NORTH TONAWANDA'S COMMUNITY FOREST MANAGEMENT PLAN

A PLAN TO GUIDE THE MAINTENANCE, PROTECTION, AND ENHANCEMENT OF NORTH TONAWANDA'S COMMUNITY TREES.

March 2022

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CITY OF **North Tonawanda**

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COMMUNITY FOREST MANAGEMENT PLAN
- NORTH TONAWANDA NY -

ACKNOWLEDGEMENTS

- THE CITY OF NORTH TONAWANDA, NY -

Youth, Recreation, and Parks Department

Engineering Department

Public Works Department

North Tonawanda Botanical Garden Organization, Inc.

Lumber City Development Corporation

North Tonawanda community members

- PLANIT GEO, INC.-

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Cover photo source: Lisa Zakes
All other photos unless noted are from the City of North Tonawanda, NY

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Source: Billy Butski Photography

MISSION STATEMENT

North Tonawanda's Community Forest Management Plan provides the framework to maintain, protect, and enhance the City's community trees. North Tonawanda is dedicated to achieving the goals set forth in this Plan through shared commitments with its partners and residents. This shared commitment will lead to a city where the benefits of the community forest are utilized for environmental, economic, and local success for present and future generations.

VISION STATEMENT

North Tonawanda will create a healthy, sustainable, and resilient community forest that is properly managed and cared for, benefiting all residents in the community.

CITY LEADER STATEMENT

North Tonawanda is known as the "Lumber City" because it was from the mid-19th century through the 1970s, a lumber transportation and forwarding center of significance of the ready availability of lumber. Not only are we surrounded by water on three sides, but a vast array of beautiful trees throughout our parks and residential neighborhoods. We are dedicated to caring for and supporting the goals of the Forestry Management Plan.

-Mayor Austin Tylec

EXECUTIVE SUMMARY

Source: Live & Love
North Tonawanda

The City of North Tonawanda is dedicated to building a thriving community forest for a healthy and vibrant place to live, work, and play. The more than 12,000 city street and park trees throughout North Tonawanda are an asset that brings value and benefits to the community. Furthermore, trees on private property provide added benefits. Together, these public and private trees constitute a "community forest". This resource provides environmental benefits, adds to property values, and contributes to an enhanced quality of life for all North Tonawanda residents.

Realizing the community forest is a valued asset, North Tonawanda, also known as "the City", invested in a collaborative planning process with support from the New York State Department of Environmental Conservation. The planning process involved extensive resource and program analysis to develop a clear, concise, and timeline-oriented Community Forest Management Plan. The overall goal of the planning process was to develop a sustainable Community Forestry Program for the preservation and expansion of the community forest to serve the public interest by improving the community's physical, social, cultural, and economic environment. This effort was led by the Department of Youth, Recreation, and Parks, Department of Public Works, and tree committee members, who are committed to this measured, monitored, and strategic long-term investment. The strategic planning process evaluated all aspects of a comprehensive community forestry program. Together, this team developed goals and actions to guide the City's Community Forestry Program over the next 8 years.

The development of a comprehensive Community Forest Management Plan included an analysis of the 2021 public tree and "vacant site"—i.e. potential planting sites—inventory along rights-of-way and in city parks. This Plan complements and supports the objectives of the City of North Tonawanda's adopted Comprehensive Plan and serves as a guide to future investment in the community forest resource. As stated in the Comprehensive Plan:

"*The City of North Tonawanda shall strive to maintain the delicate balance between sustainable practices and prudent utilization of its many sensitive and protected environmental resources, while improving the link between recreation and environmental education.*"

This Community Forest Management Plan supports the goals established in Comprehensive Plan—Protect and promote the City's abundant open space, environmental resources and recreational opportunities; improve the availability of water dependent and water enhanced

recreational and educational opportunities along the Niagara River and Erie Canal; maximize the utilization of existing infrastructure and resources to link recreation and environmental education; and improve connections between residential areas and recreation/community resources.

TREE INVENTORY SUMMARY

The October 2021 inventory completed by International Society of Arboriculture Certified Arborists from PlanIT Geo's Inventory team, included trees and planting sites along public street rights-of-way (ROW) and in specified parks and public facilities.

12,927
Total trees

21%
Crimson King maple

Crown cleaning
Primary maintenance need

17
Parks inventoried

18.4"
Average diameter

500
Planting sites identified

THE BENEFITS AND VALUE OF THE COMMUNITY FOREST

The 12,927 public trees in North Tonawanda provide value in terms of improved well-being and increased property values, air quality improvements, reduction in stormwater volumes and an improvement in water quality, energy savings from the shade of their canopy and protection from cool winds, and their ability to sequester and store carbon. These values originating from research conducted by the U.S. Forest Service and implemented in i-Tree software, equate to:

$1.9 million total annual value of benefits

$147 in annual benefits per tree

$63 in benefits per capita
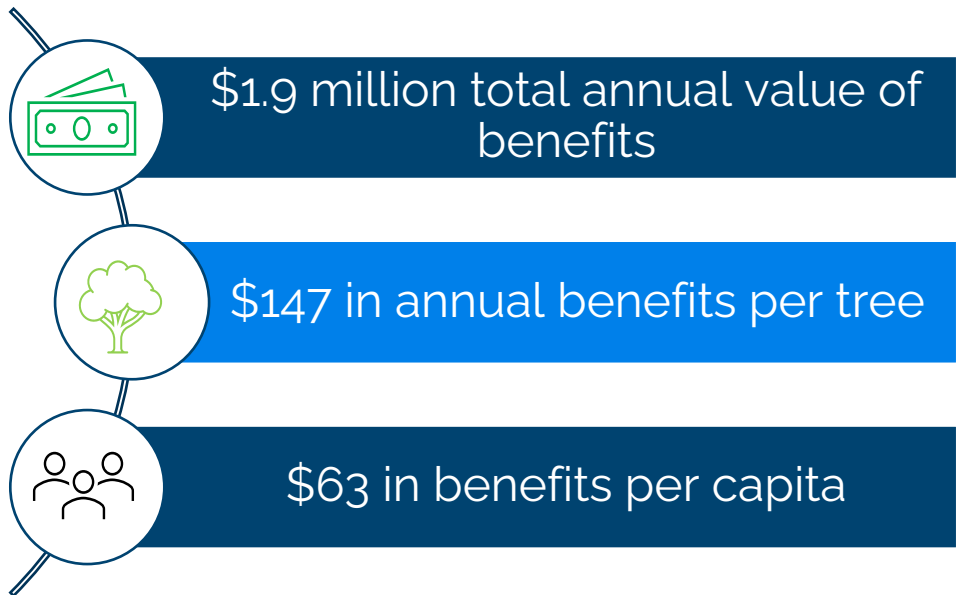
PLAN FRAMEWORK

The City is devoted to sustaining and enhancing the benefits trees provide to the community by developing and following this strategic Community Forest Management Plan. At the same time, stresses from the urban environment including air pollution, pests and diseases such as emerald ash borer, invasive species, climate change, damage by vehicles, increased impervious surfaces, infrastructure conflicts, and soil compaction reduce the diversity and magnitude of these benefits and may lead to tree-related problems. Compounding these issues are the concerns regarding current City staffing levels, budgets necessary for adequate community forest management, and absent or outdated policies and ordinances for tree protection. With this understanding, it was imperative that the City develop a Community Forest Management Plan to be a 8-year roadmap answering the questions of *What do we have? What do we want? How do we get what we want?* and, *How are we doing?* The following will provide an overview of the outcomes of this process to develop the Plan's recommendations.

WHAT DO WE HAVE?

The first step in the planning process included a baseline assessment of the community forest resource. In 2021, the City completed an inventory of City-owned trees and potential planting spaces within the public rights-of-way and parks. An analysis of the tree inventory data was conducted to identify trends in characteristics and maintenance needs for City-owned trees.

The inventory recorded 12,727 live trees across the City, of which 79% are street trees. Citywide, there are 140 unique tree species, with the top five shown in the chart (right) consisting of Crimson King maple, Norway maple, silver maple, red maple, and honeylocust. There is concern about biodiversity for the 65% of trees consisting of maples (*Acer*), which will be discussed later in this Plan.

Figure 1: Public tree species diversity distribution

The tree inventory analysis determined that the structure of all City-owned trees consists of 8% young trees (diameter of 1-6 inches) but the established age classes (12-18 inches and 18-24 inches) have the highest distribution with 52% of the trees. On the other hand, the mature tree age classes (24-30 inches and >30 inches) contain half that number of trees at 26%.

The table below summarizes the recommended maintenance approach based on the 2021 tree inventory. A total of 1,275 trees were identified as either Priority 1 or 2 removal and a total of 10,607 trees require routine pruning. Of the 12,727 trees, 8,704 street trees are recommended for a 7-year routine pruning cycle and 1,903 park trees for the same cycle. There

are 1,045 young trees that should be training pruned every three years, resulting in 348 trees per year. To compensate for tree loss and to increase canopy Citywide, it is recommended that at least 135 trees be planted per year with more ideal numbers around 191 trees per year.

Table 1: Summary of the recommended tree management program for the City of North Tonawanda

REMOVAL	1,275 200 1,075	Total Trees Priority 1 Removals Priority 2 Removals	Year 1-3
ROUTINE STREET TREE PRUNING CYCLE	8,704 1,243	Total Street Trees Trees Per Year	7-year cycle @ Year 3
ROUTINE PARK TREE PRUNING CYCLE	1,903 272	Total Park Trees Trees Per Year	7-year cycle @ Year 3
YOUNG TREE TRAINING CYCLE	1,045 348	Total Young Trees Trees Per Year	3-year cycle @ Year 1
TREE PLANTING	191 135	Trees Per Year (minimum) Trees Per Year (Accounts for natural mortality and recommendation to increase canopy)	Year 1-7

WHAT DO WE WANT?

Using the information gathered during the tree inventory data analysis, along with the information gathered from City staff meetings, the community forest program and the resource itself was analyzed using U.S. Forest Service auditing systems and community forest planning resources. Based on the audit, community forest management and sustainability gaps were identified to develop the following goals and action strategies in this Plan.

1) Maximize the efficiencies in maintaining trees

2) Use planning, legislation, and enforcement to integrate trees more fully

3) Implement best management practices for the benefits of trees

4) Foster support for the community forest

HOW DO WE GET WHAT WE WANT?

The following recommendations were developed to achieve the goals:

✓ Address the Priority 1 and 2 tree removals and tree pruning needs.
✓ Establish a routine 7-year pruning cycle for public trees and 3-year cycle for young trees.
✓ Continue to plant trees according to best practices in appropriate locations for increased tree canopy and added ecosystem benefits.
✓ Update the Street Tree Ordinance for tree planting, protection, and preservation of City trees.
✓ Explore and adopt shared maintenance responsibility for street trees.
✓ Engage community stewards to actively plant and maintain trees throughout the City.
✓ Acquire and maintain Tree City USA status.

Are We Getting What We Want?

Using an adaptive management approach will require the consistent monitoring of all the City's criteria for community forest sustainability. The City will be able to judge if the new approaches to community forest conservation are being effective, develop relationships between management actions and outcomes, and identify significant trends. This will allow the City to adjust management actions over time as changes occur both in the physical/biological environment and in the expectations of the City's residents.

Work plans will enable the City to effectively monitor progress towards goals and the overall vision for the community forest. A team consisting of City staff, partners, and community members dedicated to the Plan will ensure the actions are implemented, monitored, reported, and adapted over time to support updates to the Plan after the 7-year planning term.

> *"Urban trees and forests are considered integral to the sustainability of cities as a whole. Yet, sustainable urban forests are not born, they are made. They do not arise at random, but result from a community-wide commitment to their creation and management."*
>
> | Clark et al., 1997 "A Model of Urban Forest Sustainability"

Source: Katie Gibas

COMMUNITY FORESTRY IN NORTH TONAWANDA

Geographically, the City of North Tonawanda is in Western New York's Niagara County and occupies approximately 11 square miles. North Tonawanda is on the eastern banks of the Niagara River and is bounded to the north by the Town of Wheatfield, to the south by the City of Tonawanda, and on the east by the Town of Amherst. With an estimated population of 30,245 (2019), the City is rich in natural, cultural, and historic resources and features a diverse collection of residential and commercial settings.

North Tonawanda's location along the Niagara has shaped much of the City's history. With the construction of the Erie Canal, North Tonawanda became the largest port on the Great Lakes. In addition, North Tonawanda became known as "The Lumber City" due to its past primary industry of transporting lumber from the upper Great Lakes to east coast markets.

In 1897 the City of North Tonawanda split off from Tonawanda, with the Erie Canal as its southern boundary. North Tonawanda's prominent place within the lumber industry subsided in the mid-20th century due to changes in the utilization of the Erie Canal and the successful development of the St. Lawrence Seaway System. Yet, the City's logistical location remained an asset as manufacturing and chemical industries utilized the City's excellent rail and roadway transport systems. Residential settlement patterns outside the urban core began as a response to the need for worker housing for the city's burgeoning.

Beginning in the 1960's North Tonawanda's population began to slowly decline, a result of a loss of industry and manufacturing operations. However, the City has recognized its strengths, from a rich history and culture to the miles of Erie Canal and Niagara River waterfront. The City has made comprehensive revitalization efforts in the last 15 years to establish a community vision and identity. This includes ensuring community members have access to quality recreational activities and maximized natural resource utilization.

North Tonawanda is a community that recognizes its trees as one of its most valuable resources and with this Community Forest Management Plan, has dedicated itself to the preservation, proper maintenance, and continued enhancement of the community forest. The trees throughout North Tonawanda are an asset that bring value and benefits to the community. The community forest provides environmental benefits, adds to property values, and contributes to an enhanced quality of life for all of North Tonawanda's residents. These community forest efforts along with the transformation of the river's edge are a tremendous opportunity to bolster the City as a whole.

Unfortunately, the trees comprising the community forest in North Tonawanda suffer from the rigors of urban life, including pests and diseases, the current and changing climate, air pollution, compacted soils, limited growing spaces, and limited resources. To overcome such rigorous conditions for the City's trees and reap their full benefits, the care of the community forest must be strategically and efficiently planned and cared for.

This Community Forest Management Plan seeks to secure adequate tree management levels and garner the enabling support through staffing, funding, the community, and policy. Adequate tree management includes efficient and effective tree care, bolstered tree plantings to maintain age and species diversity in the public tree population, the equitable preservation and enhancement of canopy coverage citywide to enhance the character and aesthetics of neighborhoods, and exemplary stewardship of the community forest from all who live and work in North Tonawanda. The Community Forest Management Plan must be regarded as both a long-range policy guide and a living document that will respond to changing conditions over its life. It requires a close partnership between policy makers, staff, and the community. Adoption of this Community Forest Management Plan enables the City to accomplish these objectives.

THE COMMUNITY FOREST

DEFINING THE COMMUNITY FOREST

Any inhabited area that has trees and vegetation is considered a community forest though more urbanized communities often refer to this resource as an urban forest. Based on North Tonawanda's population density, tree population, and the public interaction with and received benefits from trees, North Tonawanda's resource is referred interchangeably as an urban and community forest in this Plan. The Community Forest Management Plan focuses on the City-owned trees in public rights-of-way and parks, but also has implications for the private trees and attention to these are addressed through community outreach and education efforts.

The concept of urban and community forest management developed in the 1960s out of the death and devastation of the elm tree population throughout the United States due to Dutch Elm disease. The discipline of community forestry strongly advocates for species and age diversity in a city's tree population so that the elm tree devastation of the 1960s does not happen again. Unfortunately, native and invasive pests and diseases continue to spread.

During the last three decades, community forestry has evolved as researchers and practitioners learn more about the structure and function of trees and their unique role in providing environmental, economic, and social benefits to urban areas. Community forestry provides each of these benefits in differing circumstances—as infrastructure, as part of design and development, and as efficient and productive providers of economic development.

Residents traditionally have indicated that they consider the trees in the community a priority. In urban environments, the community forest is sometimes the only day-to-day interaction with nature that many residents enjoy.

As North Tonawanda continues to grow, the community forest needs a strong advocate. This will happen with the education and support of the City's constituency, staff, and elected officials via an approved community forest management plan. The community forest is unique in the array of benefits it provides to the community, and a management plan will effectively collect and showcase these values.

While a management plan is useful in helping educate and ensure future viability, it also will set up useful parameters for the daily operations and care of the community forest. A fresh look at all of the policies currently in place will bring into focus what is necessary for day-to-day activities to ensure long-term viability and safety of the community forest.

NORTH TONAWANDA'S COMMUNITY FORESTRY BACKGROUND

North Tonawanda is situated among an abundant natural environment that includes miles of waterfront. The City is directly tied to its natural environment and North Tonawanda's residents value these assets. As stated in the City's Comprehensive Plan, in order to protect the natural environment while supporting fiscal sustainability, a range of strategies such as growing the urban forest canopy, improving the health of the river ecosystems, introducing green infrastructure, and adopting conservation measures in development projects should be implemented.

North Tonawanda has held the Arbor Day Foundation's Tree City USA certification for 13 years, showing the City's commitment to caring for its urban forest. To grow on this accomplishment, the City continues to grow the urban forest canopy through the PlaNT it Forward Program. This program involves community participation in purchasing trees to be earmarked for parks along with community planting days. This program has increased community engagement with trees and provides a helping hand to the City with tree care.

It is the City's responsibility to maintain trees within the public rights-of-way and on City-owned parks, open spaces, and facilities. North Tonawanda's Department of Youth, Recreation, and Parks and Department of Public Works are leading this Community Forest Management Plan effort and will be responsible for the planning, development, coordination and promotion of the physical, social, and economic well-being of the City. A multifaceted approach is implemented in North Tonawanda for the care and enhancement of community forestry. In addition to the Department of Youth, Recreation, and Parks, Public Works and the North Tonawanda Botanical Garden Organization work closely to grow and manage the City's urban forest.

Though it is the City's responsibility for tree care within public rights-of-way, the preservation and growth of citywide urban forest canopy should be the concern of both the City and the community residents. Currently, the City does have an ordinance for tree welfare, but there is no designated tree management professional such as a city arborist, city forester, or urban forester. With this baseline assessment of the City's community forest program, the Community Forest Management Plan was developed to provide recommendations, tree

maintenance priorities, strengthened tree management, and preservation of best practices and ordinances.

Existing city plans and efforts impact and influence North Tonawanda's community forest. In addition to the 2008 Comprehensive Plan, the City adopted the 2017 Downtown Revitalization Initiative which strives to create a long-term management plan to maintain and build on the progress with streetscapes and environmental remediations that have transformed downtown North Tonawanda into a greener city. The Community Forest Management Plan will provide even more detailed information for this initiative on how to maintain and take full advantage of the benefits of community trees.
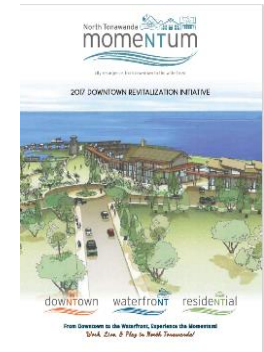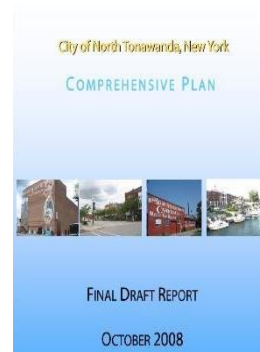
"The time has come for urban communities to stop seeing the trees and start looking at the forest. I say this because the comprehensive environmental benefits can be achieved only through a forest management program..."

John P. Rousakis, Savannah, GA Mayor in 1978 at the 1st U.S. National Urban Forestry Conference

BENEFITS PROVIDED BY TREES

The quality of life of the citizens in any community depends on the community forest, as trees make a vital and affordable contribution to the sense of community, pedestrian-friendly neighborhoods, energy savings, and air quality. Community forest management is critical to meeting the City's commitment to climate change, stormwater reduction and improved water quality, carbon sequestration, wildlife habitat enhancement, and water conservation. Trees are one of the few infrastructure investments that grow in value over time. The following data was derived from Alliance for Community Trees.[1]

Reduce Stormwater, Conserve Water and Soil

A tree's fibrous roots, extending into the soil, are premier pollution and soil erosion prevention systems. Intensely urbanized areas are covered with many impermeable surfaces. In contrast to an impervious hardscape, a healthy urban forest can reduce annual storm water runoff up to 7 percent. Highly efficient trees also absorb toxic substances such as lead, zinc, copper, and biological contaminants. Trees reduce the need for additional local stormwater filtration systems.

Reduce Stress and Improve the Quality of Life

Neighborhoods with generous canopies of trees are uplifting and good for public health. Greater contact with natural environments correlates with lower levels of stress, improving performance. Students' concentration levels go up when they are able to look out onto a green landscape. Studies show that children with attention deficit disorder function better after activities in green settings. A green environment also improves worker productivity.
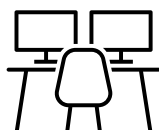
Build Safe Communities and Decrease Crime

Police and crime prevention experts agree that trees and landscaping cut the incidence of theft, vandalism, and violence by enhancing neighborhoods. Thriving trees on well-maintained streets indicate pride of ownership. Public housing residents with nearby trees and natural landscapes reported 25 percent fewer acts of domestic aggression and violence. Apartment buildings with high levels of greenery had 52 percent fewer crimes than those without any trees. Buildings with medium amounts of greenery had 42 percent fewer crimes.

[1] Alliance for Community Trees. 2011. Benefits of trees and urban forests: A research list. http://actrees.org/files/Research/benefits_of_trees.pdf

Positively Influence Climate to Ensure Sustainability

Trees absorb carbon dioxide and store carbon in wood, which helps to reduce greenhouse gases. Carbon emissions from vehicles, industries, and power plants are a primary contributor to increased air temperatures in metropolitan areas. Trees in the United States store 700 million tons of carbon valued at $14 billion with an annual carbon sequestration rate of 22.8 million tons per year valued at $460 million annually.

Clean the Air and Breathe Easier

Shade trees reduce pollution and return oxygen to the atmosphere. In addition to carbon dioxide, trees' leaves or needles absorb pollutants, such as ozone, nitrogen dioxide, sulfur dioxide, and some particulate matter.

Save Energy and Lower Energy Costs for Buildings

As natural screens, trees can insulate homes and businesses from extreme temperatures, keep properties cool, and reduce air conditioning utility bills. A 20 percent canopy of deciduous trees over a house results in annual cooling savings of 8 to 18 percent and annual heating savings of 2 to 8 percent. By planting shade trees on sunny exposures, residents and businesses can save up to 50 percent on hot-day energy bills.

