are to visually inspect the trees and evaluate them for conditions of concern at the direction of the Forestry Consultant, Tree Board, and Village Council, and make a recommendation based on their professional judgement. This position may or may not be the same entity as the Forestry Consultant, but the Tree Inspector's responsibility stops at inspection and reporting, and they are not responsible for tasks such as policy, documents, inventory maintenance, and contractor oversight.

Forestry Consultant

The Forestry Consultant's role is similar in many ways to the tree inspector, and in fact may be the same person or entity. The primary difference is that the Forestry Consultant requires experience in policy decisions, coordinating and providing oversight to tree care contractors and other vendors, being active in advocacy to partner organizations, and other higher-level functions that may be out of scope for the Tree Inspector, such as performing appraisals or participating in litigation should any arise. The Forestry Consultant should be held to the same standards as the Tree Inspector but should also have membership in the American Society of Consulting Arborists, Society of Municipal Arborists, or other similar qualifications.

Tree Care Contractors

Tree Care Contractors are the private entities tasked with maintenance of the trees. They take direction from the Public Works Department, Village Council, and Tree Board, and provide observations from their work to the Forestry Consultant as well as the Village staff and advisory boards. Tree Care Contractors should have a Certified Arborist on staff, and be members of the International Society of Arboriculture and abide by all industry standards such as the Z133, Z60, etc.

State of the Urban Forest

In February and March of 2023, Certified Arborists from GLUFM began data collection for a comprehensive “stem-by-stem” inventory of the publicly managed trees in the community of Michiana, IL. This inventory resulted in a total of 461 publicly owned trees, and it is what the inventory data below largely reflects, since these are the trees which Michiana has direct control over managing. There were also 2 other inventory types performed during our field visits:

Private Tree Sampling: Because so few trees are publicly owned in Michiana, with its narrow Right of Ways (ROWs) and limited public land, we felt like this ROW inventory would not tell the full story of Michiana’s Urban Forest. To that end, we performed a visual sampling inventory on private property (data was recorded by technicians standing on public land and visually assessing trees on private land from afar), and extrapolated those results to come up with an estimate of how many trees of each species are likely on private property in Michiana. This data is presented separately and in greater detail below. It should be noted here that this data was recorded while our technicians were standing in the public ROW, and no trespassing onto private property was performed during this task.

Private Tree ROW Interference: Because Michiana is so heavily forested and its Right of Ways so narrow, there are many potential tree and ROW conflicts which involve privately owned trees which could fail, or have parts fail, into the roadway and ROW. While locating every such conflict would be burdensome, during the course of the public tree inventory we located the clearest cases of these conflicts, which totaled 101 identified conflicts. Once again, we will detail this data in greater detail below.



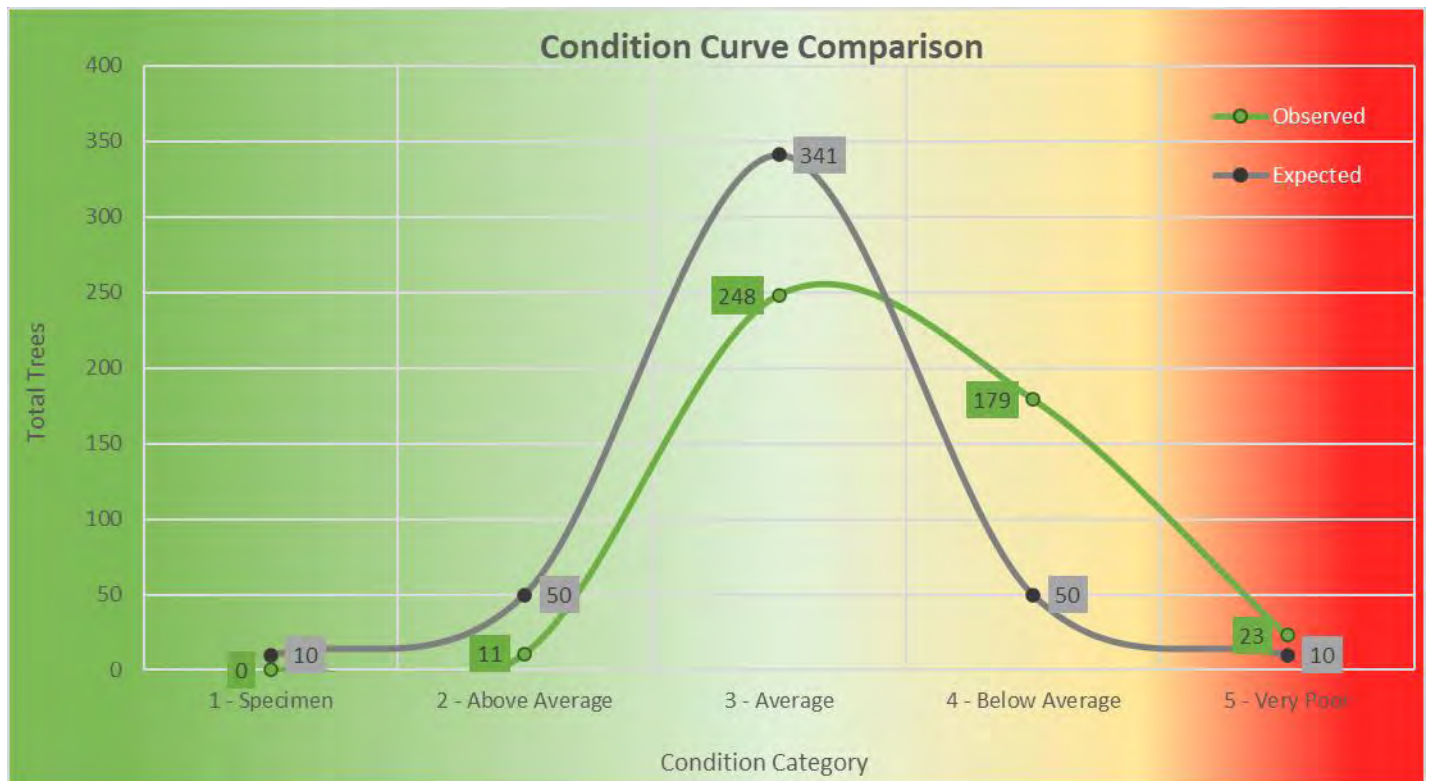
Basic Statistics – Managed Trees

Number of Street Trees Inventoried	274
Number of Park Trees Inventoried	186
Number of Private Property Trees Inventoried	101
Total Private Trees Sampled	120
Number of Planting Spaces Inventoried	12
Total Number of Species	41
Total Diameter Inches (Public Only)	7,675"
Average Tree Diameter - Inches (Public Only)	16.64"
Average Tree Condition (Public Only)	3.38 (Below Average)

Condition Curve

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

Condition 1	Specimen – Tree has no observable defects, wounds, diseases, and has perfect form for the species. Since younger trees are generally trouble free, a condition 1 tree must by the Forestry Consultant’s definition be a minimum of 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 minor defects. The overall form of the tree must be good, and consistent for the species. These trees, by the Forestry Consultant’s definition, must be a minimum of 8” DBH.
Condition 3	Average – Tree has moderate amounts of deadwood, wounds, or other defects, but is generally healthy. A wide variety of forms is acceptable for this group, which is meant to define the middle ground around which better or worse trees can be defined.
Condition 4	Below Average – Tree has defects, deadwood, wounds, disease, etc. which are likely to cause a need for removal. Very poor form or architecture can put an otherwise healthy tree in this category as well.
Condition 5	Very Poor – Tree must be removed. Defects are too far advanced for the tree to be reasonably saved. Like condition 1 trees, these are rare, as generally trees approaching this level are removed before they deteriorate to this level.



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

The Condition 1, or specimen trees, were lower than would be predicted by the standard distribution alone, with none observed. But we always expect that the specimen trees (and Condition 5 trees as well) will come in lower than their statistical norm because of their rarity, and in a small population of public trees such as this, having none observed is common. Particularly in a wooded area such as this where forest grown (vs landscape) can be subject to having some structural irregularities. A Condition 1 tree, by definition, must be at least 16” DBH (and generally much larger), have textbook perfect architecture for the species, and have no observable defects.

The Condition 5, or very poor trees, came in slightly above the expected norm. It is recommended that Condition 5 trees be prioritized and removed in a timely manner, and all of them are accounted for in the tree removal budgets on page 37.

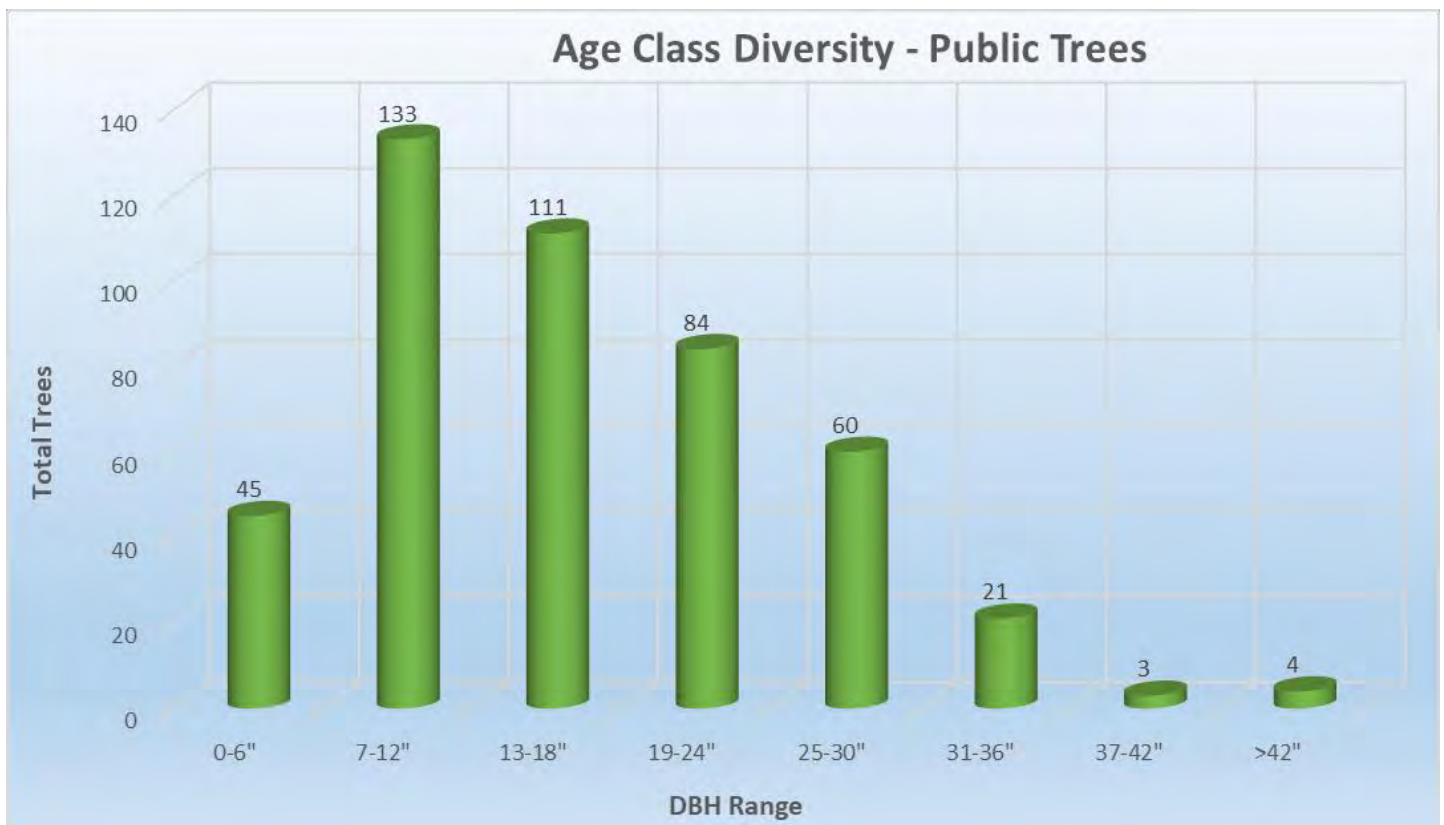
The Condition 2, or above average trees, are lower than what statistical analysis predicts. Similar to the Condition 1 category, Condition 2 trees need to have good structure that is consistent with the species in question and also be over 8” DBH. Once again, the reason for this is entirely that these trees are more naturalized than “managed” per se and have not been subject to routine maintenance.

Looking towards the future, Michiana has an immense opportunity to significantly increase the number of trees in the Condition 2 category. In general, if trees are properly mulched and maintained, newly installed trees are done so correctly and cared for well, and site selection for the trees is well matched to the species, Michiana's public tree population will be changing from below average to above average within a few years as problematic trees are pruned or removed.

The Condition 4, or below average trees, were much higher than what would be statistically expected. Again, this is entirely owed to the wooded nature of the tree population. In nature, trees are not pruned, and instead they simply "shut down" older branches which are then shed naturally over time, but which remain on the tree for many years first. We observed many trees with dead limbs which caused them to be placed in this category. With proper maintenance and using this tree inventory to be able to locate trees in need of removal and maintenance, Michiana can look to further decrease this number over the next few years.

The trees in Condition 3, or average, category were significantly lower than the expected norm. The reason for this is simply the opposite of the condition 4 trees: because there were so many trees in below average condition, there were fewer in average condition. Michiana's trees are also generally larger and more mature, whereas many municipal tree populations have greater numbers of smaller (<8" DBH) trees. Those smaller trees generally fall in the average category, so fewer small trees always equate to fewer "average" trees and more trees in other categories.

Age Class Analysis



In terms of the ages of trees on Village ROWs and in the Village's parks, the tree population was split into 8 classes of 6" diameter each. This shows how many trees are in each "age class". Because trees are measured by trunk diameter, this breakdown can help show where trees are in their life cycles. As a broad generalization, it can be said that most trees on average grow at around ½" per year.

This age class analysis chart illustrates a somewhat typical trend in the overall older age spread of a tree population seen in a wooded setting. It should also be noted here that we generally used a 6" size threshold for trees located in the ROW, so no trees or woody species were inventoried under 6" unless they were high quality species or clearly intentionally planted and not natural/volunteer trees.

The Village's tree population is largely middle aged with nearly 45% of the tree population measuring between 13-24". Somewhat surprisingly, almost 30% of the Village's trees have a DBH of 7-12" which are generally considered to be about 15-25 years old. This is surprising because without very many human-planted trees, we would expect this number to be lower. If you look at the species composition of this 7-12" group, it is around 60% invasive or aggressive species like Cottonwood, Mulberry, and Siberian Elm. This is to be expected, these trees disperse naturally with ease, and it is part of what makes them invasive and aggressive.

The remaining 40% of this 7-12" group are trees like Sassafras, Oak, and other natives which are desirable. This tells us something very important, which is that trees are naturally regenerating in the woods of Michiana! In the Midwest at large, this is not the case, and natural Oak regeneration is severely reduced. This is thought to be the result of human intervention, development, climate change, and other such factors. Oak regeneration can be used as a measuring stick for how healthy an ecosystem is, and in Michiana's case, the ecosystem appears healthy by this measure!

Trees measuring over 24" DBH account for just under 20% of the total tree population. The 1,074 trees in the 25" + DBH categories are considered to be about 50-100+ years old, though particularly with Oaks, trees may be much older than this due to their slower growth rate, possibly up to 150-200 years in some cases. The number of trees in the 30" + categories are often lower due to the natural senescence and ensuing decline of trees in urban settings. In Michiana, there are many of these "Elder Statesmen" in the population, again owing to the naturalized character of the area.

