AKWESASNE COMMUNITY FOREST MANAGEMENT PLAN

“Ha’o iethiiaten’nikòn:raren ne okwire’shón:’a ok ná:’a enwá:ton eniotiió’ten tsi nahò:ten ionateríhonte, só:’k ne entsionkhiia’takéhnha.”

(Let’s take care of our trees, so they can care for us)

FINAL 2018

Saint Regis Mohawk Tribe
Environment Division
Forestry Resources Program

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The Ranger School (SUNY-ESF) class of 2013.

Cover: John Thomas, an artist at Akwesasne, drew the turtle that illustrates the soils, trees, aquifers, supporting the mountains, grass, partridge and other creatures. The Saint Regis Mohawk Tribe also wishes to acknowledge the community for its cooperation and assistance in conducting the inventory. Niawen/Thank You.

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EXECUTIVE SUMMARY

The purpose of the 2018 Akwesasne Community Forest Management Plan is to provide a framework by which the community of Akwesasne and the Saint Regis Mohawk Tribe Forestry Resources Department can utilize to aid in the management and care of the community forest in the southern portion of Akwesasne. This management plan is intended to be a living document that will continually change and adapt with the needs of Akwesasne's community forest and provide a long-term, phased approach to ensure the preservation of the trees within this unique area.

This plan will help the Saint Regis Mohawk Tribe better service the needs of the community and Southern Akwesasne's community forest by enhancing the effectiveness of tribal government, developing a project planning structure, supporting sustainable funding sources and engaging with the community to develop a collaborative effort to improve the community forest.

Some of the key components of the plan consist of the current condition of the community forest, the vision for the future, and how that vision will be attained through a series of goals, objectives and actions. This information was gathered from the Urban Tree Inventory conducted in 2015 and from the community's ideas, desires and concerns regarding the community forest.

"Trees are a living part of our home and should be respected and protected." – Community Member

VISION FOR THE COMMUNITY FOREST

We want to be knowledgeable caretakers for our brothers and sisters, the trees, so that they will be able to provide benefits to Akwesasne’s next seven generations. We want to create a cultural relationship between the forests and people of Akwesasne so that traditional teachings and stewardship are not lost. We want to be able to plant, protect, maintain, and involve our community in caring for the forest.

MISSION

The mission of the Saint Regis Mohawk Tribe Forestry Resources is to increase, protect, maintain, fund, and engage the community in the stewardship of our forests.

GUIDING PRINCIPLES

- As humans we are given the ability to speak, so it is our responsibility to speak for all life that mother earth sustains. It is our duty to protect, preserve, and care for our strong, resilient and vulnerable life sustaining trees and forests.

- Trees represent something much more to Akwesasró:non, they are necessary for the health and survival of our culture and play an invaluable role in the preservation of future generations. Trees are an important part of Onkwehón:we culture, they connect us with the past, to inform our present and guide us toward our future. They represent pieces of who we are and are essential to the preservation of language and culture.

- Humans are the younger children of our mother and the trees are our elder brothers and sister who have been around much longer than we have. Our older brothers and sisters the trees, support us daily with many gifts: they clean the air, give beauty, prevent soil erosion, serve as wind breakers and insulators, provide shade and homes for birds and animals as well as give us food and medicines.

- The trees, our relatives come in different shapes, sizes, and species. They connect the earth to the sky, they carry messages up to the creator, and they hold great wisdom for us.

INTRODUCTION

Akwesasne's Community Forest has an important role in maintaining a healthy environment for Akwesasró:non. Trees and vegetation clean the air and water, create greener landscapes, conserve energy, improve public health, provide wildlife habitat and absorb greenhouse gases. Akwesasró:non recognize the significance of trees and the benefits they provide. Because of this, actions in forest stewardship and management must be taken to enhance and expand this important natural resource.

The creation of the Community Forest Management Plan is the first step towards addressing Akwesasne's residential, street, and publically forested areas. These unique areas are defined as the urban and community forest or any collection of trees and shrubs found within this humanly influenced environment.

This plan outlines the status, needs, and concerns surrounding the urban and community forest and presents the goals, objectives and actions needed to achieve the long-term management of this area. The success of this plan is not solely characterized by single actions, but requires the encompassing efforts of individuals, the community, and institutions coming together with a shared goal of improving this essential and unique environment.

"Trees are such a valuable resource. Their importance is beyond monetary gain. They are such an important part of our culture. They represent pieces of who we are and are essential to the preservation of language and culture. It is our responsibility to care for them." – Community Member

BACKGROUND

The Saint Regis Mohawk Tribe received assistance from the New York State Department of Environmental Conservation (NYS DEC) Division of Lands and Forests under its Urban and Community Forestry State Assistance program (Round 12) to conduct a tree inventory on the southern portion of Akwesasne's urban lands. The Forestry Program utilized the tool (i-Tree Eco) and the Hazard Tree Risk Assessment program as part of the inventory process; utilizing the grant funding in combination with tribally supported staff time and resources to conduct the inventory of urban and community trees on tribal community member's property, tribal grounds, and commercial areas.

The southern portion of Akwesasne is located on the north side of Franklin County in New York State, bordering the Saint Lawrence River. **Figure 1** shows the location of Southern Akwesasne. The topography across the area is gently rolling, ranging from about 170 to 300 feet above mean sea level. Being adjacent to the Saint Lawrence River Valley, the topography and soils are influenced by the last glaciations, the alluvial soils being moved through the Great Lakes drainage, and the Saint Regis River, flowing out of the Adirondack Mountains into the valley.

Southern Akwesasne is approximately 10,000 acres, it consists of 6,385 acres of operable forest land, followed by abandoned agricultural land and light commercial and residential development, about 3,000 acres. Land use patterns are in a constant state of change and as the population increases there is coincidental commercial and residential development growth. This results in impacts to the urban forests, air and water quality, and increased consumption of water and power. **Figure 2** shows the 3,000 acres of the urban interface in the southern portion Akwesasne.[1]

Figure 1: Location of Southern Akwesasne

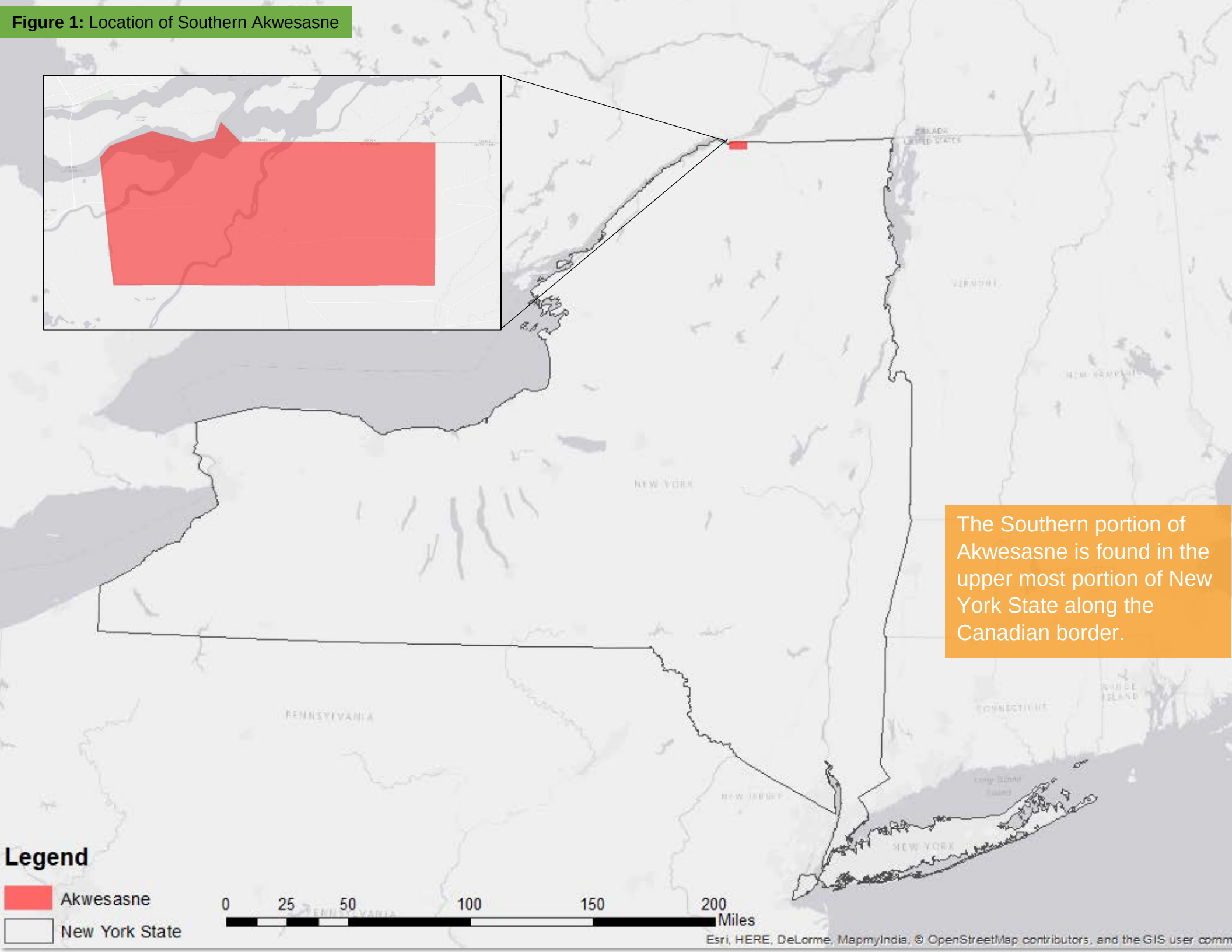


Figure 2: Urban Area of Southern Akwesasne

This map displays the urban interface within the southern area of Akwesasne. Red areas designate commercial, residential, facility, parks and other land use types defined as urban areas. These spaces are generally spread out across the land with many sections of forests and natural areas encompassing the remaining space. (Approximately 3,000 acres)

"Urban Area" is a collection of trees and shrubs found within a built environment

"Trees are important to all walks of life by giving us oxygen, cleaning the air, and stabilize earth's soil." – Community Member

WHY THE MANAGEMENT PLAN IS NEEDED

The purpose of the 2018 Akwesasne Community Forest Management Plan is to provide guidelines and information for the preservation and protection of Akwesasne's urban forest and cultural heritage. The plan will provide strategies to ensure the urban forest is healthy, safe and beneficial to the community for future generations. This comprehensive plan will help balance the changes caused by infrastructure development with the conservation of urban trees, landscapes, and forested areas. This cooperation between development and preservation is needed to ensure the beneficial continuity between natural environments and human influences.

One of the main objectives of the plan is to express the importance trees have in all walks of life, but specifically how they are valued by Akwesasró:non and the significance they hold in onkwehon:we culture. Clearly conveying this message and portraying the connection between trees and culture is the bases for bridging the understanding of the urban forest and the ways in which this unique area can be managed.

Because the urban forest is not a natural environment that is self-sustaining, it needs our help and care to be maintained. From beginning to end, with proper planting techniques to maintenance and damage prevention, urban trees need our help to keep them happy and healthy. In return, if we care for them, they will care for us.[2]

WHAT DEFINES AN URBAN FOREST

If you can look out your window and see a tree in your front yard, you are living within the urban and community forest. An “urban forest” is a collection of trees and vegetation found along streets, in parks, gardens, landscapes, river corridors, nature preserves, wetlands, shelterbelts or any other form of a humanly influenced environment. Many urban forests are distinguished by the proximity trees have with paved surfaces, buildings, parks and people. Urban forests are the result of areas that have been influenced or changed by human interactions and impacts, and are a distinct, formed environment. Unlike a natural forest ecosystem that is self-sustaining, urban forests require regular maintenance to keep them healthy and productive.

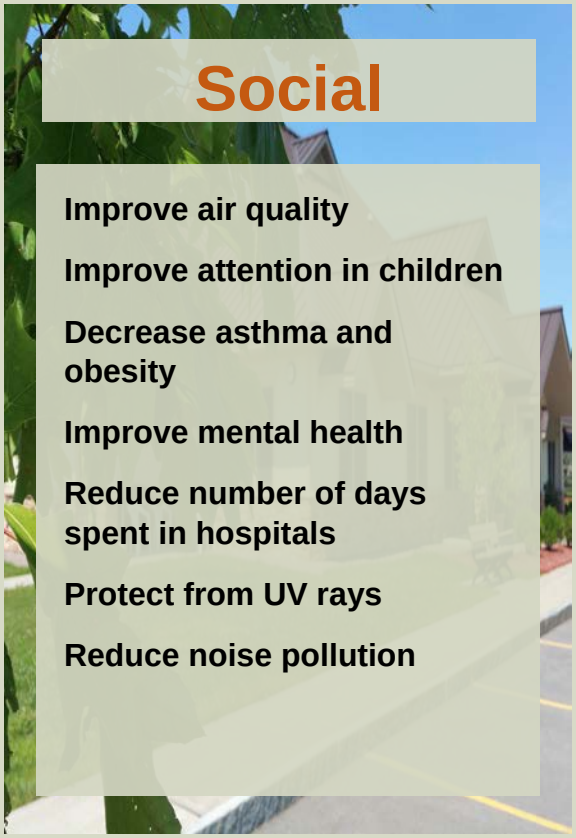
The concept of an “urban forest” itself is a holistic idea regarding trees and other vegetation within this environment and it is necessary to manage this natural resource to collect the benefits it provides us. Urban forests work at multiple levels, from a few trees in your front yard, to the surrounding neighborhoods and towns, up to regional landscapes. They create an interconnected web of vegetated spaces that provide essential ecosystem services for all of us.[4]

Ecosystem services are the many life-sustaining benefits we receive from nature—clean air and water, fertile soil for food, pollination, and flood control. These ecosystem services are very important to environmental and human health and well-being.

“Trees are not just important physically to the environment; they also have historical value and are part of creation.” – Community Member

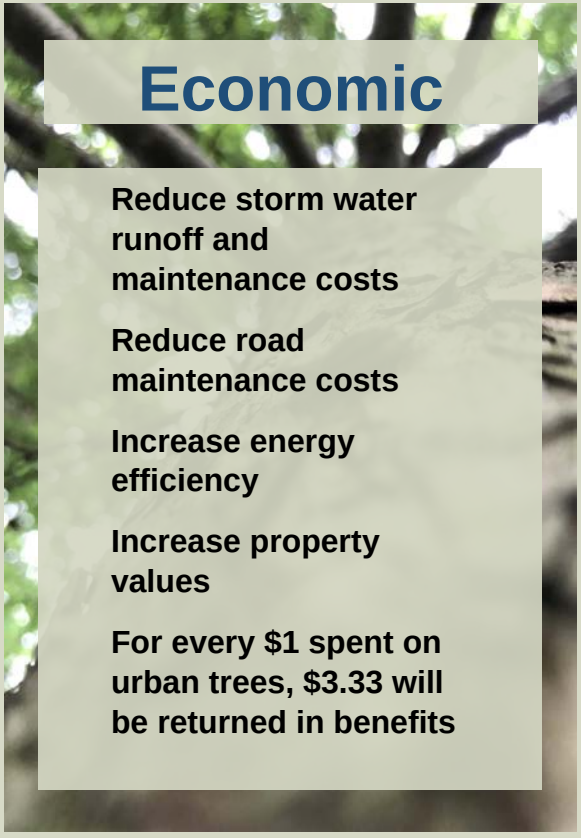
BENEFITS OF URBAN TREES

Akwesasne's trees have a never ending job of improving the natural environment and quality of life. They are vital assets to the community providing clean air, food, shelter, creating a more pleasant environment, and improving overall well-being and health. They are also an important cultural resource, which has been used for generations to create baskets, lacrosse sticks, and provide traditional medicines. For Akwesasró:non, they also carry a great significance and special importance in traditional teachings and culture.[5]



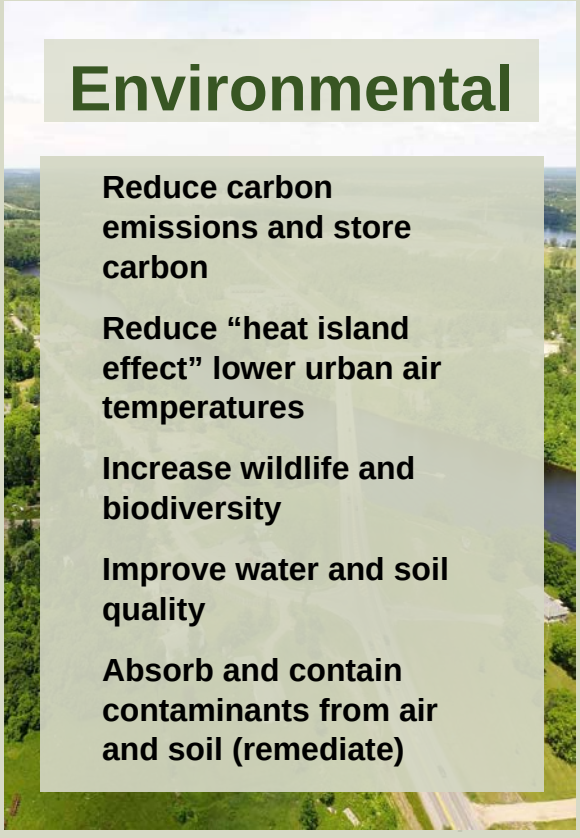
Social

- **Improve air quality**
- **Improve attention in children**
- **Decrease asthma and obesity**
- **Improve mental health**
- **Reduce number of days spent in hospitals**
- **Protect from UV rays**
- **Reduce noise pollution**



Economic

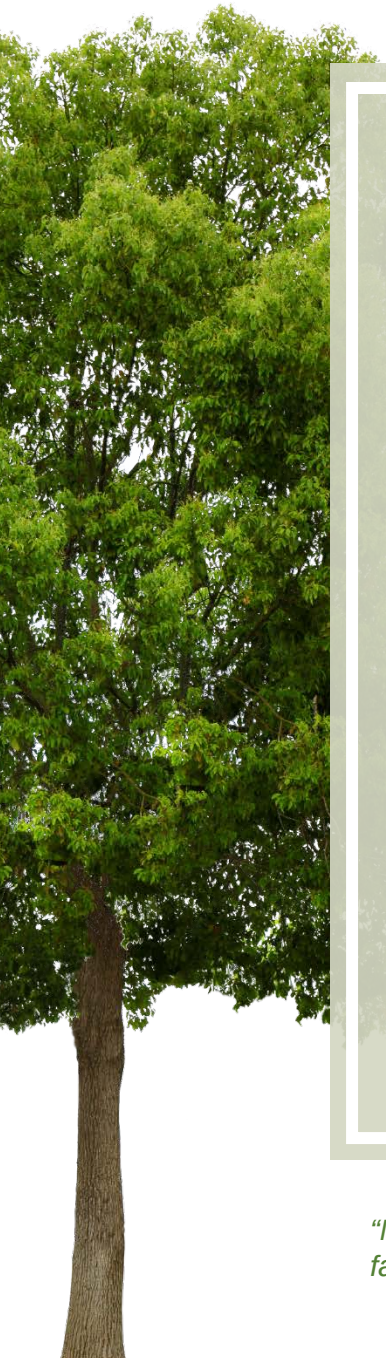
- **Reduce storm water runoff and maintenance costs**
- **Reduce road maintenance costs**
- **Increase energy efficiency**
- **Increase property values**
- **For every $1 spent on urban trees, $3.33 will be returned in benefits**



Environmental

- **Reduce carbon emissions and store carbon**
- **Reduce "heat island effect" lower urban air temperatures**
- **Increase wildlife and biodiversity**
- **Improve water and soil quality**
- **Absorb and contain contaminants from air and soil (remediate)**

BENEFITS OF URBAN TREES IN AKWESASNE



5.5%

Canopy Cover

6 tons

Of atmospheric pollutants removed per year

176 tons

Of carbon sequestered per year

8.6

Trees per acre

25,934

Estimated number of trees within the urban area

$42,000

In annual building energy savings in heating and cooling

2,200,000 *gal*

Of avoided storm water runoff annually

Total of:

$1,500,000

In annual benefits valued in avoided runoff, electricity, air quality, property values, heating, and CO_2 absorption