Reduce the Need for Street Maintenance

Shaded streets last longer and require far less pavement maintenance, reducing long- term costs. Canopy diminishes pavement fatigue, cracking, rutting, and other damage. A study from University of California at Davis found that 20 percent shade cover on a street improves pavement condition by 11 percent, which is a 60 percent savings for resurfacing over 30 years.

Raise Property Values

Trees are sound investments, for businesses and residents alike, and their value increases as they grow. Sustainable landscapes can increase property values up to 37 percent. The value of trees appreciates over time because the benefits grow as they do. For businesses, trees have added value, including higher revenues. Shoppers seek out leafy promenades that frame storefronts. Research shows that shoppers spend more—between 9 and 12 percent more—on products in tree-lined business districts.

Cooler Pavement Diminishes Urban Heat Islands

Broad canopy trees lower temperatures by shading buildings, asphalt, and concrete. They deflect radiation from the sun and release moisture into the air. The urban heat island effect is the resulting higher temperature of areas dominated by buildings, roads, and sidewalks. Cities are often 5° to 10°F hotter than undeveloped areas, because hot pavement and buildings have replaced cool vegetated land. In addition, high temperatures increase the volatility of automobile oil and oil within the asphalt itself, releasing the fumes into the atmosphere. Shade trees can reduce asphalt temperatures by as much as 36°F, which diminishes the fumes and improves air quality.

Protect Wildlife and Restore Ecosystems

Planting and protecting trees can provide habitat for hundreds of birds and small animals. Urbanization and the destruction of valuable ecosystems have led to the decline of many of species. Adding trees, particularly native trees, provides valuable habitat for wildlife.

Calm Traffic and Make Neighborhoods Safer and Quieter

People drive more slowly and carefully through tree-lined streets because trees create the illusion of narrower streets. One study found a 46 percent decrease in crash rates across urban arterial and highway sites after landscape improvements were installed. The presence of trees in a suburban landscape reduced the cruising speed of drivers by an average of 3 miles per hour. Faster drivers and slower drivers both drove at decreased speeds in the presence of trees.

Trees reduce noise pollution, buffering as much as half of urban noise. By absorbing sounds, a belt of trees 100 feet wide and 50 feet tall can reduce highway noise by 6 to 10 decibels. Buffers composed of trees and shrubs can reduce 50 percent of noise.

More information about the benefits of trees, links to the latest research papers, and other research regarding urban forestry can be found at the Invest From the Ground Up resource web page (http://investfromthegroundup.org/resources/research/).

A comprehensive analysis of the ecosystem services and benefits provided by the trees inventoried in 2021 are provided in the Value and Benefits of North Tonawanda's Trees section.
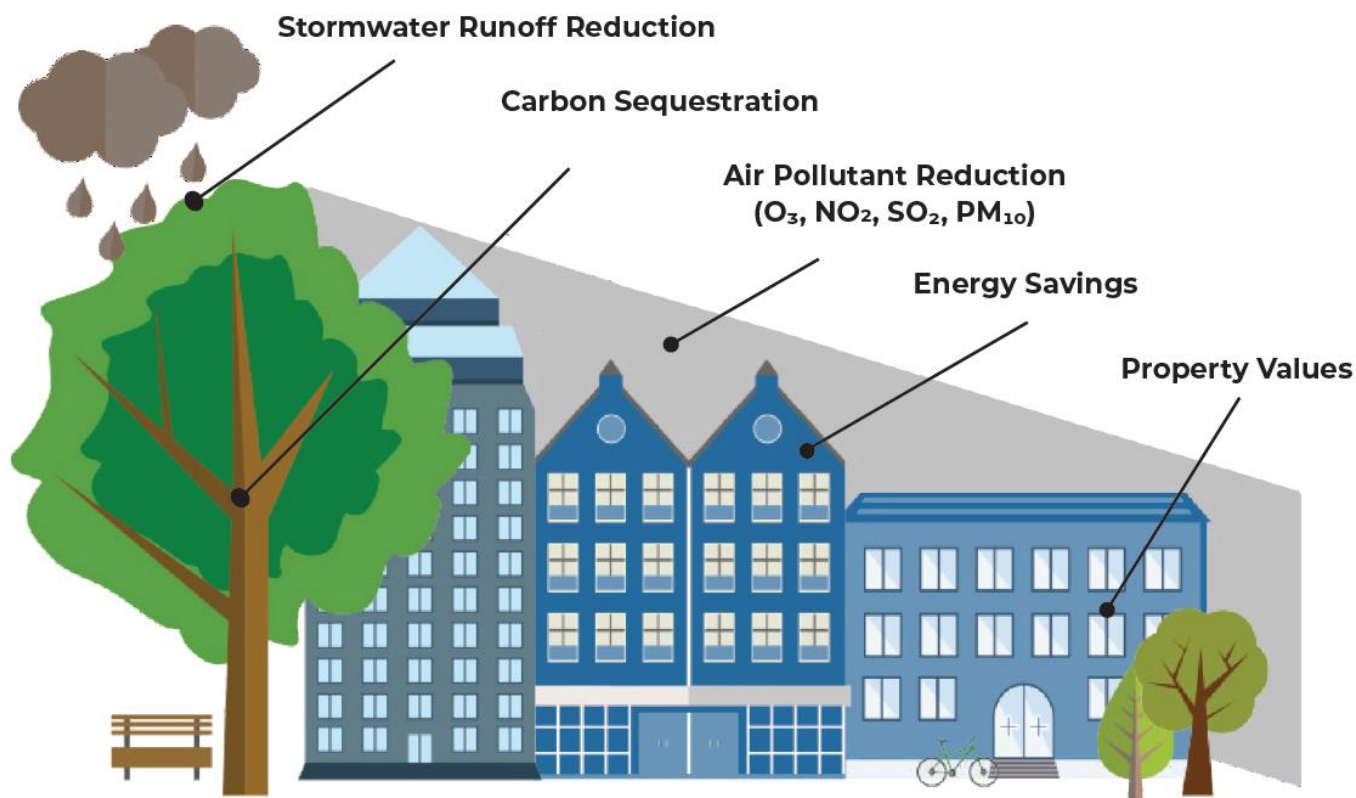
THE COMMUNITY FOREST MANAGEMENT PLAN APPROACH

Understanding the benefits and functions of the community forest, the City has developed this Community Forest Management Plan ("Plan").

> *"Without a plan, the governments and individuals responsible for taking care of an urban forest will not be effective in meeting the true needs of the trees and the community. A plan establishes a clear set of priorities and objectives related to the goal of maintaining a productive and beneficial community forest."* | American Public Works Association, 2007

Plan Purpose

Many different city planning and management actions, especially those that occur during redevelopment, have a large impact on the character and condition of the urban and community forest. A thriving and well-maintained urban forest provides a wide variety of benefits to the community. To help ensure that North Tonawanda's urban forest will continue to prosper, the City has developed this long-term plan to account for the needs of trees in the urban environment. To develop and maintain desired urban forest resource and program conditions, necessary management actions need to be executed in a timely manner. This Plan provides an overall strategy that will help the City maximize the benefits the urban forest will provide in the years to come.

✓ Establish a baseline for the state of the community forest resource, resource management, community framework, and institutional framework.
✓ Provide recommendations for a more healthy, vibrant, and sustainable urban forest.
✓ Be a living document by providing the framework and guidance for adaptive management.

Plan Framework

The best approach to managing a community forest is to develop an organized, proactive program using information (such as data gathered from a tree inventory and outlined in a tree management plan) to set goals and measure progress. This information can be utilized to establish tree care priorities, build strategic planting plans, draft cost-effective budgets based on projected needs, and ultimately minimize the need for costly, reactive solutions to crises or urgent risk mitigation.

In October 2021 North Tonawanda's tree and vacant planting site inventory was completed. At the same time, development of this Community Forest Management Plan was underway. This Plan considers the diversity, distribution, and general condition of the inventoried trees, but also provides a prioritized system for managing public trees. The following outline provides the framework of this Plan:

Tasks:
1. Inventory of trees and planting sites along public rights-of-way (ROW) and within the City's 17 pocket parks and all trees in landscaped areas of City Hall and Sweeney Cemetery.
2. Analysis of tree inventory data.
3. Development of a plan that prioritizes the recommended tree maintenance.

This plan is divided into the following sections:
A. State of the Community Forest Resource (Tree and Vacant Site Inventory Analysis):
   - Summarizes the tree inventory data and presents trends, results, and observations.
   - Summarizes the economic, environmental, and social benefits that trees provide to the community.
B. Community Forest Management:
   - Provides the tree management program recommendations, schedules, and budgets regarding tree removals, maintenance, and planting.
   - Includes recommendations for community engagement and tree stewardship.
C. Tree Maintenance and Planting Recommendations, Work Plan and Budget:
   - Utilizes the inventory data to develop a prioritized maintenance schedule and projected budget for the recommended tree maintenance over a 7-year period.

D. Community Forestry Goals:
- In addition to maintenance recommendations, this section provides the road map for North Tonawanda to establish a thriving, healthy, and sustainable community forest.

THE GUIDING PRINCIPLES OF THE COMMUNITY FOREST MANAGEMENT PLAN

Implementation of this Community Forest Management Plan will adhere to the following guiding principles:

- ✓ Recognize that the trees of the community forest are more than aesthetic enhancements.
- ✓ Trees are the backbone of the urban ecosystem and an essential part of the community's green infrastructure.
- ✓ Promote the health and growth of the community forest by following scientifically established best practices for tree selection, planting, watering, and pruning.
- ✓ Promote a robust community forest through policies and practices that reduce its vulnerability to known diseases or pest infestations, and future threats, including the anticipated effects of climate change.
- ✓ Engage in a continuous process of long-range planning for the growth and maintenance of the community forest.
- ✓ Promote public appreciation of the community forest through educational outreach programs.
- ✓ Support local businesses, institutions, organizations and individuals in their efforts to grow and maintain the community forest through community education.
- ✓ Proceed in a manner that is inclusive and transparent.

State of the Community Forest Resource

To identify the City's community forest resource baseline by analyzing and summarizing the 2021 tree and vacant site inventory data to inform the recommendations in this Plan.

Summary of Public Trees

In October 2021, PlanIT Geo's Inventory Arborists, certified by the International Society of Arboriculture, assessed and inventoried trees and possible planting sites ("vacant sites") within the public rights-of-way (ROW), all trees within the City's 17 pocket parks, and all trees within landscaped areas of City Hall and Sweeney Cemetery.

The following summaries were completed using the data available in the City's tree inventory management software, TreePlotter, to inform the Community Forest Management Plan recommendations. The data can be viewed at www.pg-cloud.com/NorthTonawandaNY/. Additional features and functionality are available to users with an account.

North Tonawanda's tree inventory management software, TreePlotter
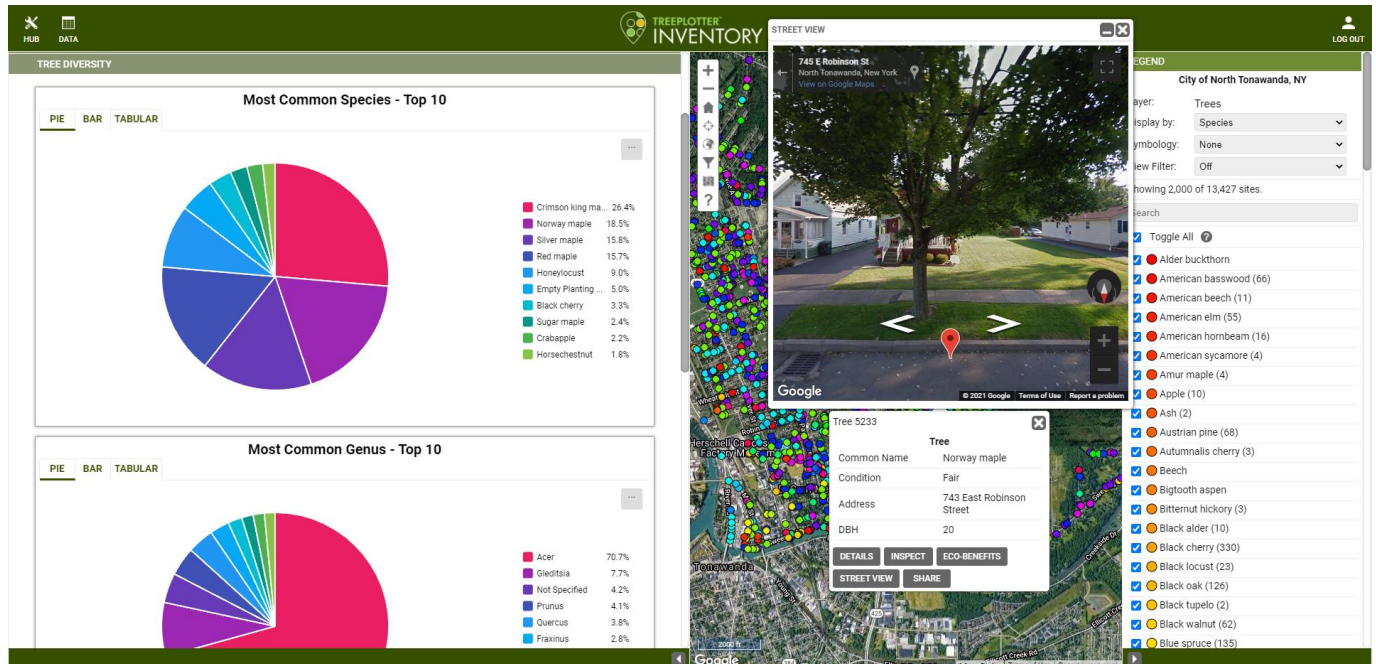
Summary of the Tree Inventory Analysis

It should be noted that the tree inventory analysis was completed in October 2021 and conditions and values may have changed since the completion of this analysis and Plan. As of October 2021, the tree inventory consisted of the following:

13,427	Data points	**10,305**	Live street trees (81%)
12,727	Total live trees	**2,422**	Live park trees (19%)
500	<u>Potential</u> planting sites	**140**	Unique tree species
65	Unique genera	**65%**	Maple (*Acer*) trees
18.4"	Average diameter	**56"**	Largest diameter
48%	Good condition	**1,275**	Priority removals

The Structure of Public Trees

The structure of the public trees in rights-of-way and parks describes the tree population in terms of its distribution, number of trees, species composition, growing space, and size classes. These summaries assist urban forest managers in strategic tree management, planting, and community outreach to ensure long lasting canopy and benefits distributed equally across the City. The following summaries include both street and park trees unless otherwise noted.

Tree Distribution

Tree distribution can affect maintenance costs, schedules, and potential risks such as pests or diseases and the effects of climate change such as droughts. Adequate distribution of trees also contributes to the City's pursuit for equitable distribution of tree canopy and associated benefits and equal access to the resource by all residents.
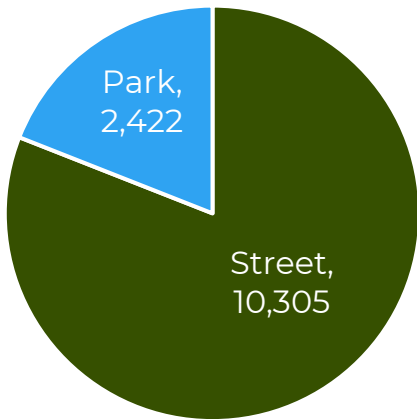
Figure 3: Live park and street trees
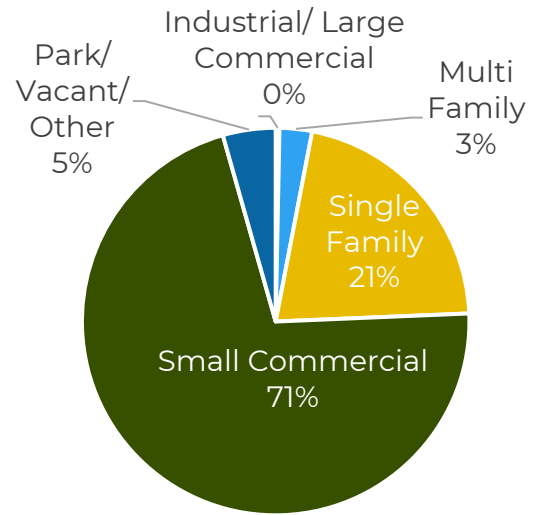
Figure 2: Public tree land use
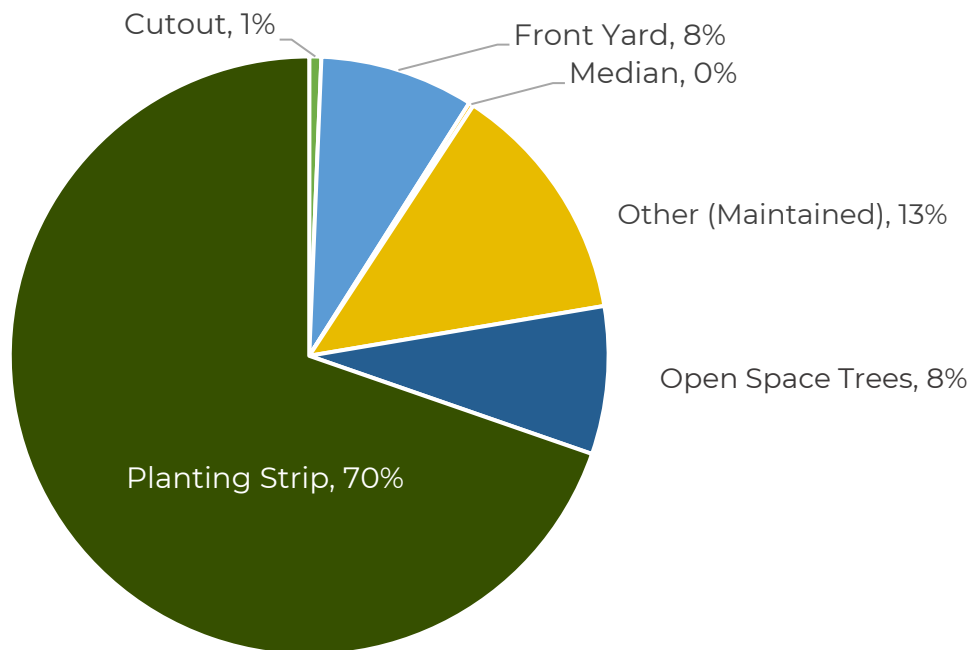
Figure 4: Public trees by location site

<u>RESULTS</u>

Street trees comprise the majority of the inventory with 81% or 10,305 live trees. Of all public trees, 71% (9,070) are in the public rights-of-way adjacent to small commercial land use. Most trees inventoried are in a "Planting Strip" Location Site with a total of 9,008 trees (70%) though most trees (40%, 3,982 trees) were recorded as having 1-5 feet of observable root space.

Overall, the distribution of trees is a healthy mix of park and street trees distributed evenly across land uses. It is common for less trees to exist in the dense industrial and large commercial land use areas. The low count of median tree plantings is a result of street design that may change as the City continues to implement its Complete Streets Program. One concern is the number of trees growing in planting areas with 1-5 feet of root space. This may cause issues with sidewalks, depending on the species, or infrastructure interference. It should be noted that underground root accommodations may be in place to not affect infrastructure but were not observed. Adequate root space should be considered for new tree installations, sidewalk and infrastructure amendments and installations, and as part of new Public Works' projects.

Tree Diversity and Composition

Tree composition data are essential since the types of trees present in a community greatly affect the amount of benefits produced, tree maintenance activities, budgets, planting goals, canopy connectivity, and the City's ability to respond to threats from invasive pests and diseases. Low species diversity (large proportion of the population consisting of trees of the same species) can lead to severe losses in the event of species-specific epidemics such as the devasting results of Dutch elm disease (DED, *Ophiostoma novo-ulmi*) and more recently, emerald ash borer (EAB, *Agrilus planipennis*). Unfortunately, many ash (*Fraxinus)* trees were planted as replacements to elms (*Ulmus*) lost from DED. Asian longhorned beetle (ALB, *Anoplophora glabripennis*) is a major threat to North Tonawanda's community forest, as seen below, 65% of the tree population falls within the *Acer* genus. Tree species diversity is crucial to the resilience of the community forest from these and future unknown threats.

Table 2: Live tree genera diversity citywide

Genus	Count	% of live trees
Acer	8,293	65%
Gleditsia	902	7%
Prunus	459	4%
Quercus	435	3%
Fraxinus	240	2%
Malus	235	2%
Tilia	188	1%
Picea	186	1%
Aesculus	180	1%
Syringa	174	1%
All other Genera	1,435	11%
Total	**12,727**	**100%**
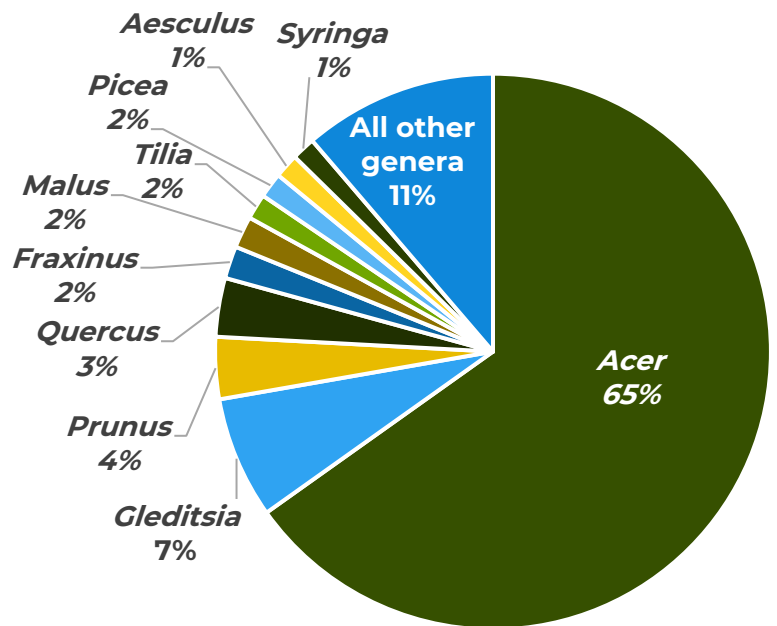
Figure 5: Live tree genera diversity citywide

The following provides a summary of the top ten species identified during the 2021 tree inventory data analysis.