A fairly equal number of trees in each age classification is, within reason, desirable and indicative of a consistent focus on tree planting and tree maintenance. In Michiana, we are seeking to reestablish that younger base of new trees being planted to pave the way for keeping the population vibrant, long lived, and healthy.

Arborist Recommendation / Maintenance

During the inventory, the Forestry Consultant's staff recorded an Arborist Recommendation for each tree which outlines what maintenance work needs to be performed in the coming years. Please note that the chart below is only for Publicly owned trees, we will examine the private trees in a separate section below.

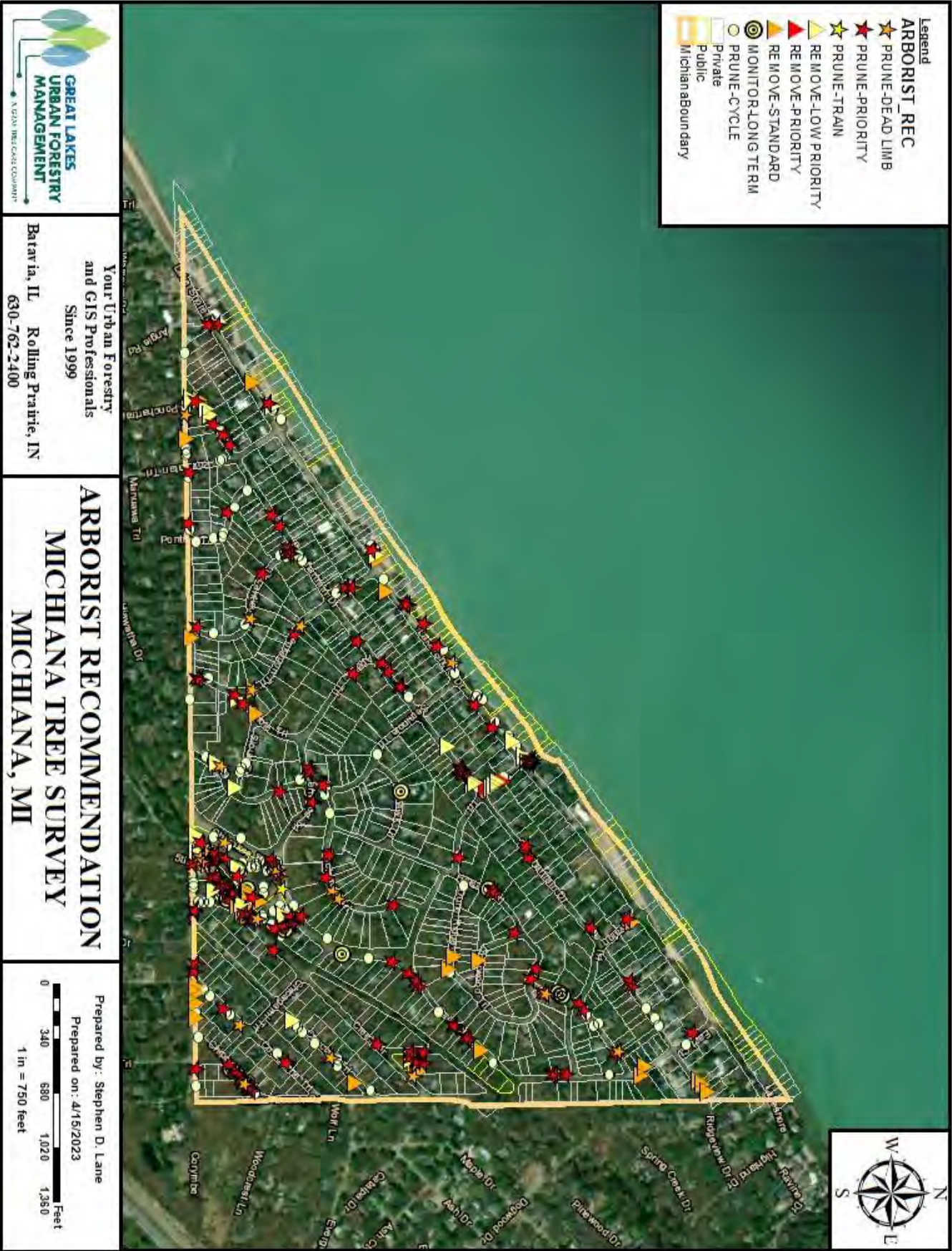


In terms of Arborist Recommendations for Michiana's tree population, the vast majority of trees require only Cyclical Pruning. The Village is currently developing a 5-year pruning cycle for its ROW and parks trees, ensuring every publicly owned ROW or Park tree in the Michiana population is pruned every 5 years. The remaining categories will be discussed briefly below.

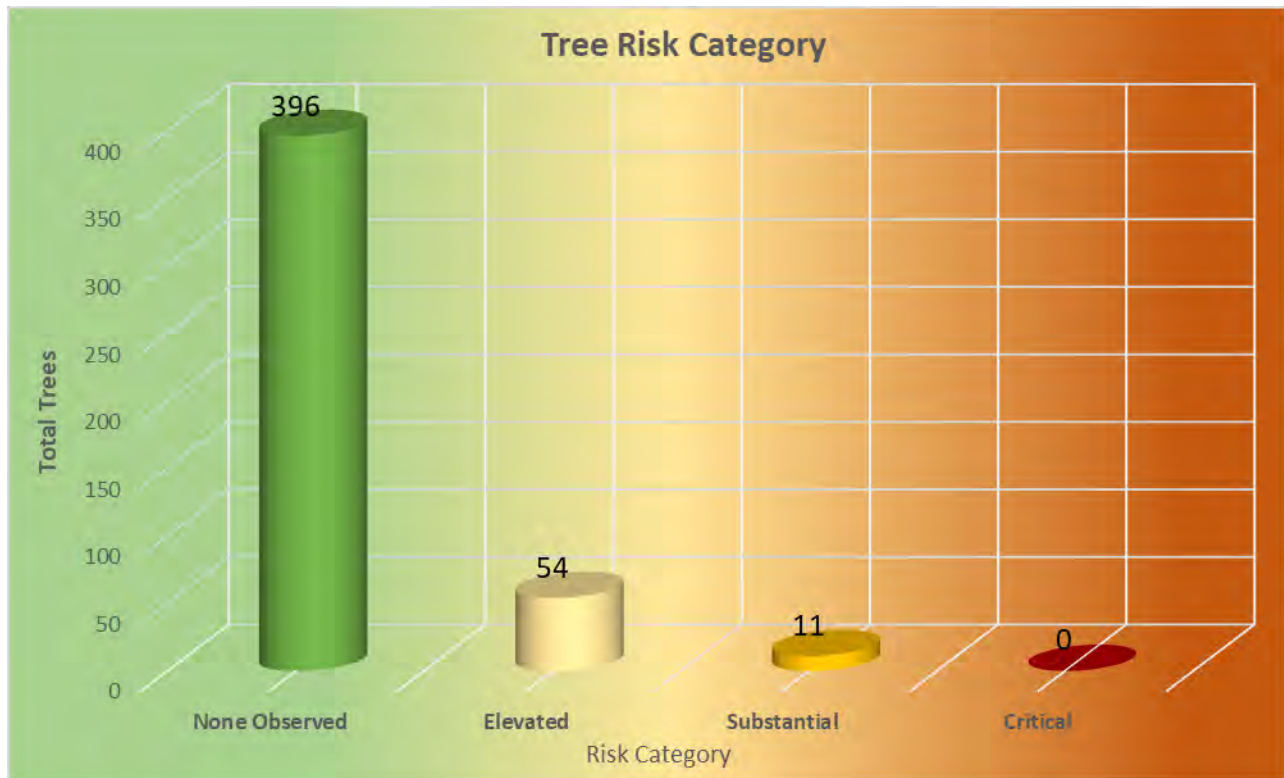
The 136 trees in the "Prune-Priority" group were those which were overgrown from a lack of maintenance or had significant deadwood up in the crown. We have prioritized these in the budgets later in this plan on page 47. These trees generally need to be pruned within 1-3 years. The "Prune-Dead Limb" group was similar but addresses trees which had a single or very few large dead limbs.

Several categories for removal were identified, 2 priority removals which should be done right away, 40 standard removals which should be done within the next 3 years, and 31 low priority removals which should be done as time and budgets allow for. Our budgets reflect all this. It should be noted that ultimately, the decision to remove rests with Michiana (the "Tree Owner"), but our recommendations were all based on Arboricultural Best Management Practices.

There were also 10 trees which fell into the "Monitor-Long Term" category. These trees showed signs of defects, pests and disease issues, or had other structural issues which caused us to put them in this category. Essentially, this category exists for trees which are in a state of change and do not readily fall into any other category. The locations of all of these items are shown in a map below.



Risk Assessments



Forestry Consultant's staff used a rapid tree risk assessment. Such rapid assessments are used in applications such as disaster relief assessments after extreme weather events where tree risk must be documented, but time frames are very short. For this reason, we must state unequivocally that these assessments are NOT meant to be legally binding, and do not represent a full ISA TRAQ evaluation of the level of risk individual trees may pose.

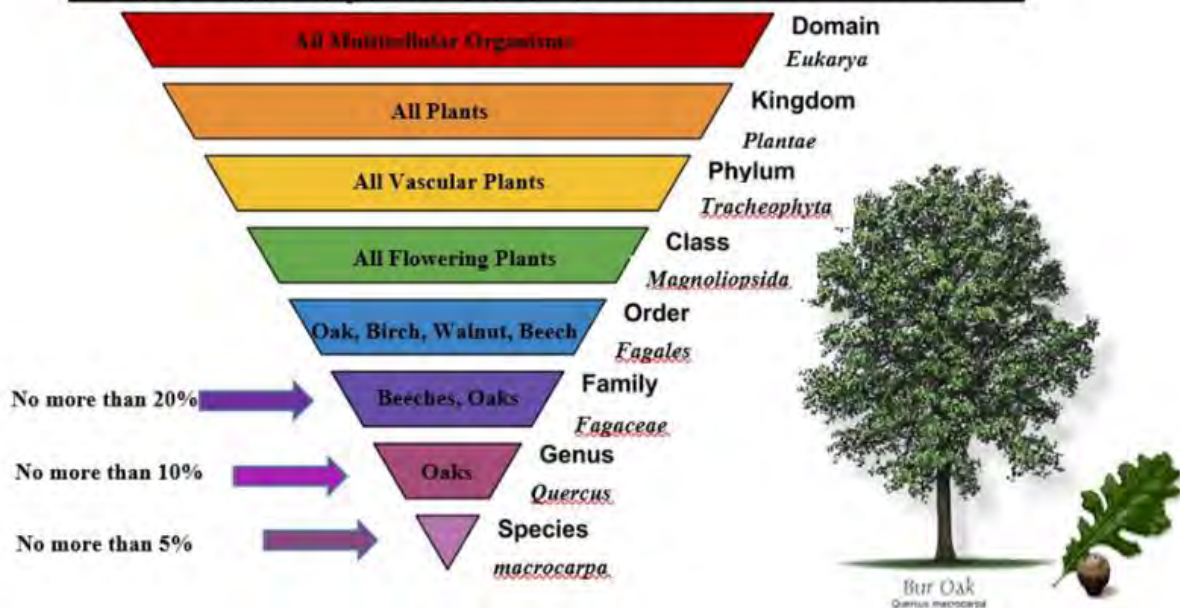
The vast majority of trees showed no observable signs of risk, which is very positive. 54 trees showed signs of elevated risk, though this is not saying they necessarily pose measurable risk to the public at present. Some may have defects that could evolve over time to become higher risk trees. The categories of risk most concerning are the Substantial and Critical risk levels. There were only 11 trees in the Substantial category, and none in the critical category. Typically, when a Critical risk tree is encountered, Michiana staff would have been notified.

No trees were found to need any form of advanced risk assessment.

Diversity Analysis

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

Taxonomy and the 20-10-5 Rule



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

The “20-10-5” rule for Michiana’s future tree plantings is recommended, which states that no more than 20% of any one family, 10% of any one genus, and 5% of any one species shall be planted during any one planting cycle. It will also be a long-term direct goal of the forestry program to have the tree population as a whole in compliance with the 20-10-5 Rule, although it may not be possible by the 2033 date used in this document. This level of taxonomic diversity is consistent with today’s arboricultural industry standards (see above graphic).

The old paradigm of urban forestry was to create landscapes in which every tree was the same type, shape, age, and height. This was thought to produce a uniform appearance. Urban foresters have since 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. We will examine these in detail below.

Taxonomic (Species) Diversity

Planting a diverse set of species ensures that communities will not fall victim to mass tree loss from pests and pathogens in the future. The reason Emerald Ash Borer (EAB) was such a devastating expense for many organizations was because their tree populations were composed of over 20% Ash trees. When these trees died and had to be removed, those organizations lost 20% of their trees.

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

The diversity of Michiana is quite good overall, considering it is in a Dune Ecosystem. Since we desire only native species in this area, a lower overall species count is actually good, as it means we are not introducing too many species which are not supposed to be there.

Spatial Diversity

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

At present, the Spatial Diversity in Michiana is generally low due to the wooded character of the area and preponderance of Oaks. While a lot of Oaks are generally good, there are many diseases (Oak Wilt, Oak Decline, Ganoderma, Burr Oak Blight, etc.) which are flaring up in our area now, and if one of these diseases gets into Michiana, it could wreak havoc on the Oak population.

For these reasons, during the tree planting planning phase on either public or private property, care should be taken to ensure that new plantings are done in a manner that yields a spatially diverse tree population, and creation of areas of low spatial diversity (monocultures) will be avoided. The creation of the multilayered canopy discussed throughout this Plan is one such strategy.

Age-Class Diversity

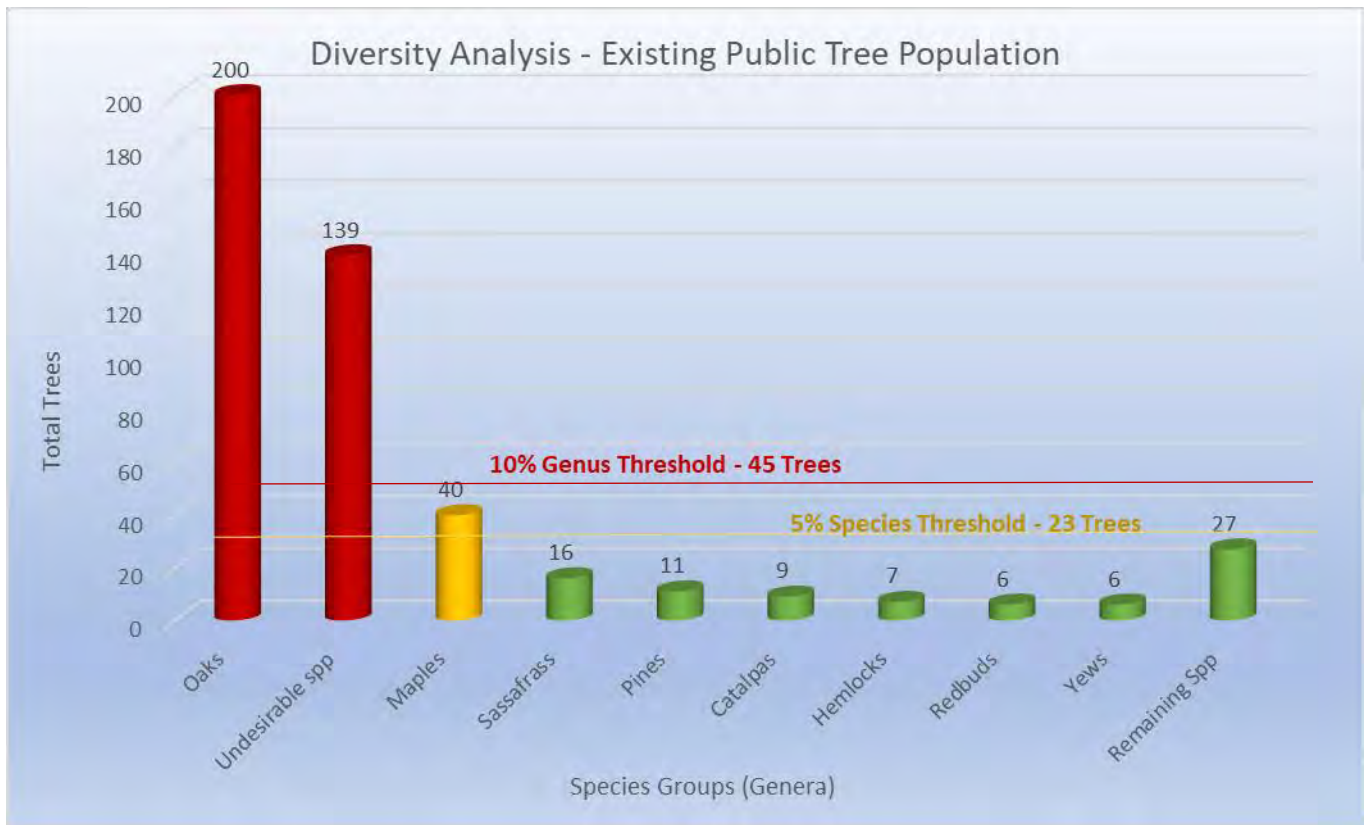
A healthy natural forest has trees of many ages. Young, intermediate, and mature trees allow for regeneration, replacement and vigor in the overall forest community. A mixture of tree species, locations, and ages will lead to great diversity, which insulates a natural forest against pest and pathogen outbreaks. Since Michiana is largely in a natural forest, we want to be especially sensitive to this topic!