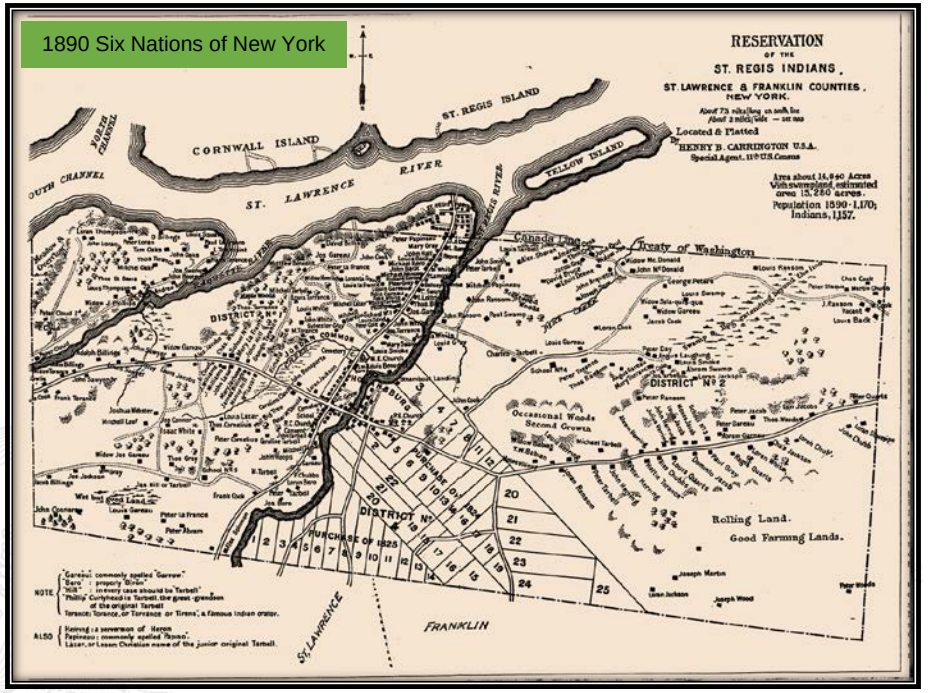
Carbon sequestration is the removal of CO_2 from the atmosphere by plants when they produce food through photosynthesis

"My family always planted trees to improve drainage and beautification on the family farm, and I believe trees to be the foundation of life." – Community Member

AKWESASNE'S URBAN AND COMMUNITY FOREST

HOW THE URBAN FOREST IN AKWESASNE WAS FORMED

Akwesasne prior to settlement in the mid 1700's was known as the "land where the partridge drums its wings" and was the main hunting grounds for the Kanienkehaka (Mohawks). The land was used for hunting, fishing, and trading and was consider a very important region for its abundance of natural resources. The significance of the natural resources in the area could be consider the main reason for the establishment of Akwesasne. Post settlement in the 1890's Southern Akwesasne was approximately 14,640 acres and said to have four "fairly well maintained" roads with "trails" to access the rest of the land. Timber was considered scarce with only small patches of small pines, the remnants of a once dense forest. The main cause of the deforestation was the potash industry in the 1800's. With 97 asheries in Saint Lawrence county in 1845, many of the trees in Akwesasne where cut and burned for potash which at that time was a very profitable industry. Agriculture also played a large role by the end of the 1890's acting as the primary valued resource and further contributed to deforestation as land was cleared to grow crops. Presently a considerable amount of the urban area and surrounding forests are compartmentalized and in an early successional ecological state or "old field succession" with very few patches of old growth forests left.[1]



1890 Six Nations of New York


Roadwork in Akwesasne

"Trees are history. Some trees have been around since before our time. They are a part of the earth and are beneficial to us as onkwehón:we. They give us air to breathe and beauty to look at." – Community Member

AKWESASNE TODAY

Today Akwesasne has moved from forested hunting grounds, to agricultural farmland, on to present conditions of 30% suburban and urbanized areas. This trend of urbanization can be seen nationwide with nearly 81% of Americans now living in developed areas and a 12% increase in urban populations since 2010.[6] These growth patterns are a very real example of how the future may look with a shift to an urbanized form of society. Just in the past 30 years, from street tree planting along state route 37, the creation of Generations Park, to residential housing development occurring on an almost daily basis, Akwesasne has had a steady and continuous expansion of urban and peri-urban spaces.

"Peri-Urban" is the landscape interface between town and country, or the transitional area between the natural forest and the urban forest

ENVIRONMENTAL ASSESSMENT

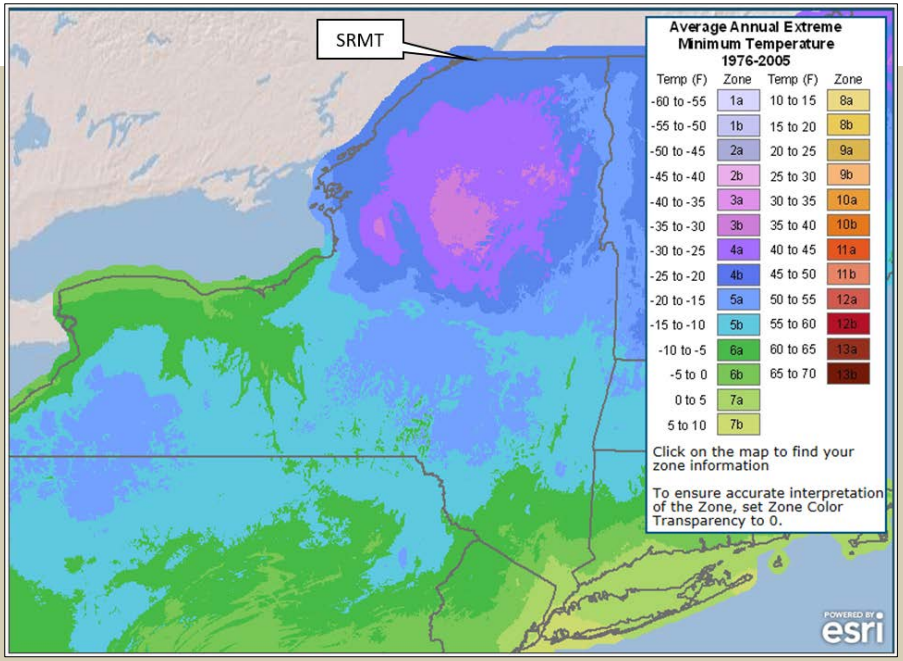
Knowing the environmental conditions of an area help land managers make better decisions by informing them of the areas ecological, biological, and climatic state. (e.g. knowing which tree species will grow well and which ones will not)

TEMPERATURE

In winter, the average temperature is 17.0° F and the average daily minimum temperature is 7.5° F. The lowest temperature on record, which occurred at Massena on January 15, 1957 was -44.0° F. In summer, the average temperature is 66.5 degrees and the average daily maximum temperature is 77.8 degrees. The highest temperature, which occurred at Massena on August 1, 1975, was 100.0° F. The mean minimum temperature for a year encountered in the region over the 30-year period from 1931 – 1960 was 33.1° F. The average period of frost free days is 140 days per year.[1]

CLIMATE ZONE

Akwesasne is located in the 45th parallel in climate zone 4 (USDA zone 4b) which is considered to be a fairly moderate climate. It is within the Saint Lawrence Plains Ecozone (USGS) and is similar to the Great Lakes Lowlands with elevations usually not exceeding 650ft. It is an immense flat plain at an average elevation of 160ft above sea level with a maximum of 230ft near Raquette point and other ridges in Akwesasne. The climate and poor drainage conditions favor the establishment of freshwater wetlands and contribute to a warmer humid climate, which favors a slightly longer growing season and promotes later season harvesting compared to other regions in New York State.[1]



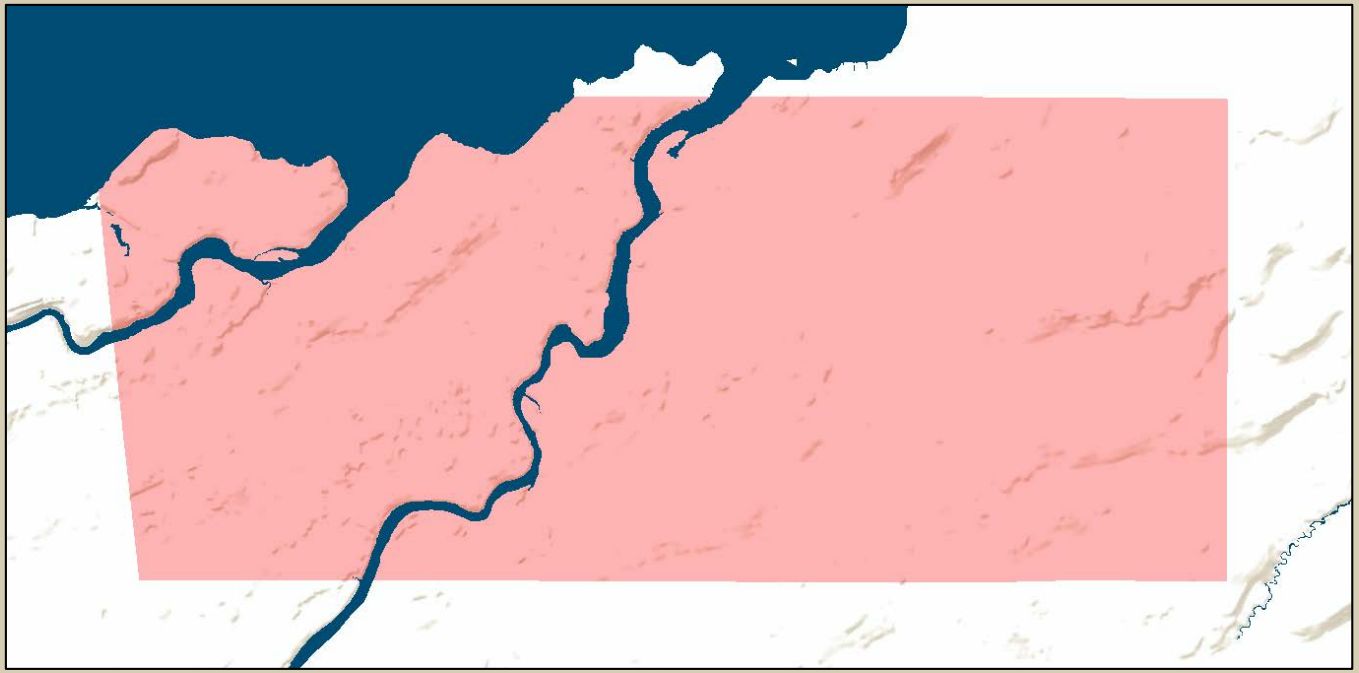
WIND PATTERN

Prevailing winds are from the southwest to west with a mean average wind speed of 10.7 mph typically during the months of November to April.[1]

TOPOGRAPHY

Southern Akwesasne's terrain is very flat, with little variation in elevation change (approx. 130 feet). Two slight ridges running across the area are the only noticeable elevation change in land features.[1]

Elevation Change across Southern Akwesasne

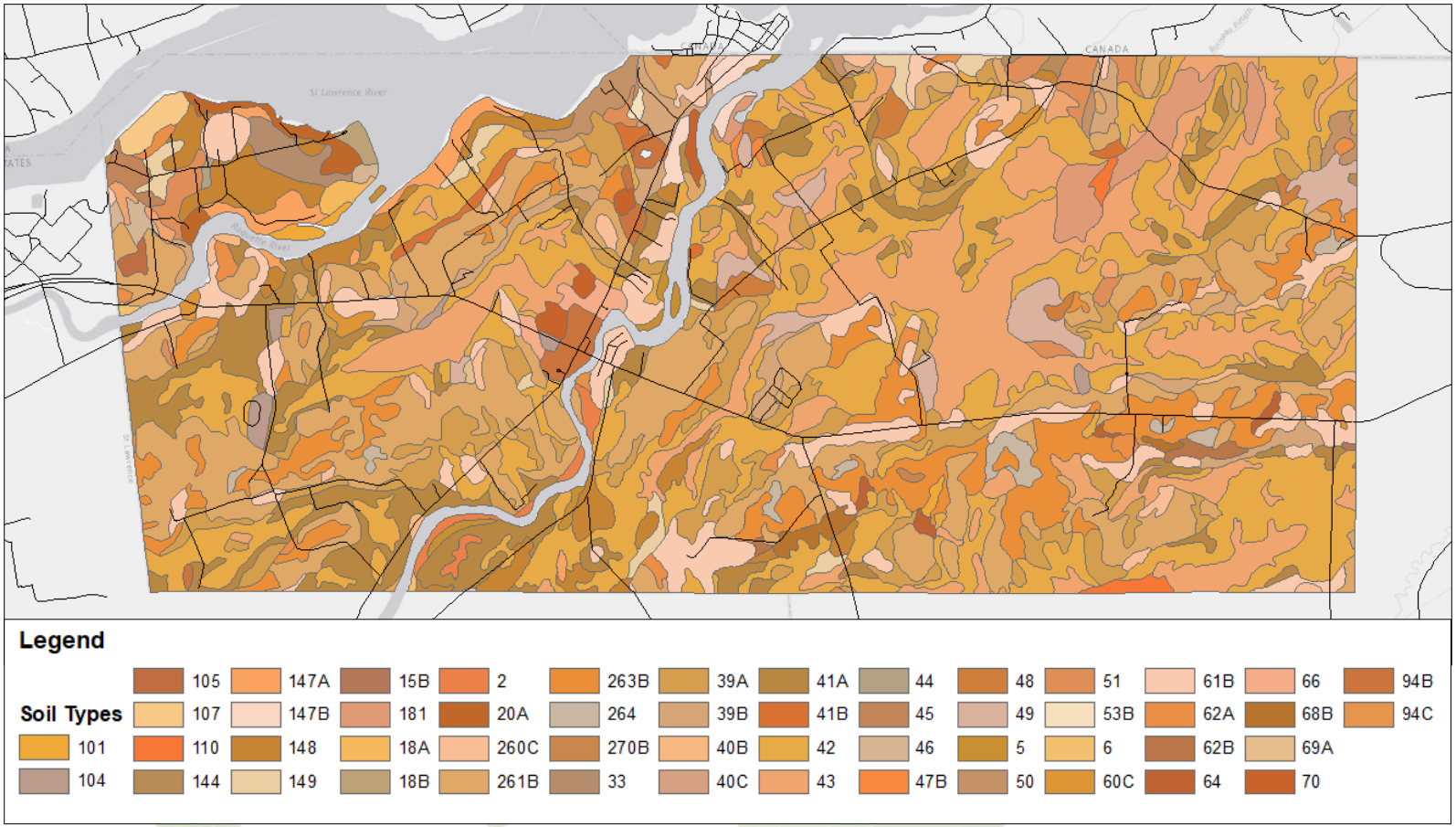


Dark shadowed areas indicate elevation changes, specifically distinct ridges across the land

"Trees are very important to me because they are a vital component to the health of our ecosystem."
– Community Member

SOIL CONDITION

Soils in southern Akwesasne are mostly laminated to massive marine and lacustrine silts and clays. They were deposited in a brackish to salt water environment and their thickness varies from 1 to 50 meters. Muskellunge and Adjidaumo soils are the most common deposits. Ridges of glacial till are scattered throughout Akwesasne and generally trend in a northeast to southeast direction, these loamy soils include Grenville and Hogansburg soils. The remaining soils consist of recent deposits of fine sand and gravel (alluvium and outwash) along stream channels of the Saint Regis and Raquette rivers.[1]



"First and foremost, trees are very important for stabilizing soils and preventing erosion." – Community Member

Soil Unit, Soil Name, Acres, Percent

2 Lovewell very fine sandy loam, stratified substratum 57.7 0.4%

5 Fluvaquents-Udifluvents complex, frequently flooded 47.0 0.3%

6 Redwater fine sandy loam 6.2 0.0%

15B Waddington gravelly loam, 3 to 8 percent slopes 2.1 0.0%

18A Adams loamy sand, 0 to 3 percent slopes 23.6 0.2%

18B Adams loamy sand, 3 to 8 percent slopes 21.3 0.1%

20A Croghan loamy fine sand, 0 to 3 percent slopes 71.7 0.5%

33 Wainola loamy fine sand 73.5 0.5%

39A Churchville silty clay loam, 0 to 3 percent slopes 935.6 6.0%

39B Churchville silty clay loam, 3 to 8 percent slopes 293.6 1.9%

40B Heuvelton silty clay loam, 3 to 8 percent slopes 27.4 0.2%

40C Heuvelton silty clay loam, 8 to 15 percent slopes 2.2 0.0%

41A Muskellunge silty clay loam, 0 to 3 percent slopes 1,070.0 6.9%

41B Muskellunge silty clay loam, 3 to 8 percent slopes 58.4 0.4%

42 Adjidaumo silty clay, 0 to 3 percent slopes 3,179.7 20.4%

43 Adjidaumo mucky silty clay, 0 to 3 percent slopes, frequently ponded 1,771.5 11.4%

44 Mino loam 6.2 0.0%

45 Sciota fine sand 37.4 0.2%

46 Deinache fine sand 33.5 0.2%

47B Elmwood fine sandy loam, 3 to 8 percent slopes 12.9 0.1%

48 Swanton very fine sandy loam 78.8 0.5%

49 Munuscong mucky fine sandy loam 234.5 1.5%

50 Hailesboro silt loam 104.0 0.7%

51 Wegatchie silt loam 152.1 1.0%

53B Nicholville very fine sandy loam, 3 to 8 percent slopes 7.6 0.0%

60C Grenville loam, 8 to 15 percent slopes 41.1 0.3%

61B Hogansburg loam, 3 to 8 percent slopes 878.0 5.6%

62A Malone loam, 0 to 3 percent slopes 87.9 0.6%

62B Malone loam, 3 to 8 percent slopes 28.3 0.2%

64 Runeberg soils, 0 to 3 percent slopes, frequently ponded 30.3 0.2%

66 Matoon silty clay loam, 0 to 3 percent slopes 48.3 0.3%

68B Fahey gravelly fine sandy loam, 3 to 8 percent slopes, loamy substratum 43.6 0.3%

69A Coveytown loamy sand, 0 to 3 percent slopes 4.3 0.0%

70 Guff silty clay loam, 0 to 3 percent slopes 58.6 0.4%

94B Neckrock-Summerville complex, gently sloping, rocky 102.2 0.7%

94C Neckrock-Summerville complex, strongly sloping, rocky 5.6 0.0%

101 Wonsqueak muck 29.4 0.2%

104 Udorthents, wet substratum 57.0 0.4%

105 Udorthents, smoothed 15.0 0.1%

107 Udorthents, loamy 47.5 0.3%

110 Borosaprists and Fluvaquents, frequently flooded 38.6 0.2%

144 Roundabout silt loam 12.7 0.1%

147A Flackville loamy fine sand, 0 to 3 percent slopes 133.7 0.9%

147B Flackville loamy fine sand, 3 to 8 percent slopes 61.4 0.4%

148 Stockholm loamy fine sand 394.7 2.5%

149 Pinconning mucky loamy fine sand 133.2 0.9%

181 Dorval muck 202.4 1.3%

260C Grenville loam, 3 to 15 percent slopes, very stony 122.2 0.8%

261B Hogansburg loam, 0 to 8 percent slopes, very stony 2,232.2 14.3%

263B Malone loam, 0 to 8 percent slopes, very stony 977.4 6.3%

264 Runeberg soils, 0 to 3 percent slopes, very stony 91.8 0.6%

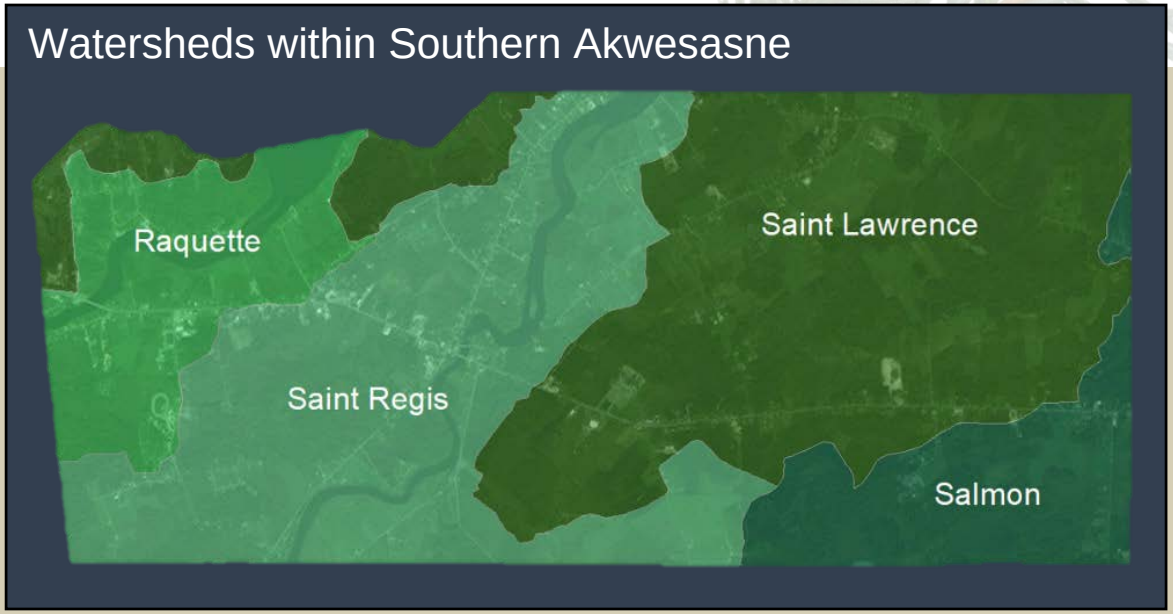
270B Coveytown loamy sand, gently sloping, very stony 4.9 0.0%