Table 3: Tree species diversity

Species	Count	% of live trees
Crimson King maple	2,652	21%
Norway maple	1,851	15%
Silver maple	1,586	13%
Red maple	1,574	12%
Honeylocust	902	7%
Black cherry	313	2%
Sugar maple	238	2%
Apple species	224	2%
Horse chestnut	179	1%
Northern red oak	164	1%
All other species	3,044	24%
Total	**12,727**	**100%**

Figure 6: Live tree species diversity citywide
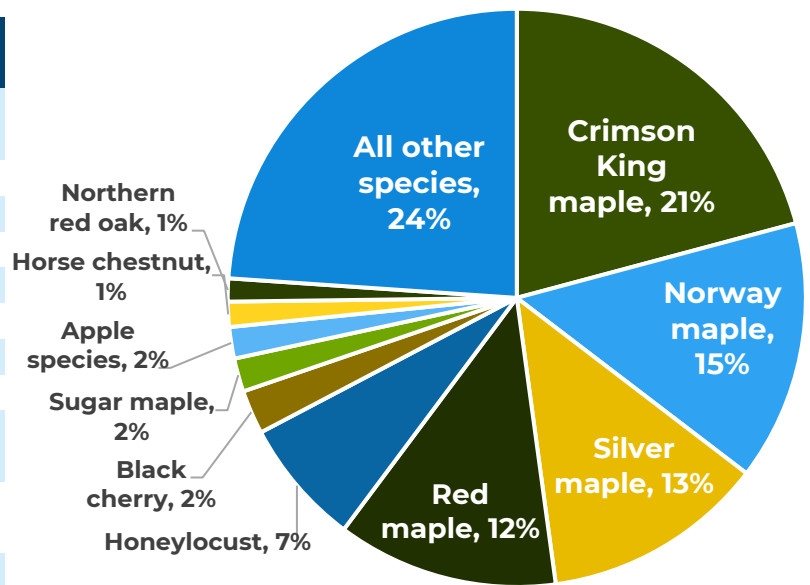
RESULTS

Based on the inventory data there exists a total of 75 unique genera with the top five comprised of *Acer* (65%), *Gleditsia* (7%), *Prunus* (4%), *Quercus* (3%), and *Fraxinus* (2%). The top five genera make up 81% (10,329 trees) of the 12,727 total live trees recorded in the 2021 inventory.

Regarding species diversity, there exists a total of 140 unique tree species. The top ten species comprise 76% of the inventory consisting of Crimson King maple (21%), Norway maple (15%), silver maple (12%), red maple (12%), honeylocust (7%), black cherry (2%), sugar maple (2%), apple species (2%), Horse chestnut (1%), and Northern red oak (1%).

The composition of a tree population should follow the 10-20-30 Rule for species diversity—a single species should represent no more than 10% of the community forest, a single genus no more than 20%, and a single family no more than 30%. Based on this rule, Crimson King maple (*Acer platanoides* 'Crimson King'), Norway maple (*Acer platanoides*), silver maple (*Acer saccharinum*) and red maple (*Acer rubrum*) exceed the recommended 10% maximum for a single species in a population, comprising a combined 60% of the inventoried tree population. Regarding the genus threshold, maples (*Acer*) far exceed the recommended 20% maximum for a single genus in a population, comprising 65% of the inventoried trees.

DISCUSSION/RECOMMENDATIONS

Crimson King maple dominates the street trees at 26% and black cherry dominates the park trees at 13%. After black cherry, Norway maple makes up the second highest portion at 9%. The causes great concern because the abundance of these species in the community forest

makes them limiting. For a sustainable and resilient community forest, black cherry, Norway maples, and maples in general, should not be planted in new tree installations.

Black cherry faces the threat of aphids, scale, borers, leafhoppers, caterpillars, tent caterpillars and Japanese beetles. Also, as a result of the large quantity of *Acer* (maple) in the City's population, along with its susceptibility to Asian longhorned beetle and granulate ambrosia beetle (*Xylosandrus crassiusculus*), the planting of *Acer* should be limited to minimize the potential for loss in the event that these pests appear in the City's community forest.

Diameter Size Class Distribution (Relative Age)

The distribution of tree ages influences the structure of the urban forest as well as the present and future costs to the City or property owners. An uneven-age urban forest offers continued flow of benefits and a more uniform workflow allowing managers to more accurately allocate annual maintenance funds. The inventoried trees were categorized into the following diameter size classes: young trees (0-3 and 3-6 inches DBH or diameter at breast height measured at 4.5 feet), established (6-12 inches DBH), maturing (12-18 and 18-24 inches DBH), and mature trees (24-30 and >30 inches). Since tree species have different lifespans and mature at different diameters, heights, and crown spreads, actual tree age cannot be determined from diameter size class alone. However, general classifications of size can be extrapolated into relative age classes.
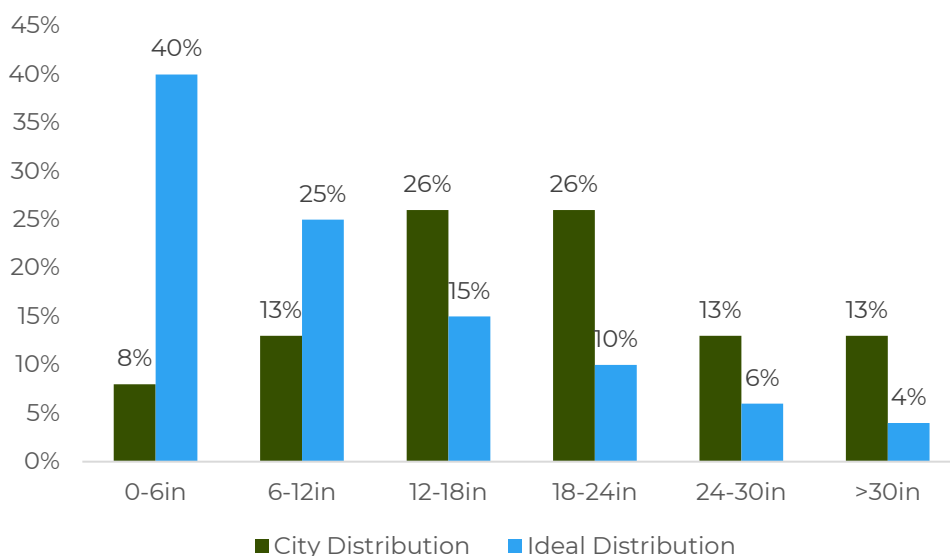
Figure 7: Relative age of live citywide trees with Richards' Ideal Distribution

RESULTS

The diameter classes were chosen so that the tree population could be analyzed according to Richards' ideal distribution (1983).[2] Based on the analysis, the distribution trends towards less ideal; young trees comprise less than half the recommended distribution with 8% instead of 40%. Overall, North Tonawanda's distribution of trees greater than 12 inches DBH exceeds the ideal distribution.

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[2] Richards, N. A. 1983. "Diversity and Stability in a Street Tree Population." *Urban Ecology* 7(2):159–171.

Richards proposed an ideal diameter size class distribution for street trees based on observations of well-adapted trees in Syracuse, New York. Richards' ideal distribution suggests that the largest fraction of trees (approximately 40% of the population) should be young (less than 8 inches DBH), while a smaller fraction (approximately 10%) should be in the large-diameter size class (greater than 24 inches DBH). A tree population with an ideal distribution would have an abundance of newly planted and young trees, and lower numbers of established, maturing, and mature trees.

Table 4: Summary of North Tonawanda's tree size distribution compared to the ideal distribution

DBH Class	Distribution Compared to Ideal Distribution
0-6in	LOW
6-12in	LOW
12-18in	HIGH
18-24in	HIGH
24-30in	HIGH
>30in	HIGH

North Tonawanda has too few young trees and an overabundance of maturing trees (12-24 inches DBH) and a slightly overabundant population of mature trees (>24 inches DBH) suggesting an overly maturing tree population. A goal for North Tonawanda' community forest should be to have an uneven-aged distribution of trees at the street, park, and Citywide levels. An aging tree population poses a potential increase in maintenance and removal demands and may leave a void in tree canopy and associated benefits if tree planting levels are not elevated. The City is below the threshold for young trees and it will also suffer a loss of ecosystem services that were provided by the mature trees if tree plantings do not increase.

It is recommended that North Tonawanda support a strong planting and maintenance program to ensure that young, healthy trees are in place to fill in gaps in tree canopy and replace older declining trees. The City must promote tree preservation and proactive tree care to ensure the long-term survival of older trees. Additionally, tree planting and tree care will allow the distribution to normalize over time.

The distribution of individual tree ages within a tree population influences present and future costs as well as the flow of benefits. If a city assumes responsibility of tree maintenance within public rights-of-way, an ideal age/size distribution in the tree population allows managers to allocate annual maintenance costs uniformly over many years and assures continuity in overall tree canopy coverage and associated benefits which are often dependent on the growing space of individual trees (e.g. open grown versus restricted growing areas).

The Condition and Maintenance Needs of Public Trees

Tree characteristics and outside forces affect the management needs for urban and community trees. An analysis of the condition and maintenance requirements enables managers to plan the community forest and target outreach to property owners and the community as a whole. Tree condition indicates how well trees are managed and how well

they perform given site-specific conditions. Tree maintenance needs are inventoried for public safety reasons and for the health and longevity of the trees. Understanding the maintenance needs assists tree managers in establishing daily work plans.

Tree Condition

The condition of individual trees was assessed based on methods defined by the International Society of Arboriculture (ISA). Several factors were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition of each inventoried tree was rated Excellent, Good, Fair, Poor, or Dead. In this Plan, the general health of the inventoried tree population was characterized by the most prevalent condition assigned during the inventory. Comparing the condition of the inventoried tree population with relative tree age (or size class distribution) can provide insight into the stability of the population.

Figure 11: Condition of all citywide trees
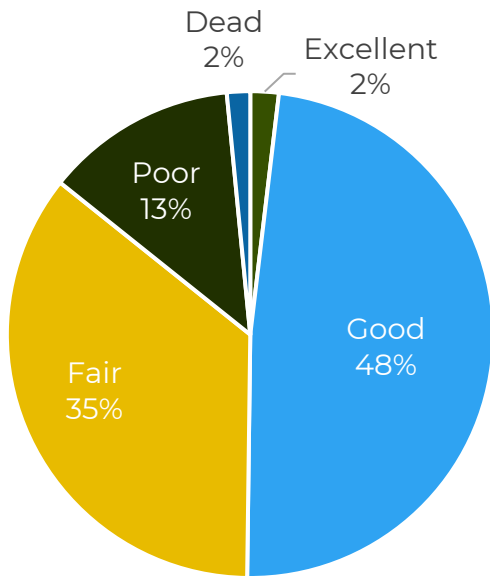
Figure 10: Condition of all citywide trees by relative age
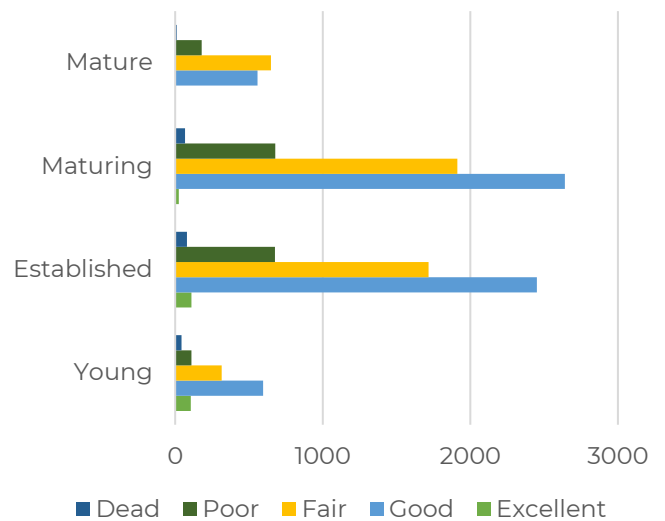
Figure 9: Condition of street trees by relative age

Figure 8: Condition of park trees by relative age
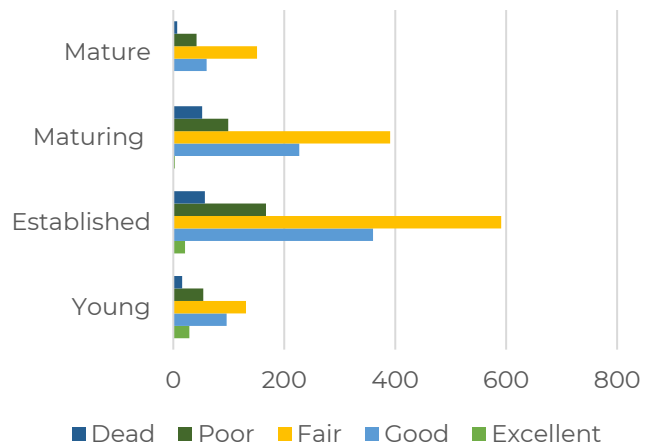
Tree condition was analyzed citywide and by location within city parks or public rights-of-way. The overall condition of all trees (both streets and parks) is split evenly between Good (48%) and Fair (35%). Only 2% of all trees were recorded as Dead at the time of the inventory.

In addition, the condition was summarized by relative age classes. Comparing the condition of the inventoried tree population with relative tree age (or size class distribution) can provide insight into the stability of the population. As seen in Figure 10, Citywide, most of the young and established trees are in Good condition with 51% and 49%, respectively. The majority of maturing and mature trees are in Fair condition with 36% and 46%, respectively. When comparing Figure 11 and Figure 12 (street versus park trees), a larger percentage of young (63%), established (57%), and maturing trees (54%) are in Good condition in the public rights-of-way; whereas, park trees of all ages are most commonly in Fair condition across the board- young (36%), established (16%), maturing (9%), and mature (13%).

DISCUSSION/RECOMMENDATIONS

The young, established, and maturing trees in the ROW are in better condition overall compared to the same size class in parks. This may be a result of more frequent care and attention placed on street trees compared to parks.

The condition of North Tonawanda's inventoried tree population is typical for a citywide tree population and specifically for the street and park trees. The data analysis has provided the following insight into maintenance needs and historical maintenance practices.

The similar trend in condition across the tree population reveals that growing conditions and/or past management of trees were consistent.

- Younger trees rated in Fair or Poor condition may benefit from improvements in structure that may improve their health over time. Pruning should follow ANSI A300 (Part 1) standards.[3]
- Poor condition ratings among mature trees were generally due to visible signs of decline and stress, including decay, dead limbs, sparse branching, or poor structure. These trees will require corrective pruning, regular inspections, and possible intensive plant health care to improve their vigor.
- Proper tree care practices are needed for the long-term general health of the community forest. Following guidelines developed by ISA and those recommended by ANSI A300 (Part 5) standards[4] will ensure that tree maintenance practices ultimately improve the health of the community forest.

Relative Performance Index

Relative Performance Index (RPI) is a comparison of a species' condition rating of "Good" and the tree population's "Good" rating. Using the percent of Good trees for a given species divided by the tree population percentage of Good trees gives a value of equal to 1, less than 1, or greater than 1. A value equal to 1 means the particular species is as healthy as the overall tree population. A value less than 1 means the species isn't as healthy as the overall tree population. A value greater than 1 means the species is healthier than the overall tree population. RPI

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[3] ANSI, American National Standards Institute. 2017. ANSI A300 (Part 1)-2017 Pruning

[4] ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction

answers the question of how well a species is performing in terms of health compared to the entire inventoried population.

Table 5: Relative Performance Index (RPI) of the most common tree species

Common Name	Relative Performance Index
Crimson King maple	1.10
Norway maple	0.90
Silver maple	0.95
Red maple	1.00
Honeylocust	1.16
Black cherry	0.82
Sugar maple	0.94
Apple species	1.01
Horse chestnut	1.04
Northern red oak	1.03

RESULTS

The table provides a summary of the RPI's in order of abundance in the tree population. Crimson King maples are most abundant but have a lower RPI (1.10) compared to honeylocust (1.16). Therefore, honeylocust has the best health of all of the species, despite it not being the most common. Though the maple species have relatively high RPIs, there is concern for the species due to the overabundance of its planting and potential invasive threats (most notably Asian Longhorned beetle).

Crimson King maple	Norway Maple	Silver Maple	Red Maple	Honeylocust

Black Cherry	Sugar Maple	Apple species	Horse chestnut	Northern Red Oak

Figure 12: Leaf images of the top ten most common trees in North Tonawanda, NY

Tree Observations

Tree observations were recorded during the 2021 inventory to further describe a tree's health, structure, or location when more detail was needed.

Table 6: Summary of North Tonawanda's tree inventory observations

Observation	Count	% of all Sites
Crown Dieback	7,236	54%
Hardscape Damage	3,965	30%
Cavity Decay	3,905	29%
Mechanical Damage	3,490	26%
Poor Structure	3,373	25%
Improperly Pruned	2,235	17%
Poor Root System	1,694	13%
Codominant Stems	1,184	9%
Canker	1,042	8%
Girdling roots (Circling)	734	5%
Serious Decline	557	4%
Included Bark	297	2%
Vines	205	2%
Pests	118	1%
Poor Location	115	1%
Fungal growth/Fruiting Bodies	99	1%
Improperly Mulched	47	0%
Grate/Guard	36	0%
Nutrient Deficiency	19	0%
Improperly Installed	3	0%
Trees with no observation	2,375	18%
Sites with any observation	11,052	82%
Total observations	30,354	
Total Sites	13,427	100%

RESULTS

A total of 30,354 observations were recorded during the 2021 tree and vacant site inventory. A total of 11,052 sites (82%) are noted with at least one observation while 2,375 sites (18%) have no observation recorded. Crown dieback was the most frequently observed and recorded (54%) during the 2021 tree inventory.

DISCUSSION/RECOMMENDATIONS

Trees noted as having defects such as cavity or decay, poor tree architecture (codominant leader), weakly attached branches (included bark), root problems, and/or pest problems should be regularly inspected in addition to the trees noted for reinspection. Corrective actions should be taken when warranted. If the tree's condition worsens, removal may be required. It should be noted that of the 30,354 observations, 5,890 (19%) observations could have potentially been avoided. These observations include mechanical damage, improper pruning, poor location, improper mulching, and improper planting. The costs for treating deficient trees must be considered to determine whether removing and replacing the tree is the more viable option.

Hardscape Damage

In an urban setting, space is limited both above and below ground. Trees in this environment often cause hardscape damage that can lead to negative connotations for city trees. This is why it is important to consider this data when planning planting activities and selecting tree species for planting.

Table 7: Summary of hardscape damage in Citywide trees

Conflict	Presence of Conflict	%
Hardscape Damage	3,958	31%
Total trees	12,927	

RESULTS

A total of 3,958 (31%) trees were noted observed hardscape damage. This may include sidewalk or pavement upheaval.

DISCUSSION/RECOMMENDATIONS

Future tree installations should consider the growing space, root space, and site conditions to accommodate a tree's potential growth capacity. Existing hardscape conflicts should be remedied when warranted and follow the recommendations provided in this Plan.

POTENTIAL TREE PLANTING SITES

During the 2021 inventory, vacant sites, also referred to as "potential tree planting sites", were inventoried. These inventoried sites are not meant to be fully stocked within the planning horizon of this Plan but are meant to provide information for the City to utilize in all tree planting planning.

Example of a potential planting site recorded during the 2021 inventory

Potential tree planting sites within public rights-of-way (ROW) and in City parks were recorded based on the available growing space, proximity to existing trees, distance from existing above and below-ground utilities, distance from intersections, and other possible obstructions. An inventory of potential tree planting sites can provide information regarding a city's stocking level.
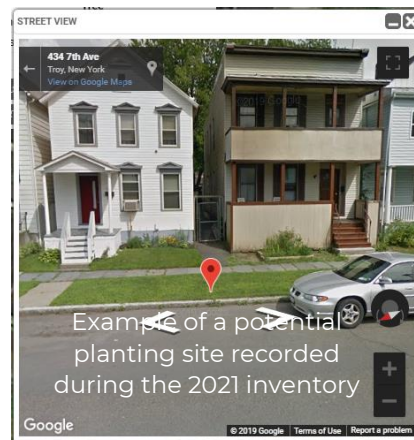
Stocking is a traditional forestry term used to measure the density and distribution of trees. For an urban/community forest such as North Tonawanda's, stocking level is used to estimate the total number of sites along the street ROW that could contain trees. The following summary provides available potential planting sites for street ROW and parks and does not provide specific recommendations regarding stocking level. A recommendation for a "no net loss" program is provided in the Tree Maintenance Schedule and Budget worksheet which suggests planting a total of 1,275 trees to account for the Priority 1 and Priority 2 removals. Additional tree plantings should be considered as part of the City's goal to increase tree canopy cover and provide additional benefits to the community. Additionally, more trees can assist the City in achieving stormwater reduction and water quality goals. Lastly, based on the analysis of the tree diameter classes citywide, the City should be planting more trees for a more ideal distribution of tree sizes that reduce tree maintenance surges and increase the flow of ecosystem services equally across the City. Planting efforts should consider engaging the community by engaging them in species selection and locations as well as planting and care.

Table 8: Summary of potential planting sites by land use and size of the site

LAND USE	Large	TOTAL
Industrial/ Large Commercial	12	3
Multi Family	28	61
Single Family	528	414
Small Commercial	67	14
Park/ Vacant/ Other	51	8
TOTAL	500	500

A total of 500 potential tree planting sites were recorded in the 2021 inventory. It is not necessarily recommended to stock these sites immediately or even in the 7-year cycle, but to provide the City with information if the opportunity arises. The Single Family land use has the highest overall count of potential planting sites across all three planting site categories (small, medium, large).

VALUE AND BENEFITS OF NORTH TONAWANDA'S PUBLIC TREES

The community forest plays an important role in supporting and improving the quality of life in urban areas. A tree's shade and beauty contribute to a community's quality of life and soften the often hard appearance of urban landscapes and streetscapes. When properly maintained, trees provide communities abundant environmental, economic, and social benefits that far exceed the time and money invested in planting, pruning, protection, and removal.

The trees growing along the public streets constitute a valuable community resource. They provide numerous tangible and intangible benefits such as pollution control, energy reduction, stormwater management, property value increases, wildlife habitat, education, and aesthetics.

The services and benefits of trees in the urban and suburban setting were once considered to be unquantifiable. However, by using extensive scientific studies and practical research, these benefits can now be confidently calculated using tree inventory information. The results of applying a proven, defensible model and method that determines tree benefit values for the City of North Tonawanda's tree inventory data are summarized in this Plan using the U.S. Forest Service's i-Tree Eco application. The results of North Tonawanda's tree inventory provide insight into the overall health of the City's public trees and the management activities needed to maintain and increase the benefits of trees into the future.