VILLAGE OF MICHIANA URBAN FORESTRY MANAGEMENT PLAN

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

Current Tree Population (Public Trees Only-Undesirable Species Noted in Red)

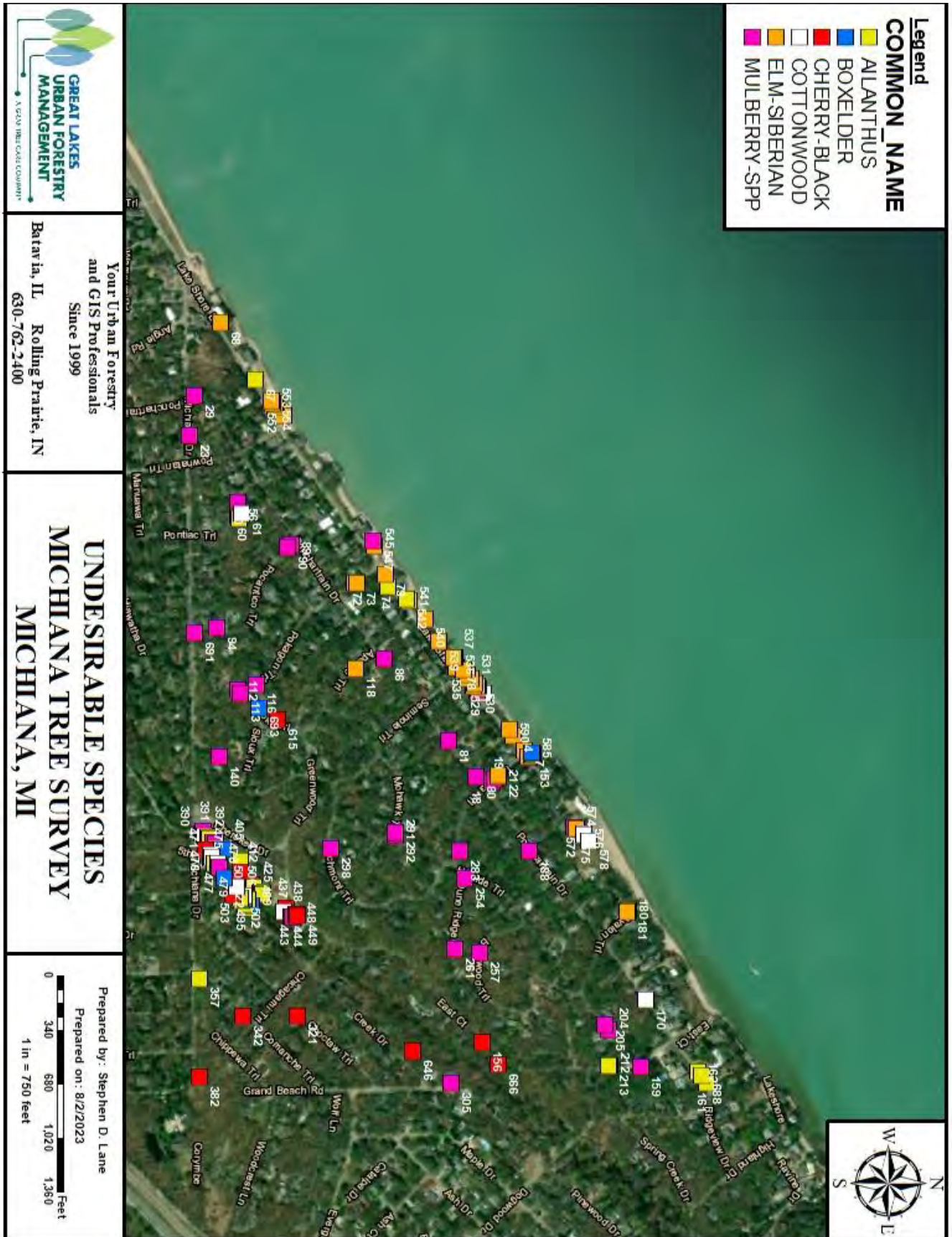
<u>COMMON NAME</u>	<u>COUNT</u>	<u>% OF TOTAL</u>	<u>AVG DBH</u>	<u>AVG COND</u>
OAK-BLACK	82	17.79%	20.95	3.63
OAK-WHITE	75	16.27%	22.51	3.43
AILANTHUS	36	7.81%	14.08	3.56
MULBERRY-SPP	32	6.94%	13.13	3.63
ELM-SIBERIAN	28	6.07%	18.29	3.61
OAK-PIN	27	5.86%	21.81	3.41
SASSAFRAS	16	3.47%	8.00	3.31
COTTONWOOD	15	3.25%	22.07	3.80
CHERRY-BLACK	14	3.04%	9.86	3.57
MAPLE-RED	14	3.04%	15.57	3.29
OAK-RED	12	2.60%	14.58	3.33
CATALPA	9	1.95%	11.11	3.56
BLACK LOCUST	8	1.74%	15.63	3.75
MAPLE-BLACK	8	1.74%	13.13	3.50
PINE-WHITE	8	1.74%	8.13	3.25
HEMLOCK-EASTERN	7	1.52%	7.86	3.00
MAPLE-NORWAY	7	1.52%	15.29	3.14
MAPLE-SILVER	7	1.52%	18.71	3.29
AMERICAN REDBUD	6	1.30%	6.33	3.00
BOXELDER	6	1.30%	13.50	3.50
YEW	6	1.30%	12.33	3.00
DOGWOOD-SPP	5	1.08%	7.20	3.40
MAPLE-SUGAR	4	0.87%	19.00	3.25
BIRCH-RIVER	3	0.65%	11.67	2.67
LINDEN-AMERICAN	3	0.65%	13.33	3.00
OAK-BURR	3	0.65%	3.00	3.00
PINE-SCOTCH	3	0.65%	8.67	4.33
SPRUCE-BLUE	3	0.65%	5.33	3.00
APPLE-CRAB SPP	2	0.43%	5.00	3.00
EASTERN REDCEDAR	2	0.43%	7.50	3.50
ELM-RED	2	0.43%	18.00	3.00
SPRUCE-NORWAY	2	0.43%	12.50	2.50
BEECH-AMERICAN	1	0.22%	12.00	3.00
BIRCH-WHITE	1	0.22%	4.00	3.00
CHERRY-SPP	1	0.22%	1.00	3.00
MAGNOLIA-SPP	1	0.22%	4.00	3.00
OAK-SWAMP WHITE	1	0.22%	15.00	3.00
TULIPTREE	1	0.22%	10.00	3.00



The “20-10-5” rule has been adopted as a Best Management Practice in Urban Forestry, and we have included 10% Genus threshold and 5% species threshold lines on the diversity analysis graph above.

Oaks account for nearly 45% of Michiana’s tree population, which is objectively very good, however as noted above it can leave a tree population or ecosystem at risk of pest or disease introductions. Though exceeding the 20% mark is fine for Oaks, we do just want to ensure that we are building diversity as well as maintaining the Oak population.

Previously, we noted that Invasive and Aggressive species (“Undesirable Species”, as noted above) account for a fair portion of Michiana’s tree population. We should note here that there is currently a battle being fought between natural regeneration of native trees, and invasion by undesirable species. As of right now, that battle is a draw, and neither side is winning. This plan will serve as a roadmap to starting to push that needle in the other direction and start getting some of these undesirable trees removed to make way for new and more diverse native tree species. A Map of the species and locations of all Undesirable species is shown on the following page.



i-Tree Report / Urban Tree Canopy Assessment

i-Tree is a 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. While the mathematics behind these models is extremely complex, those interested in learning more about them may visit the following website:

<https://www.itreetools.org/support/resources-overview/i-tree-methods-and-files>

The i-Tree suite calculates hard dollar values that trees provide to communities. Trees provide “ecological services” that saves Michiana money, such as in heating and cooling costs, where large trees help shade homes in the summer, saving on air conditioning and electricity bills, and provide windbreaks during the winter, saving on heating and natural gas costs. They also provide CO₂ uptake, reducing the effects of climate change, as well as air quality improvements by the absorption of urban pollutants. Trees also absorb stormwater, which reduces strain on stormwater infrastructure, and saves money in replacement costs. Finally, trees contribute up to 15% of the total value of a property, so they have monetary aesthetic benefits as well.

Using the tree data from the inventory, an i-Tree Streets report has been prepared. Below you will find reports on the net annual benefits of the managed tree population, replacement values, and breakdown of benefits.

i-Tree Streets Analysis Results

Michiana

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

5/1/2023

Benefits	Total (\$) Standard Error	\$/tree Standard Error	\$/capita Standard Error
Energy	6,324 (N/A)	9.29 (N/A)	12.65 (N/A)
CO ₂	1,327 (N/A)	1.95 (N/A)	2.65 (N/A)
Air Quality	2,087 (N/A)	3.06 (N/A)	4.17 (N/A)
Stormwater	20,132 (N/A)	29.56 (N/A)	40.26 (N/A)
Aesthetic/Other	196,355 (N/A)	288.33 (N/A)	392.71 (N/A)
Total Benefits	226,225 (N/A)	332.20 (N/A)	452.45 (N/A)

Total Standing Value of Michiana's Managed Tree Population

\$1,106,232

(Per CTLA's 9th Guide to Plant Appraisal)

It should be noted that the annual budget for all forestry activities recommended in this plan total approximately \$32,500 per year by 2033, so the benefits from the tree population are worth nearly 7 times what the cost put into them is on an annual basis. In addition, the total standing value as a commodity and an ecological resource of the whole tree population is \$1,106,232. 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.

These benefits can be viewed as income to Michiana's residents, and so long as the trees are well maintained, they will continue to provide these benefits, and more as the tree population grows in size. As trees grow, they also increase their benefits!

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 goal is to increase benefits even more, where the tree population pays for itself and even yields "profits"!

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

Private Property Sampling and Extrapolation

In addition to the "stem-by stem" inventory data we recorded and analyzed above, we were also able to provide an estimate of the overall species composition of Michiana on private property. To do this, we used a quadrat sampling technique and extrapolated those samples to the full extent of Michiana.

11 Digital polygons of equal size were laid out next to roadsides, and all trees 6" or larger in those polygons were inventoried fully by species, Diameter (estimated from a distance), etc. just like the publicly owned trees. We laid out the samples next to roadsides so that we could be standing on public property while inventorying trees on private property. To avoid trespass issues, all private sampling work was done from the street, and therefore we could not examine each tree in detail.

119 total trees were inventoried in these polygons, and then the data were extrapolated to the whole town. For these calculations, meters were used as a standard measure. Michiana is just over 15,000,000 square feet, not including streets. We estimated that 30% of the remaining land area was taken up by homes, driveways, and other structures, leaving approximately 10,800,000 square feet of natural forested area. Each sampling plot was 120,000 square feet. Below is a summary of the math:

15,380,186	Total square feet, minus streets
30%	Area taken up by homes/driveways/etc.
10,800,000	Remaining Forested Area (Square Feet)
120,000	Sample size square feet
90	Multiplier for totals
10,800,000/120,000 SqM = 90	

Thus, our sampling inventory was multiplied by a factor of 90 to achieve an estimate for the full diversity of the Michiana tree population. These are samples, so this is still an estimate, and there may be species which are uncommon in Michiana but still occasionally found that did not get picked up during these samples, but nonetheless, this was mathematically sound. The results of that extrapolation are shown below, along with a map showing the distribution of the sampling locations. The green column shows the estimate based on the samples, and red highlighting, as in the table above for the ROW trees, represents trees which are known to be invasive. Please note that Silver Maple and Black Cherry, while undesirable, are not technically invasive in the region:

<u>SPECIES</u>	<u>SAMPLE COUNT</u>	<u>AVG DBH</u>	<u>AVG COND</u>	<u>TOTAL COUNT</u>
OAK-BLACK	42	18.12	3.60	3780
OAK-WHITE	16	19.50	3.44	1440
SASSAFRAS	15	9.73	3.33	1350
ELM-SIBERIAN	7	14.29	3.43	630
MAPLE-RED	7	11.57	3.29	630
MAPLE-SILVER	6	19.33	3.17	540
TULIPTREE	5	33.40	3.40	450
COTTONWOOD	4	12.50	3.50	360
MAPLE-NORWAY	3	18.67	3.00	270
AILANTHUS	2	11.00	4.00	180
CHERRY-BLACK	2	10.00	3.50	180
MULBERRY-SPP	2	13.00	3.00	180
OAK-PIN	2	20.00	3.50	180
BIRCH-GRAY	1	10.00	3.00	90
CATALPA	1	10.00	3.00	90
HICKORY-SHAGBARK	1	24.00	3.00	90
MAPLE-SUGAR	1	11.00	3.00	90
PINE-WHITE	1	16.00	4.00	90
SPRUCE-BLUE	1	6.00	3.00	90
TOTAL				10,710

As you can see, the diversity on private land largely mimics what is seen on public land, with a few exceptions. First, it appears Tuliptree (*Liriodendron tulipifera*) is more common on private land than public land. It would also appear that invasive and aggressive species account for a much less proportion of the totals than on public land (around 11% on private vs 30% on public). Finally, it appears that Sassafras is far more prevalent on private land as well.