PRECIPITATION

The average annual total precipitation is about 34.11 inches. Of this, about 16.0 in. or 47%, usually falls in May through September. The heaviest 1-day rainfall during the period of record was 4.97 inches at Massena on September 14, 1979. Thunderstorms occur on about 23 days each year, most occur in June, July or August.The average seasonal snowfall is 70 in. The greatest snow depth at any one time during the period of record was 44 inches recorded on March 9, 1971. On an average, 100 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 17.0 inches recorded on April 22, 1993. The average relative humidity in mid-afternoon is about 58 percent. Humidity is higher at night, and the average at dawn is about 77 percent. The sun shines 62 percent of the time in summer and 40 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, around 10 miles per hour, from November to April.[1]

WATERSHEDS

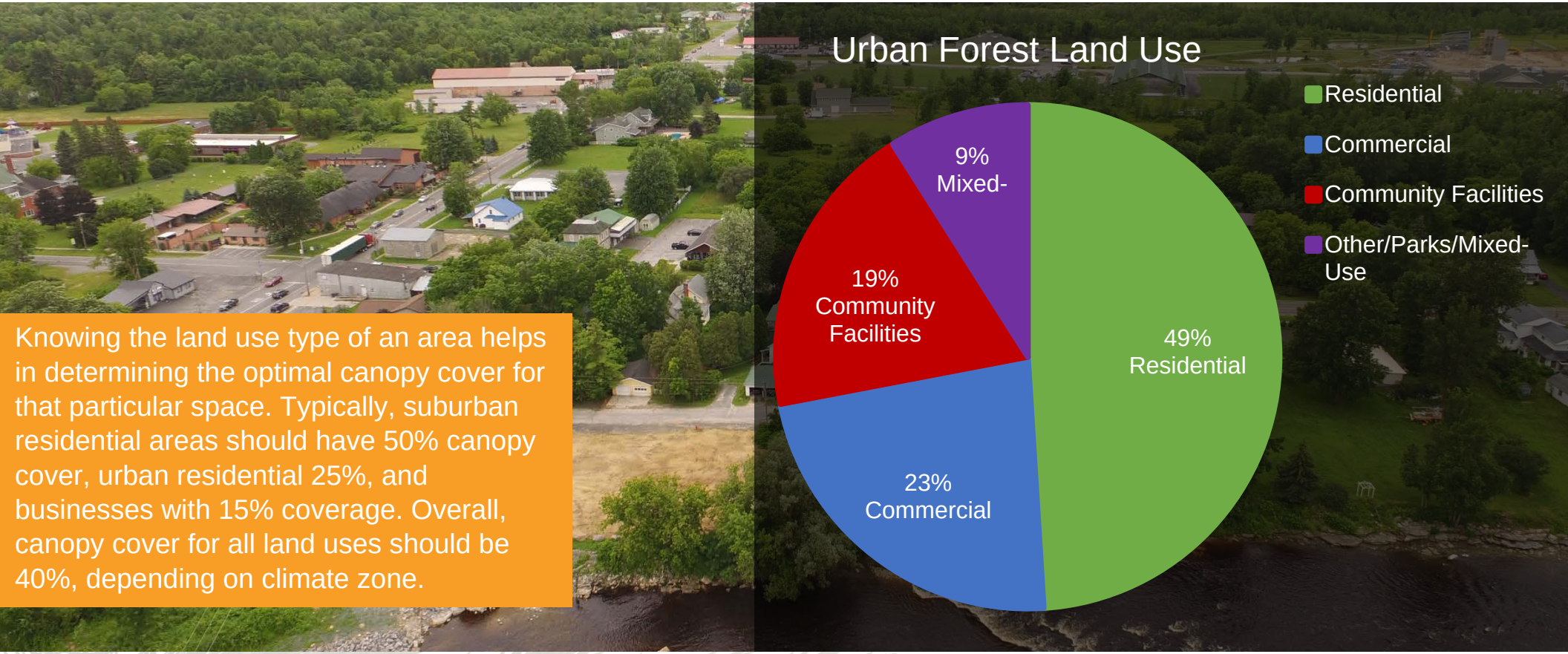
Southern Akwesasne has four distinct watersheds within the Saint Lawrence River Valley. It includes the major tributaries the Raquette River and the Saint Regis River, which converge with the Saint Lawrence River in Akwesasne. The Saint Lawrence River water quality impacts are largely stressed or impaired from sanitary discharge, atmospheric deposition, toxic contamination, onsite septic systems and agriculture and urban/storm runoff. Nonpoint source pollution impacts are a major concern for Akwesasró:non and trees and vegetation help to naturally support watershed health by reducing runoff, reducing water/air temperatures, and improving water quality.[1]



STATUS OF THE URBAN FOREST

LAND USE CATEGORIES

Land use types in the urban interface consists primarily of private/residential property, which make up half of the urban forest. Businesses/commercial buildings account for a quarter of the area, with community buildings and public facilities covering the rest. Other land use areas were found to be a mixture or combination of one or more land use types and make up a small portion of the urban area.

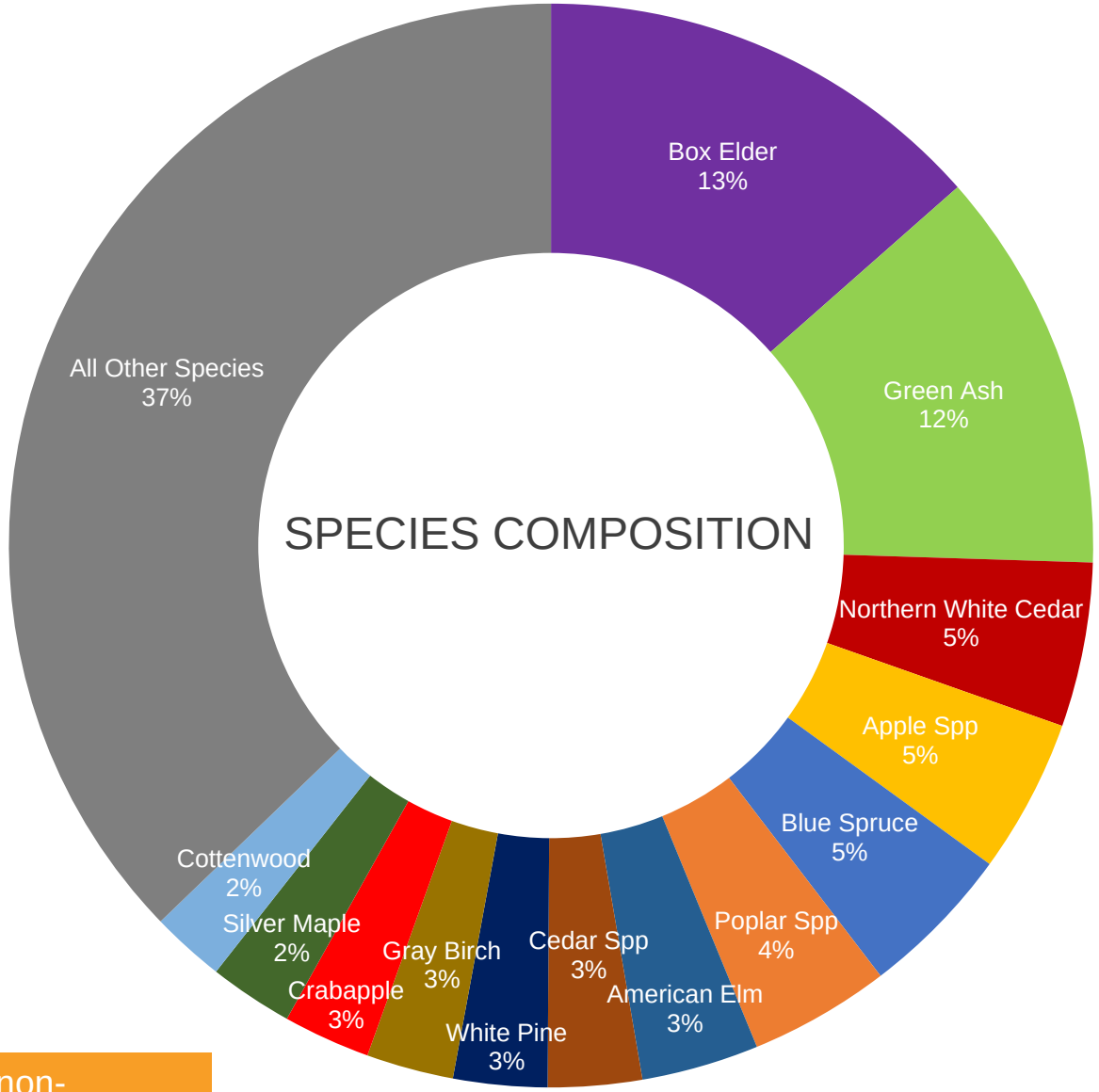


Knowing the land use type of an area helps in determining the optimal canopy cover for that particular space. Typically, suburban residential areas should have 50% canopy cover, urban residential 25%, and businesses with 15% coverage. Overall, canopy cover for all land uses should be 40%, depending on climate zone.

TREE SPECIES COMPOSITION

The most common species present within the urban forest area are Box Alder (13.5%), Green Ash (12%), Northern White Cedar (4.9%), Apple species (4.6%), Blue Spruce (4.6%), Quaking Aspen (4.2%), and American Elm (3.5%). Less common but still prevalent are Cedar species (2.8%), Eastern White Pine (2.8%), Gray Birch (2.6%), Crabapple (2.6%), Silver Maple (2.5%) and Eastern Cottonwood (2.2%). All other species encountered can be seen in (appendix 9).

There are a total of 85 different tree species found in the urban interface. Of those, 69% are native to North America, with the remaining 31% being exotic or non-native to the region.



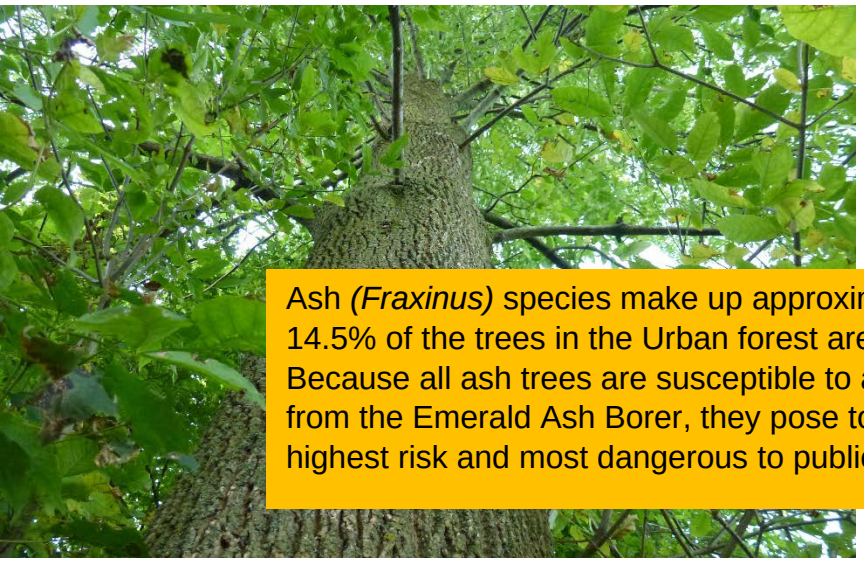
A mix of native and exotic (non-invasive) species minimize vulnerability to disease, storms, drought, pests, and other stressors.

SPECIES CONDITION

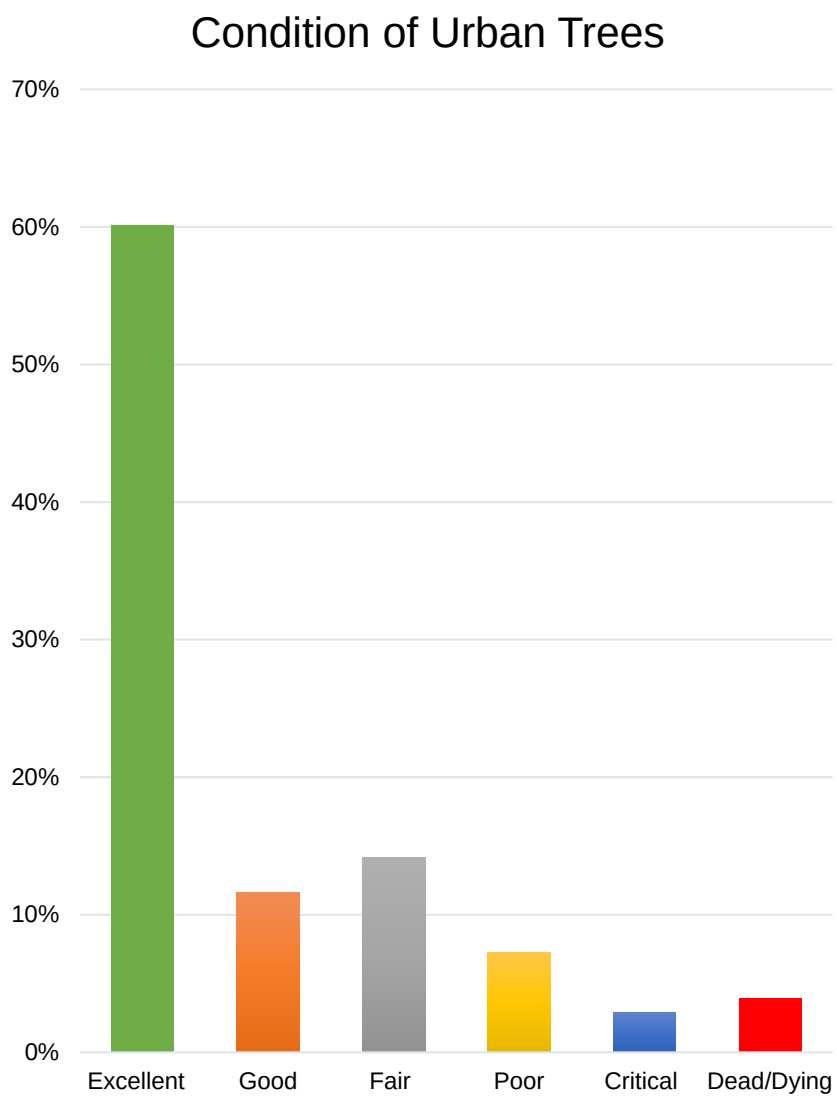
Overall, 60.1% of the trees inventoried were found to be in excellent condition with a full canopy and little to no defects. 11.7% were found in good condition with minor defects and 14.1% in fair condition.

On the other end, 7.2% of the population is in poor health, with 2.9% in critically poor health, these are trees with significant structural defects or dieback. The remaining 4.0% were either dead or dying.

High Risk species or populations in poor or worse condition include American elm (49.5%), Cottonwood species (46.4%), Willow species with (26.7%), Boxelder (25.8%), and Quaking aspen (22.9%).These species are also the most commonly encountered through the Saint Regis Mohawk Tribes annual Hazard Tree Removal Program.



Ash *(Fraxinus)* species make up approximately 14.5% of the trees in the Urban forest area. Because all ash trees are susceptible to attack from the Emerald Ash Borer, they pose to be the highest risk and most dangerous to public safety.



POLLUTION REMOVED

Current tree populations in the urban and community forest remove an estimated 98 lbs. of Carbon Monoxide, 3,457 lbs. of Trioxygen, 673 lbs. of nitrogen Dioxide, 1,617 lbs. of Particulate matter, 354 lbs. of Sulfur Dioxide, 1512 lbs. of Isoprene, 1,390 lbs. of Monoterpene, 2,902 lbs. of Volatile organic compounds, and 352,117 lbs. of Carbon annually.

By increasing the number of trees within the urban area, additional benefits can be provided by effectively reduce pollutants, improve air quality, and increasing human health overall.

CO	O_3	NO_2	SO_2	Particulate matter	Isoprene	Mono-terpene	VOC`s
98	3,457	673	354.3	1,617	1,512	1,390	2,902

Pounds of matter/gas/liquid removed or sequestered through the urban interface per year

O_3 = Trioxygen (Ozone)

PM_{10} = Large Particulate matter

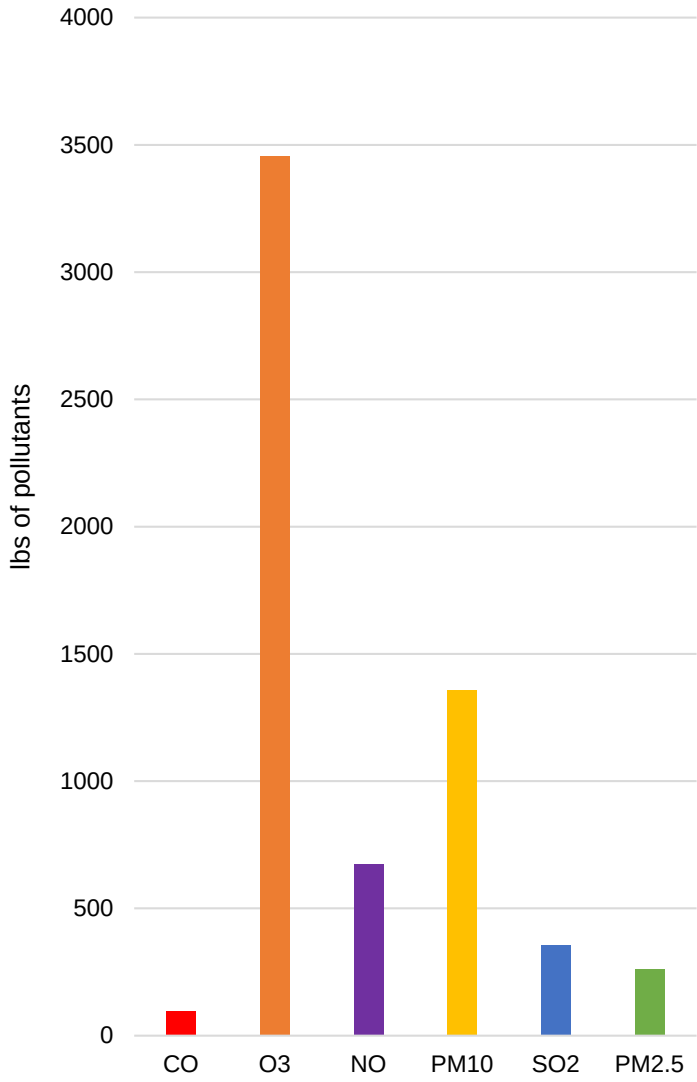
$PM_{2.5}$ = Small Particulate matter

CO = Carbon Monoxide

NO = Nitrogen Oxide

SO_2 = Sulfur Dioxide

Annual Pollution Removed



"Trees are needed to clean the air, absorb pollution, and prevent disease."
– Community Member

CANOPY COVER

Akwesasne has an extremely small canopy cover with only 5.5% of the urban area containing trees or shrubs. Canopy cover directly relates to the quality and quantity of benefits provided to an area and is a very useful tool in management decision making. Knowing Canopy cover provides a blueprint of available and unavailable planting opportunities, where spaces are lacking coverage, and the amount of improvement a particular area needs compared to others. Better knowledge allows for better distribution and monitoring of benefits throughout an area.[7]

"Tree Canopy" is the amount of land or area covered by trees when viewed from above.