Tree Tools software was developed by the U.S. Department of Agriculture, Forest Service (USDA FS) with the help of several industry partners. Learn more at www.itreetools.org.

Benefit Analysis of North Tonawanda's Public Trees

To identify the dollar value provided and returned to the community, the City's tree inventory data were formatted for use in the i-Tree Eco benefit-cost assessment tool. i-Tree Eco, a component of i-Tree Tools, analyzes an inventoried tree population's structure to estimate the costs and benefits of that tree population. The assessment tool creates an annual benefit report that demonstrates the value street trees provide.

These quantified benefits and the reports generated are described below.

- **Aesthetic/Other Benefits**: Shows the tangible and intangible benefits of trees reflected by increases in property values (in dollars).
- **Stormwater**: Presents reductions in annual stormwater runoff due to rainfall interception by trees measured in gallons.
- **Carbon Stored**: Tallies all of the carbon dioxide (CO_2) stored in the urban forest over the life of its trees as a result of sequestration. Carbon stored is measured in pounds.
- **Energy**: Presents the contribution of the urban forest towards conserving energy in terms of reduced natural gas use in the winter (measured in therms [thm]) and reduced electricity use for air conditioning in the summer (measured in Megawatt-hours ([MWh]).
- **Carbon Sequestered**: Presents annual reductions in atmospheric CO_2 due to sequestration by trees and reduced emissions from power plants due to reductions in energy use. This is measured pounds and has been translated to tons for this report. The model accounts for CO_2 released as trees die and decompose and CO_2 released during the care and maintenance of trees.

- **Air Quality**: Quantifies the air pollutants (ozone [O3], nitrogen dioxide [NO2], sulfur dioxide [SO2], particulate matter less than 10 micrometers in diameter [PM10]) deposited on tree surfaces, and reduced emissions from power plants (NO2, PM10, volatile organic compounds [VOCs], SO2) due to reduced electricity use in pounds. The potential negative effects of trees on air quality due to biogenic volatile organic compounds (BVOC) emissions is also reported.
- **Replacement Value**: Replacement values are estimates of the full cost of replacing trees in their current condition, should they be removed for some reason. Replacement values are based on the Council of Tree and Landscape Appraisers (CTLA) Guide for Plant Appraisal, which uses a trunk formula methodology.
- **Importance Value (IV)**: IVs are calculated for species that comprise more than 1% of the population. The Streets IV is the mean of three relative values (percentage of total trees, percentage of total leaf area, and percentage of canopy cover) and can range from 0 to 100, with an IV of 100 suggesting total reliance on one species. IVs offer valuable information about a community's reliance on certain species to provide functional benefits. For example, a species might represent 10% of a population but have an IV of 25% due to its substantial benefits, indicating that the loss of those trees would be more significant than just their population percentage would suggest.

The data collected from the inventory of trees completed in October 2021 was analyzed in i-Tree Eco for an understanding of the value and benefits of North Tonawanda's public trees. The following provides a summary of the results.

Table 9: Summary of the annual benefits provided by North Tonawanda's public trees*

Benefits	Total ($)	Quantity	$/tree	$/capita
Aesthetic/Other	$634,225	N/A	$49.06	$20.97
Stormwater	$228,593	27.8 million gallons	$17.68	$7.56
CO2	$24,106	3.4 million pounds	$1.86	$0.80
Energy	$189,205	1.4 M kWh, 474,249 Therms	$14.64	$6.26
Air Quality	$163,068	34,841 pounds	$12.61	$5.39
Total Benefits	**$1,901,521**		**$95.85**	**$40.98**

*Distribution of benefits per tree and per capita based on 12,927 trees and a population of 30,245 people

Table 10: Summary of benefit data for the top ten tree species in the City of North Tonawanda's tree inventory using i-Tree Eco

Most Common Trees*	# of Trees & %***	Importance Value+	Replacement Value	Relative Performance Index++
Species		(IV)	($)	(<1, =1, >1)
Crimson King maple	2,654 ,21%	44.10	4,303,649.97	1.10
Silver maple	1,863, 15%	32.50	4,326,202.94	0.95
Red maple	1,586, 13%	31.20	6,616,832.80	1.00
Norway maple	1,584, 13%	23.20	3,208,425.11	0.90
Honeylocust	903, 7%	13.90	2,897,389.42	1.16
Black cherry	322, 3%	3.80	418,185.75	0.82
Sugar maple	236, 2%	3.40	614,568.74	0.94
Horse chestnut	177, 1%	3.20	469,776.13	1.04
Northern red oak	165, 1%	2.70	859,504.00	1.03
Apple spp	163, 1%	2.10	167,305.54	1.01
Total	**12,407**	**160.10**	**$23,881,840.40**	**9.95**

*** Based on 12,407 street trees analyzed in i-Tree
+ Importance Value: 0-100 (higher IV = more important species)
++ Relative Performance Index (values of 1 or > = relative good performance)

RESULTS

Based on the 2021 inventory of trees in public rights-of-way (ROW) and in parks, North Tonawanda's public tree population provides a total of $1,901,521 in annual benefits by increasing property values, reducing stormwater volumes, sequestering carbon and storing carbon dioxide, conserving energy use, and improving air quality. This value results in approximately $95.85 in benefits provided by each tree annually and approximately $40.98 worth of benefits are shared by each resident in the City.

Due to the abundance of Crimson King maples, this tree species has the highest Importance Value (44.10). However, honeylocust has the highest relative performance index at 1.16. Although Apple species are within the top 10 most common species, they contribute significantly less in terms of benefits and has the lowest replacement value at $167,305.54.

Tree Species Importance Values (IV)

Understanding the importance of a tree species to the community is based on its presence in the ROW, but also its ability to provide environmental and economic benefits to the community. The IV calculated by i-Tree Eco considers the total number of trees of a species, its percentage in the population, and its total leaf area and canopy cover. The IV can range from 0 to 100, with an IV of 100 suggesting total reliance on one species. If IV's are greater or less than the percentage of a species in the ROW, it indicates that the loss of that species may be more important or less important than its population percentage implies.

Table 11: Tree species with the highest importance values (IV) from i-Tree Eco

Common Name	Importance Value
Crimson King maple	44.10
Silver maple	32.50
Red maple	31.20
Norway maple	23.20
Honeylocust	13.90
Black cherry	3.80
Sugar maple	3.40
Horse chestnut	3.20
Northern red oak	2.70
Apple species	2.10

RESULTS

The i-Tree Eco assessment found that Crimson King maple has the greatest IV in the ROW population at 44.10 and based on the species diversity analysis, it comprises 21% of the ROW tree population (2,652 of 12,727 live trees). This indicates that the loss of the Crimson King maple population would be economically detrimental. The second highest IV was for silver maple (32.50), followed by red maple (31.20) and Norway maple (23.20). On the other hand, with the loss of Freeman maple, sugar maple, horse chestnut, and northern red oak, there would be less of an impact with their loss as their percentage of the tree population is even less than their importance values.

COMMUNITY FOREST MANAGEMENT

To provide management recommendations to reduce costs, improve health, and grow a sustainable community forest.

TREE MANAGEMENT RECOMMENDATIONS AND BUDGETS

This 7-year tree management forest program recommended within the Community Forest Management Plan was developed to uphold North Tonawanda's vision for preserving its community forest. The management program provided in this section describes the recommended approach for proper tree care if no changes are made in tree care based on the tree inventory data and the current framework of the Community Forest Program.

This program was designed to reduce risk through prioritized tree removal and pruning, and to improve tree health and structure through proactive pruning cycles. Tree planting to mitigate removals and increase canopy cover and public outreach are important parts of the program as well. While implementing a tree care program is an ongoing process, tree work must always be prioritized to reduce public safety risks. It is recommended to complete the work identified during the inventory based on the assigned Maintenance Priority—(Priority 1), (Priority 2), (Priority 3), and (Priority 4). However, it is also essential to routinely monitor the tree population to identify other high priority or high risk trees so that they may be systematically addressed. While regular pruning cycles and tree planting is important, priority work (especially for high priority and high risk trees) must sometimes take precedence to ensure risk is expediently managed. The following maintenance recommendations were recorded during the 2021 inventory:

- **Maintenance Priority**: Informs the maintenance practices and specific trees to address in order of priority. These priorities are categorized as (Priority 1), (Priority 2), (Priority 3), and (Priority 4).
- **Priority 1 and Priority 2** maintenance may refer to the removal of the dead, diseased, damaged, or uprooted tree and/or the removal of a probable or imminent risk such as a broken limb or split leader.
- **Priority 3** maintenance is the routine pruning to manage risk or health, develop structure, provide clearance, manage shape, improve aesthetics, manage fruit or flower production, and/or manage wildlife habitat.
- **Priority 4** maintenance refers to the structural pruning of young, developing trees to remove diseased, damaged, or crossing branches; to form a central branch leader; to improve branching structure; to establish the lowest permanent branch; and/or remove sucker growth and epicormic shoots. Additional Priority 4 maintenance for young trees may include watering, amending or adding mulch, adding or removing stakes or ties, and/or soil amendments or fertilizer treatment.
- **Maintenance Type**: Provides additional information about the maintenance priority recommendation. Understanding the maintenance type helps to establish maintenance routes, schedules, and budgets.

The City of North Tonawanda and its tree managers may use Microsoft Excel or TreePlotter to filter for specific Priorities outlined in this section (Priority 1-4). Specific Priority parameters detailed in the table below for the City to observe and utilize. As part of the Management Plan project, the City was provided an export of the complete inventory data in Excel format along with links to map scenarios ("Custom URLs") within TreePlotter for data analysis.

Table 12: Priority maintenance parameters for North Tonawanda's trees

	Tree Inventory Export to Excel	TreePlotter Filter
Priority 1	200 trees a. Status = dead, or b. Condition = dead	200 trees Tree Filter: Condition = ('Dead') or Status = ('Dead')
Priority 2	1,075 trees a. Status = alive, and b. Tree work=removal	1,075 trees Tree Filter: Status = ('Alive') and (Tree Work='Removal')
Priority 3	10,607 trees a. DBH >6"	10,607 trees Tree Filter: not Condition = ('Dead') and not DBH Range = ('0-3in' or '3-6in') and not Status = ('Dead' or 'Proposed Site - Large' or 'Proposed Site - Medium' or 'Proposed Site - Small' or 'Removed' or 'Stump') and not (Tree Work='Removal')
Priority 4	1,045 trees a. DBH <6"	1,045 trees Tree Filter: not Condition = ('Dead') and not DBH Range = ('6-12in' or '12-18in' or '18-24in' or '24-30in' or '>30in' or 'N/A') and not Status = ('Dead' or 'Proposed Site - Large' or 'Proposed Site - Medium' or 'Proposed Site - Small' or 'Removed' or 'Stump') and not (Tree Work='Removal')

Priority and Proactive Tree Maintenance

In this Plan, priority tree maintenance includes tree removals and pruning of trees with an assessed Maintenance Priority of Priority 1 or Priority 2. Proactive tree maintenance includes pruning of Priority 3 trees and Priority 4 trees that are young and developing. Tree planting, inspections, and community outreach are also considered proactive maintenance.

Maintenance Priority

Although tree removal is usually considered a last resort and may sometimes create a reaction from the community, there are circumstances in which removal is necessary. Trees fail from natural causes, such as diseases, insects, and weather conditions, and from physical injury due to vehicles, vandalism, and root disturbances. It is recommended that trees be removed when corrective pruning will not adequately eliminate the hazard or when correcting problems would be cost-prohibitive. Trees that cause obstructions or interfere with power lines or other infrastructure should be removed when their defects cannot be corrected through pruning or other maintenance practices. Diseased and nuisance trees also warrant removal. Even though large short-term expenditures may be required, it is important to secure the funding needed to complete priority tree removals. Expedient removal reduces risk and promotes public safety. The following sections briefly summarize the recommended removals identified during the inventory completed in October 2021.
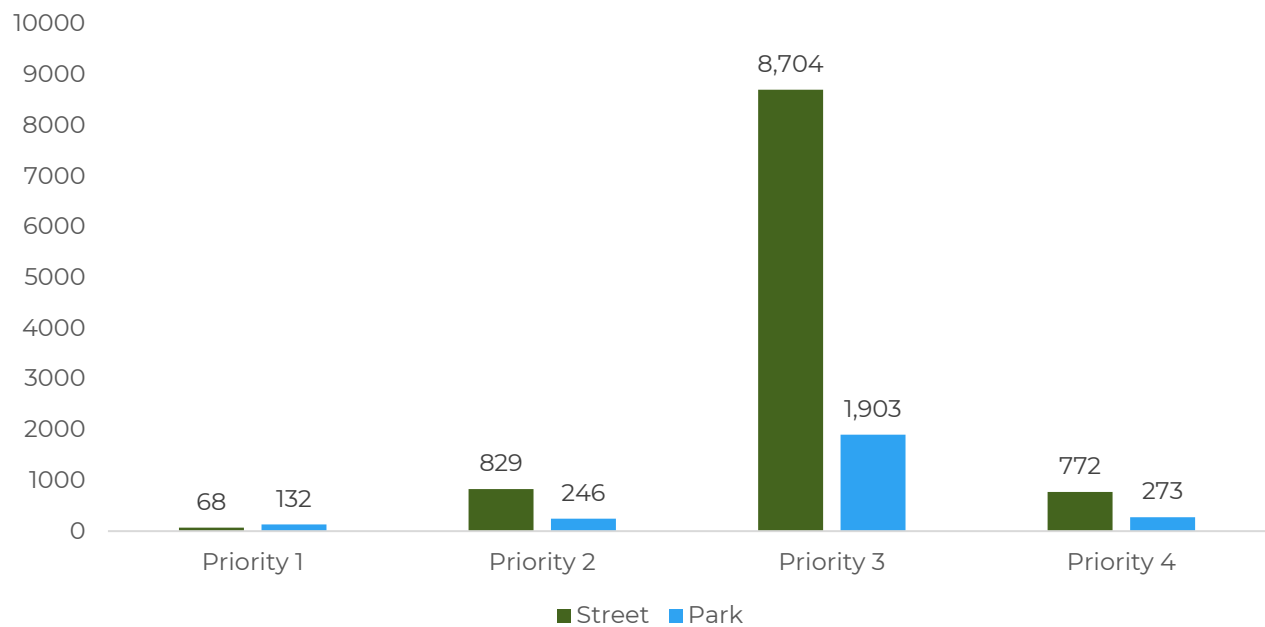
Figure 13: Summary of maintenance priority counts for street and park trees

RESULTS

A total of 200 trees were identified as requiring (Priority 1) maintenance of which 68 trees reside in the public rights-of-way and 132 within the City's parks. A total of 1,075 trees were identified as requiring (Priority 2) maintenance of which 246 trees reside in the public rights-of-way and 829 within the City's parks.
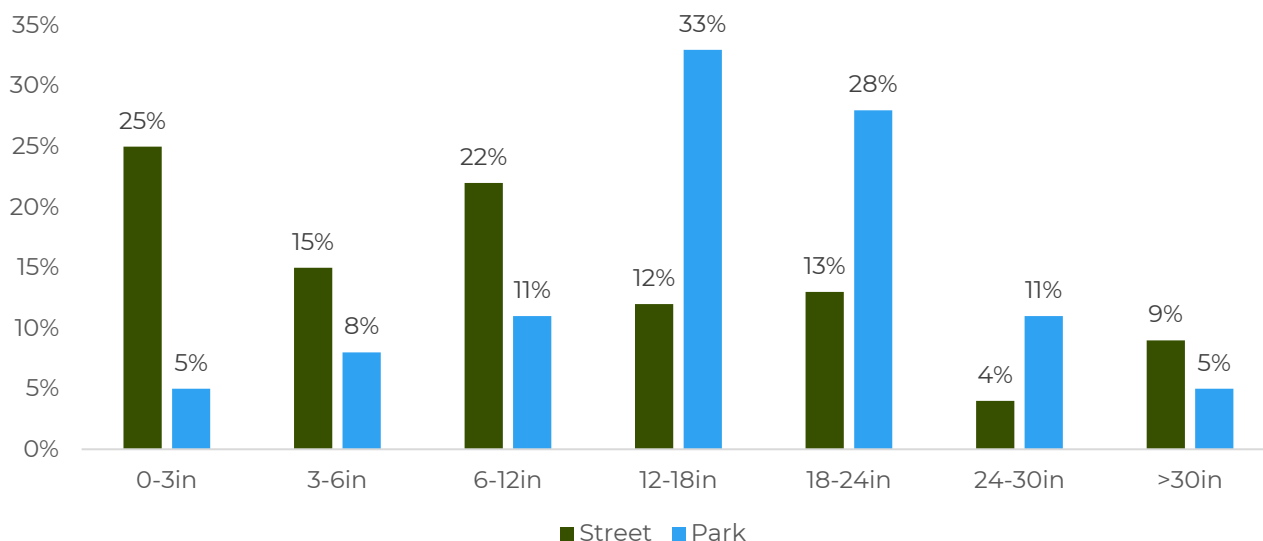
Figure 14: Summary of Priority 1 trees requiring removals for street and park trees

RESULTS

The majority of Priority 1 trees requiring removal within the public rights-of-way are in the 0-3-inch diameter class (17 trees). In the parks, trees requiring removal are primarily in the 12-18-inch diameter class (43 trees).

DISCUSSION/RECOMMENDATIONS

Trees identified as requiring Priority 1 maintenance with a Maintenance Type recommendation of Removal should be addressed first. The count of trees by diameter class nor the size of the tree necessarily dictate priority. Priority should be based on a variety of considerations including but not limited to the tree's size, condition, location, potential targets, and other factors. The City should use the TreePlotter software application to locate these trees and prioritize. Following mitigation of the Priority 1 maintenance, trees listed as Priority 2 should be addressed based on the Maintenance Type and other factors previously stated. Priority 2 maintenance may coincide with Priority 1 maintenance if the trees are near one another or other factors that support cost and time efficiency and promptness of tree issue mitigation.

Unless already slated for removal, trees noted as having poor tree architecture or weakly attached branches and codominant stems or missing or decayed wood should be inspected on a regular basis. These observations can be filtered in the City's TreePlotter software application to identify the location of these trees for monitoring. Summaries of observations are provided further in this analysis. Corrective action should be taken for these observations when warranted. If their condition worsens, tree removal may be required. Proactive tree maintenance that actively mitigates elevated-risk situations will promote public safety. Updating the tree inventory data can streamline workload management and lend insight into setting accurate budgets and staffing levels. Inventory updates should be made electronically and can be implemented using the City's TreePlotter or similar software applications.

Proactive Tree Maintenance

The following summaries provide information regarding routine pruning of trees to prevent future issues and to improve the overall health of the tree. This information is used to inform the recommended Routine (Priority 3) maintenance tasks to establish the maintenance cycles and associated costs. For detailed information on proper tree maintenance and planting best practices, refer to Appendix G.
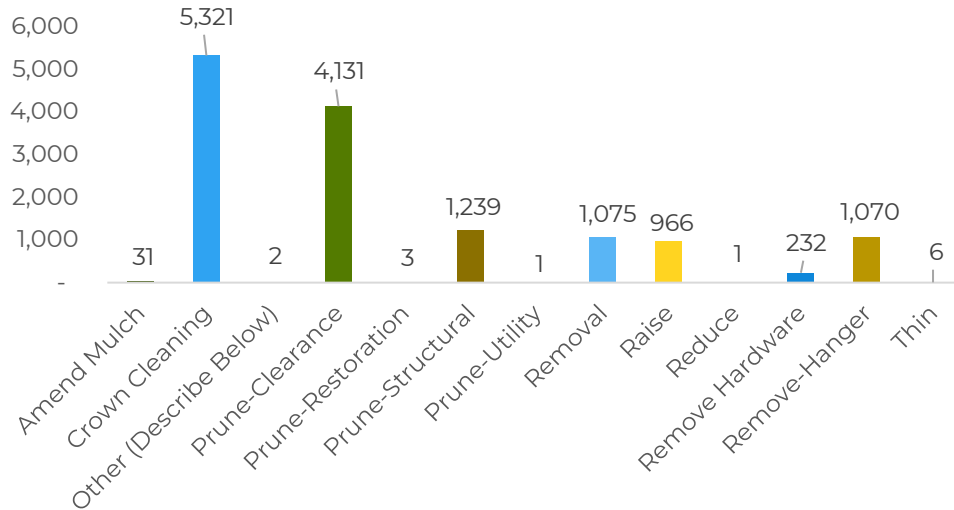
Figure 15: Summary of maintenance needs for all trees

MAINTENANCE TERMS AND DEFINITIONS

Table 13: Definitions of tree maintenance terms

Term	Definition
Amend Mulch	Turn or replenish mulch; or remove mulch from tree trunk
Crown Cleaning	Prune to remove dead, dying, diseased, and broken branches from the tree crown
Insects	Tree shows signs of damage caused by insects and treatment is necessary
Other (Describe Below)	Check here and describe in notes below within TreePlotter
Prune-Clearance	Prune to remove branches to provide clearance from structures, vehicles, and other objects
Prune-Restoration	Prune to remove large dead wood and restore the tree to create a better condition
Prune-Structural	Prune to establish a strong arrangement or system of scaffold branches
Prune- Utility	Prune to minimize utility conflicts
Removal	Remove tree
Raise	Prune to remove lower limbs from a tree crown to provide clearance
Reduce	Prune to reduce the height and/or spread of a tree crown
Remove Hardware	Remove hardware from a tree
Remove-Hanger	Remove hanging branch from tree
Thin	Prune to remove live branches to reduce crown density

The majority of trees that are not Priority 1 or 2 have been assigned "Crown cleaning" as a routine tree maintenance recommendation.