All of these things make empirical sense. When invasive and aggressive trees invade, they do so from roadsides and other transportation corridors. So, the corridors themselves have more invasive species. Also, the prevalence of more desirable species (Tuliptree and Sassafras in this example) are much higher as they have not been supplanted by invasives. All of this adds up to showcase the fact that while Michiana certainly has some issues with invasive and aggressive species, this issue has largely not spread beyond the transportation corridors, and the interior land is largely still unaffected. Therefore, the time truly is now to start using this plan to mount an offensive attack against the invasives and plan for diversifying the native species. Below is a map of these locations:



From a standpoint of maintenance, the privately sampled trees also show an interesting pattern, which is that they tend to be in slightly better condition than the ROW trees:

ARBORIST REC	SAMPLE COUNT	AVG COND	TOTAL COUNT	% OF TOTAL
PRUNE-CYCLE	64	2.92	5760	53.78%
PRUNE-PRIORITY	22	4.00	1980	18.49%
PRUNE-DEAD LIMB	17	3.88	1530	14.29%
REMOVE-STANDARD	8	4.50	720	6.72%
MONITOR-LONG TERM	7	4.00	630	5.88%
REMOVE-LOW PRIORITY	1	4.00	90	0.84%

Proportionally, there are more cycle prune trees on private land (54%) than public land (48%), which shows the trees are generally in better condition, and the percentage of removals overall for private trees was much lower on private land (8%) vs on public land (16%). As far as condition goes, average tree condition on private samples was slightly better (3.46) than on public land (3.56). As people plan on planting and removing trees on their private land, we propose that they follow largely the same strategy as the rest of this plan, which we detail further below in the maintenance subsections.

Private Property Right of Way Issues

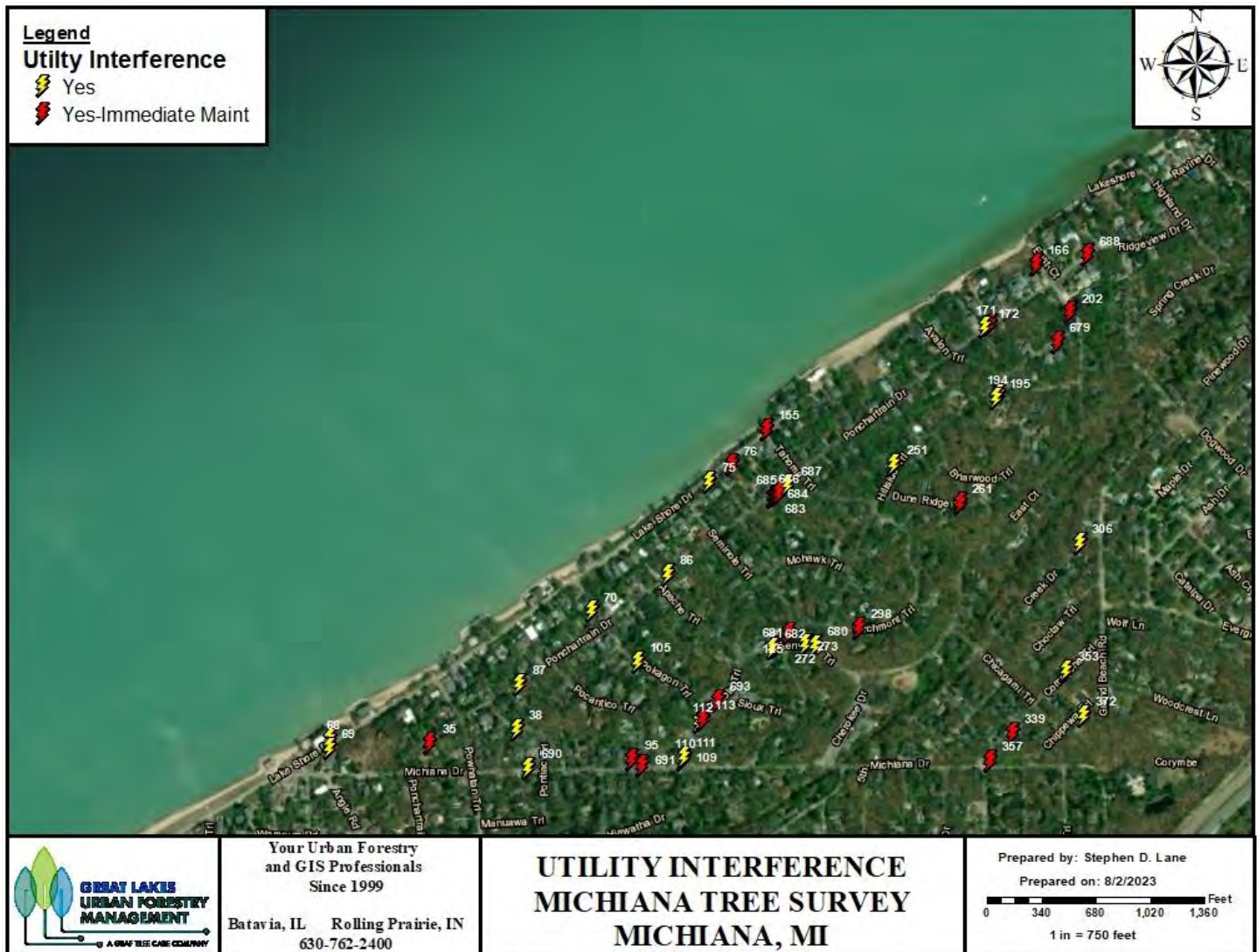
As previously mentioned, we also identified trees on private land which are in need of pruning or removal, because if the tree or tree part were to fail, it would do so into the public ROW where it could cause injury or property damage. During this effort, 101 such trees were recorded, that data appears in the table below:

<u>Recommendation</u>	<u>Total Trees</u>	<u>Total Diameter In.</u>
Prune-Dead Limb	2	35
Prune-Priority	81	1,797
Remove-Low Priority	3	48
Remove-Standard	15	256

A few concepts are worthy of discussion here in terms of tree ownership and property line issues. Generally speaking, a tree's ownership is determined by where its trunk emerges from the ground, not necessarily where the crown and branches are. If the trunk straddles 2 or more properties, it is likely jointly owned by both property owners, and must have consent from both to remove a tree. However, generally a tree that is legally owned by 1 property owner may be pruned back to the property line by an adjacent property owner if branches overhang, so long as it does not kill the tree. The point for Michiana is that high risk limbs hanging over the parkway may be legally trimmed by the Village, but trees on private property may not be removed without the property owner's consent. Therefore, some work will have to be done working with homeowners to create a reasonable policy to deal with these private property / ROW conflicts.

Utility Issues

During the inventory, trees whose branches were clearly conflicting with the overhead utility lines were identified and categorized as either being a standard conflict, or requiring immediate maintenance. A map of the location of these trees is below:



As mentioned previously, for more information from the local utility, American Electric Power (AEP), please consult the following material for more information regarding pruning under powerlines, as well as to find contact information for the utility:

https://www.indianamichiganpower.com/lib/docs/community/projects/TreeTrimmingBrochure_Mar06.pdf

Generally speaking, Michiana is aiming to keep trees planted under powerlines to those which have as mature height of 15' or less, in order to avoid future conflicts between trees and utilities. Fortunately, there are a wide variety of smaller trees and even native shrubs which can fill this role. It should also be noted that under no circumstance should a resident or non-utility arborist attempt to prune or remove limbs which are contacting utility lines, this may result in a fatal electric shock.

The Benefits of Larger, Healthier Trees

Larger trees provide greater benefits to the community: They create more shade to offset cooling costs, absorb more storm water, create greater buffers against cool winter winds for heating costs, and absorb and sequester more carbon than smaller trees do.

Below are several examples of Ecological Services provided by trees:

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

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

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

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

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

Return on Investment

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

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

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

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

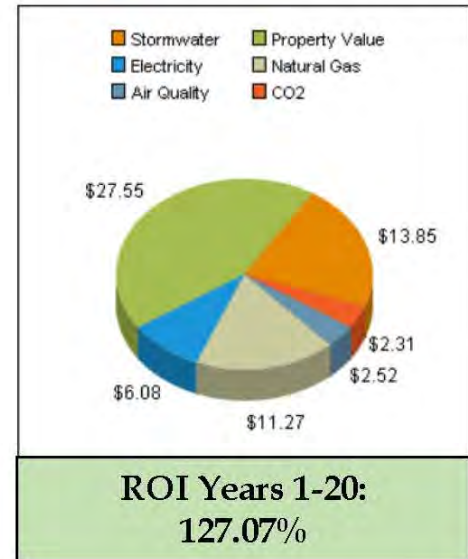
VILLAGE OF MICHIANA URBAN FORESTRY MANAGEMENT PLAN

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

Costs

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

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

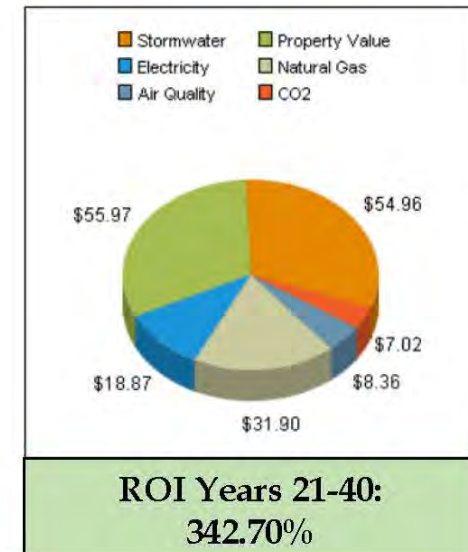


Return on Investment: Years 21-40 (13-24" Diameter)

Costs

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

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

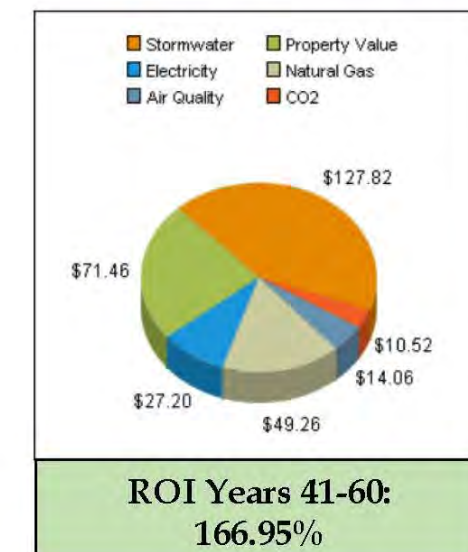


Return on Investment: Years 41-60 (25-36" Diameter)

Costs

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

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



Tree Removals

At the time the inventory concluded, there were 73 managed trees which had been called for removal during the inventories. Of these, 2 are listed as a Priority Removal, 40 are listed as Standard Removals, and 31 are listed as Low Priority Removals based on the inventory data. A direct goal of this Urban Forestry Management Plan is to have all identified trees marked as Removals during the inventory to be removed within 5 years of this plan's adoption.

By percentage, this is an average number of removals in terms of comparably sized tree populations, with removals representing about 3.6% of the total population. Typically, tree inventories reveal between 3-5% of the tree population requiring some form of removal. It should be noted here that to avoid disturbing soil stability, many stumps in the Critical Dune areas will have to remain and not be ground out. This is atypical for tree removal, but necessary in some areas of Michiana.

After this initial 3–5-year period to address the removals identified in the inventory, reevaluation of the tree population on an annual or semiannual basis by Michiana staff or the Forestry Consultant will specify which trees require removal. These numbers, detailed below, are meant to be placeholders for budget calculations and diversity standards. This does not require that this number of trees be removed each year, this is simply a projection based on the existing inventory data.

For purposes of projection, costs have been estimated using a rate of \$25/ diameter inch for tree removal, which is a conservative estimate based on current market pricing. Rates could certainly be found lower than this in a competitive bid, or they may wind up being higher.

Removals: Budget and Timeline Projections

Milestones	2023	2024	2025	2026	2027	2028-2033
Trees Removed	5 + Brush	5 + Brush	10	22	10	15/year
Diameter Inches	101 + Brush	113 + Brush	161 + Brush	201	252	200
Notes	All Priority Removals and Standard Removals 28" and Greater + ROW Brush	Standard Removals Between 20-27" + ROW Brush	Standard Removals Between 14-19" + ROW Brush	Standard Removals Below 14"	Low Priority Removals 20" and Larger	Remaining Low Priority Removals + Inventory Update Removals
Removal Cost (2023)	\$4,000	\$4,250	\$4,500	\$5,025	\$6,300	\$5,000
Cost (CPI)	\$4,000	\$4,250	\$4,500	\$5,025	\$6,300	\$5,750

The number of removals, based on the data, will remain relatively steady based on projections at between 5-20 trees per year. Based on discussions with Michiana, this should be well within their existing annual budget.

As this is a program to be adaptively managed, these budget tables can be updated periodically to reflect actual costs being paid. Michiana's regional cost may differ from the national averages we used to calculate these costs. By creating Requests For Proposals framed as part of an Urban Forestry program, contractor pricing will likely be lower than what Michiana has historically paid. The trees requiring removal are shown in the map below, as well as the data tables provided in Appendix C.



Tree Planting

As a means of attaining the goals of increasing canopy cover and increasing overall diversity significantly, this plan calls for the planting of more trees. These trees will be planted by contractors, or possibly volunteers who have been properly trained. This plan has a direct goal of planting trees where they have the best chances to establish and thrive based on their specific sites and species requirements and enhancing the ecological character of the Dune Ecosystem.

For the goals and milestones shown below, plantings should be expected to hold steady at approximately 40 per year on parkways & ROWs, which will outpace the number of expected removals called for each year by a ratio of 1.5 : 1. As explained above, through Michiana is space limited, there are many ways to plant additional trees in the space available.

For the costs of planting, \$400 per tree (installed) has been used. This is a reasonable estimate based on retail costs, and Michiana may be able to perform planting at a more favorable rate by using containerized smaller stock. Projections below have been estimated using 2" caliper balled and burlapped tree, installed. If volunteer labor is employed, these costs could be reduced significantly as mentioned above in the Strategic Partnerships section.

Plantings: Budget and Timeline Projections

Milestones	2023	2024	2025	2026	2027	2028-2033
Trees Planted	5	10	15	20	30	40
Planting Cost (2021)	\$2,000	\$4,000	\$6,000	\$8,000	\$12,000	\$16,000
Planting Cost (CPI)	\$2,000	\$4,000	\$6,000	\$8,000	\$12,000	\$18,400

The Importance of Planning Your Tree Planting

The Right Tree in the Right Site

Urban Forestry has an unfortunate history of not planning carefully for tree planting. Whatever was readily available, inexpensive, urban tolerant, and grew fast was seen as desirable, and often planning of tree plantings was left to developers, or nurseries and plantsmen. It is more crucial now than ever that we have a process to plan our tree plantings.

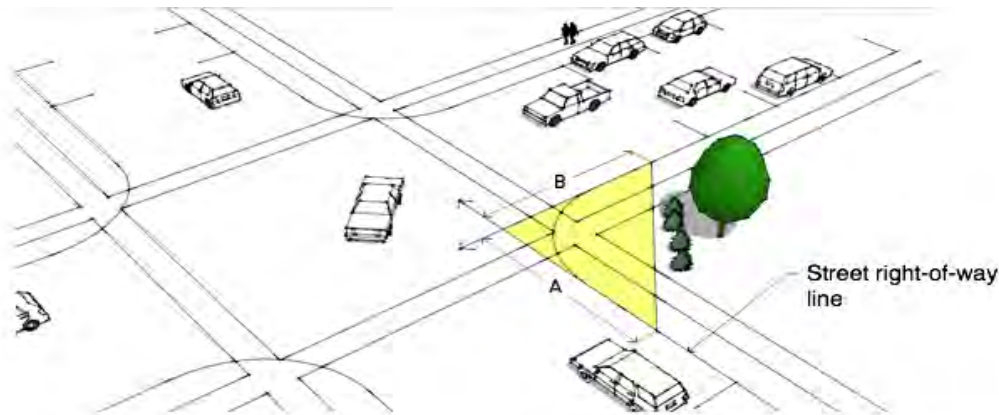
This process should involve assessing each site to be planted in much the same way we would assess a tree, except that in this case, we look for factors such as available above and below ground growing space, how much light the site receives, amount of soil moisture present, and possibly other factors such as soil pH and texture.