Recommended tree canopy goals

- Average tree cover for all zones 40%
- Suburban residential zones 50%
- Urban residential zones 25%
- Central business districts 15%

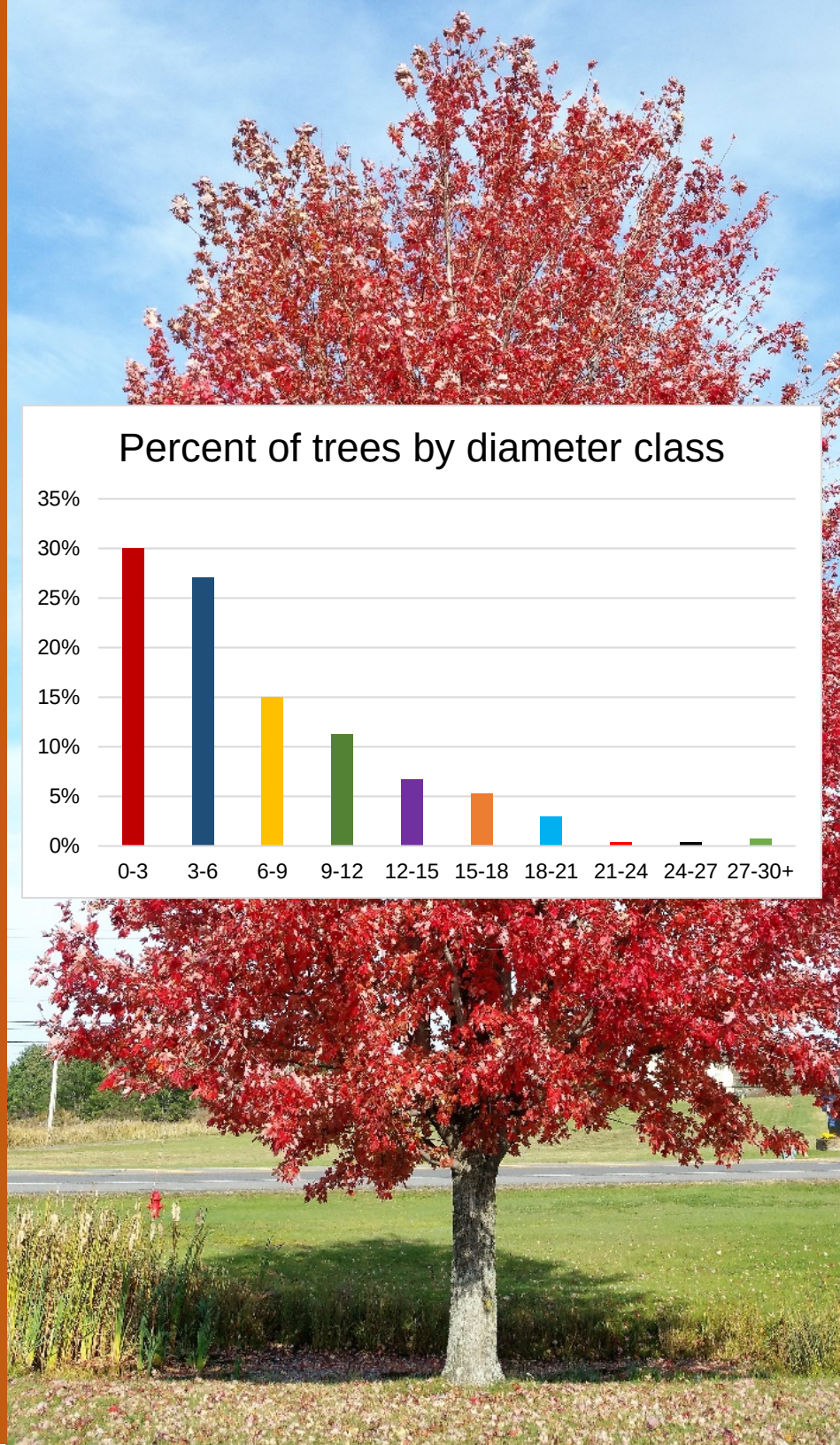
"Trees provide clean air and I believe they are very important for mother earth to survive." – Community Member

AGE DISTRIBUTION

In the urban area, the overall average diameter of trees are 8.7'', with over half (57%) of the population of trees being less than 6". This trend of small diameter trees is also seen in the surrounding forested lands in southern Akwesasne and is most likely contributed to the history of the area being cleared for agriculture and potash production. Although healthy, large trees make the most significant contributions to urban forests in terms of benefits, a diversity of large established mature trees and younger/smaller trees are needed to support complex ecosystems and create unity between the two different structural environments. It is recommended that a typical urban forest consist of 40% young/small trees and 10% large diameter trees. One of the most effective strategies for increasing average tree size is to preserve and manage the existing trees. Proper maintenance and damage prevention are key components of this, such as regular pruning, disease and pest control, or protective/exclusion fencing during construction to prevent soil compaction and root damage.[8]

Ideal size/age composition for an urban forest is 40% younger/smaller trees (i.e. diameters less than 8") and 10% with diameters more than 24".

"We plant 5 trees every year for the 5 people in our family. We use them for medicine and to help the environment." – Community Member



SPECIES DIVERSITY

There should never be more than 10% of any one species, no more than 20% of any genus, and no more than 30% of any family in the urban area.


Ginkgo


PawPaw


Catalpa

Maintaining a variety of species in an urban forest is extremely important in sustaining a forests health and resilience**.** Retaining biodiversity helps to reduce potential widespread infestation or fatality from species-specific insects or diseases. Because forest pests typically affect only one specific species, a single type or group of tree species should never dominate the urban forest. Biodiversity is also important in maintaining natural ecosystem stability and adding functionality and aesthetics to urban landscapes.

Some examples of historically devastating population losses attributed to exotic pest/disease are the American Chestnut Blight in the early 1900's killing nearly 4 billion trees, Dutch Elm Disease since the 1930's killing 40 million, and now the Emerald Ash Borer as of 2003. These large-scale destructive events are a result of over planting of a single genus or species in an area without accounting for future alterations or destructive events.[9]

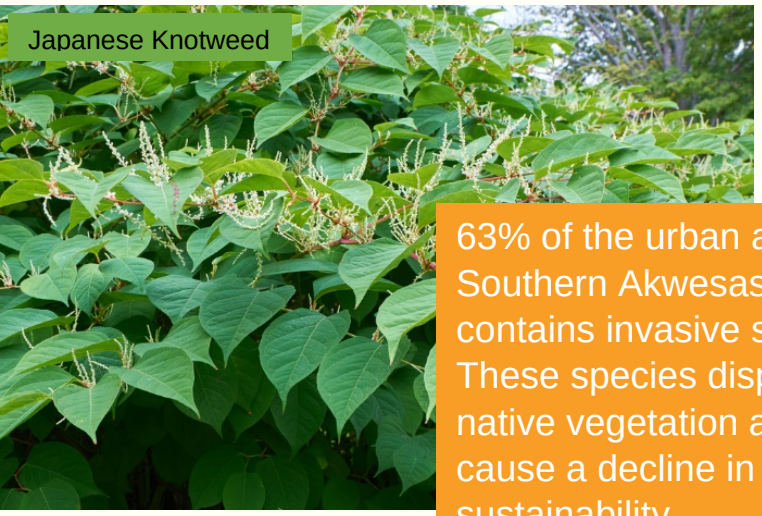
Currently about 69% of the trees in Akwesasne's urban forest are native to North America and 31% are exotic or "non-native". This leaves plenty of room for increasing species diversity with new plantings of trees and shrubs to protect against future infestations of invasive species.

Because of the destructive force of the Emerald Ash Borer, southern Akwesasne poses to lose 14.5% of its urban ash tree population. This is a tremendous loss not only to biodiversity in the urban environment, but also culturally to Akwesasró:non language, traditions, and way of life.

"It is important to have healthy, biodiverse ecosystems. Our future generation's survival depends on it." – Community Member

INVASIVE SPECIES

An invasive species is any kind of living organism, plant, insect, fish, fungus, or bacteria that is not native to an ecosystem. Invasive species have the potential to displace native species, reduce native wildlife habitat, reduce forest health and productivity, alter ecosystem processes and degrade recreation areas. These species in particular tolerate a variety of habitat conditions, grow and reproduce rapidly, compete aggressively for resources (food, water, and sunlight) and lack natural enemies or pests to control their populations.[10] In Southern Akwesasne, nearly 63% of the urban area contains some kind of vegetative invasive species. This issue is of great concern for Akwesasró:non, because losing native plants and animals means losing a piece of cultural heritage and language.


Japanese Knotweed

63% of the urban area in Southern Akwesasne contains invasive species. These species displace native vegetation and cause a decline in sustainability.


Purple Loosestrife

Invasive Species Encountered

Common Buckthorn *(Rhamnus cathartica)*

Common Hawthorn *(Crataegus monogyna)*

Wild Parsnip *(Pastinaca sativa)*

Angelica *(Angelica archangelica)*

Tartarian Honeysuckle *(Lonicera tatarica)*

Staghorn Sumac *(Rhus typhina)* (native)

Lesser Burdock *(Arctium minus)*

Chinese Aspen *(Populus adenopoda)*

White Poplar *(Populus alba)*

Common Reed *(Phragmites australis)*

Japanese Knotweed *(Fallopia japonica)*

Purple Loosestrife (*Lythrum salicaria)*

Norway Maple (*Acer platanoides)*

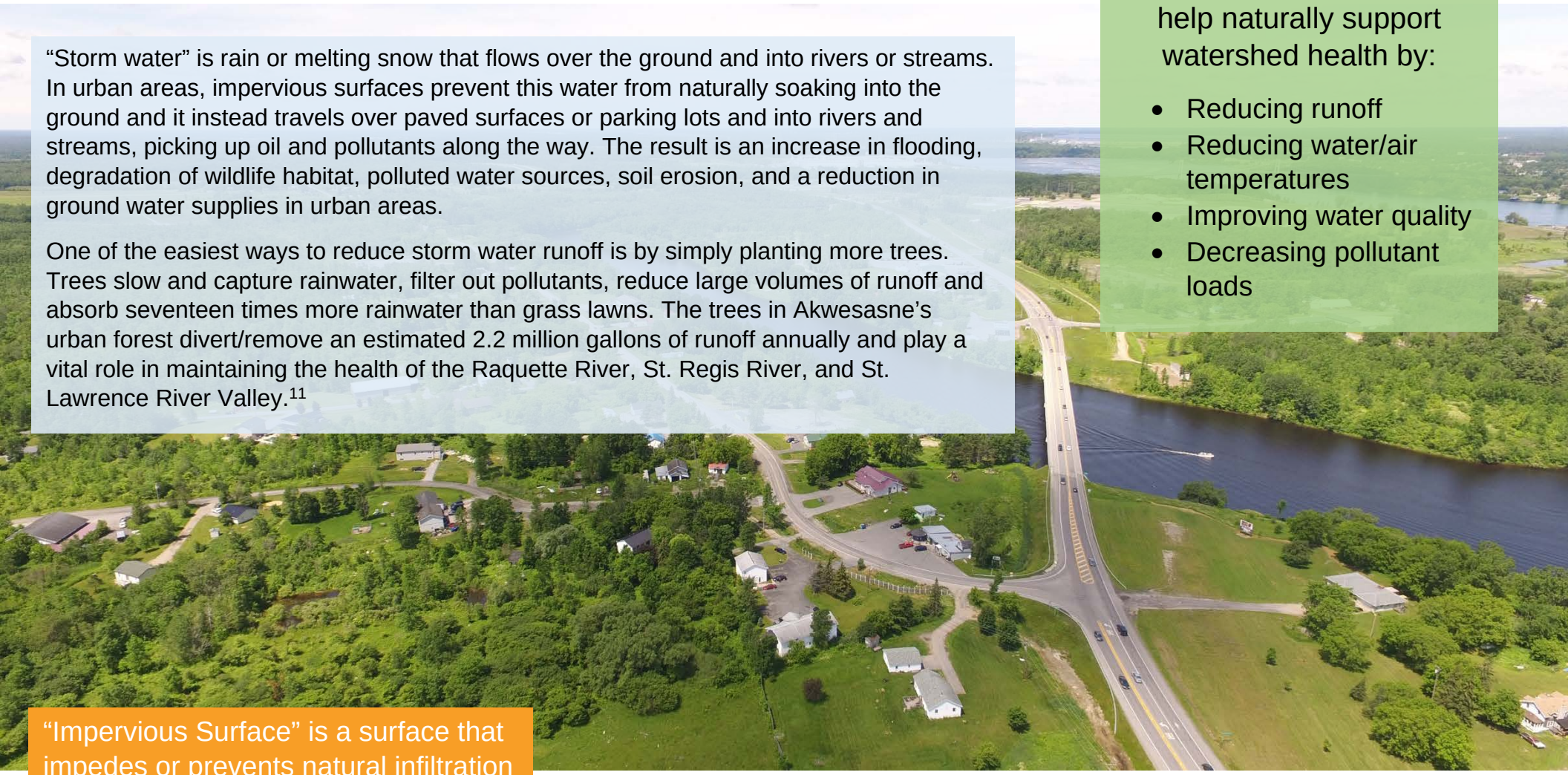
AVOIDED RUNOFF

“Storm water” is rain or melting snow that flows over the ground and into rivers or streams. In urban areas, impervious surfaces prevent this water from naturally soaking into the ground and it instead travels over paved surfaces or parking lots and into rivers and streams, picking up oil and pollutants along the way. The result is an increase in flooding, degradation of wildlife habitat, polluted water sources, soil erosion, and a reduction in ground water supplies in urban areas.

One of the easiest ways to reduce storm water runoff is by simply planting more trees. Trees slow and capture rainwater, filter out pollutants, reduce large volumes of runoff and absorb seventeen times more rainwater than grass lawns. The trees in Akwesasne’s urban forest divert/remove an estimated 2.2 million gallons of runoff annually and play a vital role in maintaining the health of the Raquette River, St. Regis River, and St. Lawrence River Valley.[11]

Urban trees and vegetation help naturally support watershed health by:

- Reducing runoff
- Reducing water/air temperatures
- Improving water quality
- Decreasing pollutant loads



“Impervious Surface” is a surface that impedes or prevents natural infiltration of water into the soil (ea. driveways, sidewalks, parking lots, etc.)

TREES AND ENERGY SAVINGS

Trees affect energy consumption in urban areas by shading buildings, cooling air temperatures, and blocking cold winter winds. Homeowners that utilize properly placed trees in their landscaping “energy efficient landscaping” benefit from reduced building energy consumption and lower monthly heating and cooling costs. These small individual energy savings, spread out over the entire urban area add up to reduce the overall demand for power production and consumption and benefit the community as a whole.

When planting a tree to reduce energy costs, the species, site location, type of building, and climate zone should be considered. The main goal is to provide sun to a building in the winter and shade in the summer.[12] (See appendix 8)

Energy Efficient Landscaping

- Just three strategically placed trees can decrease utility bills by 50%
- Deciduous trees shade your house in the summer providing 10-30% savings in cooling costs

The trees in the urban and community forest provide annual energy saving effects of:

4,557 kWh in heating per year.

6,473 kWh in cooling per year.

An estimated $42,000 in annual building energy savings.

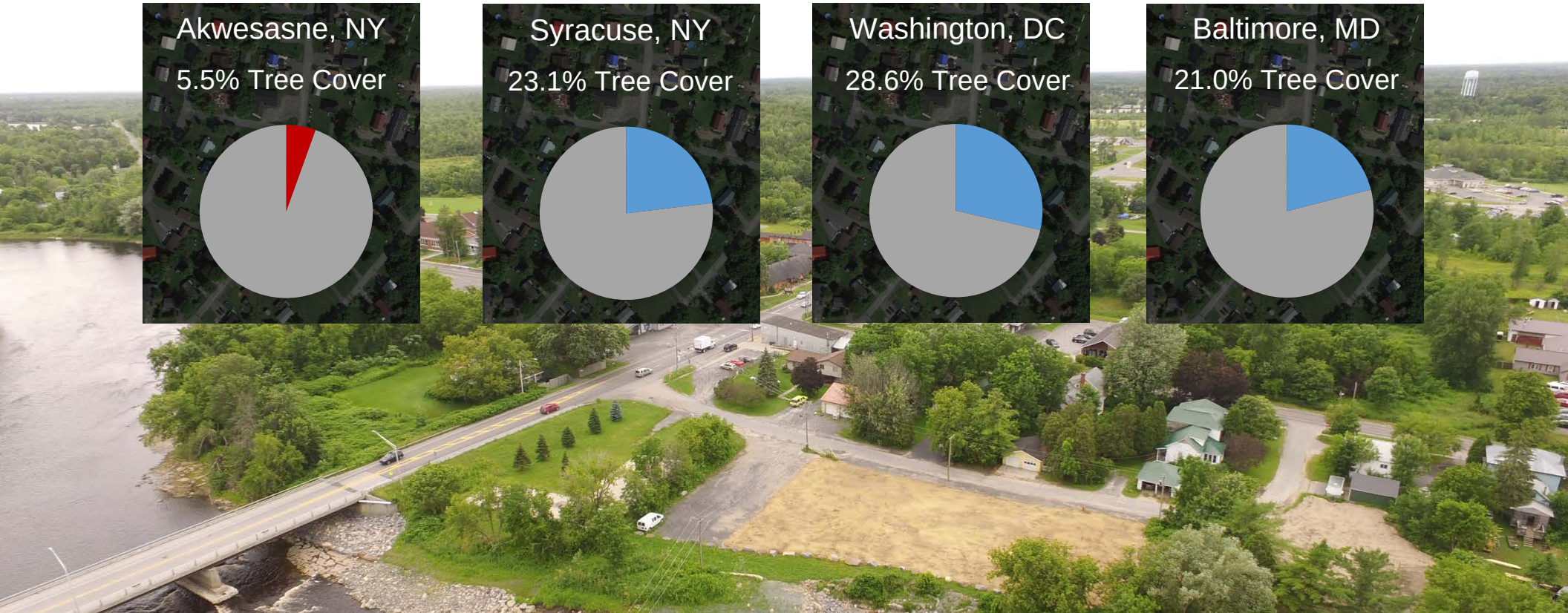
“Trees are an important and necessary part of the environmental life cycle!” – Community Member

ISSUES FACING THE URBAN FOREST

Page

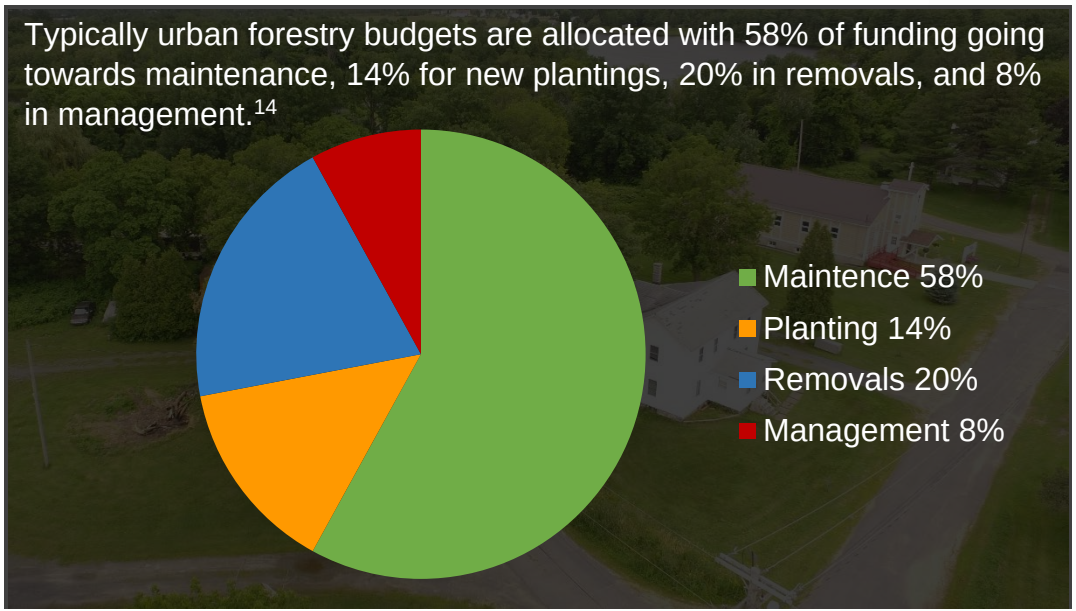
Low Canopy Cover

Akwesasne's extremely low canopy cover of 5.5% is a very important indicator for the need in improvement. This number directly relates to the number of trees and the benefits they provide to the area. Compared to other cities/urban areas, Akwesasne has one of the lowest canopy covers. Although southern Akwesasne is not comparable in size or acreage to a major city, the same rules apply in terms of the correlation between tree density and the amount of benefits provided. Urban tree canopy percentage is just one of many criteria to consider in measuring or quantifying the health of an urban forest. Other factors include age class diversity, species diversity, number of healthy trees, etc. All of these features should be factored in when determining appropriate canopy cover goals for an urban forest. Ensuring an adequate establishment of new trees and the preservation of old heritage trees is the best way to offset loss in tree canopy cover due to tree mortality, development, or other impacts on the environment caused by human influences.[13]



Inadequate Funding

One of the main issues affecting the urban forest is a lack of funding. This issue stems from an inherent lack of resources coupled with the behavior of just responding to issues, rather than taking a proactive or preventative approach. With all of the existing funding allocated to responding to hazard tree removals, which are very important for public safety, it leaves little to no money left for the maintenance of the urban forest. By adopting a proactive urban forest management strategy and allocating funding to maintenance rather than just removals, many of the current issues such as the high number of hazard trees could be significantly reduced and in some situations eliminate the need for certain tree removals altogether. This issue is a common problem and relates to urban forests being viewed as an unnecessary luxury and not a vital component of public health and safety in communities.[14]



Funding Guidelines:

From future population projections, in 2040 it is estimated that there will be 18,776 people residing in Akwesasne[1]. Based on cost-benefit analysis, the average municipal urban forestry budgets and average per capita expenditure by population level, similar to that of Akwesasne are:

Population	Annual Budget	Per Capita
10,000-29,999	$172,465	$9.57

(Annual urban forest budget based on population size)

Little to No Maintenance Performed

With 72% of the urban forest privately owned many of the trees in Akwesasne lack maintenance and regular pruning, at no fault to the property owner. Maintaining healthy urban trees often requires an investment and sometimes costly, specialized skills that can only be performed by a certified Arborist, such as pruning that requires climbing, specific equipment, or certification/licensing. These costs are typically viewed as a luxury or not a necessity and are often not prioritized in a homeowners or businesses budgets.