DISCUSSION/RECOMMENDATIONS
This information is used to inform the Routine (Priority 3) maintenance summarized in the following section.
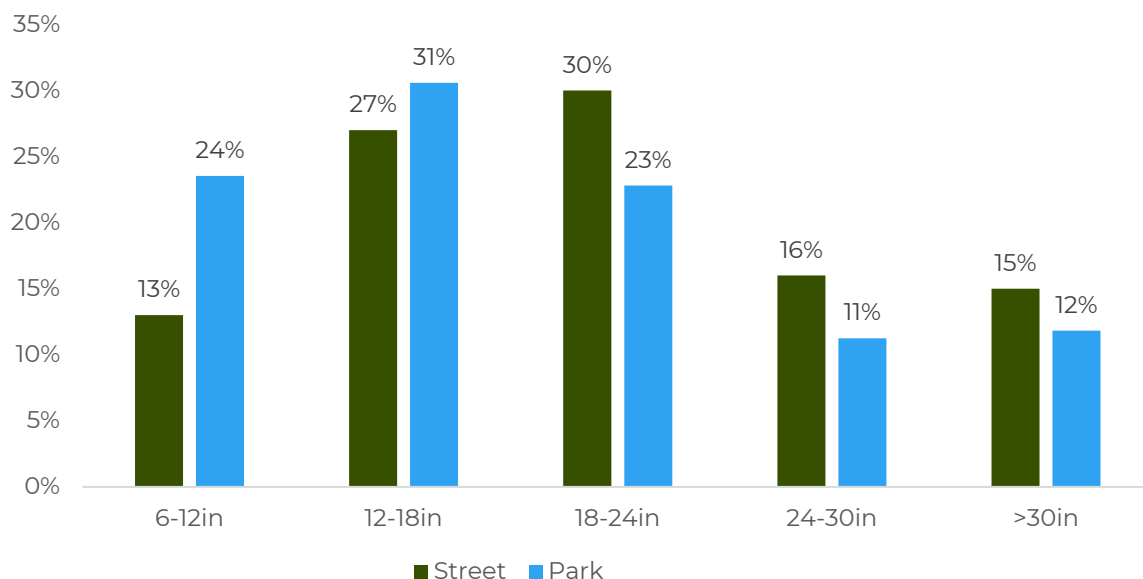
Figure 16: Summary of street and park tree Priority 3 (routine) maintenance by diameter class

Proactive Tree Maintenance – Priority 3 (Routine)

The previous section summarized the general Maintenance Type assigned to trees not requiring Priority 1 or 2 maintenance. This general type of maintenance applies to the routine pruning of trees for maintaining the health of the tree and the safety of the public. As such, trees with this Maintenance Type recommendation were assigned a Maintenance Priority of "Routine (Priority 3)". Routine pruning generally requires cleaning the canopy of both small and large trees to remove defects such as dead and/or broken branches that may be present even when the rest of the tree is sound. In these cases, pruning the branch or branches can correct the problem and reduce risk associated with the tree. The chart above provides a summary of the Priority 3 trees by diameter class since the size of the tree and their frequency can affect maintenance costs.

RESULTS
Street and park trees greater than 6 inches in DBH were summarized to understand the distribution of Priority 3 (Routine) trees. Of the 10,607 trees recommended for Routine (Priority 3) maintenance, 8,704 are street trees and 1,903 are park trees. The 12-18-inch diameter class contains the highest count of Priority 3 trees in parks with 582 trees (31%). On the other hand, the 18-24-inch diameter class contains the highest count of street trees with 2,610 trees (30%). The diameter class with the lowest count of trees recommended for Priority 3 pruning in the ROW is the 6-12-inch class with 1,107 trees (13%). For parks, the 24-30-inch diameter class has the lowest count with 214 trees (11%).

The Routine (Priority 3) maintenance summary provides an overview of the trees that specifically require routine pruning to remove defects such as dead and/or broken branches that may be present even when the rest of the tree is sound and/or the pruning of branches for clearance of roadways, pedestrians, parking, signs, and/or utilities. These summaries do not provide the complete picture of what is required for a citywide routine pruning cycle of public rights-of-way trees because it does not include all eligible trees, only trees specifically identified during the 2021 inventory. The following section provides the appropriate tree numbers that were used in providing the recommended tree maintenance cycle.

Street and Park Tree Pruning Cycles

The goals of pruning cycles are to visit, assess, and prune trees on a regular schedule to improve health and reduce risk. It is recommended that pruning cycles begin after all Priority 1 and Priority 2 trees are corrected through removal or pruning. However, due to the long-term benefits of pruning cycles, the pruning cycles should be implemented as soon as possible. To ensure that all trees receive the type of pruning they need to mature with better structure and lower associated risk, two pruning cycles are recommended: the routine pruning cycle and the young tree pruning cycle. The cycles differ in the type of pruning, the general age of the target tree, and length.

The recommended number of trees in the pruning cycles will need to be modified to reflect changes in the tree population as trees are planted, age, and die. Newly planted trees will enter the young tree cycle once they become established. As young trees reach maturity, they will be shifted from the young tree cycle into the routine pruning cycle. When a tree reaches the end of its useful life, it should be removed and eliminated from the routine pruning cycle.

For many communities, a proactive tree management program is considered unfeasible. An on-demand response to urgent situations is often the approach. Research has shown that a proactive program that includes a routine pruning cycle will improve the overall health of a tree population. Proactive tree maintenance has many advantages over on-demand maintenance, the most significant of which is reduced risk. In a proactive program, trees are regularly assessed and pruned, which helps detect and eliminate most defects before they escalate to a hazardous situation with an unacceptable level of risk. Other advantages of a proactive program include: increased environmental and economic benefits from trees, more predictable budgets and projectable workloads, and reduced long-term tree maintenance costs. This recommended pruning cycle is provided. As stated above, the pruning cycles should be adjusted as trees are planted and removed and as trees mature and transition from the young tree pruning category to the routine pruning category. The first installment of this approach for routine pruning is provided in the following figure.

Routine Pruning Cycle Overview

By filtering the data in the City's tree inventory software, TreePlotter, the total number of trees applicable for a pruning cycle were determined. To summarize the previous figure, living street and park trees greater than 6 inches DBH (trees <6 inches are separated for young tree pruning cycles) that may be considered for Priority 3 maintenance but are not recommended for removal and are not listed for Priority 1 or 2 maintenance are eligible for a routine established and mature-tree pruning cycle. Street and park trees are separated because of the structure of the City's tree maintenance program and to enable the development of schedules and pruning grids.

STREET TREE ROUTINE PRUNING CYCLE

The routine pruning cycle for street trees includes established, maturing, and mature trees (mostly greater than 6 inches DBH) that need cleaning, crown raising, and removal of deadwood. Over time, routine pruning can reduce reactive maintenance, minimize instances of elevated risk, and provide the basis for a more defensible risk management program.

The length of the street tree routine pruning cycle is based on the size of the tree population and what was assumed to be a reasonable number of trees for a program to prune per year. Generally, the routine pruning cycle recommended for a tree population is five years but may extend to seven years if the population is large.

Figure 17: Street trees recommended for the routine pruning cycle summarized by diameter class
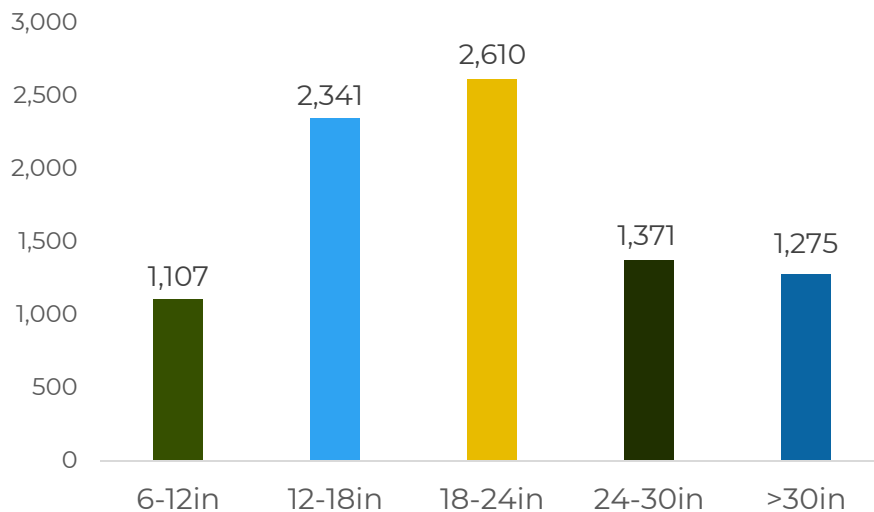
STREET TREE PRUNING CYCLE RECOMMENDATIONS & SCHEDULE

It is recommended that the City establish a 7-year routine pruning cycle for street trees in which approximately one-seventh of the tree population is to be pruned each year. The 2021 tree inventory identified 10,607 trees that should be pruned over a 7-year cycle. This results in an average of 1,516 trees to be pruned each year over the course of the cycle. It is recommended that the routine pruning cycle begin in Year Three of this 7-year plan, after all Priority 1 and Priority 2 trees are addressed.

The inventory found that most trees (8,704 of the 10,607 trees) needing routine pruning are street trees (82%). City Hall and Sweeney Cemetery are included in the street trees as their structure was more conducive to street tree management rather than park management. Figure 17 shows that a variety of tree sizes that will require pruning; however, most of the street trees that require routine pruning were within the 18-24-inch diameter class or smaller.

PARK TREE ROUTINE PRUNING CYCLE AND RECOMMENDATIONS

In addition to the street tree pruning cycle, a routine maintenance schedule is recommended for park trees. A total of 1,903 park trees are suitable for a routine pruning cycle (living park trees >6 inches DBH and not a Priority 1 or 2 removal).

The City park name was not included in the data collection, so the total number of park trees to prune each year should be divided among the 17 parks for the 7-year maintenance period. With 2,280 total park trees suitable for routine pruning, approximately 326 park trees should be pruned per year. Based on the figure below, the 12-18-inch diameter class comprises most of the park tree routine pruning with 582 trees or 31%. The park trees suitable for routine pruning includes only living trees, though some of the park trees are in less than Fair condition (362 Poor trees) and should be monitored and evaluated for removal rather than routine pruning in subsequent years. Any Priority 2 maintenance should be completed before those trees are added to the pruning cycle

Figure 18: Summary of the diameter classes of the park trees for routine pruning
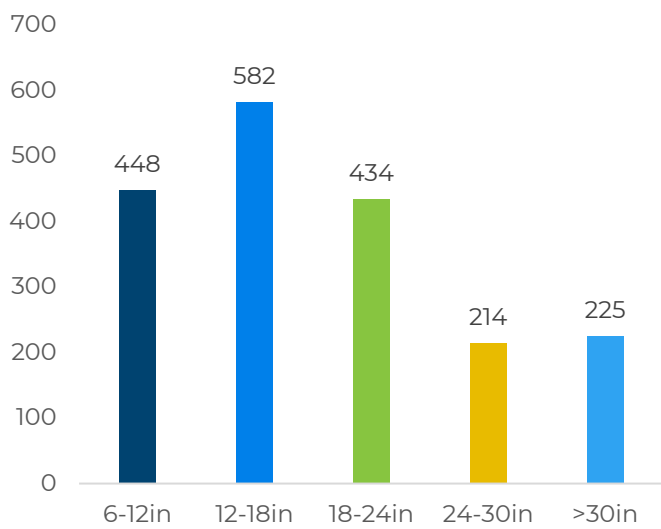
Figure 19: Summary of the condition of park trees for routine pruning
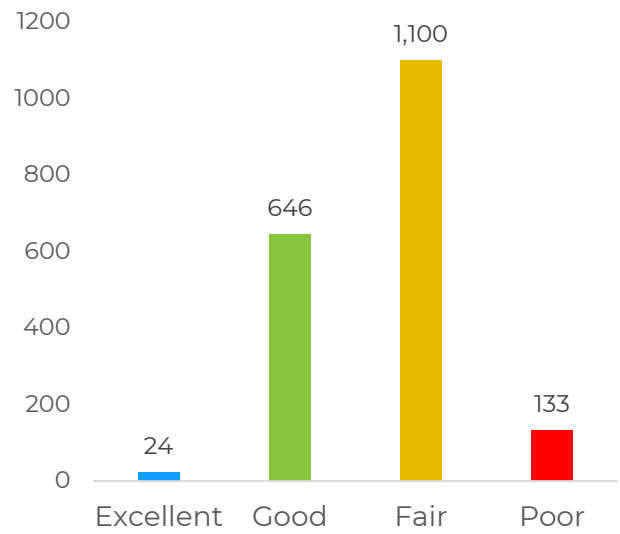
YOUNG TREE PRUNING CYCLE AND RECOMMENDATIONS

Trees included in the young tree training pruning cycle are generally less than 6 inches DBH. These younger trees sometimes have branch structures that can lead to potential problems as the tree ages. Potential structural problems include codominant leaders, multiple limbs attaching at the same point on the trunk, crossing/interfering limbs, or dead / diseased / damaged limbs. If these problems are not corrected, they may worsen as the tree grows, increasing risk and creating potential liability. Young tree training pruning is performed to improve tree form or structure; the recommended length of the young tree pruning cycle is three years because young trees tend to grow at faster rates (on average) than more mature trees. The young tree cycle differs from the routine pruning cycle in that these trees generally can be pruned from the ground with a pole pruner or pruning shear. The objective is to increase structural integrity by pruning for one dominant leader. Young tree training pruning is species-specific, since many trees may naturally have more than one leader. For such trees, young tree training pruning is performed to develop a strong structural architecture of branches so that future growth will lead to a healthy, structurally sound tree. In addition to training pruning, young trees may also require additional maintenance such as added or amended mulch, watering, added or removed stakes and ties, and/or clearance of debris and litter. These activities can potentially be remedied during the young tree training pruning.

Figure 20: Count of young street and park trees for training pruning cycle and in parks
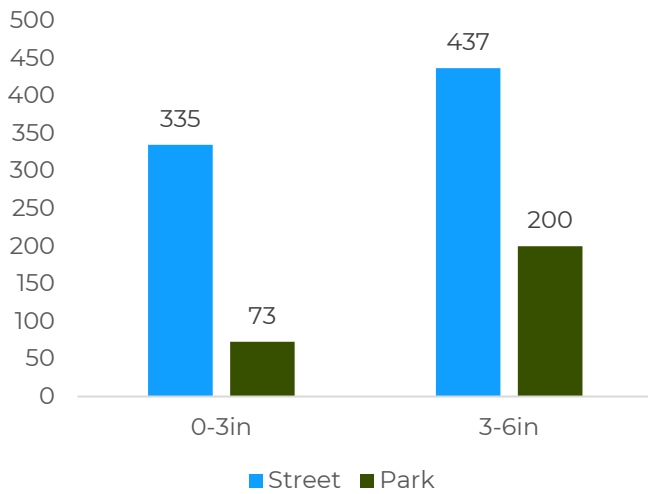
Figure 21: Condition of street and park trees considered for the young tree training pruning cycle
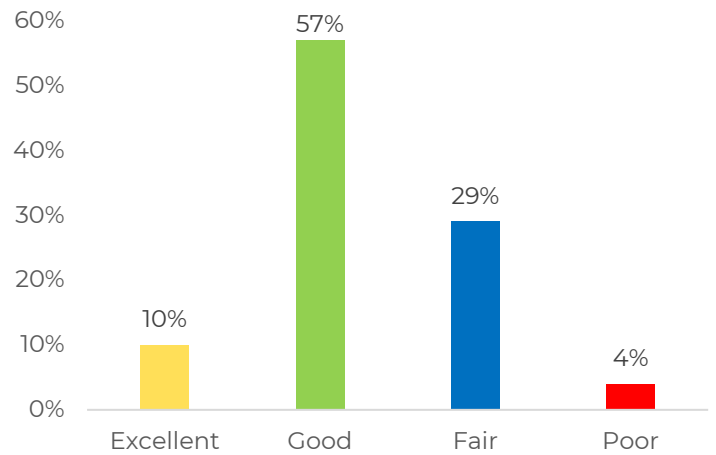
Young tree training pruning is recommended citywide (street and park trees) for trees less than 6 inches in diameter and is shown in the Tree Maintenance Schedule and Budget table as such. There are 772 street trees and 273 park trees in these diameter classes which total 1,045 trees suitable for the training pruning cycle.

Young trees that are less than Good condition should be monitored and appropriately addressed to ensure health. Young trees that cannot recover should not be included in the cycle and should instead be removed and replaced.

SUMMARY OF RECOMMENDED TREE MANAGEMENT ACTIVITIES

Utilizing data from the 2021 tree inventory, an annual maintenance schedule was developed that details the number and type of tasks recommended for completion each year. The budget projections are based on industry standards and public bid tabulations. Actual costs were not specified by North Tonawanda. A summary of the maintenance schedule is presented; a complete table of estimated costs for North Tonawanda's 7-year tree management program follows. The schedule provides a framework for completing the inventory maintenance recommendations over the next seven years. Following this schedule can shift tree care activities from an on-demand system to a more proactive tree care program.

As seen in Appendix I, the Tree Maintenance Schedule and Budget, to implement the street and park tree maintenance schedule of Priority 1 and 2 removals, Priority 1 and 2 pruning, routine pruning, training pruning, and replacement planting, the City's tree maintenance budget should be no less than $179,728 for the first year of implementation, no less than $176,164 for the second year, no less than $539,190 for the third year, no less than $459,106 for year four, no less than $458, 335 for year five, no less than $458,188 for year six, and no less than $516,621 the final year of the maintenance schedule.

This maintenance schedule addresses the 200 Priority 1 removals, 1,075 Priority 2 removals, 10,607 routine tree pruning, and 1,045 young tree training pruning. This includes trees in the public rights-of-way and in parks with this Maintenance Priority. A total of 1,045 street and park trees are less than 6 inches in diameter and require young tree maintenance for

establishing proper branching structure and tree health. This maintenance activity is included in the maintenance schedule and it is recommended to prune these trees on a three-year cycle (~348 trees per year). The routine pruning cycle of 10,607 street trees—or 1,516 trees per year for seven years—begins in the third year.

Annual budget funds are needed to ensure high risk trees are remediated and crucial routine pruning and young tree pruning cycles can begin. With proper professional tree care, the safety, health, and beauty of the community forest will improve.

If routing efficiencies and/or contract specifications allow for the completion of more tree work, or if the schedule requires modification to meet budgetary or other needs, then the schedule should be modified accordingly. Unforeseen situations such as severe weather events may arise and change the maintenance needs of trees. Should conditions or maintenance needs change, budgets and equipment will need to be adjusted to meet the new demands.

This information should be presented to the City when discussing tree maintenance priority corridors, shared responsibility of tree maintenance, budgets, and staffing levels.

Table 14: Summary of tree maintenance activity costs

	2022	2023	2024	2025	2026	2027	2028	TOTAL
Priority 1 Removals	$59,675	$56,300	$55,725	$0	$0	$0	$0	$171,700
Priority 2 Removals	$27,130	$27,095	$26,985	$26,785	$26,335	$26,215	$25,965	$186,510
Priority 3 Routine Pruning	$0	$0	$294,675	$283,210	$282,785	$282,656	$282,366	$1,425,693
Priority 4 Young Tree Pruning	$9,090	$9,090	$9,090	$9,090	$9,090	$9,090	$9,090	$63,630
Replacement Trees	$45,200	$44,600	$43,600	$30,600	$30,400	$30,200	$30,000	$254,600
Replacement Trees-Young Tree Maintenance	$0	$0	$69,600	$69,600	$69,600	$69,600	$69,600	$348,000
Annual Mortality and Planting	$38,633	$39,079	$39,515	$39,821	$40,125	$40,427	$99,600	$337,200
TOTAL	$179,728	$176,164	$539,190	$459,106	$458,335	$458,188	$516,621	$2,787,333

COMMUNITY ENGAGEMENT

A successful plan and community forestry program blend the various needs, opportunities, perspectives, and preferences of stakeholders and listens to the community.

COMMUNITY ENGAGEMENT RECOMMENDATIONS

The plan development process included substantial research regarding community outreach and education opportunities. This study provided a broad perspective of the challenges that face North Tonawanda's community forest. For successful implementation of this Plan and strengthened compassion and support for the community forest, community engagement activities should be arranged to provide updates, stewardship opportunities, and a platform for discussing varying opinions on matters pertaining to the care of the community forest. Connections and relationships that will develop among stakeholders during these meetings are valuable outcomes of the outreach process. As community awareness and actions associated with community forestry move forward, it will be the people of North Tonawanda that ultimately realize the value of their contributions to their community in the trees that grow around them.

Community Engagement Opportunities

- ✓ **Develop a tree board** consisting of environmental advocates as well as city representation

- ✓ **Revise** and keep tree ordinance updated

- ✓ **Utilize local tree program** PlaNT it Forward Program

- ✓ **Community Meetings.** Discuss the Plan, projects, and issues with residents throughout the City

- ✓ **Public Surveys.** Conduct surveys to gather rich insights into public perception on the importance of trees

- ✓ **Non-profit Partnerships.** Utilize local non-profits to create and improve partnerships

- ✓ **Social Media.** Post Plan implementation progress, announcements, and opportunities on social media

- ✓ **Fliers & News Articles.** Distribute to raise awareness and gather support

- ✓ **Press Releases.** Share projects, events, and studies in local newspapers and radio shows

- ✓ **Canvassing of Homes.** ID street blocks and areas for spreading community forestry awareness

- ✓ **Email Listserv.** Keep the community up-to-date on Plan implementation and events

RECOMMENDATIONS AND STRATEGIES

Using the guiding principles and data analysis to establish effective and measurable recommendations for advancing North Tonawanda's community forest.

Source: Mark Mulville

ACTION STRATEGY ONE:
MAXIMIZE THE EFFICIENCIES IN MAINTAINING TREES

A. Manage Risk Trees
- Address the Priority 1 and 2 tree removal needs (200 Priority 1 and 1,075 Priority 2). Use information in this Plan to acquire more funding and support.
- Use the City's TreePlotter software or similar program to prioritize the maintenance.
- Use the Tree Maintenance Worksheet provided in the Community Forest Management Plan to address the 200 Priority 1 removals in a 3-year period starting in year 1 and then spreading out the Priority 2 removals over 7 years starting in year 1. Use the worksheet to estimate costs.

B. Establish a Routine Street and Park Tree Pruning Cycle
- Establish a 7-year cycle for street and park trees, pruning approximately 1,243 street trees and 272 park trees per year.
- Use the Tree Maintenance Worksheet to estimate and budget annual and 7-year costs for routine pruning.
- Prioritize, schedule, and track tree maintenance using the City's TreePlotter software.
- Build support for the pruning cycles by using the data summarized in the Community Forest Management Plan.

C. Plant and Maintain Young Trees
- Consider a "no net loss" policy by implementing at least a 1:1 ratio in terms of tree removals to replacements. It is recommended to plant at least 191 trees per year to compensate for recommended removals and upwards of 135 trees per year to compensate for natural mortality and to grow the City's tree canopy.
- Use trained volunteer groups for the planting and post-planting care of young trees. Require the use of industry best practices. Continue to partner for grants.

D. Continue to Monitor
- As maintenance, removals, and plantings are conducted, track information in the City's TreePlotter software or similar program.
- Keep the tree inventory data maintained and monitor for any changes or risks to public trees and the community forest such as tree pests and diseases. Consider a citywide canopy assessment for a better understanding of the community forest.