Once this information is collected, planting sites can be matched with trees which are well suited to those sites. Matching the right tree to the right site like this will result in trees which establish faster, grow more vigorously, live longer, and provide far greater benefits. Even a simpler version of this process is better than nothing. In Michiana, it is imperative that planting plans maintain and enhance the ecological character of the Dune Ecosystem. Therefore, we are very specifically restricting our planting palette to only native trees approved the EGLE list provided.

The success of a tree depends on where and how it is planted. Michiana staff or the Urban Forestry Consultant should assess planting sites before trees are purchased and installed each year, to ensure the correct tree is being planted for the correct site. Each tree planted represents a 25-75+ year commitment, and this planning helps to increase the benefits to the community from this commitment. A list of acceptable species per EGLE to be planted appears in Appendix A.

Tree Spacing and Visibility Requirements

Minimum tree spacing between large, medium, or small sized deciduous shade trees should be appropriate for the species and conform to Village of Michiana Land Development and/or Municipal Code requirements. It is generally recommended this be no less than 40 feet between plantings, with some exceptions for smaller trees. This will allow trees to grow to their full potential without heavy competition for water and nutrients with neighboring trees, and without limited space for crown growth. As mentioned previously, a direct goal is to create a multilayered canopy, and this may involve some degree of latitude when it comes to spacing requirements.



Watering

Watering of newly planted trees is essential to their establishment, growth, and survival, particularly during the first 2 years of their lives. There are several different options for watering trees, including outside contractors, use of in-house staff such as the Director of Public Works, or use of volunteer labor. Since these costs can vary greatly, they have not been included in the budget table above, but it is worthy of note that determining how trees are watered may have a significant impact on the budget. Use of volunteer or in-house labor is strongly recommended to keep costs down, especially given the small number of trees anticipated to be planted each year.

Challenges of Urban Plantings

Urban planting sites are a difficult environment for a tree to thrive in, and based on long term data, it is expected that 5-10% of new plantings fail each planting cycle. Fortunately, because of its native soils and wooded character, we likely expect this number to be lower in Michiana, and survivorship to be high.

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Nonetheless, Michiana's contracts for tree planting should include a one to two-year replacement warranty for any new trees that fail to thrive in their new environment. Urban tree plantings can pose an uphill battle in many ways, due to limited soil volume, salt runoff, airborne pollutants, and other factors. New planting mortality is to be expected, despite best efforts to prevent such an outcome, but the planning measures outlined above will help to mitigate annual new planting mortality.

A map of current open planting sites is included below, though we should note that a more detailed planting plan is outside of the scope of this document.



Tree Pruning

When maintaining a tree population for its greatest benefits and lowest risk, tree pruning is one of the most cost-effective maintenance activities which can be performed. Pruning provides several important services for a tree: It reduces the risk of failure, provides clearance for utilities or other structures, reduces wind damage, maintains overall tree health, and improves overall aesthetics. A cyclical pruning program is the hallmark of a successful forestry program, and many comparable communities have robust cyclical pruning programs implemented.

During the inventory, 157 trees were identified as needing pruning. Michiana does not have a cycle pruning program but is seeking to begin a 4-year pruning cycle in 2024 and the projected budgets below reflect that. For the full 4-year pruning cycle for the estimated total tree population of 680 total trees by 2033, it is anticipated that approximately 180 trees per year will require pruning to maintain this cycle. For cost estimates of these activities, several assumptions were made:

First, because younger trees (6" and less in diameter) are easy to prune, it is assumed that the Director of Public Works or volunteers can prune all trees less than 6", and \$40 per tree was used as an estimate for this group, based on average cost in the industry at this time. This \$40 per tree projection was used for trees 7-12" DBH as well. For medium (13"-24") and large (24"+) trees, average figures of \$75 and \$150 per tree (respectively) were used, once again based on average cost in the industry (see tables below). Consistent with other budget tables, a 3% annual CPI increase was added for the final 5 years.

Pruning: Budget and Timeline Projections

Milestones	2024	2025	2026	2027	2028	2029-2034
Trees Pruned	157	160	170	180	180	180/year avg
Notes	All Priority, Dead Limb, and Training Pruning	160 Cycle Prunes/yr	170 Cycle Prunes/yr	180 Cycle Prunes/yr	180 Cycle Prunes/yr	Approximately 180 Cycle Prunes / year in perpetuity
Cost (2024)	\$8,000	\$8,000	\$8,000	\$8,250	\$8,750	\$9,000
Cost (CPI)	\$8,000	\$8,000	\$8,000	\$8,250	\$8,750	\$10,350

A map of the pruning priority levels is provided below, and matches the information provided in the table above. Given the current budget of approximately \$17,750 which Michiana has to work with, we anticipate all 2023 and 2024 pruning can be accomplished in 2024, but we have still separated them out in the map and appended data table on the off chance that Michiana wants to get started on these pruning this calendar year. The year being listed as 2024 to start in the table above is just an anticipation that the majority of this work will take place next calendar year.



Other General Maintenance

Retaining a Consultant

The task of enhancing an Urban Forestry program can be difficult! There may be new challenges and learning curves, contracts to renegotiate, bid documents to create, resident or patron concerns to manage, and other experiences which may require the assistance of a professional. At least during the initial years of navigating the goals outlined in this plan, retaining an Urban Forestry Consultant might be considered to assist with these tasks.

The Forestry Consultant may be involved in sourcing and interviewing contractors and vendors for tree pruning, removal, and planting operations, assisting in maintaining the tree inventory, training Michiana staff on tree health and risk assessments, assisting in explaining policies to residents and patrons, and preparing contract and bid specifications. The importance of this early relationship cannot be overstated, no matter how large or small the organization.

Chemical Applications

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

While Michiana and their Village Council and Tree Board is not necessarily opposed to chemical treatments for current or future pests or pathogens, we are currently exploring the use of a simple free permit, where residents can let the Village know what tree they are treating, for what condition of concern, the chemical which will be applied, who will be applying it, and when it will be applied. If there are any concerns from the Forestry Consultant, Tree Board, Director of Public Works, etc. the permit may be denied, but the Village does want to keep the option open in the event of an unforeseen introduced pest or pathogen.

Water Management

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

As we project approximately 400 additional trees being planted, with a net population increase of 200 trees over the course of the next 10 years, this concept becomes very important. A watering program, as mentioned previously, may be performed by well-trained volunteer labor, in-house staff, or by an outside contractor. Whichever way Michiana chooses to perform this task, it is vital, even though it is not represented in our budget tables due to high variability in who will perform this work.

Mulch

Proper application of mulch is a necessary and cost-effective maintenance activity. Mulch has many benefits, including reducing weed growth in the root zone, protecting the tree trunk and root flare from lawn maintenance equipment, allowing water to move into the soil, reducing evaporation and drought stress, and creating a naturally fertile soil environment. Turf grass typical of parkways competes for water and nutrients, and mulch reduces this competition. But not all mulching is beneficial. The practice known as “Volcano Mulching” is the practice of piling mulch against the trunk in excess of 3” deep. This causes moisture build up against the trunk, and can cause decay of the trunk tissue, and possibly death. Material such as crushed limestone, red volcanic rock, or rubber pellets can alter the soil chemistry in an undesirable way, and cause dieback or tree death.

Improper Mulching



Proper Mulching



Fortunately, mulch is a commodity most communities can get for free so long as they are pruning and removing trees each year. A marshalling yard for wood chips can be established in Village limits. These chips can be made available for free to residents as well as planting contractors from the Public Works Facility. This arrangement works well for everyone: Removal contractors do not have to pay to dispose of chips, residents get free woodchips, and planting contractors don't have to charge Michiana for mulch when new trees are planted. All newly planted trees should have mulch applied appropriately. A goal for Michiana should be to mulch all managed trees. Newly planted Village ROW trees will always be mulched.

As discussed earlier, the Village used to have a mulch and materials marshaling yard at the current site of its large public park. Since this is no longer a viable option, we are currently exploring alternate sites where a mulch yard could be placed.

Tree Preservation and Management During Construction

Michiana has a formal municipal ordinance as well as internal policies for outlining the care, management, and preservation of trees during both public and private construction projects. The purpose of these ordinances is to recognize the services and function that trees provide as a collective asset to the entire community and to state the goals of the Village with respect to the protection, preservation, care and planting of trees. For Michiana in particular, these codes are very important given their location in a dune ecosystem. See the Village Code of Ordinances for the complete text.



Tree protection and preservation during periods of construction involves protecting trees from damage caused by construction activities. This damage includes physical and chemical damage to the trunk, branches, and roots. Damage may be caused by equipment such as backhoes, skid steers, or other appendage-type equipment. Effects of damage to the visible above ground portions of the tree can be obvious, as when branches are broken. But hidden effects such as root compaction or improper grading may not become evident for years until the tree begins to die back.

Tree Risk Assessment

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

As of this writing, Michiana has only 2 staff members in the Public Works department, and no one is trained on how to assess tree risk. As the Village is currently in the process of seeking out a Forestry Consultant and/or Tree Inspector to perform this work, by definition its program is reactionary right now, as there are not resources to handle this task.

However, as mentioned frequently throughout this document, this plan is meant to be adaptively managed. Once a Forestry Consultant and/or Tree Inspector is retained, the Village will begin the process of developing a robust and practical Risk Assessment Policy which documents how and when inspections are performed, and what happens when elevated risk trees are identified.

Projected Budget Summary

The budget numbers below, as mentioned several times through this Plan, are conservative figures based on current industry rates for the services listed. Based on input from Michiana staff, the budget begins this year with a dollar amount that can be within their current annual budget for tree related expenses. From there, generally the budget increases slightly each year, and projects through 2034. Once again, these numbers are meant to be guideposts and not absolutes. As the realized budget numbers begin to come in, these numbers will be adjusted as we adaptively manage the urban forest.

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REMOVALS	Milestones	2024	2025	2026	2027	2028	2029-2034
	Trees Removed	5 + Brush	5 + Brush	10	22	10	15/year
	Diameter Inches	101 + Brush	113 + Brush	161 + Brush	201	252	200
	Notes	All Priority Removals and Standard Removals 28" and Greater + ROW Brush	Standard Removals Between 20-27" + ROW Brush	Standard Removals Between 14-19" + ROW Brush	Standard Removals Below 14"	Low Priority Removals 20" and Larger	Remaining Low Priority Removals + Inventory Update Removals
	Removal Cost (2024)	\$5,000	\$5,500	\$6,000	\$6,500	\$7,000	\$6,000
	Cost (CPI)	\$5,000	\$5,500	\$6,000	\$6,500	\$7,000	\$6,900

PLANTINGS	Milestones	2024	2025	2026	2027	2028	2029-2034
	Trees Planted	5	10	15	20	25	30
	Planting Cost (2024)	\$2,000	\$4,000	\$6,000	\$8,000	\$10,000	\$12,000
	Planting Cost (CPI)	\$2,000	\$4,000	\$6,000	\$8,000	\$10,000	\$13,800

PRUNING	Milestones	2024	2025	2026	2027	2028	2029-2034
	Trees Pruned	157	160	170	180	180	180/year avg
	Notes	All Priority, Dead Limb, and Training Pruning	160 Cycle Prunes/yr	170 Cycle Prunes/yr	180 Cycle Prunes/yr	180 Cycle Prunes/yr	Approximately 180 Cycle Prunes / year in perpetuity
	Cost (2024)	\$8,000	\$8,000	\$8,000	\$8,250	\$8,750	\$9,000
	Cost (CPI)	\$8,000	\$8,000	\$8,000	\$8,250	\$8,750	\$10,350

FORESTRY CONSULTANT	Milestones	2024	2025	2026	2027	2028	2029-2034
	Notes	Basic Assistance with contract prep, etc	Appraisals and Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management	Inventory Updates / Risk Management
	Cost (2024)	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000
	Cost (CPI)	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,600

MISCELLANEOUS EXPENSES	Milestones	2024	2025	2026	2027	2028	2029-2034
	Notes	Miscellaneous Expenses: Retainers / Storm Damage etc.	Miscellaneous Expenses: Retainers / Storm Damage etc.	Miscellaneous Expenses: Retainers / Storm Damage etc.	Miscellaneous Expenses: Retainers / Storm Damage etc.	Miscellaneous Expenses: Retainers / Storm Damage etc.	Miscellaneous Expenses: Retainers / Storm Damage etc.
	Cost 2024	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
	Cost (CPI)	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$4,200

TOTALS	TOTALS - 2022 \$	\$22,000	\$24,500	\$27,000	\$29,750	\$32,750	\$34,000
	TOTALS - CPI 3%	\$22,000	\$24,500	\$27,000	\$29,750	\$32,750	\$40,200

Summary / Conclusion

The Village of Michiana is a very unique community with a very unique population of trees, and unique set of environmental variables to consider, being at least partially in Critical Dune habitat. As the community has always prized its trees and natural resources, and is required by state law to be good stewards of the land they live in, the Village Council made the important decision to plan for and document the projected future of the Urban Forest in Michiana by way of this management plan.

Starting in March of 2023, we began the journey of gathering data by way of the tree inventory. That data was analyzed by our team of Arborists and GIS Analysts, and a draft of the plan was created by early May. Over the following 5 months, over the course of many meetings, emails, and correspondence, we drafted 5 separate drafts of this plan, each time working the details until we arrived at this document which plans for all facets of the future of Michiana's Urban Forest.

But we want to be abundantly clear here that this plan is not an endpoint but a starting point. This is a document which the Village can use to guide itself, but also to be a sounding board for new input, new data, and new circumstances. It is meant by definition to be adaptively managed so that it can flex to meet the challenges of an ever-changing world.

And there is much work to be done! As noted throughout, starting an Urban Forestry program from scratch is no small task. But Michiana has taken all the right steps to get off on the right footing. With goals now established for all the major components of tree work to be done in the Village (removals, pruning, utility pruning, planting, etc.), they can now start down the path of tackling this important work which both preserves public safety while also preserving the invaluable ecosystem services the trees provide to the Village, which are substantial.

We also want to be abundantly clear that there will be challenges on the road ahead. Michiana is in a geographic area where it is difficult to find Certified Arborists to perform the work at reasonable rates. They have significant budgetary and levy limitations for how much financial support they can provide to such a program. They are subject to a wide array of regulatory statutes due to their location in the dunes where tree work must be conducted differently. And of course there are all the standard challenges which come with the very nature of trees as being something that people often do not see eye to eye on.

But once again, equipped with this management plan, and being willing to change it in the face of new challenges, new data, or unforeseen circumstances put Michiana in a great place. And this plan can and should endure over time! 10, 20, or even 50 years from now, there may be very different people in the homes and on the Council of the Village, but many of the trees will still be the same. We hope this document provides a framework and planning for all of the future years of Michiana's Urban Forest. We thank the Village and its staff, residents, and other stakeholders who contributed to this project, and looks forward to continuing to service Michiana in all of its Urban Forestry Consulting needs.

Appendix A: Desirable and Undesirable Species

VILLAGE OF MICHIANA DESIRABLE AND UNDESIRABLE TREE LIST

A. The following genus of trees are examples of **desired** species:

White Oaks (*Quercus alba*)
 Red Maple (*Acer rubrum*)
 Sugar Maple (*Acer saccharum*)
 American Linden/Basswood (*Tilia americana*)
 Black Gum or Tupelo (*Nyssa sylvatica*)
 Alternate Leaved Dogwood (*Cornus alternifolia*)
 Flowering Dogwood (*Cornus florida*)
 Hickory (*Carya spp*)
 Hop-Hornbeam or Ironwood (*Ostrya virginiana*)
 Hornbeam or Blue Beech (*Carpinus caroliniana*)
 Ironwood (*Ostrya virginiana*)
 Smooth Shadbush (*Amelanchier laevis*)
 Kentucky Coffeetree (*Gymnocladus dioica*)
 Juneberry (*Amelanchier laevis* & *A. canadensis*)
 Eastern Red Cedar (*Juniperus virginiana*)
 Eastern White Pine (*Pinus strobus*)
 Balsam Fir (*Abies balsamea*)
 Hemlock (*Tsuga canadensis*)
 White cedar Arborvitae (*Thuja occidentalis*)

B. The following trees shall be deemed to be **undesirable** tree species (unless located in a designated wetland or floodplain and/or protected by state or federal law.