On the other hand, improper maintenance can be just as damaging if not more in certain cases. Education on proper tree care is a crucial factor in maintaining tree health, public safety, community benefits, etc. With basic education and outreach on the needs of urban trees, proper pruning methods, correct planting techniques, and regular maintenance, many of the current issues can be corrected with considerable improvements to the urban and community forest.[15] (See appendix 5 & 6)


Mulch is not touching trunk of tree


Burlap & wire removed from root ball


Specialized pruning

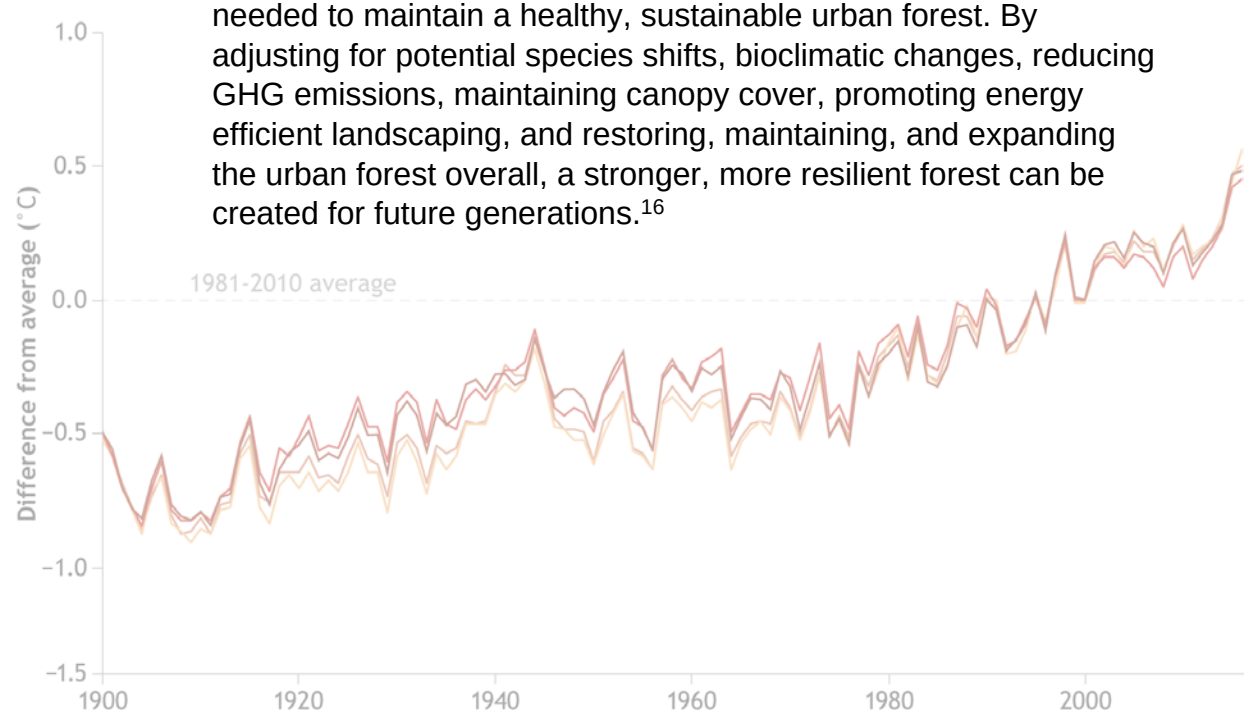

Hole is 2-3 times the size of the root ball


Loosening encircling roots

Climate Change

Urban forests play a vital role in mitigating the effects caused by climate change. With 40-70% of all greenhouse gases worldwide originating from urban areas, urban trees are the first line of defense in reducing GHG emissions. Climate change causes extremes in seasonal temperatures and alter precipitation patterns, creating stressors on the urban forest with longer, more frequent droughts, increased flooding, altered water cycles, and disruptions in natural biotic functions. These changes can cause a decline in urban forest species diversity, exacerbate the threat from invasive species and pests, increase the severity and extent of storm damage, and alter species ranges and regeneration rates.

In order to reduce the potential impacts to the urban forest, proactive management coupled with adaptation strategies will be needed to maintain a healthy, sustainable urban forest. By adjusting for potential species shifts, bioclimatic changes, reducing GHG emissions, maintaining canopy cover, promoting energy efficient landscaping, and restoring, maintaining, and expanding the urban forest overall, a stronger, more resilient forest can be created for future generations.[16]



Warmer winter temperatures (e.g. Loss of Ice Bridge in Snye)

Damage from invasive species (e.g. Emerald Ash Borer)

Increased flooding events (e.g. Flooding along Cook rd.)

Unnecessary Damage during Construction

During the construction of new homes and buildings, existing trees are often susceptible to damage from building operations, and in many cases deadly to nearby trees. Some of the most common damages that occur are physical injuries to trunks and crowns, root cutting, soil compaction, smothering of roots by added soils, and exposure to the elements. In many cases, this damage can be avoided with proper planning and care to protect trees on construction sites.[17] (see appendix 3)


Physical injuries

Tree exclusion zone

Exclusion fencing around the dripline of trees


Root cutting

Very few urban trees die of “old age”. Mechanical damage and improper tree care kill more trees than any insects or diseases.

Methods for protecting trees during construction:

- Determine if the tree should be preserved. Not all trees on building sites can or should be saved. Assess the health and structural integrity, species, size, age, and location. Some trees species are more sensitive to compaction, grade changes, and root damage and should be removed prior to construction.

- Make changes to the construction plan. Small changes in the placement or design of buildings and driveways can make a significant difference in tree survival.

- Alternative construction methods when digging, such as bridging over roots, tunneling/trenching utilities, or use of air spades.

- Erect barriers or fencing around trees to prevent damage. Setup exclusion fencing around the dripline of trees to prevent soil compaction, root damage etc.

- Limit access to construction sites allowing only one access route on and off the property. All equipment should be limited to only drive and park in this area to avoid root damage and soil compaction.

Air spade trenching to prevent root damage

Invasive Species and Lack of Biodiversity

In Akwesasne, invasive species displace many native trees and shrubs and take over large portions of the urban forest. They cause harm to the economy, environment, human health and reduce many of the benefits urban trees provide to the community. They degrade wildlife habitat, disrupt ecosystems, destroy cultural resources, and divert funding for control and removal activities. Invasive species pose one of the greatest risks to the health and diversity of urban forests.

With 66.7% of the land in the United States comprised of urban, suburban, agriculture and other humanly influenced areas, only 33.3% is forested and in a relatively natural unchanged state. Because of this, many of the natural ecosystems are reduced to small fragmented areas, which cannot support high levels of species diversity. Urban areas provide a unique opportunity to encourage both native and non-native species diversity by preserving natural environments and creating new exotic/non-native ones. By planting a number of different species and diversifying urban ecosystems, protection against invasive species can be created, significantly reducing the chance of widespread disease and pest outbreaks.[18]


Phragmites


Common Buckthorn

How to prevent the spread

- Do not plant known invasive species.
- Select diverse species of trees and shrubs.
- Use plant materials that are site appropriate and less susceptible to damaging pests and diseases.
- Avoid unnecessary soil disturbance.
- Minimize the transport of materials that may contain invasives.
- Minimize the movement of invasive species to non-infested areas during construction activities.
- Prior to relocating equipment, remove soil and debris by scraping, brushing, or washing.
- Remove soil, seeds, and other debris from shoes, clothing, and tools prior to leaving an area.
- Reduce the introduction of insects and diseases by avoiding unnecessary wounding of trees and other vegetation.[19]


Wild Parsnip

COMMUNITY VALUES

Community Values

Urban forests make important contributions to a community's well-being, vitality, value, and provide important social benefits that strengthen community connectivity. In order to better understand how the community views trees and the values they hold both culturally and spiritually, a collaborative gathering for Akwesasro:non Forest Stewardship was held, along with community surveys to determine the communities concerns, desires, and insights regarding the urban forest.

Collaborative Gathering results

A collaborative gathering was hosted on June 3rd, 2017 at the Akwesasne Housing Authority Training Center. The purpose of the gathering was to articulate Akwesasron:non values as they relate to Forest Stewardship. Below are the results of the conversation and thoughts of those in attendance at the gathering. These values are further articulated and expanded in individual interviews and will be finalized in the thesis in progress as of 12/29/17, "Haudenosaunee Forest Stewardship: Bridging biological and cultural knowledge towards community empowerment."

Values

1. Culture: Areas or places valued because they are necessary to the continuation of traditions and knowledge within Akwesasne.
    - Indicators: The natural world tells our people the timing of ceremonies
    - Basket Making: There is a long history and tradition of this activity in Akwesasne. It is important economically, as well as culturally. The knowledge around it is specific to the forest and is threatened by the emerald ash borer.
    - Teachings:

        - Ohenton Karihwatehkwen (Thanksgiving Address): Helps situate people in their ecological reality and understand that everything has a role and responsibility.
        - Original Instructions: Responsible to be thankful and offer tobacco.
        - Kaianerekowa (Great Law): Peace, Power and Good Mind.
    - Language: language is verb-based and connected to the land. It is very important to Akwesasronon and directly connected to the stewardship of the forest.
    - Names: This is intimately connected to language. It is separate because it plays a special role within Haudenosaunee culture. They tell stories and speak to a person's purpose which gives a sense of identity.
    - Lessons: There are skills and lessons within the forest. Hands-on learning can help teach students the result of their hard work, (e.g. cutting, splitting, and stacking wood to prepare a fire.) There is guidance embedded in these processes that are connected to the culture.
2. Connection to the land: Areas or places valued because they provide an access point for connecting with and maintaining a relationship with the land, which is a part of Haudenosaunee responsibilities.
    - Experience: This helps shape people's relationship with the forest and the rest of the world. The forest can share lessons about reciprocity. It can help open a person's mind up to the original instructions and being present in a simple and quite space for reflection to obtain peace and serenity. People are moved emotionally by the forest because it moves them, such as sadness to see a deplorable forest. Spirit talking happens in this space. It is a healing space, as trees can pull the sickness from you and the oxygen is concentrated to help with healing. The wellness and strength of the men in Akwesasne is connected to the forest, which is lacking. The forest is a great platform for mentorship and learning.
    - Roles and Responsibilities: Haudenosaunee recognize themselves as stewards of the land, which is expanded upon in the Ohenton Karihwatehkwen. The original instruction tells the Haudenosaunee that their number one responsibility is to care for Mother Earth. The relationship with the forest needs to be respectful and taken seriously with a good mind.
    - History: The way people relate to the land and the stories it holds.

3. Learning: Areas or places valued because they present opportunities to learn about culture, history and environment.
    - Ononhkwaon:we (Traditional Medicine): It is an incredibly valuable resource that is emphasized by elders in Akwesasne. The continuity and integrity of this knowledge must be maintained so future generations can benefit from it.
    - Practical Knowledge: There are certain properties associated with different varieties of wood that make them useful in different ways.
    - Role Models: There is a need for them because they make the learning process easier.
4. Spirit: Areas or places valued because they have a cultural significance connected to the continuity of ceremonies or connected to our stories.
    - Sacred Space: It is an area appropriate for ceremony, learning, healing, etc.
    - Ohero:kon: This is a coming of age ceremony that helps the youth connect with the natural world as they make the transition into adulthood. They receive twenty weeks of traditional education that culminates in a one to four day fast depending on years with Ohero:kon.
5. Recreation: Areas or places valued because they provide places for outdoor recreation activities and experiences.
    - Youth: It is a place for them to play and learn.
6. Biological: Areas or places valued because they are important for medicines, plants, trees, and wildlife to proliferate and fulfill their roles and responsibilities.
    - Tree Species:
        - Maple: It is the leader of all trees, referenced in the Ohenton Karihwatehkwen.
        - Slippery Elm: It is a rare species in Akwesasne. It is important because it is a medicine used often in the community. Thus, it must be safeguarded, if possible.
        - Black Ash: This is a species of very high concern. It has a high cultural significance that is connected to basket making, which has a long history in Akwesasne.

        - Black Walnut: It is an important medicine.
        - White Pine: It is the symbol for the tree of peace, which is connected to the Kaianerekowa (Great Law). There are a lot of metaphors stored in it. It has value as a medicine as well.
        - Apples Trees: important food source.
    - Other Species: Important parts of the forest cycle
        - Squirrels
        - Birds
        - Bees
        - Deer
7. Life Sustaining: Areas or places valued because they provide food, shelter, energy, and a means for the community to reach sustainable self-sufficiency.
    - Food: The forest provides sustenance for the community - fruits, nuts, and berries, such as apples in the fall and berries in the summer.
    - Shelter: It is a place for people, animals, and medicine to find refuge. A participant in the Collaborative Gathering stated, “A tree laid down to help something.” This statement speaks to the roles of the trees when they die. The canopy of the trees is another aspect of providing protection for animals, medicines, shade, etc.
    - Fuel: Firewood provides heat in the winter. The creation of fire provides an important lesson and is essential part of most ceremonies.
    - Services: Trees are a part of creation. They are an important part of the creation story. The trees care for people by binding the earth with their roots and producing oxygen.
8. Wellness: Places or areas valued because they provide a space for aiding people in acquiring a holistic well-being.

- Health: It is expressed from a holistic perspective in Akwesasne. It is connected to the medicine wheel - mental, emotional, physical and spiritual. These aspects of a person's being that need to be addressed for them to have a good mind and wellbeing.

Akwesasne Community Forest Survey results

The Akwesasne community forest survey was administered to three separate demographics in order to distinguish any variations in age or generational differences. The survey was given to attendees at the monthly community tribal meeting (ages 50+), Akwesasne Boys and Girls Club (ages 12-14), Career Pathways Program (students 16-21), and an online survey with all ages participating.

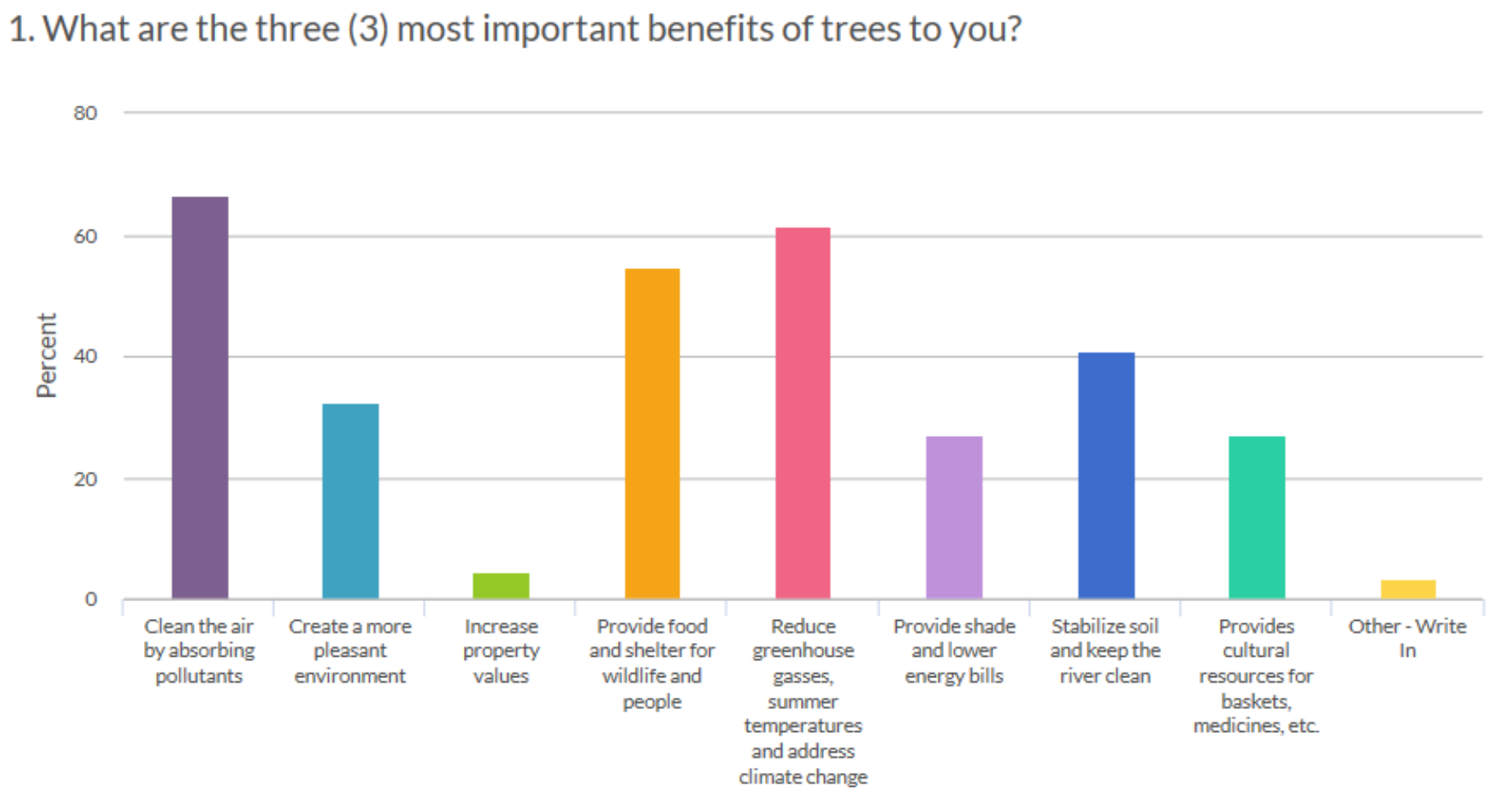
After compiling the community forest surveys, the results show that some of the most important aspects of the plan should focus on improving air quality, reducing greenhouse gasses, addressing climate change, and increasing the benefits provided by trees such as food and shelter for people and wildlife. The areas that need improvement are public areas, streets, and residential dwellings. A majority of the community support the development of a management plan to improve the urban forest and are willing to volunteer to plant and maintain trees on their property.

The surveys also showed how important trees are to Akwesasro:non on a personal level. Some of the responses illustrate the connection people have to trees both physically and spiritually.

"Trees are important to me because I have basket makers in my family, I have fishermen in my family, gardeners, as I am a gardener myself, and trees provide benefits to all of those things in so many ways. Trees provide clean oxygen and water for our bodies, and we need them in all realms of life." – Community member.