ACTION STRATEGY TWO:
USE PLANNING, LEGISLATION, AND ENFORCEMENT TO INTEGRATE TREES MORE FULLY

A. Update and Acquire Approval of the Street Tree Ordinance
- Use the recommendations and resources in the Community Forest Management Plan to assist in further updating of the City's tree ordinance when applicable.
- Conduct outreach with the community and communications with other City departments to establish awareness and clear understanding of the Street Tree Ordinance.
- Supplement the street tree ordinance with heritage tree and tree board policy.

B. Integrate Community Forestry with Plans and Policy

- Leverage the strategies listed in the City's Comprehensive Plan to achieve goals and recommendations in this Plan. This Community Forest Management Plan supports the goals established in Comprehensive Plan—Protect and promote the City's abundant open space, environmental resources and recreational opportunities; improve the availability of water dependent and water enhanced recreational and educational opportunities along the Niagara River and Erie Canal; maximize the utilization of existing infrastructure and resources to link recreation and environmental education; and improve connections between residential areas and recreation/community resources.
- Provide community forest expertise during the design and planning stages of projects to preserve appropriate existing trees, enhance tree plantings, and provide adequate canopy and root growing space.
- Provide community forest expertise when existing policy and ordinances are updated such as design standards and Zoning minimum green space requirements. Reference the adopted Street Tree Ordinance where applicable.

ACTION STRATEGY THREE:
IMPLEMENT BEST MANAGEMENT PRACTICES FOR THE HEALTH AND BENEFITS OF TREES

A. Develop and Implement Tree Planting Plans

- Develop tree planting plans to establish and maintain optimal levels of age and tree species diversity.
- Consider the spatial location of trees for increasing equity of tree canopy and associated benefits.
- Plant street and park trees that maximize benefits, minimize risk, consider site conditions and water restraints, maintenance costs, and potential tree pest and disease risk.
- Establish or update a recommended tree species list that provides recommendations based on mature tree size and the given site conditions.
- Solicit experts and advocates to serve on the community Tree Board.

B. Adhere to Best Management Practices and Standards in Tree Care

- Continue to implement approved best management practices and standards for tree planting, tree pruning, tree nursery selection, and all other community forestry operations.
- Reference these practices and standards in the Street Tree Ordinance and keep it updated.
- Require adherence to best practices and standards for any shared maintenance responsibility of young, established, and mature trees.
- Establish or update protocols relating to storm planning, response, and mitigation.
- Consider wood utilization options for any woody debris resulting from tree maintenance and removal operations.

ACTION STRATEGY FOUR:
FOSTER SUPPORT FOR THE COMMUNITY FOREST

A. Educate and Engage the Community
- Continue to implement volunteer tree stewardship programs and events.
- Provide educational materials, workshops, and information on the City's website regarding community forestry and this Plan.
- Maintain and enhance partnerships to implement recommendations in this Plan.
- Promote the community forest ecosystem benefits summarized in this Plan.
- Provide community forestry information specific to developers, businesses, and property owners.
- Lead by example by continuing to implement sound community forest management practices.
- Implement actions in this Plan to acquire and maintain the Arbor Day Foundation's Tree City USA award.
- Use the enhanced community support to acquire more resources and funding for the community forest management program.

CONCLUSION

The community forest is providing many important ecological functions and economic benefits to the City of North Tonawanda. Continuous delivery of those services depends on the long-term health and resilience of the tree population. Just under 13,000 trees exist along the public streets and parks in North Tonawanda providing a multitude of benefits including stormwater reduction, energy savings, increased property values, improved air quality, and enhanced overall community well-being. These benefits have an estimated annual value of over $1.9 million.

Managing trees in urban areas is an arduous and intricate process. Navigating the recommendations of experts, the needs of residents, the pressures of local economics and politics, concerns for public safety and liability, physical components of trees, forces of nature and severe weather events, and the expectation that these issues are resolved all at once is a considerable challenge. The City should begin to implement recommendations in this Plan as soon as possible to ensure a healthy, thriving, and sustainable community forest.

To sustain desired levels of community forest services recommended in this Plan, a multi-faceted approach must be implemented by evaluating tree maintenance responsibilities, increasing staffing and funding levels, enhancing plantings and tree care, encouraging growth and preserving existing trees, monitoring for changes in community forest characteristics, and amplifying community stewardship.

APPENDICES

APPENDIX A. DESCRIPTION OF INVENTORY FIELDS ANALYZED

Data analysis and professional judgment are used to generalize the state of the inventoried tree population ("State of the Community Forest Resource"). Recognizing trends in the data can help guide short-term and long-term management planning. In this Plan, the following attributes from the inventoried tree population were assessed:

Assessing Tree Structure

- *Land Use*: These summaries provide an overview of the distribution of trees across the City. Land use may determine existing and potential limitations, such as frequency of watering and available root space, and opportunities, such as volunteer groups or business district incentive programs. Land use may contribute to the tree's condition and growth potential.
- *Location Site* and *Root Space*: This data provides information about the existing and potential constraints or available space for continued healthy growth for a given species. An analysis of condition and these location attributes may inform future planting procedures and species selection.
- *Species and Genera Diversity*: The variety of genera and species in a specific population affects the population's ability to withstand threats from invasive pests and diseases. Diversity also impacts tree maintenance needs, costs, and timing and informs tree planting goals and canopy continuity.
- *Diameter Size Class Distribution*: The statistical distribution of a given tree population's trunk-size class, measured at 4.5-feet above grade or diameter at breast height (DBH) is used to indicate the relative age of a tree population. The diameter size class distribution affects the valuation of tree-related benefits as well as the projection of maintenance needs and costs, planting goals, and canopy continuity.

Attributes Informing Maintenance Needs

- *Condition:* The general health of a tree population, indicates how well trees are performing given their site-specific conditions. General health affects both short-term and long-term maintenance needs and costs as well as canopy continuity.
- *Relative Performance Index (RPI)*: RPI is a comparison of a species' condition rating of "Good" and the tree population's "Good" rating. Using the percent of Good trees for a given species divided by the tree population percentage of Good trees gives a value of equal to 1, less than 1, or greater than 1. A value equal to 1 means the particular species is as healthy as the overall tree population. A value less than 1 means the species isn't as healthy as the overall tree population. A value greater than 1 means the species is healthier than the overall tree population. RPI answers the question of how well a species is performing in terms of health compared to the entire inventoried population.
- *Observations*: Qualitative assessments recorded by the Inventory Arborist regarding a tree feature or feature in proximity to the tree that may affect the tree's existing or future health and/or impact tree maintenance or future. These may be observations caused by abiotic or biotic factors or by anthropogenic agents. Summaries of observations inform future species selection and/or improved planting and maintenance practices.
- *Hardscape Damage*: These observations inform future tree species selection for a given site and/or the mitigation approach for the tree and/or the hardscape damaged.
- *Maintenance Priority* and *Maintenance Type* descriptions are provided in the Tree Maintenance Recommendations section.

APPENDIX B. GUIDANCE TO DEVELOP A TREE ADVISORY COMMITTEE

To increase the capacity and voice for the trees in North Tonawanda, guidance is provided for the City to consider the benefits and challenges of establishing a Tree Advisory Committee or Tree Board.

Overview

Forming a tree advisory committee (TAC)— also referred to as a tree commission, tree board, urban forestry commission, beautification committee, environmental advisory committee, community forestry commission, among others depending on the jurisdiction— is one step that a community can take to create and sustain a community forestry program. The powers and responsibilities of a tree advisory committee are based on state statute and are assumed by local government. By forming and empowering a tree commission, a community can place the responsibility for important community decisions in the hands of unpaid volunteers with designated powers.

General Responsibilities

Tree commissions are either advisory or administrative and may have various responsibilities, including the following:

- Lessen the involvement of a municipal council for tree-related matters.
- Advise community leaders and staff on administering the urban forest.
- Stimulate and organize tree planting and maintenance.
- Develop and implement urban forest inventories, management plans, and ordinances.
- Lessen liability by arranging to remove hazardous trees and repair damage caused by trees.
- Settle community disputes caused by tree removal, planting, or maintenance.

Formation of a Tree Advisory Committee

Formation of a tree advisory committee and development of a comprehensive community forestry program usually take place together. While working with community officials to start a TAC, citizens also can undertake other aspects of a community tree program, such as fund-raising and developing tree inventories. A TAC should reflect the values and standards of the community and should help champion a community forestry effort. The formation and empowerment of a TAC can be a crucial element in developing broad-based support for community trees and ensuring long-term success and continuance of a community forestry program.

The following steps may be taken in forming a tree advisory committee:

- Organize interested citizens and informally outline problems and opportunities for a TAC to address. Identify specific occurrences or situations (such as tree failures, tree removals, pruning, sidewalk damage, or tree planting) that have caused community conflict or liability. Describe benefits that are expected to result from an organized tree program (such as lower community liability, higher real estate values, more attractive commercial areas, and healthier trees).
- Contact other communities with tree advisory committees or other experts, such as the New York State Urban Forestry Council, New York State Department of Environmental Conservation, and Cornell Cooperative Extension for advice and support.
- When ideas and plans are well organized and fairly complete, contact local government leaders and identify a municipal official who is interested in working with the group. It is important to include municipal officials early in any effort to organize a TAC.
- Hold informal meetings with concerned citizens and local officials to discuss ideas and plans. Contact the municipal solicitor to discuss how a tree advisory committee can be legally established within a community.

- Identify and agree upon the powers, authority, and responsibilities of the TAC, through meetings with municipal council members, officials, and the solicitor.
- Involve community members through public hearings and other opportunities for public participation and response.
- Develop or rewrite the ordinance that legally establishes the TAC and defines its authority and powers.
- Seek the council's approval of the ordinance at a public hearing.

Establishment of the Tree Advisory Committee Ordinance

Municipal ordinances establishing and empowering tree advisory committees should contain the following sections:

- Number of commission members,
- Experience or expertise required of members,
- Place of residence,
- Compensation, if any,
- Length of terms,
- Rotation of terms,
- Vacancies,
- Duties:
    - Adjudicate tree-related matters,
    - Approve permits for tree removal, planting, or pruning,
    - Review hazardous trees every year,
    - Provide educational opportunities and materials,
    - Arrange for tree planting,
    - Arrange for tree and stump removals,
    - And oversee pruning and other maintenance.
- Power:
    - Advisory or managerial,
    - Trees on public right-of-way or all public property,
    - And landscape plans for street trees or include development sites.

Additional Potential Responsibilities

Ordinances establishing tree advisory committees also can:

- Mandate a municipal arborist or forester position,
- Mandate and outline the creation of a municipal forestry master plan,
- Outline required standards and guidelines for tree planting and maintenance.

Supporting the Tree Advisory Committee
- Consider training members through the Arbor Day Foundation's Tree Board University.
    - An online training course consisting of eight courses:
        1. Tree Board 101
        2. Partnerships and Collaboration
        3. Engaging in the Political Process
        4. Community Forestry Planning
        5. Communications and Marketing
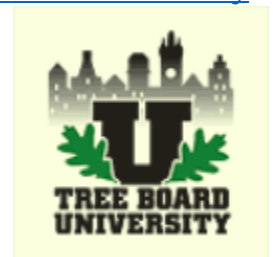
- Utilize additional resources such as the Arbor Day Foundation's Tree Board flier.
- Keep the tree advisory committee informed of the progress in implementing the Urban Forest Management Plan.
- Consider including a member(s) on the Community Forest Management Plan implementation team.
- Establish Memorandums of Understanding (MOUs) or Standard Operating Procedures (SOPs) to instill cooperation and success.
- Keep the TAC current on urban forestry research, technology, tools, and ideas.
- Communicate programs, events, strengths, challenges, and opportunities.

Summary

Tree advisory committees can have a great impact on a community's appearance and image as well as its public safety and comfort. Tree commissions, boards, or committees help champion and coordinate a comprehensive and expert program to manage and sustain public trees. They provide long-term, stable management for a valuable, long-lived resource. By forming a tree advisory committee in a community, the attractiveness of the community and its quality of life and environment can be enhanced and sustained.

Example Ordinance for Establishing the Tree Advisory Committee
ORDINANCE NO. ##-####

AN ORDINANCE OF THE CITY OF NORTH TONAWANDA, AMENDI NORTH TONAWANDA MUNICIPAL CODE TITLE X, COMMISSIONS AND BOARDS TO ESTABLISH A TREE ADVISORY COMMITTEE

WHEREAS, the City Council desires to establish a Tree Advisory Committee to facilitate the development and implementation of the 2022 Community Forest Management Plan and public tree-related policies, projects, and programs that serve to enhance the City's community forest and associated benefits including human health and well-being, reduced surface temperatures, air and water quality improvements, improved wildlife habitats and ecosystems, climate change adaptation and mitigation, increased property values, among others as defined in Section XX of North Tonawanda's Tree Ordinance; and

WHEREAS, the City Council desires the Tree Advisory Committee to encourage community members and organizations to take actions to help achieve the City's community forestry goals as adopted by the City Council and documented in the City's Community Forestry Management Plan and other tree-related plans, as amended from time to time.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF NORTH TONAWANDA DOES ORDAIN AS FOLLOWS:

:

CHAPTER XX. TREE ADVISORY COMMITTEE

Sections:

X-XX-1. Creation and regulations.

X-XX-2. Composition.

X-XX-3. Meetings.

Sec. X-XX-1 Creation.

A Tree Advisory Committee is established and shall be added to the list of commissions established by city council in Chapter 22. The uniform regulations for council-established city boards, commissions and committees contained in Chapter 22 apply to the Tree Advisory Committee unless otherwise provided in this ordinance.

Sec X-XX-2 Composition.

The Tree Advisory Committee shall consist of five members. To the extent feasible, the committee shall include representatives with expertise and leadership interests related to various urban forest landscapes and activities including tree planting, tree assessments, arboriculture, tree preservation, policy, and community engagement. Consideration should also be given to having the commission reflect the diversity of the Renton community relative to geographic location, gender, age and ethnicity.

Sec. X-XX-3 Meetings.

The Tree Advisory Committee shall meet quarterly. A subgroup of the committee may convene additional working group meetings and may rely on community groups to work on focused topics of interested related to special projects and programs. The city council and Tree Advisory Committee shall meet annually in a work session with city staff to review accomplishments, discuss issues and establish a Tree Advisory Committee work plan for the following year.

Sec. X-XX-4 Duties and responsibilities.

The Tree Advisory Committee shall act in an advisory capacity to the city council and shall have the following duties and responsibilities, functions, and objectives:

(a) Assist the city with the implementation of actions included in adopted urban forestry and public tree plans, including the Community Forest Management Plan and other plans related to or impacting/influencing community forest/public tree management, public tree planting, climate change mitigation/adaptation, and tree preservation.

(b) Help advocate for North Tonawanda's community forest interests with regional agencies, including support for community forest management funding.

(c) Assist the city with public education, outreach, and promotional activities in order to stimulate the greatest possible community participation in efforts such as tree plantings, tree inventories, tree pest and disease monitoring, tree maintenance, and other sustainable urban forestry activities supported by the Community Forest Management Plan.

(d) Assist with city applications for grant funding from the NYS Department of Environmental Conservation and other sources identified in the Community Forest Management Plan for community forest planting, maintenance, management, and community engagement.

(e) Provide input on the preparation of new and updated urban forestry policies, plans and projects.

(f) Make recommendations to the manager overseeing community forest management and the city council on matters related to trees, tree preservation, and arboriculture, including the review of city tree ordinances, policies and programs.

(g) Make recommendations to the manager overseeing urban forest management [Urban Forester and Natural Resources Manager] and city council regarding matters affecting development of privately and publicly landscaped areas within the city.

(h) To the extent that there are references in North Tonawanda Municipal Code, specifically Tree Regulations, to the authority or responsibilities of the Tree Advisory Committee is authorized to exercise that authority or responsibility. In particular, the Tree Advisory Committee is authorized to take action as the decision-making body for specified actions set forth in this code, particularly related to appeals of decisions regarding planting and removal of city trees.

(i) Provide a forum to receive public comment on urban forestry topics.

(j) Oversee the City's Landmark Trees Program by raising awareness and encouraging participation.

(k) At the request of the city council, the Tree Advisory Committee may perform other advisory functions not noted above.

Sec. X-XX-5 Terms.

The term of the Tree Advisory Committee members shall be four years. The terms shall be staggered such that four of the committee members' terms will conclude on December 31 of the second year and five will conclude on December 31 of the fourth year. If a committee member does not complete a full term, a new committee member may be appointed for the duration of that term.

Sec. X-XX-6 Term Limit.

No person shall be eligible to serve as a member of the Tree Advisory Committee for more than two full terms.

SECTION 2. SEVERABILITY

If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held by a court of competent jurisdiction to be invalid, such a decision shall not affect the validity of the remaining portions of this Ordinance. The City Council of the City of North Tonawanda hereby declares that it would have passed this Ordinance and each section or subsection, sentence, clause and phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases be declared invalid.

SECTION 3. EFFECTIVE DATE

This Ordinance shall take effect and will be enforced thirty (30) days after its adoption.

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SECTION 4. PUBLICATION AND POSTING

This ordinance must be published once in a newspaper of general circulation, printed and published in Niagara County and circulated in the City of North Tonawanda, within fifteen (15) days after its adoption.

* * *

The foregoing ordinance was introduced before the City Council of the City of North Tonawanda at the regular meeting of the City Council, held on the __ day of _____ and finally

adopted at a regular meeting of the City Council held on the __ day of _____ by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

_____
Mayor

ATTEST: APPROVED AS TO FORM:

_____
_____
City Clerk   Sr. Deputy City Attorney II

Appendix C. North Tonawanda Tree Ordinance

Chapter 91 Trees

Adopted by the Common Council of City of North Tonawanda 11-16-2010.[1] Amendments noted where applicable

§ 91-1 Findings; intent.

A. The City of North Tonawanda hereby finds that there is a direct relationship between the planting of trees in sufficient number in populated areas and the health, safety and welfare of communities, and as related to the natural, scenic and aesthetic values of trees and the physical and visual qualities of the environment which municipalities are authorized to protect. Trees abate noise, provide welcome shade to people, preserve the balance of oxygen in the air by removing carbon dioxide and fostering air quality, and add color and verdure to human construction. They also stabilize the soil and control microclimatic effects, and provide a natural habitat for wildlife. The destructive and indiscriminate removal of trees causes increased municipal costs for proper drainage control, impairs the benefits of occupancy of existing and unimproved real property in the area of destruction, and adversely affects the health, safety and general welfare of the inhabitants of the City.

B. It is the purpose and intent of this law to regulate the removal of trees from public property within the City in order to preserve, protect and enhance a most valuable natural resource. It is also the intent of this law to establish standards limiting the removal and insuring the replacement of trees sufficient to safeguard the ecological and aesthetic environment necessary for a healthy community.

§ 91-2 Definitions.

As used in this chapter, the following terms shall have the meanings indicated:

CALIPER
The diameter of a tree trunk as measured at a person's breast height.

CANOPY
The uppermost spreading branchy layer of a group of trees.

CITY
The City of North Tonawanda.

CITY AGENCY
Any department, board, commission, or committee of the North Tonawanda government or individual duly appointed to represent such entity.

CROWN
The mass of branches, twigs and leaves at the top of the tree, with particular reference to its shape.

PARK TREE
A tree located within one of the City's municipal parks or recreation areas.
PERSON
Any corporation, firm, partnership, association, trust, estate, one or more individuals and any unit of government or agency or subdivision thereof except for a City agency.

PRIVATE PROPERTY
Lands privately owned or controlled by persons.

PUBLIC PROPERTY
Lands owned by the City, dedicated as rights-of-way within the City or otherwise prescribed for public use within the City.

STREET TREE
A tree located within the right-of-way bounds of a street within the City of North Tonawanda.

TOP or TOPPING
Cutting back of limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree.

TREE and SHRUBS
Any woody plants that have self-supporting, above- ground parts, which are viable year round.

§ 91-3 Tree welfare.

A. No person shall cut, mar or otherwise injure any street tree planted or growing in or along the streets of the City; provided, however, that the Department of Public Works, the Department of Public Works at the direction of the Mayor, or a person authorized by the Mayor, may cut or trim street trees where such cutting or trimming is required to preserve the public health, safety and/or welfare. This subsection shall not be interpreted to restrict a property owner from performing minor trimming (branches less than one inch in diameter) from the ground on street trees in front of his/her property where his/her intent is to maintain the tree and not to damage, mar or injure it. Tree pruning standards shall comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance – Standard Practices," unless more stringent requirements are indicated.

B. It shall be unlawful for any person, firm or other entity to top any street or park tree. Trees severely damaged by storms or other causes, or trees under utility wires or other obstructions where other pruning practices are impractical shall be exempted from this section at the determination of the Department of Public Works or the Mayor.

C. No stones, cement, blacktop or other substances which will impede the passage of water and air to the roots of a tree in or on any street, park or public property shall be placed or maintained unless an open space of at least 12 square feet is left outside and around the trunk of the tree, except with the written permission of the Department of Public Works.

D. Excavation within the street right-of-way for the purpose of compliance with this section shall not be undertaken without a permit from the City Engineer.

E. The Department of Public Works shall have the right to prune any street tree for the following reasons:
 (1) Tree branches are obstructing light from a street lamp or obstruct the view of street intersections, traffic control devices or signs.
 (2) To provide a clear space of eight feet above the surface of a sidewalk.
 (3) To provide a clear space of 13 feet above the surface of a street.

F. It is the responsibility of the Department of Public Works and the Mayor, with input from a committee designated by the Mayor, to determine if trees or shrubs on City-owned property are hazardous and to remove dead or hazardous trees or shrubs from City-owned property. If replacement is recommended by the Department of Public Works or the Mayor, the City shall replace the tree or shrub within one year of removal. Property owners shall have the right to replace removed trees at their own cost and upon prior approval of the Department of Public Works or the Mayor.

G. Wherever it is necessary to remove a tree or shrub from a public right-of-way in connection with the paving of a sidewalk or the paving or widening of a street, the City or responsible agency or person shall replant such tree or shrub or replace it. If conditions prevent planting in the right-of-way, this requirement may be satisfied by planting on the adjoining property if the property owner agrees.

H. No person or City agency shall plant, prune, remove, replace or otherwise disturb any tree or shrub on any public street, park or other City-owned property without first submitting a written request therefor and obtaining written permission from the Department of Public Works or the Mayor. Requests for written permission shall be acted on within five business days of filing the written request with the Department of Public Works. All copies of requests for written permission shall also be filed with the Mayor and Common Council. All work for which such permission is given shall be done in accordance with the Department of Public Works' rules and regulations as duly adopted.