Black Alder (*Alnus glutinosa*)
 Black Cherry (*Prunus serotina*)
 Black Locust (*Robinia pseudoacacia*)
 Box Elder (*Acer negundo*)
 Catalpa (*Catalpa speciosa*)
 European White Birch (*Betula pendula*)
 Ginko (*Ginkgo biloba* male and female)
 Common Honeylocust (*Gleditsia tinctoria*) thorned variety
 Japanese Maple (*Acer saccharinum*)
 Norway Maple (*Acer platanoides*)
 Pear (*Pyrus calleryana*) or other
 Russian Olive (*Elaeagnus angustifolia*)
 Silver Maple (*Acer saccharinum*)
 Tree of Heaven (*Ailanthus altissima*)
 White Mulberry (*Morus alba*)
 Red Mulberry (*Morus rubra*)
 Poplars (*Populus* species)
 Willows (*Salix* species)
 Siberian Elm (*Ulmus pumila*)
 Russian Olive (*Elaeagnus angustifolia*)

C. All replacement trees shall be considered protected trees at time of placement, regardless of size.

It should be noted here that there are other species which should likely be acceptable in the Dune and dune ecotone regions of Michiana, but we have limited the current list to the above species based on the work of the Michiana Tree Board, EGLE, and the Michigan Department of Natural Resources.

Appendix B: Utility Conflicts

TREE ID	PARK NAME	ADDRESS	STREET	COMMON NAME	DBH	CONDITION	ARBORIST R	UTILITY ISSUES
38		36	PONTIAC TR	OAK-PIN	14	3	PRUNE-PRIORITY	Yes
68		3740	LAKE SHORE DR	ELM-SIBERIAN	24	3	PRUNE-PRIORITY	Yes
69		3731	LAKE SHORE DR	LINDEN-AMERICAN	18	3	PRUNE-PRIORITY	Yes
70		3896	PONCHARTRAIN DR	SPRUCE-BLUE	8	3	PRUNE-PRIORITY	Yes
75		4059	LAKE SHORE DR	OAK-BLACK	8	3	PRUNE-PRIORITY	Yes
86		3954	PONCHARTRAIN DR	MULBERRY-SPP	12	4	PRUNE-PRIORITY	Yes
87		3835	PONCHARTRAIN DR	OAK-PIN	30	4	PRUNE-PRIORITY	Yes
105		55	POKAGON TR	MAPLE-RED	17	3	PRUNE-PRIORITY	Yes
109		9	POKAGON TR	MAPLE-NORWAY	25	4	PRUNE-PRIORITY	Yes
110		9	POKAGON TR	OAK-PIN	11	3	PRUNE-PRIORITY	Yes
111		9	POKAGON TR	MAPLE-NORWAY	8	3	PRUNE-PRIORITY	Yes
112		10	SIOUX	MULBERRY-SPP	8	3	PRUNE-PRIORITY	Yes
172		4230	PONCHARTRAIN DR	BIRCH-WHITE	4	3	PRUNE-PRIORITY	Yes
194		4198	HILLSIDE TR	DOGWOOD-SPP	12	4	MONITOR-LONG TERM	Yes
195		4198	HILLSIDE TR	DOGWOOD-SPP	10	4	MONITOR-LONG TERM	Yes
251		4122	HILLSIDE TR	HEMLOCK-EASTERN	4	3	PRUNE-PRIORITY	Yes
272		11	GREENWOOD TRL	AMERICAN REDBUD	12	3	PRUNE-PRIORITY	Yes
273		11	GREENWOOD TRL	HEMLOCK-EASTERN	10	3	PRUNE-PRIORITY	Yes
306		4160	GRAND BEACH RD	OAK-BLACK	25	4	PRUNE-DEAD LIMB	Yes
353		4041	COMANCHE TR	HEMLOCK-EASTERN	6	3	PRUNE-PRIORITY	Yes
372		4107	CHIPPEWA TR	MAPLE-RED	16	3	PRUNE-PRIORITY	Yes
680		11	GREENWOOD TRL	HEMLOCK-EASTERN	6	3	PRUNE-PRIORITY	Yes
681		15	APACHE TR	BIRCH-RIVER	18	2	PRUNE-PRIORITY	Yes
682		15	APACHE TR	APPLE-CRAB SPP	7	3	PRUNE-PRIORITY	Yes
687		4077	PONCHARTRAIN DR	OAK-WHITE	13	4	REMOVE-LOW PRIORITY	Yes
690		3840	MICHIANA DR	SPRUCE-NORWAY	10	3	PRUNE-PRIORITY	Yes
155	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	4	4	REMOVE-LOW PRIORITY	Yes-Immediate Maint
35		3766	PONCHARTRAIN DR	LINDEN-AMERICAN	10	3	PRUNE-PRIORITY	Yes-Immediate Maint
76		4069	LAKE SHORE DR	OAK-BLACK	4	3	PRUNE-PRIORITY	Yes-Immediate Maint
95		3884	MICHIANA DR	OAK-WHITE	23	4	PRUNE-PRIORITY	Yes-Immediate Maint
113		10	SIOUX	MULBERRY-SPP	15	4	REMOVE-LOW PRIORITY	Yes-Immediate Maint
125		50	APACHE TR	PINE-WHITE	7	3	PRUNE-PRIORITY	Yes-Immediate Maint
166		4280	PONCHARTRAIN DR	OAK-BLACK	6	3	PRUNE-PRIORITY	Yes-Immediate Maint
171		4230	PONCHARTRAIN DR	OAK-BLACK	15	3	PRUNE-PRIORITY	Yes-Immediate Maint
202		90	EAST CT	PINE-SCOTCH	12	5	REMOVE-STANDARD	Yes-Immediate Maint
261		38	BRIARWOOD TR	MULBERRY-SPP	14	4	REMOVE-STANDARD	Yes-Immediate Maint
298		4044	BRIARWOOD TR	MULBERRY-SPP	14	3	PRUNE-PRIORITY	Yes-Immediate Maint
339		4093	COMANCHE TR	OAK-BLACK	14	4	PRUNE-PRIORITY	Yes-Immediate Maint
357		4043	COMANCHE TR	AILANTHUS	9	4	REMOVE-STANDARD	Yes-Immediate Maint
679		4273	HILLSIDE TR	EASTERN REDCEDAR	8	4	PRUNE-PRIORITY	Yes-Immediate Maint
683		4077	PONCHARTRAIN DR	YEW	9	3	PRUNE-PRIORITY	Yes-Immediate Maint
684		4077	PONCHARTRAIN DR	YEW	12	3	PRUNE-PRIORITY	Yes-Immediate Maint
685		4077	PONCHARTRAIN DR	YEW	11	3	PRUNE-PRIORITY	Yes-Immediate Maint
686		4077	PONCHARTRAIN DR	YEW	12	3	PRUNE-PRIORITY	Yes-Immediate Maint
688		4354	PONCHARTRAIN DR	AILANTHUS	13	4	REMOVE-STANDARD	Yes-Immediate Maint
691		3886	MICHIANA DR	MULBERRY-SPP	12	4	REMOVE-STANDARD	Yes-Immediate Maint
693		21	POKAGON TR	BOXELDER	17	5	REMOVE-STANDARD	Yes-Immediate Maint

Appendix C: Removals

TREE ID	PARK NAME	ADDRESS	STREET	COMMON NAM	DBH	CONDITION	Year
398	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	30	5	2023
15		124	TAHOMA TR	EASTERN REDCEDAR	7	3	2023
24		4100	PONCHARTRAIN DR	PINE-WHITE	7	5	2023
116		21	POKAGON TR	MULBERRY-SPP	29	4	2023
327		4155	CHOCTAW TR	OAK-PIN	28	5	2023
399	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	25	5	2024
496	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	21	5	2024
23		40	POWHATAN TR	MULBERRY-SPP	25	4	2024
73		3915	LAKE SHORE DR	ELM-SIBERIAN	21	4	2024
362		4043	COMANCHE TR	OAK-BLACK	21	5	2024
419	Michiana Village Park	4000	CHEROKEE DR	MAPLE-RED	14	4	2025
502	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	16	4	2025
658	Village Owned Lots	4144	CHOCTAW TR	OAK-BLACK	18	5	2025
159		89	EAST CT	MULBERRY-SPP	16	5	2025
162		4350	PONCHARTRAIN DR	AILANTHUS	15	4	2025
243		68	DUNE RIDGE DR	OAK-BLACK	14	4	2025
257		38	BRIARWOOD TR	MULBERRY-SPP	18	4	2025
261		38	BRIARWOOD TR	MULBERRY-SPP	14	4	2025
358		4043	COMANCHE TR	OAK-BLACK	19	5	2025
693		21	POKAGON TR	BOXELDER	17	5	2025
543	lakefront	3900	LAKE SHORE DR	MAPLE-SILVER	10	4	2026
402	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	8	5	2026
417	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	5	2026
429	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	4	2026
430	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	10	5	2026
443	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	8	4	2026
444	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	4	2026
476	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	12	5	2026
487	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	5	2026
493	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	12	5	2026
10		3761	PONCHARTRAIN DR	PINE-SCOTCH	8	5	2026
67		3760	LAKE SHORE DR	AILANTHUS	6	4	2026
74		3919	LAKE SHORE DR	AILANTHUS	4	4	2026
138		10	SIOUX	SASSAFRAS	8	5	2026
156		45	EAST CT	CHERRY-BLACK	11	5	2026
161		4354	PONCHARTRAIN DR	AILANTHUS	6	4	2026
178		175	AVALON TR	CATALPA	12	4	2026
202		90	EAST CT	PINE-SCOTCH	12	5	2026
357		4043	COMANCHE TR	AILANTHUS	9	4	2026
359		4043	COMANCHE TR	SASSAFRAS	6	5	2026
688		4354	PONCHARTRAIN DR	AILANTHUS	13	4	2026
691		3886	MICHIANA DR	MULBERRY-SPP	12	4	2026
4	lakefront	4000	LAKE SHORE DR	ELM-SIBERIAN	20	4	2027
7	lakefront	4000	LAKE SHORE DR	ELM-SIBERIAN	25	4	2027
466	Michiana Village Park	4000	CHEROKEE DR	BLACK LOCUST	33	4	2027
518	Michiana Village Park	4000	CHEROKEE DR	OAK-BLACK	20	4	2027
2		3767	PONCHARTRAIN DR	OAK-PIN	33	4	2027
3		3761	PONCHARTRAIN DR	OAK-PIN	30	4	2027
21		4100	PONCHARTRAIN DR	ELM-SIBERIAN	22	4	2027
22		4100	PONCHARTRAIN DR	ELM-SIBERIAN	26	4	2027
80		124	TAHOMA TR	MULBERRY-SPP	23	5	2027
320		4133	CHOCTAW TR	OAK-BLACK	20	4	2027
155	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	4	4	2028
544	lakefront	3900	LAKE SHORE DR	MAPLE-SILVER	9	4	2028
389	Michiana Village Park	4000	CHEROKEE DR	CATALPA	12	4	2028
404	Michiana Village Park	4000	CHEROKEE DR	CATALPA	9	4	2028
405	Michiana Village Park	4000	CHEROKEE DR	BOXELDER	12	4	2028
407	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	14	4	2028
408	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	4	2028
409	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	8	4	2028
437	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	4	2028
467	Michiana Village Park	4000	CHEROKEE DR	BLACK LOCUST	12	4	2028
499	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	4	2028
551	Village Owned Lots	3700	LAKE SHORE DR	ELM-SIBERIAN	10	4	2028
646	Village Owned Lots	4144	CHOCTAW TR	CHERRY-BLACK	8	4	2028
18		4100	PONCHARTRAIN DR	MULBERRY-SPP	17	4	2028
19		4100	PONCHARTRAIN DR	MULBERRY-SPP	17	4	2028
29		3750	MICHIANA DR	MULBERRY-SPP	5	3	2028
81		4053	PONCHARTRAIN DR	MULBERRY-SPP	8	4	2028
113		10	SIOUX	MULBERRY-SPP	15	4	2028
132		10	SIOUX	OAK-PIN	18	4	2028
140		10	SIOUX	MULBERRY-SPP	10	4	2028
687		4077	PONCHARTRAIN DR	OAK-WHITE	13	4	2028