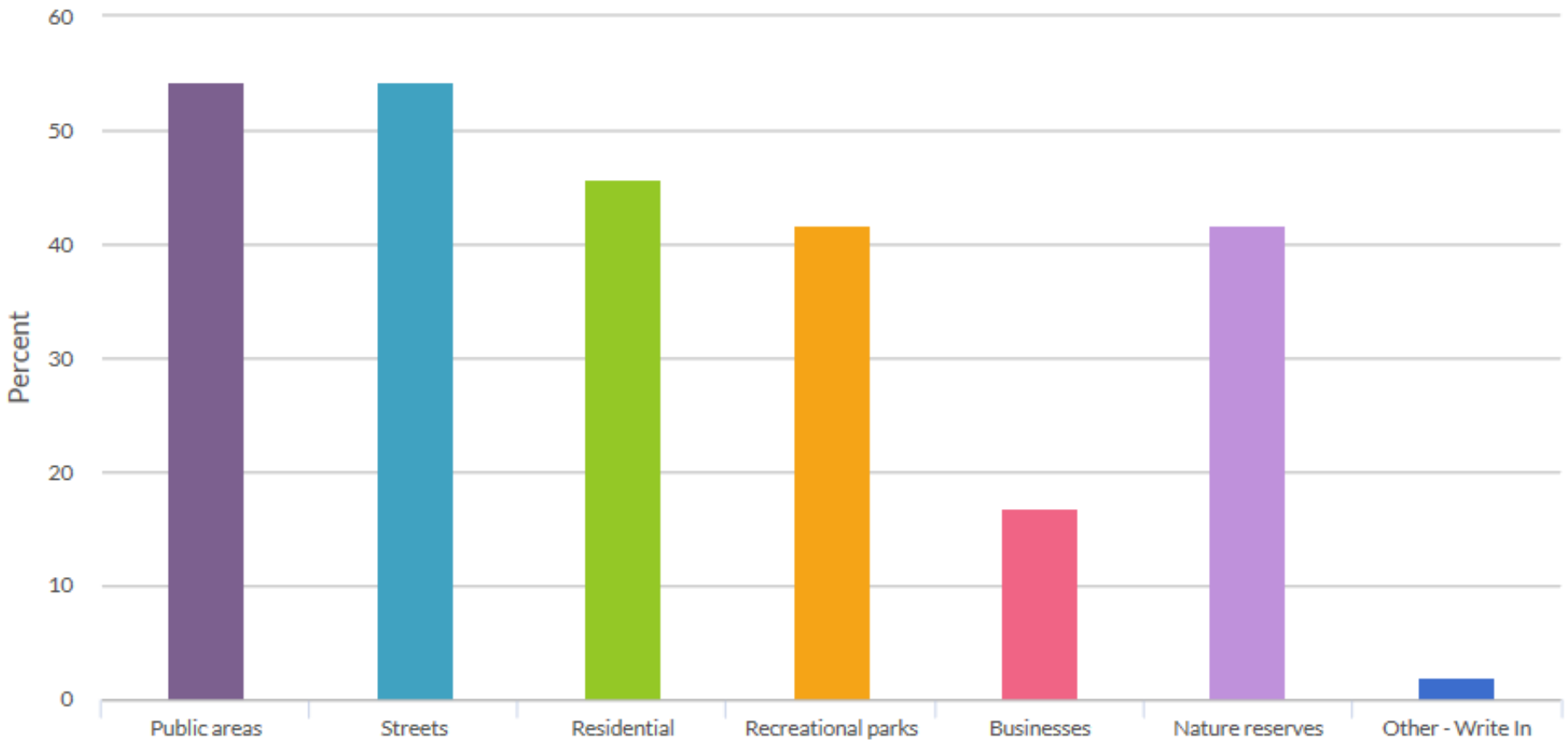
"Trees are such a valuable resource. Their importance is beyond monetary gain. They are such an important part of our culture. They represent pieces of who we are and are essential to the preservation of language and culture. It is our responsibility to care for them." – Community member.

Survey Question responses



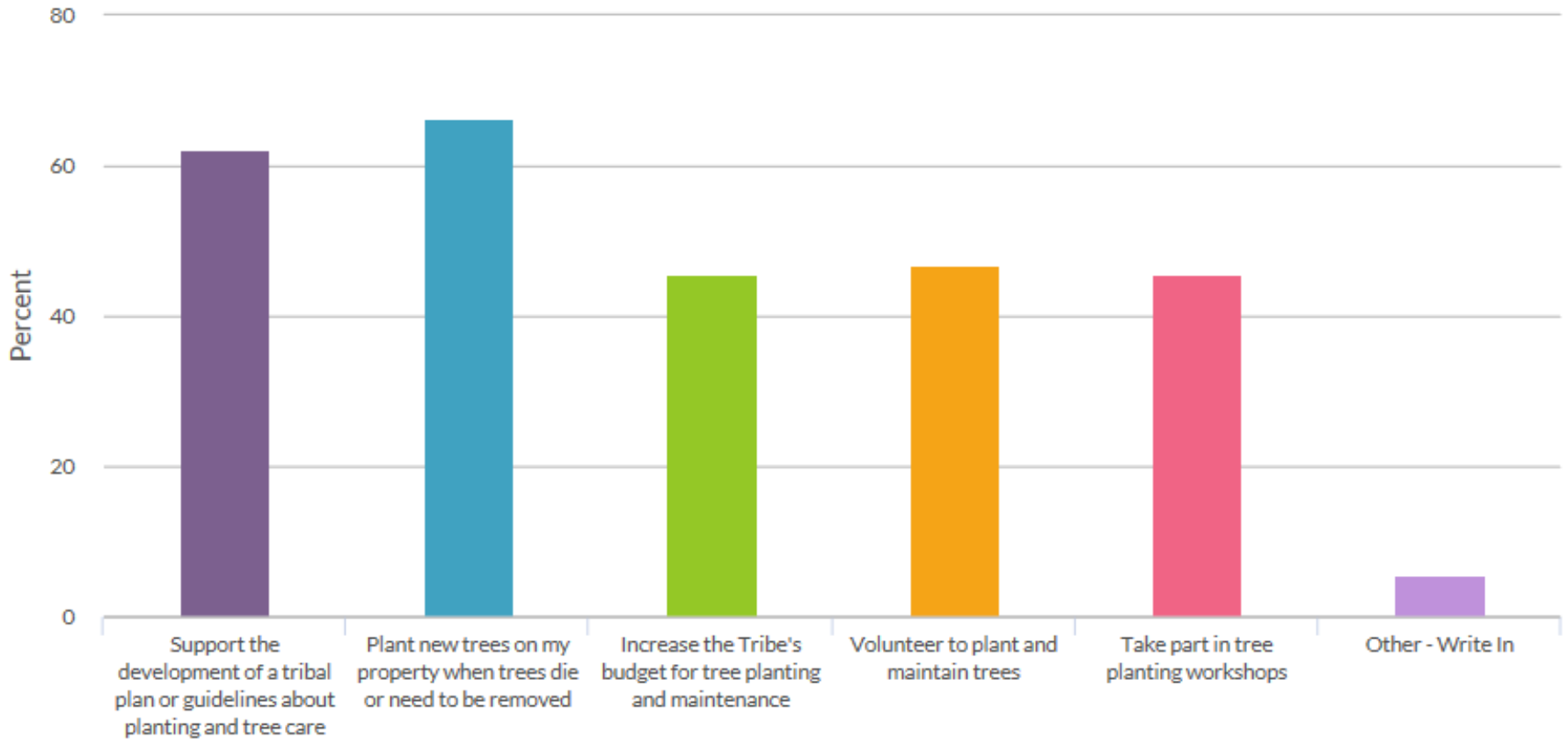
Other-written in responses include traditional teachings and knowledge, relaxation in the shade under trees, and natural learning experiences.

3. In Akwesasne, what areas should be improved?



Other-written in responses include improving homeowners lawns/landscaping.

4. What would you be willing to do to ensure Akwesasne trees are maintained and protected for future generations? (check all that apply)



Other-written in responses include contributions of skills to support the implementation of the project, donations of tree seedlings and other materials to help offset costs, teaching community members about the cultural importance of trees, self-education to be better able to help out .

STRATEGY FRAMEWORK

STRATEGIC PLAN

The basis for the management plan is comprised of the following five goals for the urban forest. Each goal is accompanied by a series of objectives and actions needed to achieve the desired outcome.

Increase

Goal 1

Increase and preserve proper canopy cover and green infrastructure throughout Akwesasne to provide optimal benefits to the community.

Protect

Goal 2

Protect Akwesasne's existing urban and community forest from damage and loss.

Maintain

Goal 3

Maintain the urban and community forest in Akwesasne with a cooperative effort between agencies, inter-tribal departments, and the community.

Fund

Goal 4

Secure a long-term **funding** strategy for the urban and community forest in Akwesasne.

Engage

Goal 5

Engage the community, local groups, and businesses in caring for the urban and community forest.

"We are connected with trees and we would not exist without them." – Community Member

Goal 1: **Increase and preserve proper canopy cover and a reasonable distribution of green infrastructure throughout Akwesasne to provide optimal benefits to the community by increasing the existing canopy cover of 5.5 percent to 35 percent overall by 2048.**

Objective 1: Increase the number of trees per acre and canopy cover in the urban interface by planting 250,000 trees over the next 30 years.

Action 1.1: Plant 1,200 new trees through the Great Lakes Restoration Initiative Reduce Runoff from Degraded Sites through Green Infrastructure. With the additional 1,200 trees, improvements can be made on the currently low storm water runoff capacity of 8.6 trees per acre and 5.5% canopy cover. Planting will take place on public parks and private residences with a focus on replacing hazard trees that have been removed and increasing the urban forest benefits on 132.2 acres.

Action 1.2: Promote the idea of planting "generational trees" to meet the goal of planting 250,000 trees in Akwesasne over the next 7 generations. This would mean each person in the community would have to plant two trees in their lifetime. Create a graphic representation of what the community would look like if every person planted just two trees in their lifetime, a "family generational tree" that would be displayed on social media and billboards. This idea would incorporate "generational trees," as a concept, and act as an element in the action of caring for the next generation or reaching out and touching future generations through acts of conscious ethics applied in the present day. The promotion of this value will aid and reinforce community members involvement in conservation and stewardship of the land, as their actions will be speaking directly to future generations of Akwesasró:non. (See appendix 1 for additional information)

Action 1.3: Focus on planting 30% culturally important tree species as it relates to Akwesasne's cultural continuity and integrity. Although all trees are culturally important, specific species are important in ceremonies, traditional medicines, etc. and should be planted for traditional teachings and cultural preservation. Approximately 75,000 culturally significant trees would need to be planted. (See appendix 2 for cultural species list)

"Green Infrastructure" are all the components, such as trees and shrubs, which make up a network of natural and semi-natural areas within the urban environment that deliver a wide range of ecosystem services such as clean water, clean air, climate regulation, flood prevention, pollination, etc.

Objective 2: Offset the loss of canopy cover due to residential, facility, and business development, hazard tree removals, and mortality caused by invasive species (e.g. Emerald Ash Borer).

Action 2.1: Develop a tree replacement protocol for trees that have been removed. Replace all dead or removed trees on a 2:1 basis, for every tree removed, two trees will be planted to replace it. If trees cannot be replaced in the same location, plantings should take place on suitable alternative locations or on available planting sites elsewhere and aim to fill in gaps in canopy cover on vacant or degraded sites.

Action 2.2: Work with the community to develop an approach for the utilization and replacement of the 14.5 percent of Ash trees (3,700 trees), which will be lost due to the Emerald Ash Borer (EAB). Traditional Basket making is extremely important in Akwesasró:non culture and traditional teachings. The loss of ash trees as a cultural resource is a saddening and even life altering event, as basket making is a way of life for many. Concurrent with this action, forestry resources will promote the preservation of this cultural knowledge and activity through collaborations with other organizations in Akwesasne to address this issue. Alternative basket making materials will be researched further, ash tree seed collection and preserving will be continued and possible injections of highly valued ash trees to be preserved where situations permit. (See appendix 4)

Objective 3: Increase the social, economic, and environmental benefits provided by the urban and community forest in Akwesasne.

Action 3.1: In future management decisions, consider selecting and planting trees based on their ability to provide specific benefits. Select performance-based tree species and plant in targeted areas where they are needed most (e.g. species tolerance to salt, pollution, saturated or clay soils).

Action 3.2: Improve air quality by using trees to mitigate and absorb pollution, reduce greenhouse gasses, and address the effects of climate change. In the species selection process, selecting trees that emit less volatile organic compounds (VOCs) and placing the selected trees in strategic locations such as high volume traffic corridors and known pollution sources. Where possible, focus on planting large evergreens, trees with large canopy structures, and trees with large leaf surface areas.

Action 3.3: Manage storm water runoff by increasing green infrastructure. Intercept rainfall to help reduce the speed and amount of stormwater entering collection and treatment facilities and residential areas during large storm events. Planting Large and medium broadleaf evergreen trees, large conifers and some deciduous trees with large leaf surface areas will have greater stormwater benefits and should be planted where space allows. Create walkway gardens and landscaping around walking trails, construct rain gardens in low areas or areas below grade, and remove impermeable surfaces where possible.

Action 3.4: Adopt adaptation strategies to combat climate change. Research projections for individual tree species, review future suitable habitat data models (Tree Atlas), and assess Landscape Disturbance and Succession model (LANDIS) data and changes in tree growth overtime to determine a tree species ability to respond to climate change. Additional strategies include quantifying carbon storage potential of trees by species, Re-use or recycling urban wood to retain carbon storage capacity, planting trees with high uptake of carbon such as fast-growing species and those with significant biomass.

Action 3.5: Maintain an updated list of recommended trees to plant in Akwesasne. The list will provide guidance to the community on species selection, ideal planting locations, species tolerances, and comparable alternative species for replacement of trees (e.g. replacing Ash trees lost to EAB mortality).It should also include the various benefits provided by different trees, performance information and species evaluations. (See appendix 7)

Action 3.6: Encourage tree planting and maintenance at local businesses to create landscapes that are more inviting for residents, visitors and merchants. Convey the benefits trees provide for businesses; people stay longer, return more often, travel from farther distances, purchase more goods, and pay higher prices at businesses with green landscapes. Engage businesses by creating a “Green Business Award” that they would receive in recognition for improving the community by becoming a greener business. Plantings would be overseen and approved by the SRMT forestry resources program.

Action 3.7: The construction of a native plant nursery and greenhouse to supply the Saint Regis Mohawk Tribe and the community with locally grown nursery stock. The Native Plants Restoration and Capacity Building project will help the SRMT build its resource management capacities to improve and restore the tribal territory fish and wildlife habitats by operating and managing a native plant nursery. The nursery will focus on the propagation of native plants on Tribal lands and provide a self-sufficient, long-term economic resource. The project will restore

riparian, forest, urban, and shrub-land within targeted areas and will include the propagation of native plants that are culturally significant and hold traditional values.

Action 3.8: Create a Christmas tree farm in combination with The Native Plants Restoration and Capacity Building project for additional revenue generating opportunities. The profits made from cultivating and selling evergreens as christmas trees could be used to create a “Greening of Akwesasne fund” and aid local community groups by donating trees and resources for tree planting activities in the community. Additionally, Christmas trees can be returned after use for recycling through the annual “Recycle Your Christmas Tree Program” at the SRMT transfer station. In cooperation with the forestry resources chipping project, trees will be chipped and utilized for mulch, compost, or as fish habitat, riparian buffers, etc.

Goal 2: Protect Akwesasne’s existing community forest from damage and loss by stabilizing current populations, reducing impacts, promoting proper tree care, increasing biodiversity and resilience, and facilitating replacement measures.

Objective 1: Improve tree protection and avoid unnecessary tree damage during construction projects.

Action 1.1: Generate a tree protection plan for construction and development projects. The plan would include important provisions to protect trees such as consultation with SRMT Forestry Resources, protective barriers, construction exclusion zones, drip line fencing, and limited access routes. The tree protection plan should be reviewed and employed by contractors and attached to all future construction documentation. (See appendix 3)

Action 1.2: Integrate project plans, development review, and project tracking between SRMT Forestry Resources and Planning and Infrastructure departments in future construction projects. Cooperation between departments will facilitate the effective review of planting issues at an early stage in the development process and prevent further damage to existing or not yet established trees.

Action 1.3: Encourage designers and engineers to incorporate existing trees into building and site designs. During the review of building plans consideration to the existing trees on the site should be given, especially high valued, large diameter, mature canopy trees. If possible, where a high value tree would be impacted, design alternatives such as off-set driveways, small changes to the placement of structures, or alternative construction methods such as less damaging tunneling and trenching techniques (use of air spades). (See appendix 3)

Objective 2: Reduce damage to the urban and community forest by developing strategies to combat invasive species, disease, and forest pests.

Action 2.1: Involve SRMT Forestry Resources in the early stages of planning and design of development projects to ensure appropriate recommendations on tree species selection, maintaining species biodiversity, and improving resilience to future pathogens and diseases. Forestry Resources should be an active participant in the planning and design of infrastructure changes.

Action 2.2: In future planting activities maintain a variety of species in order to create a more diverse and resilient urban forest**.** By retaining biodiversity, Akwesasne will be more resistant to widespread infestation or fatality from species-specific insects or diseases. Because forest pests typically affect only one specific species, a single type or group of tree species should never dominate the urban forest and should never be planted in rows or groups of single species. Plant no more than 10% of any one species, no more than 20% of any genus, and no more than 30% of any family.

Action 2.3: Encourage the planting of both native and non-native species. Selecting diverse, non-native species of trees will support climate change adaptation and can be used as an adaptation tool by assisting with the migration of southerly-acclimatized species northward. During this century, forest regions will be affected by climate change and certain species will become susceptible to that change. Some species will be vulnerable and decline while others will see an increase in productivity and distribution. This information will be useful in the expectations of future management decisions. (See appendix 7 for tree species list)

Action 2.4: Collaborate with other tribes in the southern regions of the United States to engage in knowledge sharing regarding climate change and concerns with species resilience. Knowledge has been passed down and shared for thousands of years (i.e. alligator dance) within communities about uses and behaviors of trees. This knowledge is an instrumental resource to aid in future management decisions.

Action 2.5: Stop planting known invasive, hybridized, or species, which have invasive qualities or undesirable growth habits. These types of trees can influence the gene pool of native species, jeopardize the urban ecological integrity and displace, weaken, or kill desirable plants. Forestry Resources should review landscaping plans for new developments to ensure that known invasive species are not included among the proposed plants. Forestry Resources should also generate a “No Planting List” of known invasive species, make sure this list is up to date and made available to the community.

Objective 3: Promote proper care and maintenance of urban and peri-urban trees in Akwesasne.

Action 3.1: Create educational opportunities for the community by hosting tree care workshops, classes, and producing publications, videos and on-line materials that emphasize the importance and long-term benefits of proper tree care. Outreach materials should include proper tree pruning and planting techniques, identification of pests and disease, and site-specific requirements.

Action 3.2: Create culturally oriented material for distribution through multiple media platforms. The designing and implementation should come from the cultural knowledge holders in the community and should be overseen and reviewed by Akwesasne Cultural Center (ACC).

Goal 3: **Maintain the community forest in Akwesasne with a cooperative effort between agencies, inter-tribal departments, and the community. Employ best management practices; cost efficient procedures, long-term proactive tree care, monitoring of forest health affecting agents, phased removals, recycling of green material, and rotational resource monitoring through data collection**

Objective 1: Preserve the existing green infrastructure in Akwesasne with proactive maintenance.

Action 1.1: Establish a Tree Maintenance/Pruning Program where property owners could apply for tree pruning and maintenance services on an annual basis. This would reduce the number of potential hazard trees, increase the overall health and vigor of the urban forest, and significantly lower future tree removal costs.

Action 1.2: Employ or contract a certified arborist to conduct regular maintenance under a five-year pruning cycle. Under the current Hazard Tree Removal Program, all work conducted is in response to emergencies or high-risk situations and is costly and inefficient, with some applicants waiting as long as 3 years to be serviced. Methods such as structural pruning of young tree (5-10 years) and a block-pruning maintenance approaches would greatly reduce costs and be much more efficient than the current system. Regular tree pruning would reduce safety hazards associated with unmaintained trees and in certain situations eliminate the need to remove the tree all together.

Objective 2: Provide recycling of green material and the re-use of wood products as a renewable resource available to the community.

Action 2.1: Expand upon the existing free to drop off down woody debris and free to pick up wood chips service at the SRMT Transfer Station facility. Explore the possibility of creating a Wood Re-Use Program and taking unwanted higher quality wood to be milled and donated to community groups, SRMT departments and programs, and other non-for-profit organizations. This would maximize the use of green waste, help the community, and act as a carbon sink by reducing the amount of greenhouse gases released into the atmosphere by storing carbon.

Action 2.2: Implement a plan to recycle the wood products created from the Hazard Tree Removal Program. When possible, direct the contracted tree removal service to cut hazard trees to log lengths so that it could be milled into lumber and utilized by SRMT departments and programs (e.g. building materials for the agricultural program). This would require the purchase of a portable sawmill and training staff on proper milling techniques.

Objective 3: Monitor for forest health affecting agents and employ the help of the community in citizen observation and reporting of forest pests and diseases.

Action 3.1: Continue annual Early Detection Rapid Response (EDRR) Forest Pest Trapping through the USDA-APHIS and new and upcoming invasive species training for forestry resources staff.

Action 3.2: Continue to encourage community members to monitor and report any strange plants and insects that they see in Akwesasne to forestry resources. Create an easy access and reporting system for people to conduct citizen science. Also, include a reporting structure that outlines the results of their contributions within the larger framework of the information.

Action 3.3: Expand outreach and education on invasive species and the damage they cause to the local ecosystem by hosting public invasive species workshops and events. Work with Cornell cooperative extension (CCE), Department of Environmental Conservation (NYS DEC), and St. Lawrence-eastern lake Ontario partnership for regional invasive species management (SLELO PRISM) to host educational events in Akwesasne.

Objective 4: Implement resource monitoring to manage the community forest through continued data collection and analysis.

Action 4.1: Update the 2015 urban and community forest inventory. This inventory consisted of a 10 percent sample on the 3000 acres of urban area in Akwesasne and was conducted on 40 private residential lots, 19 Businesses, 16 Community facilities, and 7 other land use sites. This inventory should be updated within the next 10 years after improvements have been made to the urban infrastructure.