I. Private utility companies or City agencies conducting regular maintenance work on trees or shrubs may be granted general permits to cover their work on a yearly basis. Tree pruning standards referenced in Subsection A shall be complied with.

J. Except as provided in Subsection F, whenever a person or City agency obtains written permission pursuant to Subsection H of this section to remove a tree or shrub from any City-owned land for the purpose of construction or for any other reason, such person or agency shall make payment to the City in the amount of the purchase cost of replacement tree(s) or shrub(s) prior to the issuance of such tree removal permit. The City shall install such replacement tree(s) or shrub(s) within one year of the permitted removal in a location(s) to be determined by the Department of Public Works somewhere in the City. Such replacement shall meet the standards of size, species and placement as provided for in the tree removal permit issued by the Department of Public Works. Unless the Department of Public Works, for good cause, determines otherwise, trees shall be replaced by the caliper inch, such that for every inch of diameter removed, an equal number of caliper inches shall be replaced (e.g., the removal of one twelve-inch caliper tree shall necessitate the planting of six two-inch caliper trees or four three-inch caliper trees, etc.).

K. Requests from private citizens that new street trees by planted near their property shall be accommodated in accordance with planting priorities set by the Department of Public Works.

L. Specifications governing tree species, size, spacing and method and location of planting shall be approved by the Department of Public Works. Inspection of the trees by the Department of Public Works shall be carried out, whenever possible, prior to planting in order to ensure tree health and quality. Whenever any person is required to replace a tree pursuant to this chapter, a one-year guaranty of the tree's health shall be provided for such replacement trees.

§ 91-4 Issuance or denial of permit; appeals.

A. The decision of the Department of Public Works or the Mayor to grant or deny an application for tree removal shall be based on the following criteria:

    (1) The physical condition of and the apparent health of the tree.

    (2) The proximity of the tree to existing or proposed structures and utility appurtenances and the amount of damage or obstruction the tree is causing.

    (3) The desirability of preserving any tree by reason of its size, age or some other outstanding quality, such as uniqueness, rarity or status as a landmark or species specimen.

    (4) The tree's potential for hazard to the traveling public or the general public's safety and health.

    (5) The environmental effect of the removal of the tree(s).

    (6) The intention of the applicant to replant trees at the site.

    (7) Any unreasonable hardship to the applicant, which will result from modification or denial of the requested permit.

B. Any applicant aggrieved by a decision of the Department of Public Works or the Mayor may, within 30 days of the date on which the decision was mailed to the applicant, appeal such decision to the Common Council. The appeal shall be in writing and include a copy of all papers filed with the Department of Public Works along with a copy of the decision of the Department of Public Works or the Mayor. The appeal shall be deemed filed when it is received by the City Clerk. The Common Council shall vote on the appeal at the next regularly scheduled Common Council meeting after a complete appeal is filed with the City Clerk. A simple majority vote of the North Tonawanda Common Council shall be necessary to overturn the Department of Public Works' or Mayor's decision.

§ 91-5 Emergency work.

A. This chapter shall not govern any emergency activity immediately necessary to protect life, safety or property or to maintain access to any property. Any such activity shall incorporate reasonable efforts to protect trees and shrubs on City property from unnecessary damage.

B. Any person or City agency engaged in any action covered by Subsection A shall make a reasonable effort to notify the Department of Public Works prior to commencing that action and shall, in any event, provide written notice of the emergency and work done to the Department of Public Works.

§ 91-6 Penalties for offenses.

A. Any person violating any of the provisions of this chapter shall be punished, upon conviction, by a fine of not more than $250 and/or 15 days in jail for each violation. Each day that a violation of or failure to comply with any provision of this enactment or any regulation promulgated hereunder by the Common Council occurs shall constitute a separate and distinct violation.

B. A civil penalty shall be assessed in addition for the removal or destruction of any tree on public property without authorization in the amount of the appraised value of the tree, not to exceed $2,500 per tree.

Appendix D. Proposed Landmark (Heritage, Significant) Tree Ordinance Template

(I) **Definition**.

    (A) "Landmark tree" means a tree that has been so designated by resolution of the City Council as well as any tree that has been designated in the General Plan as a primary historic resource.

(II) **Designation and listing of landmark trees**.

    (A) City Council designation of landmark trees. Any tree meeting the following criteria may be designated by resolution of the City Council as a landmark tree. All trees so designated shall be placed on a landmark tree list which may be updated from time to time by subsequent City Council resolutions.

        (1) Presumptive qualification for landmark tree designation. A tree meeting all of the following criteria presumptively qualifies for designation as a landmark tree:

            (a) DBH is 54 inches or greater;

            (b) The tree's structure and character exemplify its species or it has an extraordinary form caused by environmental influences;

            (c) The tree is free, or can practicably be made to be free, of any structural defect posing a threat of either injury to persons or of substantial damage to property;

            (d) The tree has substantial aesthetic appeal, or its lack of such appeal can be remedied by standard arboricultural practices; and

            (e) Probability that the tree will survive more than 5 years from date of landmarking while retaining substantial aesthetic appeal is at least 50 percent.

        (2) Other factors supporting landmark tree designation. Whether or not a tree meets the criteria of subsection (A)(1), it may qualify for landmark tree designation based on any of the following criteria:

            (a) The tree has an important historic significance in that:

                1. It is associated with events that have made a significant contribution to local, state or national cultural heritage; or

                2. It is associated with the life of a person important to local, state or national history;

            (b) The tree is a native tree or a tree of exceptional adaptability to the [CITY] region which has a special significance to the community;

            (c) The tree has an especially prominent and beautiful visual impact;

            (d) The tree is one of a group of trees that as a group meets one or more of the criteria of this section for landmark tree designation; or

            (e) Any other factor causing the tree to have a special and important significance to the community.

    (B) Trees that are primary historic resources. Trees which have been and which in the future are designated in the General Plan as primary historical resources are hereby further designated as landmark trees.

    (III) **Prohibition on removal of or damage to trees except when expressly permitted**. No person shall remove, damage or relocate a private tree or any landmark tree, whether publicly or privately owned, except as follows:

    (A) When authorized by a permit issued by the [AUTHORITY], which permit shall, while any person is removing or damaging the subject tree, be posted on the lot by the applicant so as to be prominently visible from the street;

(B) When removal, damage or relocation is allowed without permit;

(C) When expressly authorized as part of a City-issued entitlement or permit for a development project; or

(D) In the case of a landmark tree, when authorized by the City Council in accordance with this Chapter.

(IV) **Procedure for designation of landmark trees and removal of such designation**.

(A) Initiation of the process. The [AUTHORITY] shall from time to time propose landmark tree designation or removal of such designation based on the criteria of sections (II)(A) and (II)(B), and the proposal shall be acted upon as provided in this section. Such proposals may include City-owned trees, which proposals shall be exempt from the payment of fees and costs. Additionally, the process for landmark tree designation or removal of such designation may be commenced by motion of the City Council or by the tree's owner filing an application for such action.

(B) Fee and cost for application to remove landmark tree designation. A fee in an amount established by resolution of the City Council and an advance deposit to cover estimated cost of inspection and any required report(s) shall be charged for an owner's application for removal of a landmark tree designation. In all other cases, no fee or costs shall be charged.

(C) Inspection and reports. Following initiation of the process, the tree shall be inspected by the [AUTHORITY] or by a qualified arborist selected by the [AUTHORITY] and retained by the City. The [AUTHORITY] shall prepare a City Council agenda report applying the above stated legislative findings and the applicable criteria set out in sections (II)(A) and (II)(B). The report shall set out the [AUTHORITY]'s recommendation on the proposal and reasons supporting it.

(D) Notice of hearing. Notice of any hearing conducted pursuant to this section shall comply with section [section #].

(E) Action by the City Council. The City Council shall conduct a noticed public hearing and shall review the proposal, any written inspection report, and the recommendation of the [AUTHORITY], all in light of the above-stated legislative findings and the applicable criteria of sections (II)(A) and (II)(B). The Council's decision shall be set out in a resolution.

(V) **Policy for protection of landmark trees**.

(A) Special status of landmark trees. Landmark trees, including those on City-owned property may be removed, damaged, or relocated only in accordance with the provisions of this Chapter which specifically pertain to them.

(B) Environmental significance of landmark trees. Landmark trees are significant community resources, and the damaging or removing of any landmark tree shall be regarded as causing at least a potentially substantial adverse change in the environment unless either of the following criteria is met:

(1) Probability that the tree will survive while retaining most of its aesthetic appeal for an additional five (5) years is less than fifty (50) percent; or

(2) Because of disease, age or damage, the tree has lost most of its original aesthetic appeal, which cannot feasibly be restored.

(C) Preservation standards for landmark trees.

(1) When damage or removal would constitute a substantial adverse change in the environment.

When removal of a landmark tree would constitute a substantial adverse change in the environment, authorization to either damage or remove the

tree shall not be given if its preservation intact is feasible in light of economic, environmental and technological factors. Provided however, that authorization to damage or remove a landmark tree may be given if the tree meets the criteria of Section III A-D.

(2) When removal would not constitute a potentially substantial adverse change in the environment Damage or removal of landmark trees which would not constitute a potentially substantial adverse change in the environment may be authorized when such action is found to be appropriate.

(D) **Measures available to preserve landmark trees**. In order to accommodate the preservation of landmark trees in cases where authorization of removal or damage might otherwise appear warranted, the City Council may, in its discretion, consider the following measures to make feasible the preservation of a tree:

(1) Directing an application for variance of zoning regulations;

(2) Transfer of development rights to offset any substantial economic burden or loss that City-required preservation of the tree might place on its owner; or any other reasonable means of avoiding removal or damage of the tree.

Tree Policy Element	Description
ANSI Standards	Reference and adherence to ANSI Standards for arboricultural practices (A300), safety (Z133), or Nursery Stock (ANSI Z60.1) (any or all).
Ages/Diameter Distribution	Specific management for the development of an age-diverse tree population
Arborist Standards	Standards of practice for arborists (i.e. Certification).
Best Management Practices (BMPs)	Establishes or references tree maintenance BMPs (i.e. written comprehensive standards & standards).
No Net Loss	Can refer to trees, basal area, or canopy.
Fertilization and Mulching	Fertilization or mulching standards required for conserved & planted trees.
Lightning Protection Systems	BMP written to the ANSI A300 Standard.
Planting	Planting and transplanting standards required/specified. ANSI A300 Standard.
Pruning	Pruning standards required for conserved & planted trees. ANSI A300 Standard.
Removal	Infrastructure damage, stump grinding, etc.
Utility	Utility pruning, planting, and installation policy (e.g. boring vs. trenching).
Support Systems (Guying and Bracing)	BMP written to the ANSI A300 Standard.
Tree Risk	Tree risk assessment procedures; ISA BMP or equivalent. (ANSI A300 Part 9 & ISA BMP)
Disaster Response/Recovery Mechanism	Staff knowledge of the municipality's protocol for requesting disaster resources through the county or state with access to mutual aid and EMAC.
Urban Forestry as part of the County Disaster Plan	The CFMP is incorporated into the county/municipal disaster plan; specifically in reference to debris management and risk mitigation.
Recordkeeping, Reporting, and Communications	A process has been put in place to maintain records on requests, inspections, evaluations, and mitigation of risk; and on the communications among the managers related to those risk assessments.
Construction Management Standards	Written standards for: tree protection, trenching/boring in CRZs, pre-construction mulching, root or limb pruning, watering (any or all). See ISA BMPs.
Design Standards	Standards for design that specifically require trees; standards for tree placement (i.e. location), soil treatment, and/or drainage.
Genus/Species Diversity	Suggests or requires diversity of plant material.
Green Stormwater Infrastructure (GSI)	BMPs for site level GI practices like rain gardens and swales. Small-scale projects.
Inventory Data Collection	Adopt or develop applicable (written) standards for local urban tree inventory data collection to support QA/QC.
Minimum Planting Volume	Minimum required root zone volume.
Minimum Tree Size	Minimum caliper for tree replacements, and/or minimum size of existing trees to receive tree density or canopy credit.

Root Protection Zone (CRZ)	Defines adequate root protection zone; Critical Root Zone (CRZ).
Safety	Refer to ANSI Z133 Safety Standards.
Topping	Prohibits topping or other internodal cuts (public & private).
Tree Species List	Identifies and publishes a list of the most desirable, recommended, and/or preferred species (may include native and non-native species); alternatively, a list of species prohibited.
Tree Quality Standards	Written standards for tree selection at nursery in addition to Z60.1.
Utility Right-of-Way (ROW) Management	Requirements for planting, pruning, and/or removal of trees within a utility ROW.
Significant Trees	Criteria for designating trees of unique size, history, location, species, etc. and the protection practices of such trees.
Urban Agriculture	Enabled urban food forestry practices.
Wood Utilization	Larger diameter material is processed for wood products.
Third-party forest products certification compliance	Adoption of one of the international standards for production of wood products, for example, Forest Stewardship Council™ (FSC®). Standards can apply to any/all publicly owned and managed trees; parks, street trees, and/or community forests.
Energy generation	Local or regional use of chips or other woody debris for co-generation facilities.
Composting of Leaf and/or Other Woody Debris	Leaves and small woody debris are captured and used on-site or processed by someone by composting for reuse.
Urban Interface (WUI)	Programs or policies that improve management of the urban interface for fire and/or invasive species.
Performance Monitoring	Recognizes the annual or biennial calculation of metrics (e.g. some component of ecosystem services) for the purpose of tracking management performance.
Canopy Goals	Established based on the i-Tree Canopy and Planting Prioritization data. Develop canopy goals at the parcel level, by land use, neighborhood, census boundary, and citywide. Use U.S. Forest Service and i-Tree research to calculate number of trees to achieve canopy percentages.

APPENDIX F. COMMUNITY FORESTRY RESOURCES

Local Resources
- North Tonawanda's TreePlotter app: https://pg-cloud.com/NorthTonawandaNY/
- NYS Department of Environmental Conservation Urban and Community Forestry: https://www.dec.ny.gov/lands/4957.html
- NY State Urban Forestry Council: https://nysufc.org/
- NYSDEC Emerald Ash Borer: https://www.dec.ny.gov/animals/7253.html
- Cornell Cooperative Extension: http://ccerensselaer.org/environment
- New York City Tree Planting Standards: http://www.nycgovparks.org/permits/trees/standards.pdf
- Cornell University Urban Tree Booklet: http://www.hort.cornell.edu/uhi/outreach/recurbtree/pdfs/~recurbtrees.pdf
- New York State Flora Atlas: http://newyork.plantatlas.usf.edu/
- NYS DEC Invasive Species List: http://www.dec.ny.gov/animals/65408.html

Community Outreach and Education
- The Nature Conservancy "Health Trees, Healthy Cities": https://www.conservationgateway.org/ConservationPractices/cities/hthc/Pages/default.aspx/training-resources
- U.S. Forest Service "Outreach Services Strategies for all Communities": http://actrees.org/files/What_We_Do/OutreachStrategies.pdf
- Project Learning Tree: https://forestry.ces.ncsu.edu/ncplt/

Regional Urban Forestry
- National Urban and Community Forestry Advisory Council: https://www.fs.fed.us/managing-land/urban-forests/ucf/nucfac
- American Forests: http://www.americanforests.org/
- Urban Forestry Index: www.urbanforestryindex.com
- TreeLink: www.treelink.org
- Trees Are Good: www.treesaregood.org
- Society of Municipal Arborists: http://www.urban-forestry.com/
- Arbor Day Foundation: www.arborday.org
- Alliance for Community Trees: https://www.arborday.org/programs/alliance-for-community-trees/
- Tree Care Industry Association: http://www.tcia.org/
- The New York State Arborists, ISA Chapter: https://nysarborists.com/

Tree Ordinances
- Guidelines for Developing and Evaluating Tree Ordinances (automatic download):
- https://ir.library.oregonstate.edu/downloads/pg15bm22x
- Sample Tree Ordinance: https://www.arborday.org/programs/treecityusa/documents/sample-tree-ordinance.pdf
- Example Tree Contracting Specifications: https://www.springfieldmo.gov/DocumentCenter/View/11756
- Trees and Development Guidelines: http://www.a2gov.org/departments/field-operations/forestry/Pages/StreetTreesDevelopment.aspx
- American Public Works Association "Urban Forestry Best Management Practices for Public Works Managers: Ordinances, Regulations, & Public Policies":

https://www2.apwa.net/Documents/About/CoopAgreements/UrbanForestry/UrbanForestry-3.pdf

Urban Forest Storm Preparedness
- Urban Forest Strike Teams: http://articles.extension.org/pages/71461/urban-forest-strike-teams
- APA "Hazardous Tree Management and Post-Disaster Tree Management": https://www.planning.org/research/treemanagement/

Trees and Stormwater
- Urban Watershed Forestry Management: http://www.forestsforwatersheds.org/
- EPA Green Infrastructure: http://water.epa.gov/polwaste/green/upload/stormwater2streettrees.pdf

Urban Forests and Climate Change
- U.S. Forest Service "Urban Forests and Climate Change": https://www.fs.usda.gov/ccrc/topics/urban-forests-and-climate-change

Tree Management Best Practices
- ANSI A300 Standards: https://tcia.org/TCIA/BUSINESS/ANSI_A300_Standards_/TCIA/BUSINESS/A300_Standards/A300_Standards.aspx?hkey=202ff566-4364-4686-b7c1-2a365af59669
- ANSI A300 Pruning Specification Writing Guide: https://www.tcia.org/TCIAPdfs/Resources/Arboriculture/A300TreeCareStandards/A300Pruning-SpecificationWritingGuide-20170413.pdf
- ANSI Z60.1 Nursery Standards: https://www.americanhort.org/page/standards

Trees and Utilities
- Penn State Extension "Questions about Trees and Utilities": https://extension.psu.edu/questions-about-trees-and-utilities
- Utility Arborist Association "Common Questions about Electric Utility Pruning": https://uaa.wildapricot.org/page-18073
- VA Cooperative Extension "Trees and Shrubs for Problem Landscape Sites: Overhead Utility Easements" (automatic download): https://www.urbanforestrysouth.org/resources/library/ttresources/trees-and-shrubs-for-problem-landscape-sites-overhead-utility-easements/at_download/file
- The eXtension Foundation "Trees for Energy Conservation": http://articles.extension.org/trees_for_energy_conservation
- Arbor Day Foundation "Energy-Saving Trees": http://energysavingtrees.arborday.org/#About

Urban Wood Utilization
- http://ncufc.org/urban_wood_utilization_introduction.php

Planning Resources
- Vibrant Cities Lab's Community Asset & Goal-Setting Tool by American Forests and the U.S. Forest Service: https://www.vibrantcitieslab.com/assessment-tool/
- U.S. Forest Service and Davey Institute "Sustainable Urban Forest Guide": http://www.itreetools.org/resources/content/Sustainable_Urban_Forest_Guide_14Nov2016.pdf

- WI DNR "Technical Guide to Developing Urban Forestry Strategic Plans & Management Plans: http://dnr.wi.gov/topic/UrbanForests/documents/UFPlanningGuide.pdf
- Municipal Urban Forestry Staff American Public Works Association "Urban Forestry Best Management Practices for Public Works Managers: Staffing": https://www2.apwa.net/Documents/About/CoopAgreements/UrbanForestry/UrbanForestry-2.pdf
- Tree Boards: http://www.tufc.com/pdfs/treeboard_handbook.pdf

Urban Forestry Funding
- DEC Urban Forestry https://www.dec.ny.gov/lands/5285.html
- How to Fund Your Urban Forestry Program: https://planitgeo.com/library/how-to-fund-your-urban-forestry-program/
- Alliance for Community Trees "Funding Sources": http://actrees.org/resources/tools-for-nonprofits/fundraising-tools-for-nonprofits/
- Penn State Extension "Sustaining and Funding an Urban Forestry Program": https://extension.psu.edu/sustaining-and-funding-an-urban-forestry-program
- American Public Works Association "Urban Forestry Best Management Practices for Public Works Managers: Budgeting & Funding": https://www2.apwa.net/Documents/About/CoopAgreements/UrbanForestry/UrbanForestry-1.pdf

Tree and Urban Forest Ecosystem Benefits
- U.S. Forest Service i-Tree: www.itreetools.org
- U.S. Forest Northeast Community Tree Guide: Benefits, Costs and Strategic Planting: http://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf
- U.S. Forest Service "The Urban Forest and Ecosystem Services": https://www.fs.fed.us/psw/publications/mcpherson/psw_2016_mcpherson001_livesley.pdf

Tree Assessment Resources
- U.S. Forest Service Urban Tree Canopy Assessments (UTC): www.nrs.fs.fed.us/urban/utc/
- PlanIT Geo Urban Tree Canopy Assessments: https://planitgeo.com/geospatial-mapping-services/
- i-Tree Canopy Assessments: https://canopy.itreetools.org/
- PlanIT Geo Tree Inventory Software: www.treeplotter.com
- North Tonawanda, NY's TreePlotter Software: www.pg-cloud.com/NorthTonawandaNY

Technical Resources
- University of Florida IFAS Extension: Developing a Preventative Pruning Program: Young Trees
- University of Florida IFAS Extension: Developing a Preventative Pruning Program: Mature Trees
- University of Florida IFAS Extension: Selecting Quality Trees from the Nursery
- University of Florida IFAS Extension: Urban Design for a Wind Resistant Urban Forest

Other Resources
- American Forests "Vibrant Cities Lab": http://www.vibrantcitieslab.com/

- ISA International Dictionary Online: https://wwv.isa-arbor.com/education/onlineresources/dictionary
- PlanIT Geo Reports and Plans: www.planitgeo.com/urban-forestry-resource-library/

APPENDIX G. TREE MAINTENANCE AND PLANTING BEST PRACTICES

The community forest within North Tonawanda plays a significant role in maintaining the health and vitality of urban life. The community forest provides a wealth of benefits to neighborhoods and residents through the reduction of energy consumption, the removal of pollutants from the air and water, reduction in stormwater flows, increased valuation of private property, increased worker productivity, reduction in stress and violent crime, as well as providing recreational opportunities and aesthetic diversity. At the same time stresses from the urban environment including air pollution, damage by vehicles, increased impervious surface, soil compaction, and maintenance neglect reduce the diversity and magnitude of these benefits and may lead to tree-related problems.