Appendix D: Undesirable Species

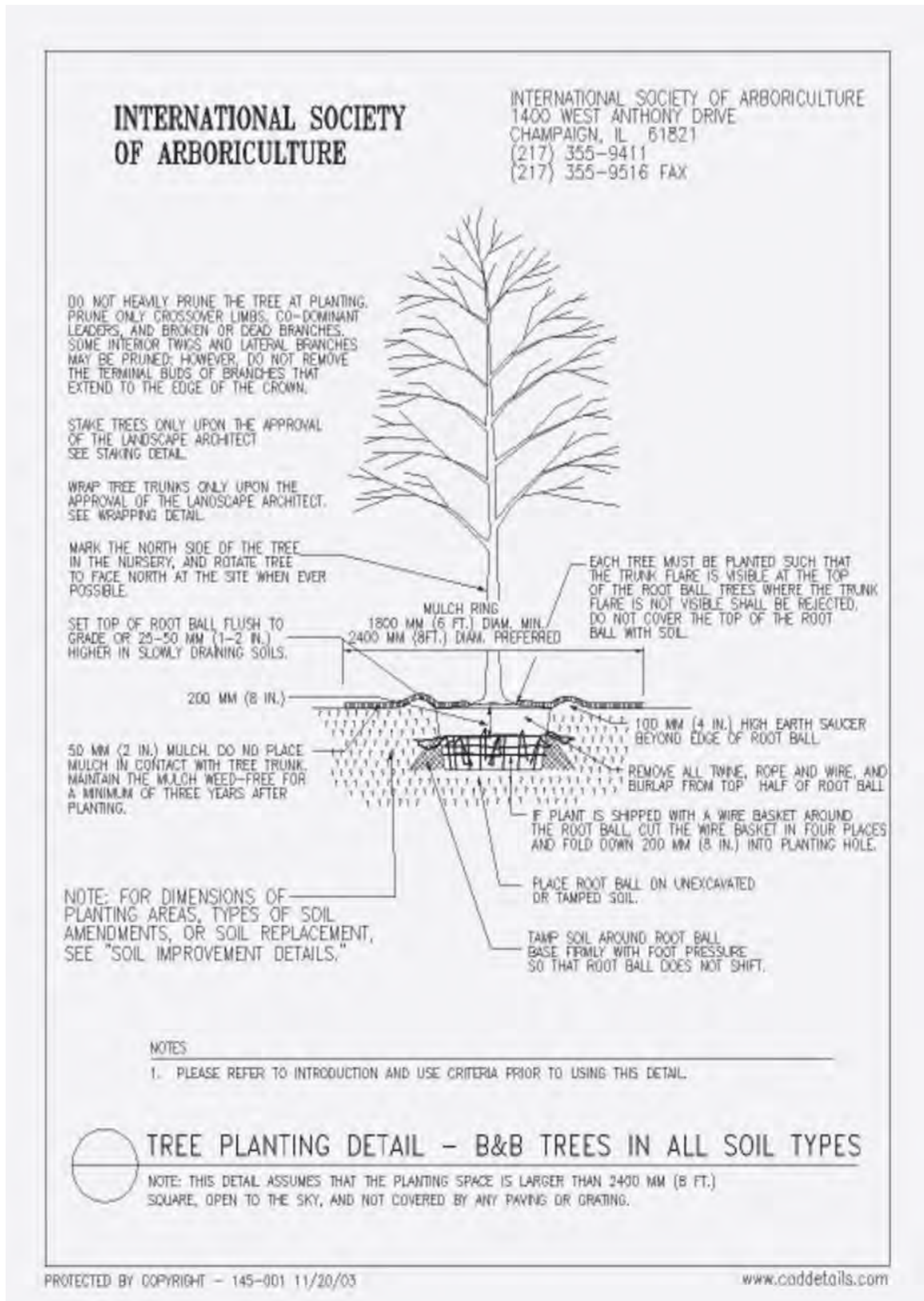
TREE ID	PARK NAME	ADDRESS	STREET	COMMON NAM	DBH	CONDITION	ARBORIST REC
60		97	PONTIAC TR	AILANTHUS	14	4	REMOVE-STANDARD
67		3760	LAKE SHORE DR	AILANTHUS	6	4	REMOVE-STANDARD
74		3919	LAKE SHORE DR	AILANTHUS	4	4	REMOVE-STANDARD
161		4354	PONCHARTRAIN DR	AILANTHUS	6	4	REMOVE-STANDARD
162		4350	PONCHARTRAIN DR	AILANTHUS	15	4	REMOVE-STANDARD
212		4295	HILLSIDE TR	AILANTHUS	9	3	PRUNE-CYCLE
213		4295	HILLSIDE TR	AILANTHUS	10	3	PRUNE-CYCLE
357		4043	COMANCHE TR	AILANTHUS	9	4	REMOVE-STANDARD
393	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	15	3	PRUNE-CYCLE
394	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	13	3	PRUNE-CYCLE
407	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	14	4	REMOVE-LOW PRIORITY
408	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	4	REMOVE-LOW PRIORITY
409	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	8	4	REMOVE-LOW PRIORITY
420	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	23	3	PRUNE-CYCLE
423	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	3	PRUNE-CYCLE
424	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	16	3	PRUNE-CYCLE
425	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	19	3	PRUNE-CYCLE
426	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	20	3	PRUNE-CYCLE
427	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	12	3	PRUNE-CYCLE
428	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	11	3	PRUNE-CYCLE
430	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	10	5	REMOVE-STANDARD
475	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	3	PRUNE-CYCLE
477	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	3	PRUNE-CYCLE
487	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	9	5	REMOVE-STANDARD
491	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	11	3	PRUNE-CYCLE
492	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	19	3	PRUNE-CYCLE
493	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	12	5	REMOVE-STANDARD
494	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	19	3	PRUNE-CYCLE
495	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	29	3	PRUNE-CYCLE
496	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	21	5	REMOVE-STANDARD
498	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	15	3	PRUNE-CYCLE
500	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	10	3	PRUNE-CYCLE
502	Michiana Village Park	4000	CHEROKEE DR	AILANTHUS	16	4	REMOVE-STANDARD
528	lakefront	3900	LAKE SHORE DR	AILANTHUS	8	4	REMOVE-STANDARD
541	lakefront	3900	LAKE SHORE DR	AILANTHUS	22	4	PRUNE-PRIORITY
542	lakefront	3900	LAKE SHORE DR	AILANTHUS	40	4	PRUNE-PRIORITY
550	Village Owned Lots	3700	LAKE SHORE DR	AILANTHUS	15	3	PRUNE-CYCLE
688		4354	PONCHARTRAIN DR	AILANTHUS	13	4	REMOVE-STANDARD
405	Michiana Village Park	4000	CHEROKEE DR	BOXELDER	12	4	REMOVE-LOW PRIORITY
489	Michiana Village Park	4000	CHEROKEE DR	BOXELDER	13	3	PRUNE-CYCLE
497	Michiana Village Park	4000	CHEROKEE DR	BOXELDER	16	3	PRUNE-CYCLE
522	Michiana Village Park	4000	CHEROKEE DR	BOXELDER	13	3	PRUNE-CYCLE
585	lakefront	4100	LAKE SHORE DR	BOXELDER	10	3	PRUNE-CYCLE
693		21	POKAGON TR	BOXELDER	17	5	REMOVE-STANDARD
156		45	EAST CT	CHERRY-BLACK	11	5	REMOVE-STANDARD
321		4133	CHOCTAW TR	CHERRY-BLACK	12	3	PRUNE-CYCLE
342		4093	COMANCHE TR	CHERRY-BLACK	4	3	PRUNE-CYCLE
382		4101	CHIPPEWA TR	CHERRY-BLACK	10	3	PRUNE-CYCLE
412	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	10	3	PRUNE-CYCLE
417	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	5	REMOVE-STANDARD
437	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	4	REMOVE-LOW PRIORITY
443	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	8	4	REMOVE-STANDARD
448	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	10	3	PRUNE-CYCLE
449	lakefront	4000	CHEROKEE DR	CHERRY-BLACK	11	3	PRUNE-CYCLE
468	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	3	PRUNE-CYCLE
499	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	9	4	REMOVE-LOW PRIORITY
503	Michiana Village Park	4000	CHEROKEE DR	CHERRY-BLACK	18	3	PRUNE-CYCLE
615		21	ORIOLE TR	CHERRY-BLACK	12	3	PRUNE-CYCLE
646	Village Owned Lots	4144	CHOCTAW TR	CHERRY-BLACK	8	4	REMOVE-LOW PRIORITY
666		48	EAST CT	CHERRY-BLACK	8	4	PRUNE-DEAD LIMB
61		97	PONTIAC TR	COTTONWOOD	16	3	PRUNE-CYCLE
170		4260	PONCHARTRAIN DR	COTTONWOOD	13	3	PRUNE-CYCLE
390	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	25	3	PRUNE-CYCLE
392	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	38	4	PRUNE-PRIORITY

VILLAGE OF MICHIANA URBAN FORESTRY MANAGEMENT PLAN

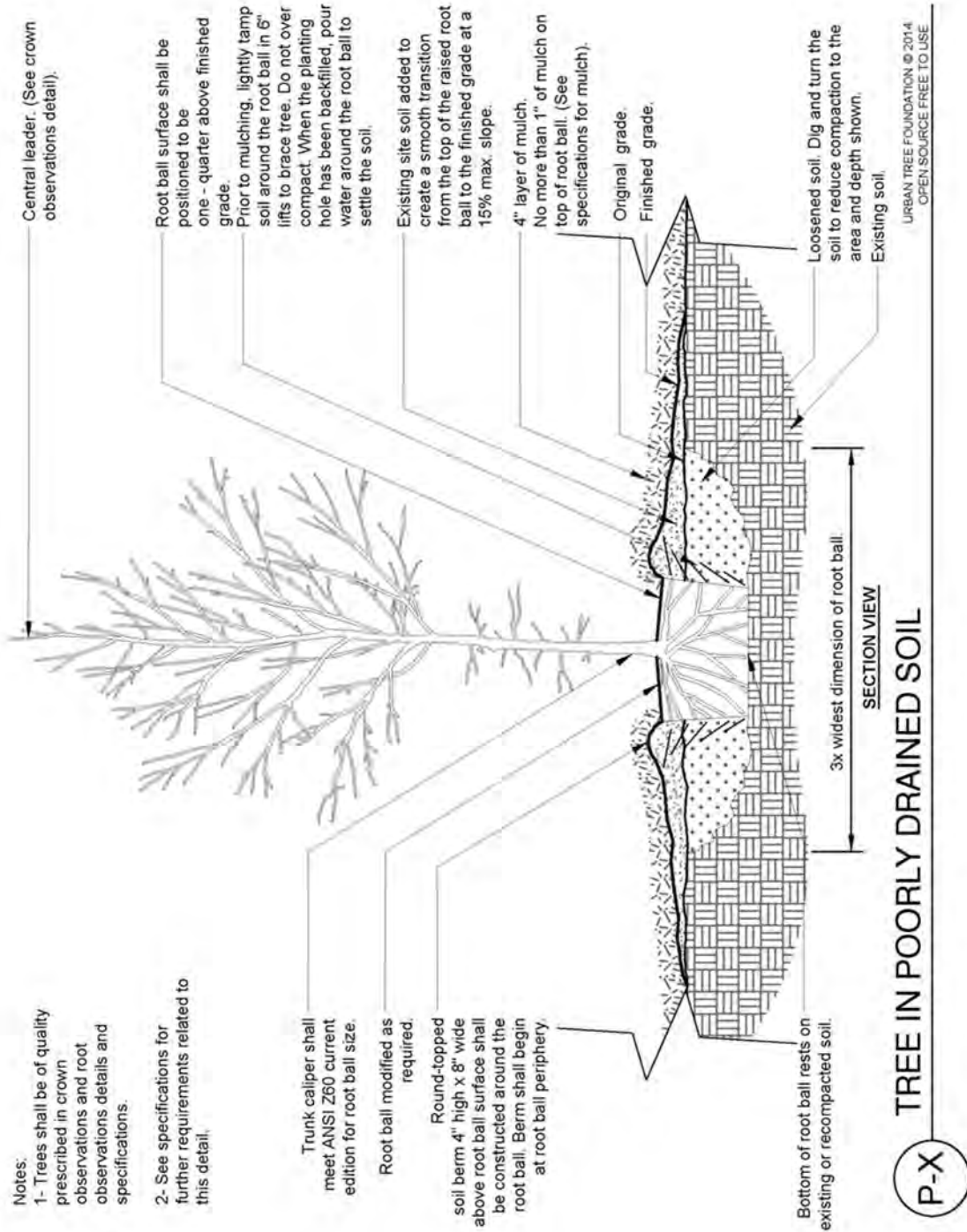
398	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	30	5	REMOVE-STANDARD
399	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	25	5	REMOVE-STANDARD
401	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	20	4	PRUNE-PRIORITY
402	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	8	5	REMOVE-STANDARD
438	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	32	3	PRUNE-CYCLE
471	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	36	4	PRUNE-PRIORITY
476	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	12	5	REMOVE-STANDARD
478	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	28	3	PRUNE-CYCLE
501	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	14	3	PRUNE-CYCLE
506	Michiana Village Park	4000	CHEROKEE DR	COTTONWOOD	17	3	PRUNE-CYCLE
525	lakefront	3900	LAKE SHORE DR	COTTONWOOD	20	3	PRUNE-CYCLE
553		3700	LAKE SHORE DR	COTTONWOOD	13	4	PRUNE-PRIORITY
575		4149	LAKE SHORE DR	COTTONWOOD	14	3	PRUNE-CYCLE
576		4149	LAKE SHORE DR	COTTONWOOD	10	3	PRUNE-CYCLE
578		4149	LAKE SHORE DR	COTTONWOOD	10	5	REMOVE-STANDARD
4	lakefront	4000	LAKE SHORE DR	ELM-SIBERIAN	20	4	REMOVE-LOW PRIORITY
7	lakefront	4000	LAKE SHORE DR	ELM-SIBERIAN	25	4	REMOVE-LOW PRIORITY
21		4100	PONCHARTRAIN DR	ELM-SIBERIAN	22	4	REMOVE-LOW PRIORITY
22		4100	PONCHARTRAIN DR	ELM-SIBERIAN	26	4	REMOVE-LOW PRIORITY
68		3740	LAKE SHORE DR	ELM-SIBERIAN	24	3	PRUNE-PRIORITY
72		3915	LAKE SHORE DR	ELM-SIBERIAN	21	4	PRUNE-PRIORITY
73		3915	LAKE SHORE DR	ELM-SIBERIAN	21	4	REMOVE-STANDARD
78	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	24	3	PRUNE-CYCLE
79	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	13	3	PRUNE-CYCLE
118		3957	PONCHARTRAIN DR	ELM-SIBERIAN	12	4	PRUNE-PRIORITY
154	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	19	4	PRUNE-PRIORITY
155	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	4	4	REMOVE-LOW PRIORITY
180		180	AVALON TR	ELM-SIBERIAN	4	3	PRUNE-CYCLE
181		180	AVALON TR	ELM-SIBERIAN	14	4	PRUNE-PRIORITY
527	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	8	3	PRUNE-CYCLE
529	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	12	4	REMOVE-STANDARD
530	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	14	4	PRUNE-PRIORITY
531	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	14	4	PRUNE-PRIORITY
532	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	16	3	PRUNE-CYCLE
533	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	18	3	PRUNE-CYCLE
535	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	10	3	PRUNE-CYCLE
536	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	18	3	PRUNE-CYCLE
537	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	20	4	PRUNE-DEAD LIMB
539	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	28	4	PRUNE-PRIORITY
540	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	32	4	PRUNE-PRIORITY
545	lakefront	3900	LAKE SHORE DR	ELM-SIBERIAN	20	4	PRUNE-PRIORITY
548	Village Owned Lots	3700	LAKE SHORE DR	ELM-SIBERIAN	23	3	PRUNE-CYCLE
549	Village Owned Lots	3700	LAKE SHORE DR	ELM-SIBERIAN	12	3	PRUNE-CYCLE
551	Village Owned Lots	3700	LAKE SHORE DR	ELM-SIBERIAN	10	4	REMOVE-LOW PRIORITY
552	Village Owned Lots	3700	LAKE SHORE DR	ELM-SIBERIAN	14	3	PRUNE-CYCLE
554		3700	LAKE SHORE DR	ELM-SIBERIAN	10	4	PRUNE-PRIORITY
574		4149	LAKE SHORE DR	ELM-SIBERIAN	16	3	PRUNE-CYCLE
583	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	20	3	PRUNE-CYCLE
584	lakefront	4100	LAKE SHORE DR	ELM-SIBERIAN	18	4	PRUNE-PRIORITY
590	lakefront	4000	LAKE SHORE DR	ELM-SIBERIAN	30	3	PRUNE-CYCLE
18		4100	PONCHARTRAIN DR	MULBERRY-SPP	17	4	REMOVE-LOW PRIORITY
19		4100	PONCHARTRAIN DR	MULBERRY-SPP	17	4	REMOVE-LOW PRIORITY
23		40	POWHATAN TR	MULBERRY-SPP	25	4	REMOVE-STANDARD
29		3750	MICHIANA DR	MULBERRY-SPP	5	3	REMOVE-LOW PRIORITY
50		97	PONTIAC TR	MULBERRY-SPP	6	3	PRUNE-CYCLE
56		97	PONTIAC TR	MULBERRY-SPP	14	3	PRUNE-CYCLE
80		124	TAHOMA TR	MULBERRY-SPP	23	5	REMOVE-LOW PRIORITY
81		4053	PONCHARTRAIN DR	MULBERRY-SPP	8	4	REMOVE-LOW PRIORITY
86		3954	PONCHARTRAIN DR	MULBERRY-SPP	12	4	PRUNE-PRIORITY
89		3855	PONCHARTRAIN DR	MULBERRY-SPP	9	4	PRUNE-PRIORITY
90		3855	PONCHARTRAIN DR	MULBERRY-SPP	4	3	PRUNE-CYCLE
94		3884	MICHIANA DR	MULBERRY-SPP	24	3	PRUNE-CYCLE
112		10	SIoux	MULBERRY-SPP	8	3	PRUNE-PRIORITY
113		10	SIoux	MULBERRY-SPP	15	4	REMOVE-LOW PRIORITY
116		21	POKAGON TR	MULBERRY-SPP	29	4	REMOVE-STANDARD
140		10	SIoux	MULBERRY-SPP	10	4	REMOVE-LOW PRIORITY
153	lakefront	4100	LAKE SHORE DR	MULBERRY-SPP	13	3	PRUNE-CYCLE
159		89	EAST CT	MULBERRY-SPP	16	5	REMOVE-STANDARD
188		4153	PONCHARTRAIN DR	MULBERRY-SPP	24	4	PRUNE-PRIORITY
204		4222	HILLISIDE TR	MULBERRY-SPP	20	4	PRUNE-PRIORITY
205		4222	HILLISIDE TR	MULBERRY-SPP	10	4	PRUNE-PRIORITY
254		4133	HILLISIDE TR	MULBERRY-SPP	8	3	PRUNE-CYCLE
257		38	BRIARWOOD TR	MULBERRY-SPP	18	4	REMOVE-STANDARD
261		38	BRIARWOOD TR	MULBERRY-SPP	14	4	REMOVE-STANDARD
283		85	TAHOMA TR	MULBERRY-SPP	12	4	PRUNE-PRIORITY
291		4080	HILLISIDE TR	MULBERRY-SPP	18	4	REMOVE-STANDARD
292		4080	HILLISIDE TR	MULBERRY-SPP	15	4	REMOVE-STANDARD
298		4044	BRIARWOOD TR	MULBERRY-SPP	14	3	PRUNE-PRIORITY
305		4200	GRAND BEACH RD	MULBERRY-SPP	14	4	REMOVE-STANDARD
391	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	9	3	PRUNE-CYCLE
396	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	3	PRUNE-CYCLE
397	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	15	3	PRUNE-CYCLE
429	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	4	REMOVE-STANDARD
444	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	4	REMOVE-STANDARD
479	Michiana Village Park	4000	CHEROKEE DR	MULBERRY-SPP	8	3	PRUNE-CYCLE
526	lakefront	3900	LAKE SHORE DR	MULBERRY-SPP	13	3	PRUNE-CYCLE
547	lakefront	3900	LAKE SHORE DR	MULBERRY-SPP	8	3	PRUNE-CYCLE
572		4149	LAKE SHORE DR	MULBERRY-SPP	12	3	PRUNE-CYCLE
691		3886	MICHIANA DR	MULBERRY-SPP	12	4	REMOVE-STANDARD