Action 4.2: Conduct an Urban Tree Canopy Cover Analysis every 10 years in order to track size, growth or decline in the urban area. This will provide information on the progress towards meeting planting and canopy improvement goals by estimating tree cover, tree benefits for a given area, and classifying ground cover types. A combination of data and software should be used: aerial imagery, LiDAR data, remote sensing software (i-Tree Canopy) and other analysis tools.

Action 4.3: Create a full census database that is available to the public through an online urban forest mapping source that will be integrated into the SRMT website. The database should be updated annually with new plantings, removals, and tree maintenance and pruning activities. This will help in keeping accurate records of activates in the urban forest and facilitate in cost efficient management (BMP's).

Action 4.4: Monitor cultural resources by conducting an inventory to measure occurrence and health of traditionally significant tree species within the urban interface. The inventory would consist of tree species, health, ability to produce material, reproduce viable stock for planting etc. Additional information will be collected as it relates to different tree species cultural use and importance. However, this material will be protected and made available to only Akwesasro:non. Further, the locations of these cultural significant resources will not be recorded or reported, and only made available to community members that have a need for them.

Objective 5: Develop a cooperative effort between agencies, inter-tribal departments, and the community.

Action 5.1: Encourage forestry resources staff to be a participating member of local community committee's and tribal department assemblies (e.g. Akwesasne Tourism, convenient store association, planning and infrastructure, economic development etc.) By attending such meetings, forestry resources will be able to stay informed and involved with upcoming changes in infrastructure and land use trends and help to direct operations towards a common shared goal regarding Akwesasne's community forest.

Action 5.2: Build a community-wide understanding and valuing of the urban forest. Private landowners hold almost all of the urban forest so it is crucial that the community has a collective value in the management and preservation of this area. Through outreach and education shift individual's perspectives of trees and how they interact with them (Paradigm shift). Encourage forest stewardship and show how trees are not just monetary objects, but are part of what make the community, "Trees become an extension of your family".

Action 5.3: Engage regional cooperation and interaction among neighboring communities, local groups, and surrounding agencies by linking efforts and teaming up to take on larger geographic and ecological issues such as water, air, and soil quality or threats posed by invasive species (EAB). Collaborate with Mohawk Council of Akwesasne (MCA), NYS DOT, National Grid, NYS DEC, and Tribal Departments.

Goal 4: Secure a long-term funding strategy for the community forest in Akwesasne. Pursue funding sources for green infrastructure establishment, replacement, and maintenance.

Objective 1: Increase the number of trees planted in the urban and community forest from additional funding sources and alternative grant opportunities.

Action 1.1: Seek donations from private companies, businesses and individuals by crowdsourcing small public projects. Using web based and mobile device tools (GoFundMe) to fund minor public projects would allow residents and businesses to easily "text" or make small donations on-line for a specific project such as planting a tree in a public place or caring for trees in a park (e.g. donating to plant a Christmas tree in Generations Park.)

Action 1.2: Encourage tribal government and decision makers to view urban trees as a capital asset in Infrastructure Improvement Project budgets. Tree planting and maintenance should be a valid expenditure of large road, utility, or facility improvement projects and should be considered as one of the important features in budgeting for projects.

Action 1.3: Look again to the U.S. Forest Service Great Lakes Restoration Initiative (GLRI) for additional funding in the future. With the Emerald Ash Borer (EAB) now present in Akwesasne since 2016, Akwesasne will lose approx. 3,700 trees in the urban and community forest. Funding opportunities such as the "Mitigate Emerald Ash Borer (EAB) Impacts" will aid in the replanting and tree canopy restoration effort to enhance and restore biodiversity and water quality in the community forest.

Action 1.4: Establish an interpersonal relationship with local small businesses by sponsoring a "Green Business Award" that would be presented to a business for improvements made on reducing their carbon footprint, contributing to/purchasing carbon offsets, in-kind donations to urban forest improvement projects or simply planting trees on their property. This would in turn provide advertising and promote their business as becoming "greener" and helping both the trees and the community. Recognition could be displayed on billboards, social media, at community events etc.

Action 1.5: Host small local business sponsored community outreach workshops or events. Activities could be focused on tree planting and care and revolve around Earth Day (April 22nd). Businesses would be able to purchase trees for the workshop and have them planted on their property by the workshop participants for a "hands on" experience with proper tree planting.

Objective 2: Construct a tree maintenance funding strategy for long-term tree care.

Action 2.1: Form a Tree Maintenance Funding Program to cover the costs of tree care**.** State and federal grants are typically available to fund the establishment of new trees but not the maintenance costs associated with trees after planting. A comprehensive funding strategy should be created to help maintain long-term care for all age class trees in the urban area. Allocating and redistributing funding sources or amending contracts from one project to another could be one method.

Action 2.2: Better utilize existing funding to meet and maintain canopy cover goals. A portion of funding from the Hazardous Tree and Downed Woody Debris Removal Program could be used to hire a certified arborist for preventive pruning and removal of dangerous limbs or branches. This would not only reduce hazard tree removal costs now and in the future, but it would also help maintain green infrastructure goals for the community forest by decreasing the number of trees removed.

Action 2.3: Develop a tree care initiative with a funding goal and draw from the community's ability to fundraise for good causes and helping people in need (e.g. raffle, board, trivia, etc.). Expand upon the already strong sense of unity within the community to help the urban forest.

Goal 5:

Engage the community, local groups, and businesses in caring for the urban and community forest. Promote educational opportunities through culturally oriented activities, shift individual's perspective of trees, and change how they interact and connect with them.

Objective 1: Engage with various schools within Akwesasne to convey culturally oriented material.

Action 1.1: Translate important actions associated with tree care and important traditional knowledge into Mohawk. Identify individuals and agencies to aid with interpretation and translation, such as Akwesasne Cultural Center (ACC) and The Saint Regis Mohawk Tribes Language and Cultural Resources Departments.

Action 1.2: Visit schools during certain times of the year that line up with the ceremonial calendar to educate youth with the assistance of the Akwesasane Cultural Restoration Program. Through this, students will be able to align what they are learning in the longhouse with the natural environment and the importance trees hold in culture.

Action 1.3: Work in partnership with native cultural resources personnel at the local high schools (Massena Central High School and Salmon River High School). Juncture efforts in the development of projects for youth that are designed at promoting the importance of traditional knowledge as it relates to trees and the environment.

Action 1.4: Collaborate with education departments such as Saint Regis Mohawk Tribe Education program and Akwesesane Mohawk Board of Education (AMBE) to seek out students enrolled in universities to undertake research projects and independent studies. These projects would be related to science and forestry, and would focus on the development of resource bridging between biological and cultural knowledge.

Action 1.5: Develop a scholarship or stipend to support research projects and independent studies. All projects would be developed, reviewed, and evaluated by the Saint Regis Mohawk Tribes Education Department and the Akwesasne Task Force on the Environment (ATFE). Proposals of students and researchers would be assessed before granting permission to access culturally sensitive materials.

Objective 2: Seek and maintain a strong network with community knowledge holders such as Akwesasne Cultural Center (ACC) and the Mohawk Council of Akwesasne Wholistic Health (MCAWH).

Action 1.1: Identify knowledge holders and their area of expertise (e.g. medicinal, nutritional, spiritual, etc.) to assist in the creation of a cultural database. Collect culturally significant information and compile into a comprehensive database that would be easily accessible for the community. All data would have restricted access and would only be available at the Akwesasne Cultural Center Library and Museum.

Objective 3: Make access to information about the benefits provided by urban trees readily available to the community. Provide urban forest education and improve ecological literacy.

Action 3.1: Develop a community outreach plan by using the many faucets of multimedia (e.g. Instagram, Twitter, Snap Chat (for younger generation) and Facebook (for older generation)). Outreach plan would include the employment of outside social media marketing personnel to represent and manage all content and outreach materials. The plan would focus on engaging the community with daily/weekly/monthly awareness posts or informational blogs to create interactive and up to date material on urban forestry.

Action 3.2: Form an open source online urban forest resource database. Engage the community by requesting assistance with data collection of urban trees located at individual's residences. Participants would simply download a smartphone app like the "Trees Count" mobile inventory app and submit their results. This information would be compiled and uploaded to an online source to be reviewed and shared with the community. This would be beneficial by building interest in urban forestry, updating the 2015 urban forest inventory, and create interactions with trees and the community.

Action 3.3: Produce informational signage describing the benefits provided by trees visible to the public. Incorporate signage for select trees within Generations Park to highlight tree species, the benefits it provides, cultural significance, medicinal uses, etc. Signs will have both English and Mohawk translations displayed and incorporate the Ohenton Karihwatehkwen (thanksgiving address).

Action 3.4: Create a graphic (visual) representation for perfectly placed trees within a residential landscape. The graphic would depict energy efficient landscaping and the progress of the increasing annual benefits the trees provide to the homeowner.

Action 3.5: Expand upon the "Annual Seed and Tree Give Away" as an opportunity to increase outreach and education on proper tree planting and care. Information should provide community members with the basic knowledge of proper tree selection, planting techniques, maintenance requirements, invasive species and pest/disease identification, etc.

Objective 4: Preserve cultural teachings, traditions, and knowledge within Akwesasne through activities that connect and maintain the Haudenosaunee (people's) relationship to the land.

Action 4.1: Encourage the planting of Ononhkwaon:we (Traditional Medicine) plants as an alternative landscaping choice in order to benefit the local biosphere, preserve cultural teachings and to provide additional educational tools. (See appendix 2)

Action 4.2: Seek community input on what types of trees they would like to see planted in the urban area. Specifically, what trees would benefit the community the most (e.g. trees that would promote a healthier living space, trees that hold cultural significance, trees that have serene or emotional value, etc.) A questionnaire or online survey could be made available through online sources, social media or (SRMT) webpage.

Action 4.3: Support community voluntary tree planting and training programs focused around Earth Day on April 22nd and Arbor Day on April 28th. Look to local community groups (e.g. Akwesasne Boys and Girls Club) to participate in tree planting to help the younger generation connect and interact with trees and the environment.

Akwé:kon énska entitewahwe'nón:ni ne onkwa'nikòn:ra

(All one we shall collect and gather our minds)

(See appendix 10 for an example of specific numerical values regarding the potential targeted goals for the urban and community forest; the benefits urban trees could provide Akwesasne, "by the numbers")

IMPLEMENTATION STRATEGY

IMPLEMENTATION

In order to successfully implement the Community Forest Management Plan, the participation and cooperation with numerous agencies, tribal departments, and community partners will be necessary to carry out the actions put forth by the management plan.

The implementation plan describes the actions needed to achieve the goals and objectives, sets a time frame for the anticipated work involved, and identifies the parties or partners that would be advantageous to the project matrix.

PARTNERS AND AGENCIES KEY

USFS GLRI	United States Forest Service Great Lakes Restoration Initiative
ATFE	Akwesasne Task Force on the Environment
SRMT P&I	Saint Regis Mohawk Tribe Planning and Infrastructure
ACOC	Akwesasne Chamber of Commerce
AT	Akwesasne Tourism
SRMT ED	Saint Regis Mohawk Tribe Office of Economic Development
CM	Community Members
AHA	Akwesasne Housing Authority
ACSA	Akwesasne Convenient Store Association
ABGC	Akwesasne Boys and Girls Club
AELC	Iohahi:io Adult Education and Learning Center
MCAWH	Mohawk Council of Akwesasne Wholistic Health
AMBE	Akwesasne Mohawk Board of Education
SRMT EP	Saint Regis Mohawk Tribe Education Program
MCA	Mohawk Council of Akwesasne Environment Program
NYS DOT	New York State Department of Transportation
NYS DEC	New York State Department of Environmental Conservation
NG	National Grid
NYPA	New York State Power Authority
ACC	Akwesasne Cultural Center
USFS NIACS	Northern Institute of Applied Climate Science

Goal 1: **Increase and preserve proper canopy cover and a reasonable distribution of green infrastructure throughout Akwesasne to provide optimal benefits to the community by increasing the existing canopy cover of 5.5 percent to 35 percent overall by 2037.**

Objectives	Actions	Timeline	Partners
1.1 Increase the number of trees per acre and canopy cover in the urban interface by planting 250,000 trees over the next 20 years.	1.1.1 Planting new trees to prevent storm water runoff and increase canopy cover in public parks and private residences.	2 YEARS / ONGOING	USFS GLRI, CM
	1.1.2 Promote the concept of “generational trees” to meet the goal of planting 250,000 trees.	ONGOING	ACC, AELC, ABGC, AMBE, SRMT EP
	1.1.3 Planting culturally significant trees that can be used for traditional medicines, ceremonies, etc.	ONGOING	ACC, MCAWH, CM
1.2 Offset the loss of canopy cover due to residential, facility, and business development, hazard tree removals, and mortality caused by invasive species (e.g. Emerald Ash Borer).	1.2.1 Develop a tree replacement protocol. Replace trees on a 2:1 basis.	ONGOING	ATFE
	1.2.2 Develop an approach for the utilization and replacement of Ash Trees lost to EAB mortality.	5 YEARS	CM, ACC, ATFE
1.3 Increase the social, economic, and environmental benefits provided by the urban and community forest in Akwesasne.	1.3.1 Consider selecting trees based on their ability and select performance-based tree species and plant in degraded areas.	ONGOING	NYS DEC, USFS GLRI
	1.3.2 Improve air quality	ONGOING	USFS GLRI
	1.3.3 Manage storm water runoff	ONGOING	USFS GLRI

	1.3.4 Create strategies to combat climate change	ONGOING	USFS NIACS
	1.3.5 Maintain and update a list of recommended trees to plant in Akwesasne	ANNUALLY	USFS GLRI, USFS NIACS
	1.3.6 Encourage tree planting and maintenance at local businesses to create landscapes that are more inviting for residents, visitors and merchants.	ANNUALLY / ONGOING	ACOC, AT, ACSA
	1.3.7 Creation of a plant nursery and green house (Native Plants Restoration and Capacity Building project)	5 YEARS / ONGOING	USFS
	1.3.8 Establish a Christmas Tree farm	5 YEARS / ONGOING	USFS

Goal 2: **Protect Akwesasne's existing community forest from damage and loss by stabilizing current populations, reducing impacts, promoting proper tree care, increasing biodiversity and resilience, and facilitating replacement measures.**

Objectives	Actions	Timeline	Partners
2.1 Improve tree protection and avoid unnecessary tree damage during construction projects.	2.1.1 Create a tree protection plan for construction and development projects.	5 YEARS	SRMT P&I, AHA
	2.1.2 Integrate project plans, development review, and project tracking between SRMT Forestry Resources and Planning and Infrastructure	5 YEARS	SRMT P&I
	2.1.3 Promote designers and engineers to incorporate trees into building and site designs	ONGOING	SRMT P&I
2.2 Reduce damage to the urban and community forest by developing strategies to combat invasive species, disease, and forest pests.	2.2.1 Involve Forestry Resources in the early stages of planning and design of development projects	ONGOING	SRMT P&I
	2.2.2 In future planting activities maintain a variety of species in order to create a more diverse and resilient urban forest	ONGOING	SRMT P&I, AHA
	2.2.3 Encourage the planting of both native and non-native species to assist with climate change adaptation	ONGOING	ACC, ABGC, AMBE, SRMT P&I, AHA
	2.2.4 Collaborate with other tribes to discuss climate change and concerns with species resilience	ONGOING	ATFE
	2.2.5 Stop planting known invasive species	ONGOING	AELC,ABGC, ATFE, SRMT EP
2.3 Promote proper care and maintenance of urban and peri-urban trees in Akwesasne	2.3.1 Create educational opportunities for the community by hosting tree care workshops, classes, and producing publications, videos and on-line materials	2 YEARS / ONGOING	AHA, ACSA, ACOC, ACC, AELC, AMBE, ATFE
	2.3.2 Create culturally oriented material for distribution through multiple media platforms.	5 YEARS	ACC, MCAWH

Goal 3: **Maintain the community forest in Akwesasne with a cooperative effort between agencies, inter-tribal departments, and the community. Employ best management practices; cost efficient procedures, long-term proactive tree care, monitoring of forest health affecting agents, phased removals, recycling of green material, and rotational resource monitoring through data collection and analysis.**

Objectives	Actions	Timeline	Partners
3.1 Preserve the existing green infrastructure in Akwesasne with proactive maintenance.	3.1.1 Institute a Tree Maintenance/Pruning Program	ONGOING	NG, NYPA, NYS DEC, USFS, CM
	3.1.2 Conduct regular pruning maintenance cycles	EVERY 5 YEARS	NG, NYPA, NYS DEC, USFS, NYS DOT, CM
3.2 Provide recycling and the re-use of wood products as a renewable resource available to the community.	3.2.1 Expand on existing wood chip services and uses	ONGOING	—
	3.2.2 Make a plan to recycle wood product from Hazard Tree Removal	5 YEARS / ONGOING	—
3.3 Monitor for forest health affecting agents and employ the help of the community in citizen observation and reporting of forest pests and diseases.	3.3.1 Continue monitoring for new and upcoming invasive species	ONGOING	USDA, CM
	3.3.2 Encourage community members to report any strange plants or insects	ONGOING	CM
	3.3.3 Expand education and outreach on invasive species	ONGOING	AELC,ABGC, ATFE, SRMT EP
3.4 Implement resource monitoring to manage the community forest through continued data collection and analysis.	3.4.1 Update the 2015 urban and community forest inventory	8 YEARS	—
	3.4.2 Conduct an Urban Tree Canopy Cover Analysis	EVERY 10 YEARS	—
	3.4.3 Create a census database for the public to use	5 YEARS	
	3.4.4 Monitor cultural resources by conducting an inventory	5 YEARS /	

	3.4.3 Create a full census database that is available to the public through an online urban forest mapping source	5 YEARS	—
	3.4.4 Monitor cultural resources by conducting an inventory	5 YEARS / ONGOING	ATFE, ACC
3.5 develop a cooperative effort between agencies, inter-tribal departments, and the community.	3.5.1 Encourage forestry staff to be active members of local committees	ONGOING	—
	3.5.2 Build a community understanding and value of urban forests	ONGOING	AELC,ABGC, ATFE, SRMTEP, ACC, CM, AMBE
	3.5.3 Engage in interaction with other communities, local groups and surrounding agencies.	ONGOING	All agencies and community groups

Goal 4: **Secure a long-term funding strategy for the community forest in Akwesasne. Pursue funding sources for green infrastructure establishment, replacement, and maintenance.**

Objectives	Actions	Timeline	Partners
4.1 Increase the number of trees planted in the urban and community forest from additional funding sources and alternative grant opportunities.	4.1.1 Pursue donations from companies, business, and individuals.	ONGOING	AT, ACOC, CM, ACSA
	4.1.2 Encourage tribal government to view trees as an asset.	ONGOING	—
	4.1.3 Look for additional funding opportunities in future projects	ONGOING	AT, ACOC, CM, ACSA
	4.1.4 Sponsor a “Green Business Award” to create a relationship with local small businesses.	ANNUALLY	AT, ACOC, CM, ACSA
	4.1.5 host small local business sponsored community outreach workshops	ANNUALLY	AT, ACOC, CM, ACSA, AHA
4.2 Construct a tree maintenance funding strategy for long-term tree care.	4.2.1 Form a Tree Maintenance Funding program to cover the cost of tree care.	5 YEARS / ONGOING	—
	4.2.2 Utilize existing funding to meet and maintain canopy cover goals	ONGOING	—
	4.2.3 Create a tree care initiative with help from the community for fundraising opportunities	ONGOING	AT, ACOC, CM, ACSA

Goal 5: **Engage the community, local groups, and businesses in caring for the urban and community forest. Promote educational opportunities through culturally oriented activities, shift individual's perspective of trees, and change how they interact and connect with them.**

Objectives	Actions	Timeline	Partners
5.1 Engage with various schools within Akwesasne to convey culturally oriented material.	5.1.1 Translate actions for tree care and important knowledge into Mohawk	ONGOING	ACC, MCAWH, CM
	5.1.2 Visit schools to educate youth about ceremonies, the natural environment, and the importance or trees	ONGOING	ACC, MCAWH
	5.1.3 Work to promote the importance of traditional knowledge	ONGOING	ACC, MCAWH
	5.1.4 Seek out students in university to undertake research	ONGOING	AMBE, ATFE, SRMT EP
	5.1.5 Develop scholarship or stipend to support research projects and independent studies.	ONGOING	AMBE, ATFE, SRMT EP
5.2 Seek and maintain a strong network with community knowledge holders such as ACR and MCAHH.	5.2.1 Create a cultural database by meeting with knowledge holders.	ONGOING	ACC, ATFE, CM
5.3 Make access to information about the benefits provided by urban trees readily available to the community. Provide urban forest education and improve ecological literacy.	5.3.1 Develop an outreach plan using social media	ONGOING	—
	5.3.2 Create an open source online urban forest resource database.	10 YEARS / ONGOING	—
	5.3.3 Produce informational signage describing the benefits of trees, cultural significance, medicinal uses, etc.	ONGOING	ACC, ATFE, MCAWH
	5.3.4 Create a visual representation for tree placement	ONGOING	
	5.3.5 Expand the "Annual Seed and Tree Give Away" as a way to increase outreach to community.	ONGOING	
5.4 Preserve cultural	5.4.1 Encourage the planting of traditional medicines	ONGOING	

	5.3.4 Create a graphic (visual) representation for energy efficient landscaping and the progress of the increasing annual benefits trees provide to the homeowner.	2 YEARS	—
	5.3.5 Expand the “Annual Seed and Tree Give Away” as a way to increase outreach to community.	ANNUALLY	—
5.4 Preserve cultural teachings, traditions, and knowledge within Akwesasne through activities that connect and maintain the Haudenosaunee relationship to the land.	5.4.1 Encourage the planting of traditional medicines as an alternative landscaping choice	ONGOING	ACC, CM, ATFE
	5.4.2 Seek community input on what types of trees they would like to see planted in the urban area and what trees would benefit the community the most	ONGOING	CM
	5.4.3 Support community voluntary tree planting and training programs focused around Earth Day on April 22nd and Arbor Day on April 28th	ANNUALLY	—

MONITORING PLAN

MONITORING PLAN

The monitoring plan measures the progress towards the strategic plan's goals over time and manages the outcomes of the actions. Monitoring the activities and actions not only keeps track of progress, but it helps in providing the information needed to adjust management methods or strategies.