The inherently close interaction between people and trees in the City requires active and diligent management of the urban and community tree and forest resources to ensure public safety. To enhance tree canopy and associated benefits, trees need to be properly maintained and planted.

The City of North Tonawanda can use this information to make any updates to the proposed Street Tree Ordinance.

Tree Maintenance Best Practices

The following provides an overview of tree maintenance best practices. It is not intended to be an extensive or comprehensive summary of best practices. All tree maintenance practices should follow the American National Standards Institute's (ANSI) A300 Standards (Parts 1-10).

Reasons for Tree Pruning

1. *Pruning for Safety*
   Involves removing branches that could fall and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines. Safety pruning can be largely avoided by carefully choosing species that will not grow beyond the space available to them and have strength and form characteristics that are suited to the site.

2. *Pruning for Health*
   Involves removing diseased or insect-infested wood, thinning the crown to increase airflow and reduce some pest problems, and removing crossing and rubbing branches. Pruning can best be used to encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather. Removing broken or damaged limbs encourages wound closure.

3. *Pruning for Form*
   Improves the structure of trees and removes branches that are more likely to fail. Branches that are poorly attached may be broken off by wind and accumulation of snow and ice. Branches removed by such natural forces often result in large, ragged wounds that rarely seal.

4. *Pruning for Aesthetics*
   Involves enhancing the natural form and character of trees or stimulating flower production.

   To reduce the need for pruning it is best to consider a tree's natural form. It is very difficult to impose an unnatural form on a tree without a commitment to constant.

Common Types of Tree Pruning

1. *Crown Cleaning*
    Consists of the selective removal of dead, dying, diseased, and weak branches from a tree's crown. No more than 25% of the live crown should be removed in any one year, even for young trees.

2. *Crown Thinning*
    Primarily for hardwoods, thinning is the selective removal of branches to increase light penetration and air movement throughout the crown of a tree. The intent is to maintain or develop a tree's structure and form. To avoid unnecessary stress and prevent excessive production of epicormic sprouts, no more than one-quarter of the living crown should be removed at a time. If it is necessary to remove more, it should be done over successive years.

    Branches with strong U-shaped angles of attachment should be retained. Branches with narrow, V-shaped angles of attachment often form included bark and should be removed.

3. *Crown Raising*
    The practice of removing branches from the bottom of the crown of a tree to provide clearance for pedestrians, vehicles, buildings, lines of site, or to develop a clear stem for timber production. After pruning, the ratio of the living crown to total tree height should be at least two-thirds. On young trees temporary branches may be retained along the stem to encourage taper and protect trees from vandalism and sunscald.

4. *Crown Reduction*
    Most often used when a tree has grown too large for its permitted space. This method, sometimes called drop crotch pruning, is preferred to topping because it results in a more natural appearance, increases the time before pruning is needed again, and minimizes stress (see drop crotch cuts in the next section). Crown reduction pruning, a method of last resort, often results in large pruning wounds.

Types of tree pruning:

Before   Crown Cleaning   Crown Thinning   Crown Raising   Crown Reduction
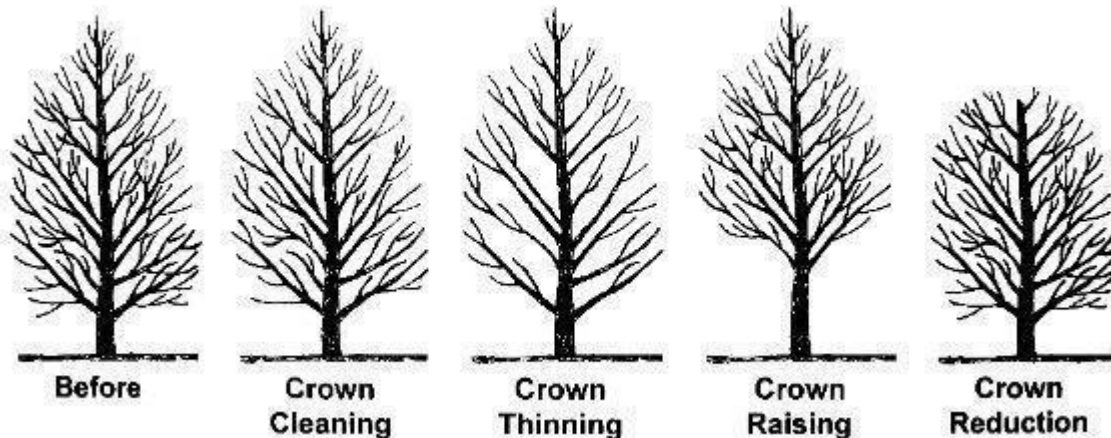
Tree Pruning Cuts

Pruning cuts should be made so that only branch tissue is removed and stem tissue is not damaged. To find the proper place to cut a branch, look for the branch collar that grows from the stem tissue at the underside of the base of the branch. On the upper surface, there is usually a branch bark ridge that runs parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar. A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar.

Types of pruning cuts and the proper branch cutting technique:

Natural target pruning properly removes a branch while protecting the branch collar, which is essential for wounds to heal. First cut A, second cut B, and third cut C-D.
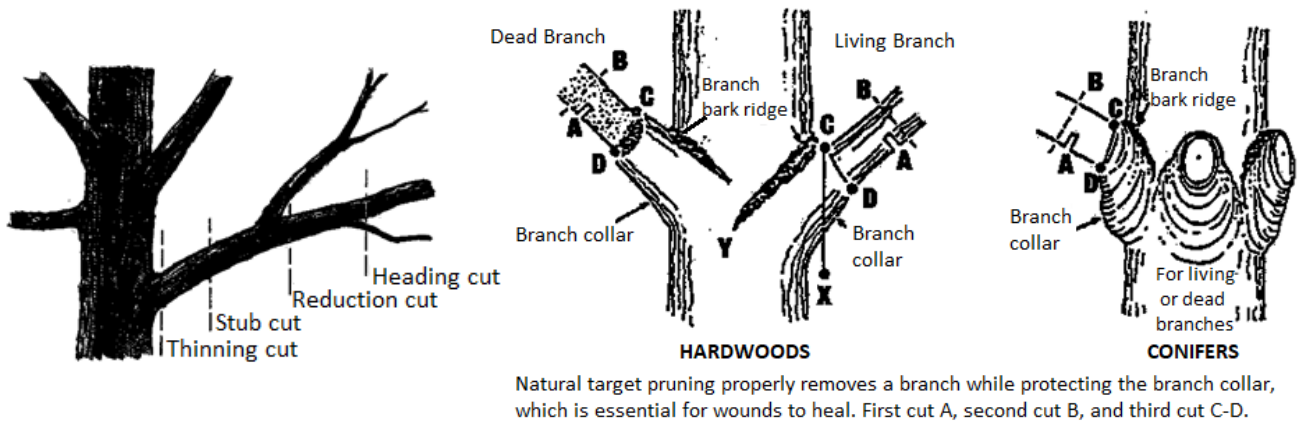
Image source: Pennsylvania State University Urban Forestry Extension

Utility Tree Maintenance Best Practices
Utility Tree Pruning Overview

The City should work with the utility companies to ensure proper pruning practices are followed and that open communication between the company, the city, and the public are maintained. The International Society of Arboriculture provides guidelines for maintaining trees near power lines (*Best Management Practices – Utility Pruning of Trees*, G. Kempter).

Maintaining power lines free of tree growth is based on a consistent, planned trimming cycle of the utility vegetation management company. This approach improves electric service to all the customers who get their power from that line. A sensible approach to trimming trees means having a thorough maintenance plan that improves the safety and reliability of electric service to residents. Residents and the City staff should not attempt to trim any vegetation growing near or on any overhead power lines.

Utility Tree Maintenance Techniques

1. *Directional Pruning*
   Removes entire branches and limbs to the main trunk of the tree and future growth is directed away from the power lines. Reduction cuts are used for removing these branches and limbs and should be pruned properly back to a lateral branch that is at least one-third the diameter of the branch being removed. This allows for good wound closure and protects apical dominance and reduces sprouts.

   Avoid topping or rounding over trees. This removes more foliage than directional pruning, increases the number of tree wounds, stresses the tree, causes unstable decay, and increases water sprouts.

2. *Right Tree Right Place*
   Selecting the right tree for the site can reduce potential safety hazards and improve the reliability of the electric service. Smaller trees near power lines do not need to be excessively pruned and do not lose their natural form.

3. *Recommended Trees*
   Trees potentially suitable for planting adjacent to power lines should be shorter and slow growing to prevent clearance issues.

Example of trees directionally pruned for clearance from power lines:
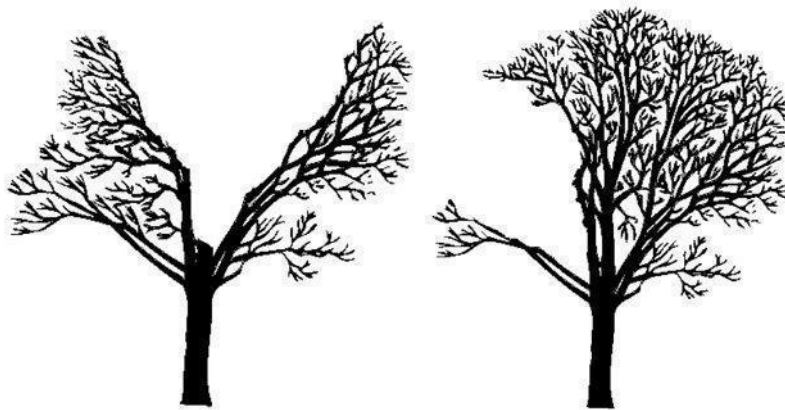
Young Tree Maintenance Best Practices
Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require less corrective pruning as they mature.

Young Tree Maintenance Techniques

1. *Consider the Nature Form and Desired Growth*
   Accentuate the natural branching habit of a tree and correct any structural problems over time, if needed, to not stress the tree.

2. *Pruning in 1-2 Years after Planting*
   Prune as little as possible after planting to ensure there are enough temporary branches to produce food for new growth of roots, trunk, and branches. Prune only dead, broken, malformed, or diseased branches. Remove codominant leaders to maintain one dominant trunk. Prune for clearance if absolutely necessary. Keep size of branch removed to less than one inch in diameter.

3. *Pruning 2-3 Years after Planting*
   Prune any dead, broken, malformed, or diseased branches. Remove any suckers from the base of the tree. Next, determine the permanent branch structure by considering:

   - Remove, thin, or cut back any competing leaders
   - Remove crossing or rubbing branches, keeping the branch that maintains the natural form
   - Thin excessively crowded branches but do not lions-tail
   - Remove branches with narrow angles between the branch and trunk (consider species)

- Remove branches to maintain well-spaced branches along and around the trunk. Ideal mature trees will have lateral branches that are 18-24 inches apart (depending on species)
- Avoid pruning near time of bud break
- Prune flowering trees after flowering

Example of branches to be pruned for newly planted trees to promote good structure:
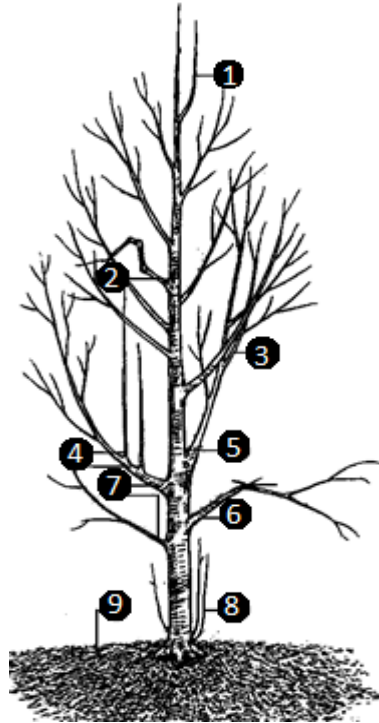
Prune competing leader

Prune malformed branches

Remove crossing branches

Remove water sprouts

Remove branches with poor angles

Prune broken or damaged branches

Prune temporary branches over time

Remove suckers

Apply 2-3" of mulch

Photo source: Pennsylvania State University Urban Forestry Extension

Tree Planting Best Practices

The following provides an overview of best practices that should be considered and followed before during and after planting trees.

- Trees to be planted should be selected from an approved tree planting list developed to maintain and enhance species diversity that are suitable for the North Tonawanda, NY Plant Hardiness Zone and changing climates.
- Planting material will conform to the latest version of the American Standard for Nursery Stock (American National Standards Institute [ANSI] Z60.1). Trees to be planted should be of standard quality or better and should be true to name and type of their species variety.
- Trees should not be planted in tree lawns less than 2 feet in width or in planting pits less than 5 feet long by 5 feet wide.
- Trees should not be planted within 50 feet of any major intersection, or within 20 feet of a fire hydrant, a driveway, or a pole supporting a light.
- The burlap and twine from balled-and-burlap trees should be removed from the tree and the tree pit. Wire tree baskets may remain on the root ball, but the top one-third should be clipped and removed from the planting hole.
- Mulch should be placed around trees in a minimum 3-foot circle and 3-inch depth to protect trees from lawnmower damage and competition from turf; mulch will be kept away from tree trunks.
- Newly planted trees should be irrigated weekly during droughts in the growing season for three years

Example annual work schedule for community trees (https://extension.psu.edu/annual-work-plans-for-tree-commissions - click "Download PDF")

Annual Work Schedule for Community Trees
(Each dot in chart below = one week/month. Circle dot(s) to show when work will be down.)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Planning and administration	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. prioritize work to be done	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. organize activities	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
2. Tree Planting	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. survey potential planting sites	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. decide locations, species, and cultivars	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
c. notify adjacent property owners	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
d. announce and hold public hearing	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
e. order trees	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
f. inspect and tag trees in nursery	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
g. receive, inspect, and store trees	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
h. plant trees, prune, stake, and water	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
i. water trees periodically	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
3. Tree Pruning	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. survey trees, decide which to prune	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. arrange for crew, equipment, and supplies, or arrange for service contract	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
c. supervise pruning and disposal of wastes	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
4. Tree Removal	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. survey trees, decide on removals	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. notify adjacent property owners	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
c. announce and hold public hearings	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
d. arrange for crew, equipment, and supplies, or arrange for service contract	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
e. supervise removals	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
f. grind stumps, reseed	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
5. Public relations and funding	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. report to municipal officials	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. prepare news releases	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
c. arrange news and TV coverage of events	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
d. submit Tree City USA application	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
e. submit grant applications	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
f. develop education programs	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
g. hold Arbor Day ceremony	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
h. conduct youth education	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
6. Other Tasks	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
a. water trees during drought	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
b. fertilize deficient trees	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
c. control diseases and insects, as needed	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
d. collect leaves and recycle	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
e. clean up storm breakage	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
f. conduct training, professional development	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •
g. train tree workers	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •

APPENDIX I. TREE MAINTENANCE SCHEDULE AND BUDGET

This maintenance schedule and budget worksheet was developed based on the 2021 street and park tree and vacant site inventory. An interactive version of this worksheet was provided as part of the Community Forest Management Plan project. Plan recommendations regarding tree maintenance are based on this analysis and worksheet. The rates in the worksheet are based on general industry recommendations and can be further customized to the City's estimates. The maintenance worksheet is laid out on the next page.

Estimated Costs for Each Activity

Activity	DBH Class	Cost / Tree	Year 1 # of Trees	Year 1 Total Cost	Year 2 # of Trees	Year 2 Total Cost	Year 3 # of Trees	Year 3 Total Cost	Year 4 # of Trees	Year 4 Total Cost	Year 5 # of Trees	Year 5 Total Cost	Year 6 # of Trees	Year 6 Total Cost	Year 7 # of Trees	Year 7 Total Cost	Total Year Cost	Total Trees
Priority 1: Critical Removals (addressed in first 3 years)	0-3"	$100	8	$800	8	$800	7	$700									$2,300	23
	3-6"	$175	7	$1,225	7	$1,225	6	$1,050									$3,500	20
	6-12"	$300	10	$3,000	10	$3,000	9	$2,700									$8,700	29
	12-18"	$850	17	$14,450	17	$14,450	17	$14,450									$43,350	51
	18-24"	$1,275	16	$20,400	15	$19,125	15	$19,125									$58,650	46
	24-30"	$1,550	6	$9,300	6	$9,300	6	$9,300									$27,900	18
	>30"	$2,100	5	$10,500	4	$8,400	4	$8,400									$27,300	13
Activity Total(s)			**69**	**$59,675**	**67**	**$56,300**	**64**	**$55,725**	**-**	**$0**	**-**	**$0**	**-**	**$0**	**-**	**$0**	**$171,700**	**200**
Priority 2: Immediate Removals (Split into 7 years)	0-3"	$30	5	$150	5	$150	4	$120	4	$120	4	$120	4	$120	4	$120	$900	30
	3-6"	$35	8	$280	7	$245	7	$245	7	$245	7	$245	7	$245	7	$245	$1,750	52
	6-12"	$80	22	$1,760	22	$1,760	21	$1,680	21	$1,680	21	$1,680	21	$1,680	21	$1,680	$11,920	149
	12-18"	$120	47	$5,640	47	$5,640	47	$5,640	47	$5,640	47	$5,640	46	$5,520	46	$5,520	$39,240	327
	18-24"	$200	45	$9,000	45	$9,000	45	$9,000	44	$8,800	44	$8,800	44	$8,800	44	$8,800	$62,200	311
	24-30"	$250	16	$4,000	16	$4,000	16	$4,000	16	$4,000	16	$4,000	16	$4,000	15	$3,750	$27,750	111
	>30"	$450	14	$6,300	14	$6,300	14	$6,300	14	$6,300	13	$5,850	13	$5,850	13	$5,850	$42,750	95
Activity Total(s)			**157**	**$27,130**	**156**	**$27,095**	**154**	**$26,985**	**153**	**$26,785**	**152**	**$26,335**	**151**	**$26,215**	**150**	**$25,965**	**$186,510**	**1075**
Priority 3 Routine Tree Pruning (7-year cycle beginning at year 3)	0-3"	$20					-	$0	-	$0	-	$0	-	$0	-	$0	$0	0
	3-6"	$30					-	$0	-	$0	-	$0	-	$0	-	$0	$0	0
	6-12"	$75					223	$16,725	222	$16,650	222	$16,650	222	$16,650	222	$16,650	$83,325	1555
	12-18"	$120					418	$50,160	418	$50,160	418	$50,160	418	$50,160	417	$50,040	$250,680	2923
	18-24"	$170					502	$85,340	435	$73,950	435	$73,950	435	$73,950	434	$73,780	$380,970	3044
	24-30"	$225					227	$51,075	227	$51,075	227	$51,075	226	$50,946	226	$50,946	$255,118	1585
	>30"	$425					215	$91,375	215	$91,375	214	$90,950	214	$90,950	214	$90,950	$455,600	1500
Activity Total(s)			**-**	**$0**	**-**	**$0**	**1,516**	**$294,675**	**1,516**	**$283,210**	**1,515**	**$282,785**	**1,515**	**$282,656**	**1,515**	**$282,366**	**$1,425,693**	**10607**
Priority 4 Training Prune (3-year cycle beginning at year 1)	0-3"	$20	136	$2,720	136	$2,720	136	$2,720	136	$2,720	136	$2,720	136	$2,720	136	$2,720	$19,040	408
	3-6"	$30	212	$6,370	212	$6,370	212	$6,370	212	$6,370	212	$6,370	212	$6,370	212	$6,370	$44,590	637
Activity Total(s)			**348**	**$9,090**	**348**	**$9,090**	**348**	**$9,090**	**348**	**$9,090**	**348**	**$9,090**	**348**	**$9,090**	**348**	**$9,090**	**$63,630**	**1045**

Activity	Item	Cost / Tree	Year 1 # of Trees	Year 1 Total Cost	Year 2 # of Trees	Year 2 Total Cost	Year 3 # of Trees	Year 3 Total Cost	Year 4 # of Trees	Year 4 Total Cost	Year 5 # of Trees	Year 5 Total Cost	Year 6 # of Trees	Year 6 Total Cost	Year 7 # of Trees	Year 7 Total Cost	Total Year Cost	Total Trees
Replacement Tree	Purchasing	$90	226	$20,340	223	$20,070	218	$19,620	153	$13,770	152	$13,680	151	$13,590	150	$13,500	$114,570	667
	Planting	$110	226	$24,860	223	$24,530	218	$23,980	153	$16,830	152	$16,720	151	$16,610	150	$16,500	$140,030	667
Activity Total(s)			**452**	**$45,200**	**446**	**$44,600**	**436**	**$43,600**	**306**	**$30,600**	**304**	**$30,400**	**302**	**$30,200**	**300**	**$30,000**	**$254,600**	**1334**
Replacement Tree - Young Tree Maintenance (beginning at year 3)	Mulching	$100	0	$0	0	$0	348	$34,800	348	$34,800	348	$34,800	348	$34,800	348	$34,800	$174,000	1740
	Watering	$100	0	$0	0	$0	348	$34,800	348	$34,800	348	$34,800	348	$34,800	348	$34,800	$174,000	1740
Activity Total(s)			**0**	**$0**	**0**	**$0**	**696**	**$69,600**	**696**	**$69,600**	**696**	**$69,600**	**696**	**$69,600**	**696**	**$69,600**	**$348,000**	**3480**
Annual Mortality Removals (1% of 12,727 total live trees) (includes stump removal)	Average DBH 18.4 / $300		127	$38,181	127	$38,181	127	$38,181	127	$38,181	127	$38,181	127	$38,181	127	$38,181	$267,267	891
Annual Planting Mortality (total removals over 7 years. Does not include vacant sites at this time) (1% of tree plantings)	Average Tree / $200		2	$452	4	$898	7	$1,334	8	$1,640	10	$1,944	11	$2,246	13	$2,546	$11,060	55
Annual Established & Planting Mortality Totals			**130**	**$38,633**	**132**	**$39,079**	**134**	**$39,515**	**135**	**$39,821**	**137**	**$40,125**	**139**	**$40,427**	**140**	**$40,727**	**$337,200**	**946**
Activity Grand Total			**1,156**		**1,149**		**3,348**		**3,155**		**3,152**		**3,151**		**3,149**			**18,261**
Cost Grand Total				**$179,728**		**$176,164**		**$539,190**		**$459,106**		**$458,335**		**$458,188**		**$516,621**	**$2,787,333**	

North Tonawanda's Community Forest Management Plan was developed to provide the road map for the City to maintain a healthy and sustainable community forest that is properly managed and cared for, benefiting the City and its citizens with improved economic and environmental well-being, increased public safety, cost effective maintenance, and informed tree planting decisions.