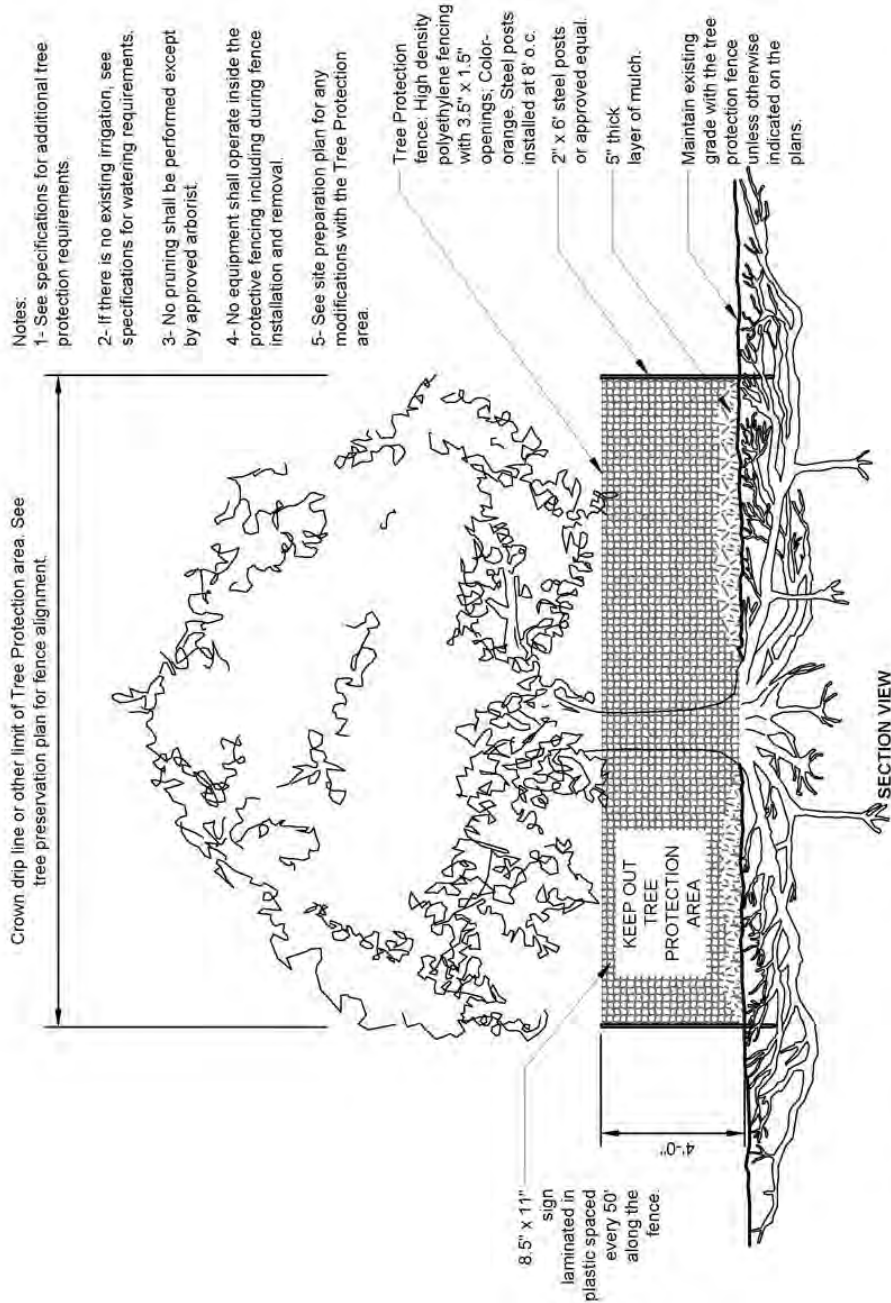
Appendix F: Balled and Burlapped Planting Detail



Appendix G: Containerized Planting Detail



Appendix H: Tree Protection Detail



TREE PROTECTION

S-X

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

ISA Basic Tree Risk Assessment Form

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

Target Assessment

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

Site Factors

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

Tree Health and Species Profile

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

Load Factors

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

Tree Defects and Conditions Affecting the Likelihood of Failure

— Crown and Branches —

Unbalanced crown ☐ LCR _____ % Cracks ☐ _____ Lightning damage ☐
 Dead twigs/branches ☐ _____ % overall Max. dia. _____ Codominant ☐ _____ Included bark ☐
 Broken/Hangers Number _____ Max. dia. _____ Weak attachments ☐ _____ Cavity/Nest hole _____ % circ.
 Over-extended branches ☐ Previous branch failures ☐ _____ Similar branches present ☐
 Pruning history Dead/Missing bark ☐ Cankers/Galls/Burls ☐ Sapwood damage/decay ☐
 Crown cleaned ☐ Thinned ☐ Raised ☐ Conks ☐ Heartwood decay ☐ _____
 Reduced ☐ Topped ☐ Lion-tailed ☐ Response growth _____
 Flush cuts ☐ Other _____

Main concern(s) _____

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

— Trunk —

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

Response growth _____
 Main concern(s) _____

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

— Roots and Root Collar —

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

Response growth _____
 Main concern(s) _____

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

VILLAGE OF MICHIANA URBAN FORESTRY MANAGEMENT PLAN

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

Matrix 1. Likelihood matrix.

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

Matrix 2. Risk rating matrix.

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

Notes, explanations, descriptions _____

Mitigation options _____ Residual risk _____
 _____ Residual risk _____
 _____ Residual risk _____
 _____ Residual risk _____

Overall tree risk rating Low ☐ Moderate ☐ High ☐ Extreme ☐

Work priority 1 ☐ 2 ☐ 3 ☐ 4 ☐

Overall residual risk Low ☐ Moderate ☐ High ☐ Extreme ☐

Recommended inspection interval _____

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

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

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

All of the ANSI Z133.1 safety standards shall apply to all tree care operations outlined in the Urban Forestry Management Plan. Listed below is a basic overview of the standard, and it is not verbatim. A full text of this manual will be made available to all the Public Works Department 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 Michiana staff and contractors working near electrical hazards shall be qualified to do so and shall be educated in the full ANSI standards for Electrical Hazards and Line Clearance.
11. Vehicles and mobile equipment shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements and shall be equipped with all standard safety devices, decals, and instructions, and shall be operated within all federal, state, and local motor vehicle codes and ordinances.

12. Aerial devices shall be inspected and maintained by qualified personnel in accordance with the manufacturer's requirements, and shall be equipped with all standard safety devices, decals, and instructions.
13. Aerial devices shall be stabilized by wheel chocks, outriggers, or stabilizers as necessary for the device, and shall never be used to lift, hoist, or lower logs or equipment unless specifically designed to do so.
14. Aerial devices shall be equipped with fall protection devices and permanent load ratings, both in accordance with ANSI/SIA 92.2 or 92.5, as applicable to the specific aerial device.
15. No aerial device shall be allowed to make contact with electrical conductors, and minimum safe 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.

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

ANSI Z60.1

1. All root ball and container sizes for all balled and burlapped stock shall conform to the Z60.1 standards for width and depth, such that they encompass enough of the fibrous root system as necessary for the full recovery of the plant upon installation.
2. All bare root stock shall conform to ANSI Z60.1 standards for minimum root spread.
3. All containerized stock shall conform to ANSI Z60.1 standards for plant and container size, as specified by Michiana, 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 Michiana prior to the beginning of work each day. If portions of the work site are outside of the original scope of work, the controlling authority shall be notified immediately.
2. Location of utilities, obstructions, and other such hazards above and below ground shall be taken into account prior to planting and transplanting operations. These include, but are not limited to, gas, electric, sewer, communication, drainage, and signage.
3. The following shall be taken into consideration prior to transport and planting: Requirements of individual trees, compass orientation of field-grown trees, site feasibility assessments, soil assessment, and drainage assessment.
4. Tools for planting and transplanting shall be properly labelled or purchased for their intended use, and be maintained in accordance with the manufacturer's recommendations
5. The system used to move and store the plant shall minimize desiccation and other damage to the crown, trunk or rootball, and the health and vigor of the plant shall be maintained during these periods.

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

ISA BMP Manual – Tree Planting

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

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

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

ANSI A300 - Part 1

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

ISA BMP Manual

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

Appendix M: Tree Protection (ANSI/ISA BMP)

ANSI A300 – Part 5

1. Tree management plans and specifications for tree management shall be written and administered by a certified arborist qualified in the management of trees and shrubs during site planning, development, and construction. Such activities may include, but are not limited to: demolition, grading, building construction, walkway or roadway construction, excavation, trenching and boring, or other such activity which has the potential to negatively impact trees.
2. The management of trees and shrubs shall be incorporated into the following phases of the site development process:
 - A. Planning
 - B. Design
 - C. Pre-Construction
 - D. Construction
 - E. Landscape
 - F. Post-Construction
3. During the Planning phase, an assessment of tree and shrub resources on the site shall be performed by a certified arborist. The assessment shall identify the species, condition, and size of each tree and shall be incorporated into the site design. Trees to be retained or protected shall appear on site design maps. Trees on neighboring property which could also be impacted should also be considered.
4. During the design phase, a tree management report shall be developed for trees to be conserved on the site, and shall be included in the construction plans and specifications, which may include, but are not limited to:
 - A. Trees to be retained
 - B. Tree and Root Protection Zones (TPZ/RPZ)
 - C. Tree Protection Zone barriers
 - D. Tree Protection plans
 - E. Soil erosion control
 - F. Soil compaction controls
 - G. Staging and storage areas
 - H. Other relevant on-site activities

5. Grading and demolition plans shall include all trees to be retained and removed, as well as the tree protection plans for working around trees to be retained. Plans shall also include equipment routes for avoiding the TPZ. Consequences for non-compliance shall be specified.
6. During the pre-construction phase, all tree protection plans shall be effectively communicated to all parties involved with the site development, and tree protection zone barriers shall be in place prior to the beginning of any construction activities.
7. The TPZ shall be delineated around all trees to be protected during construction, and shall be based on the size, species, and condition of the tree and its root system. Six to 18 times the diameter of the tree is generally considered to be acceptable. Deviations from this diameter may be made at the discretion of a certified arborist. Activities which could damage tree roots or compact soil should be avoided in the TPZ
8. Fencing or other visible barriers to the TPZ shall be installed prior to site clearing, grading, and demolition, and maintained throughout the construction and landscaping phase. When this is not feasible, alternate methods may be considered.
9. During the construction phase, compliance with tree protection plans shall be monitored by a certified arborist, and any damage to tree barriers or trees, or non-compliance shall be reported to the project manager or owner, or other controlling authority.
10. When removing vegetation or pavement during demolition, equipment used adjacent to the TPZ shall be specified to avoid damage to the tree and the surrounding soil, and soil protection measures shall be in place prior to vehicle or heavy traffic in or near the TPZ.
11. Storage or disposal of construction materials or hazardous materials shall not occur in the TPZ.
12. Fill within the TPZ shall not be permitted without mitigation to allow for proper air and water availability to existing roots. If fill cannot be avoided in the TPZ, compaction of fill shall be avoided, and consideration shall be given to a permanent well installation to protect the tree and its roots.
13. During the landscape, irrigation, and lighting phase, levels of compliance shall be documented and reported by a certified arborist. Non-compliance shall be reported to the project manager.
14. During the post-construction phase, a remedial and long-term maintenance plan shall be specified for existing and new landscaping, to ensure success of preservation efforts and newly planted landscaping.
15. Pruning shall be considered to reduce wind sail when necessary. It should not be considered to compensate for root loss.
16. Mulch shall be applied to as much of the tree protection zone as possible, in order to create a favorable soil environment for root recovery after construction activities.

ISA BMP Manual

1. A cost-benefit analysis shall be conducted during the planning phase. In some cases, money may be better invested in tree planting post-construction.
2. The species and age of tree shall be evaluated by a certified arborist, so that trees in good condition with desirable characteristics are preserved, but those in poor condition or with undesirable characteristics are not.
3. A tree inventory and tree management report shall be conducted during the planning phase, and a certified arborist shall work closely with developers to ensure best management practices are being met for both parties.
4. Effort shall be made to retain groups of trees, such that there is a wind and solar buffer around the highest quality trees if possible.
5. The Critical Root Zone (CRZ) is the area around the tree trunk where roots essential for tree health and stability are located. A Tree Protection Zone (TPZ) is an arborist-defined area around the tree which should include the CRZ, as well as additional area to ensure future stability and growth. The TPZ is subject to the professional opinion of the certified arborist.
6. An attempt shall also be made to preserve native soil for landscape planting as native soil with horizons and development is preferred over fill or black dirt.
7. If a sufficient TPZ cannot be established, a 6-12" layer of hardwood mulch, 3/4-inch plywood mat over a four-inch layer of hardwood mulch, or other such measures shall be temporarily installed over the CRZ in order to prevent root and soil compaction.
8. Trunk protection shall be installed on trees very close to construction activities, and should consist of 2x4 or 2x6 planks, strapped snugly to the tree trunk with wire or other strapping, preferably with a closed-cell foam between the trunk and the planks.
9. When roots over one inch cannot be avoided, they shall be pruned, not left torn or crushed. Acceptable methods of pruning are:
 - A. Excavation using supersonic air tools, pressurized water, or hand tools, followed by selective root cutting
 - B. Cutting through the soil along a predetermined line with a tool designed to cut roots
 - C. Mechanically excavating the soil 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.