Goals	Monitoring Plan Actions
GOAL 1: Increase and preserve proper canopy cover and a reasonable distribution of green infrastructure throughout Akwesasne to provide optimal benefits to the community by increasing the existing canopy cover of 5.5 percent to 35 percent overall by 2037.	1. Update the 2015 inventory. After improvements have been made to the urban forest through the USDA-GLRI project and 1,200 trees have been planted, conduct an inventory within 8 years to reassess the urban forest resource. 2. Conduct an Urban Tree Canopy Cover Analysis every 10 years in order to track size, growth or decline in the urban area. This will provide information on the progress towards meeting planting and canopy improvement goals by estimating tree cover, tree benefits for a given area, and classifying ground cover types. A combination of data and software should be used: aerial imagery, LiDAR data, remote sensing software (i-Tree Canopy) and other analysis tools.

GOAL 2: Protect Akwesasne's existing community forest from damage and loss by stabilizing current populations, reducing impacts, promoting proper tree care, increasing biodiversity and resilience, and facilitating replacement measures.	1. Administer and monitor a tree protection plan for construction and development projects. Make sure important provisions to protect trees such as consultation with SRMT Forestry Resources, protective barriers, construction exclusion zones, drip line fencing, and limited access routes are implemented and followed. The tree protection plan we be reviewed and employed by contractors and attached to all future construction documentation. 2. Incorporate project plans, development review, and project tracking between SRMT Forestry Resources and Planning and Infrastructure departments in construction projects. Cooperation between departments will facilitate the effective review of planting issues at an early stage in the development process and prevent further damage to existing or not yet established trees.
GOAL 3: Maintain the community forest in Akwesasne with a cooperative effort between agencies, inter-tribal departments, and the community. Employ best management practices; cost efficient procedures, long-term proactive tree care, monitoring of forest health affecting agents, phased removals, recycling of green material, and rotational resource monitoring through data collection and analysis.	1. Create a full census database that is available to the public through an online urban forest mapping source that will be integrated into the SRMT website. The database will be updated annually with new plantings, removals, and tree maintenance and pruning activities. 2. Monitor cultural resources by conducting an inventory to measure occurrence and health of traditionally significant tree species within the urban interface. The inventory will consist of tree species, health, ability to produce material, reproduce viable stock for planting etc. Additional information will be collected as it relates to different tree species cultural use and importance. However, this material will be protected and made available to only Akwesasronon. The cultural resources inventory will be updated every 10 years to track changes in growth/decline.

	3. Continue annual Early Detection Rapid Response (EDRR) Forest Pest Trapping through the USDA-APHIS and new and upcoming invasive species training for forestry resources staff.
GOAL 4: Secure a long-term funding strategy for the community forest in Akwesasne. Pursue funding sources for green infrastructure establishment, replacement, and maintenance.	1. Track funding resources and utilization. Continue to seek out grant, donation or fundraising opportunities to supplement forestry resources budget. 2. Form a Tree Maintenance Funding Program to cover the costs of tree care**.** A comprehensive funding strategy will help to maintain long-term care for all age class trees in the urban area. Continually allocate and redistribute funding from one project to another to better utilize limited resources.
GOAL 5: Engage the community, local groups, and businesses in caring for the urban and community forest. Promote educational opportunities through culturally oriented activities, shift individual's perspective of trees, and change how they interact and connect with them.	1. Annually administer community surveys regarding the urban forest. Feedback from the community will not only help with assessing the effectiveness of educational outreach efforts, it will also continue to bring attention to urban forestry and engage interest to the topic. 2. Annually review all outreach materials such as informational signage, graphics, online content, etc. to make sure all information is up to date and concurrent with the latest scientific research. 3. Develop a scholarship or stipend to support research projects and independent studies. All projects will be developed, reviewed, and evaluated by the Saint Regis Mohawk Tribes Education Department and the Akwesasne Task Force on the Environment (ATFE). Proposals of students and researchers will be assessed before granting permission to access culturally sensitive materials.

APPENDICES

Resources

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Appendix 1

Seven Generations

The concept of “Seven Generations” is present across the Haudenosaunee. This value is the consistent awareness about “those who are not yet born but who will inherit the world” (Haudenosaunee Confederacy, n.d.). This is a value that is situated within our minds as we make decisions that will impact their quality of life and ability to access our valuable traditional knowledge. Oren Lyon’s speaks to this subject with, “When we walk upon Mother Earth we always plant our feet carefully because we know the faces of our future generations are looking up at us from beneath the ground” (Arden et al., 1990, p. 68). I believe this subject speaks directly to our relationship with the land. We all come from Mother Earth and our next generation will rise from her as well. We must be careful of the way we tread upon mother earth because we are only borrowing it from future generations (Haudenosuanee Confederacy, n.d.). This displaces time. We are intimately connected to the future through our actions on the land. Our actions will directly impact the quality of life of future generations. We want them to be able to enjoy the better conditions of the land and culture because these two are so intimately interwoven. The next “seven generations” is a concept that speaks to the lines of generational knowledge and foresight within our community. This was temporally conceptualized by Philip White-Cree through placing yourself at the center. You can reach into the past to draw for the knowledge of your great-grandparent, grandparent and parents. You are the present in this framework. At the center, you become the conduit for the continuity of knowledge to you children, grandchildren, and great-grandchildren. This is the way in which our knowledge is continuous and transmitted orally across generations. It is reiterative in its’ manifestation. In this, we invoke the past to look forward to the world we are leaving for our children because our world is the results of our past elders.

Appendix 2

Cultural planting selections for Akwesasne

Latin Name	Common Name	Uses
Abies baslmamea	Balsam Fir	Medicinal
Acer pensylvanicum	Striped Maple	Food
Acer rubrum	Red Maple	Food
Acer saccharum	Sugar Maple	Food
Acer spicatum	Mountain Maple	Food
Alnus incana	Speckled Alder	Medicinal, Rare
Amelanchier aborea	Smooth/Downy Serviceberry	Medicinal, Food, Rare
Amelanchier canadensis	Service Berry	Medicinal, Food, Rare
Betula alleghaniensis	Yellow Birch	Medicinal
Betula lenta	Sweet Birch	Medicinal
Carpinus caroliniana	Blue Beech/ American Hornbean	Medicinal
Carya cordiformis	Bitternut Hickory	Medicinal, Food, Spiritual
Carya ovata	Shagbark Hickory	Medicinal, Food, Spiritual
Castanea dentata	American Chestnut	Food
Ceanothus americanus	New Jersey Tea	Medicinal
Celtis occidentalis	Common Hackberry	Medicinal, Food, Rare
Cornus alternifolia	Pagoda/alternate-leaved Dogwood	Medicinal, Rare

Cornus amomum ssp.obliqua	Silky Dogwood	Medicinal, Rare
Cornus florida	White Flowering Dogwood	Medicinal, Rare
Cornus racemosa	Gray Dogwood	Medicinal, Rare
Cornus rugosa	Round-leaved dogwood	Medicinal, Rare
Cornus sericea	Red Osier Dogwood	Medicinal, Food, Rare
Corylus americana	American Hazelnut	Food
Corylus cornuta	Beaked Hazelnut	Medicinal, Food
Fagus grandifolia	American Beech	Medicinal, Food, Rare
Gaylussacia baccata	Black Huckleberry	Food
Hamamelis virginiana	Common Witch Hazel	Medicinal
Ilex verticillata	Winterberry	Medicinal, Rare
Juglans cinerea	Bitternut Hickory	Food
Juglans nigra	Black Walnut	Medicinal, Food
Juniperus communis	Common Juniper	Medicinal
Juniperus virginiana	Eastern Red Cedar	Medicinal, Spiritual
Larix laricinia	Tamarack/American Larch	Medicinal
Lindera benzoin	Spice Buch	Medicinal, Rare, Not Found in region
Lonicera canadensis	Canada Fly Honeysuckle	Medicinal, Rare
Lonicera dioica	Glaucous Honeysuckle	Medicinal, Rare
Lonicera hirsuta	Hairy Honeysuckle	Medicinal, Rare, Not Found in region
Lonicera oblongifolia	Swamp Fly Honeysuckle	Medicinal, Rare, Not Found in region
Magnolia acuminata	Cucumber Tree	Medicinal, Rare, Not Found in region
Malus coronaria	Allegheny/Wild Crabapple	Food, Rare
Ostrya virginiana	Ironwood/Hop Hornbeam	Tools, handles, etc.
Physocarpus opulifolius	Eastern Ninebark	Rare
Picea glauca	White Spruce	Medicinal
Picea mariana	Black Spruce	Medicinal
Pinus rigida	Pitch Pine	Medicinal
Pinus strobus	Eastern White Pine	Medicinal, Spiritual
Platanus occidentalis	Sycamore	Medicinal, Rare, Not Found in region
Populus balsamifera	Balsam poplar	Medicinal, Spiritual

Populus deltoides	Eastern Cottonwood	Medicinal
Populus tremuloides	Trembling Aspen	Rare
Prunus pensylvanica	Pin Cherry	Food, Rare
Prunus serotina	Wild Black Cherry	Medicinal, Food
Prunus virginiana	Common Choke Cherry	Food
Quercus bicolor	Swamp White Oak	Medicinal, Food
Quercus ilicifolia	Bear/Scrub Oak	Not Found in region
Quercus macrocarpa	Bur Oak	Rare
Quercus rubra	Red Oak	Rare
Rhus aromatica	Fragrant Sumac	Medicinal
Rhus copallinum	Dwarf/Shining Sumac	Medicinal
Rhus glabra	Smooth Sumac	Medicinal
Rhus typhina ssp. hirta	Staghorn Sumac	Medicinal
Rosa acicularis	Prickly Wild Rose	Spiritual
Rubus allegheniesis	Highbush Blackberry	Medicinal, Food
Rubus canadensis	Smooth Blackberry	Medicinal, Food
Rubus idaeus ssp. sachalinensis	Wild Red raspberry	Medicinal, Food
Rubus odoratus	Purple-Flowering Raspberry	Medicinal, Food
Salix discolor var. eriocephala	Pussy Willow	Spiritual
Salix exigua	Coyotes/Sandbar Willow	Medicinal, Rare
Salix nigra	Black Willow	Medicinal, Spiritual
Sambucus canadensis	Wild Elderberry	Medicinal, Food
Sorbus americana	American Mountain Ash	Medicinal, Spiritual
Spiraea alba	Meadowsweet	Medicinal
Spiraea latifolia	Broad-Leaved Meadowsweet	Medicinal
Staphylea trifolia	American Bladdernut	Food
Thuya occidentalis	White Cedar	Medicinal, Spiritual
Tilia americana	American Basswood	Medicinal, Spiritual
Tsuga canadensis	Eastern Hemlock	Medicinal
Ulmus americana	White Elm	Not Found in region
Ulmus rubra	Slippery Elm	Medicinal

Vaccinium angustifolium	Low Sweet Blueberry	Food
Vaccinium macrocarpon	Large Cranberry	Medicinal, Food
Viburnum acerifolium	Maple-leaved Viburnum	Medicinal
Viburnum dentatum	Southern Arrowood	Rare
Viburnum lentego	Nannyberry	Medicinal, Food
Viburnum opulus var americana	Highbush Cranberry	Medicinal, Food
Viburnum rafinesquianum	Downy Arrowood	Rare

Appendix 3

Avoiding Tree Damage During Construction

Possible ways in which existing trees may be damaged during a construction project and methods for planning and facilitating the prevention of tree damage. *Homes are often constructed near existing trees to take advantage of their aesthetic and environmental value. Unfortunately, the processes involved with construction can be deadly to nearby trees. Proper planning and care are needed to preserve trees on building sites. An arborist can help you decide which trees can be saved. The arborist can also work with the builder to protect the trees throughout each phase of construction.*

How Trees Are Damaged During Construction

Physical Injury to Trunk and Crown. Construction equipment can injure the above-ground portion of a tree by breaking branches, tearing the bark, and wounding the trunk. These injuries are permanent and, if extensive, can be fatal.

Root Cutting. Digging, grading, and trenching associated with construction and underground utility installation can be quite damaging to roots. A tree's root system can extend horizontally a distance 1 to 3 times greater than the height of a tree. It is important to cut as far away from a tree as possible to prevent damage that can compromise tree health and stability. Cutting under a tree's crown can reduce tree vitality. Cutting roots close to the trunk can severely damage a tree and limit its ability to stay upright in storms.

Soil Compaction. An ideal soil for root growth and development contains about 50 percent pore space for water and air movement. Heavy construction equipment can compact soil and dramatically reduce pore space. Compaction inhibits root growth, limits water penetration, and decreases oxygen needed for root survival.

Smothering Roots by Adding Soil. The majority of fine water-and-mineral-absorbing roots are in the upper 6 to 12 inches (15 to 30 cm) of soil where oxygen and moisture levels tend to be best suited for growth. Even a few inches of soil piled over the root system to change the grade can smother fine roots and eventually lead to larger root death.

Exposure to the Elements. Trees in a forest grow as a community, protecting each other from the elements. The trees grow tall with long, straight trunks and high canopies. Removing neighboring trees during construction exposes the remaining trees to increased sunlight and wind which may lead to sunscald or breakage of limbs and stems.

Getting Advice
Not all trees on the building site can or should be preserved. Your arborist can assess the health and structural integrity of trees on your property and suggest measures to preserve and protect them. When determining which trees to retain, consider the species, size, age, location, and condition of each tree. Your arborist can advise you about which trees are more sensitive to compaction, grade changes, and root damage.

Planning
Your arborist and builder should work together early in the planning phase of construction. Sometimes small changes in the placement or design of your house or driveway can make a great difference in whether a critical tree will survive. Alternative construction methods can be discussed, such as bridging over the roots as a substitute for a conventional walkway, if flexibility in placement is limited. If utilities cannot be re-routed away from trees, less damaging tunneling and trenching installation techniques exist.

Erecting Barriers
Treatment for construction damage is limited, so it is vital that trees be protected from injury. Set up sturdy fencing around each tree that is to remain, as far out from the tree trunk as possible to provide above- and below-ground protection. Place fence approximately one foot (0.3 m) from the trunk for each inch (2.5 cm) of trunk diameter. Instruct construction personnel to keep fencing intact and the fenced area clear of building materials, waste, and excess soil. No digging, trenching, or other soil disturbance should be allowed in the fenced area.

Limiting Access
If possible, allow only one access route on and off the property. All contractors must be instructed where they are permitted to drive and park their vehicles. Often this same access drive can later serve as the route for utility wires, water lines, or the driveway.
Specify storage areas for equipment, soil, and construction materials. Limit areas for burning (if permitted), cement wash-out pits, and construction work zones. These areas should be located away from protected trees.

Specifications
All measures intended to protect your trees must be written into the construction specifications and should detail exactly what can and cannot be done to and around the trees. It is a good idea to post signs as a reminder. Fines and penalties for violations should be built into the specifications. The severity of the fines should be proportional to the potential damage to the trees, and should increase for multiple infractions.

Maintaining Good Communication

Communicate your objectives clearly with your arborist, builder, and all subcontractors. Construction damage to trees is often irreversible.Visit the site at least once a day if possible. Your vigilance will pay off as workers learn to take your wishes seriously. Take photos at every stage of construction. If any infraction of the specifications does occur, it will be important to prove liability.

Final Stages

Careful planning and communicating with landscape designers and contractors is just as important as avoiding tree damage during construction. Irrigation system installation, grading, and planting bed cultivation can damage root systems.

Post-Construction Tree Maintenance

Your trees will require several years to adjust to the injury and environmental changes that occur during construction. Stressed trees are more prone to health problems, such as disease and insect infestations. Talk to your arborist about continued monitoring and maintenance for your trees. Despite the best intentions and most stringent tree preservation measures, injury to your trees may still occur. Your arborist can suggest remedial treatments to help reduce stress and improve the growing conditions around your trees.

Developed by the International Society of Arboriculture (ISA), a non-profit organization supporting tree care research around the world and dedicated to the care and preservation of shade and ornamental trees. For further information, contact: ISA, P.O. Box 3129, Champaign, IL 61826-3129, USA.
E-mail inquiries: isa@isa-arbor.com

Appendix 4

Recommended Alternative Ash Tree Replacement Species

Scientific Name	Common Name	Hardiness Zone	Max Height (ft)	Max Spread (ft)	Tolerates
ACER RUBRUM	RED MAPLE	4 ~ 10	70	50	
ACER SACCHARUM	SUGAR MAPLE	3 ~ 8	80	60	
AESCULUS GLABRA	OHIO BUCKEYE	4 ~ 7	40	40	
AESCULUS HIPPOCASTANUM	HORSECHESTNUT	4 ~ 7	75	65	
BETULA LENTA	BLACK BIRCH	3 ~ 7	70	60	
BETULA NIGRA	RIVER BIRCH	4 ~ 9	70	60	
BETULA PENDULA	EUROPEAN WHITE BIRCH	3 ~ 6	70	50	
CARYA CORDIFORMIS	BITTERNUT HICKORY	4 ~ 9	80	50	
CELTIS OCCIDENTALIS	NORTHERN HACKBERRY	3 ~ 9	60	60	
CHAMAECYPARIS THYOIDES	ATLANTIC WHITE CEDAR	4 ~ 9	50	40	
GINKGO BILOBA	GINKGO	4 ~ 8	80	40	salt
GLEDITSIA TRIACANTHOS	HONEYLOCUST	4 ~ 8	80	70	
GYMNOCLADUS DIOICUS	KENTUCKY COFFEETREE	4 ~ 8	80	55	pollution
JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4 ~ 9	65	25	
MACLURA POMIFERA	OSAGE ORANGE	4 ~ 9	60	60	

MAGNOLIA ACUMINATA	CUCUMBER TREE	4 ~ 8	75	35	
MALUS BACCATA	SIBERIAN CRABAPPLE	2 ~ 7	40	40	salt
OSTRYA VIRGINIANA	EASTERN HOPHORNBEAM	4 ~ 9	40	30	
QUERCUS BICOLOR	SWAMP WHITE OAK	4 ~ 8	60	60	wet soil
QUERCUS MACROCARPA	BUR OAK	3 ~ 8	80	80	wet soil
QUERCUS PALUSTRIS	PIN OAK	4 ~ 8	70	60	wet soil
QUERCUS RUBRA	NORTHERN RED OAK	4 ~ 8	75	75	
SASSAFRAS ALBIDUM	SASSAFRAS	4 ~ 8	60	40	
TAXODIUM DISTICHUM	BALDCYPRESS	4 ~ 10	70	45	wet soil & salt
THUJA OCCIDENTALIS	NORTHERN WHITE CEDAR	3 ~ 7	40	15	wet soil
TILIA CORDATA	LITTLELEAF LINDEN	4 ~ 7	70	50	
AESCULUS FLAVA	YELLOW BUCKEYE	4 ~ 8	75	50	
CHAMAECYPARIS NOOTKATENSIS	ALSAKA CEDAR	4 ~ 8	35	12	
PRUNUS PADUS	EUROPEAN BIRD CHERRY	4 ~ 6	40	40	
NYSSA SYLVATICA	BLACK GUM	4 ~ 9	75	35	salt
CATALPA SPECIOSA	CATALPA	4 ~ 8	70	50	clay soil
PLATANUS OCCIDENTALIS	SYCAMORE	4 ~ 9	100	100	wet soil

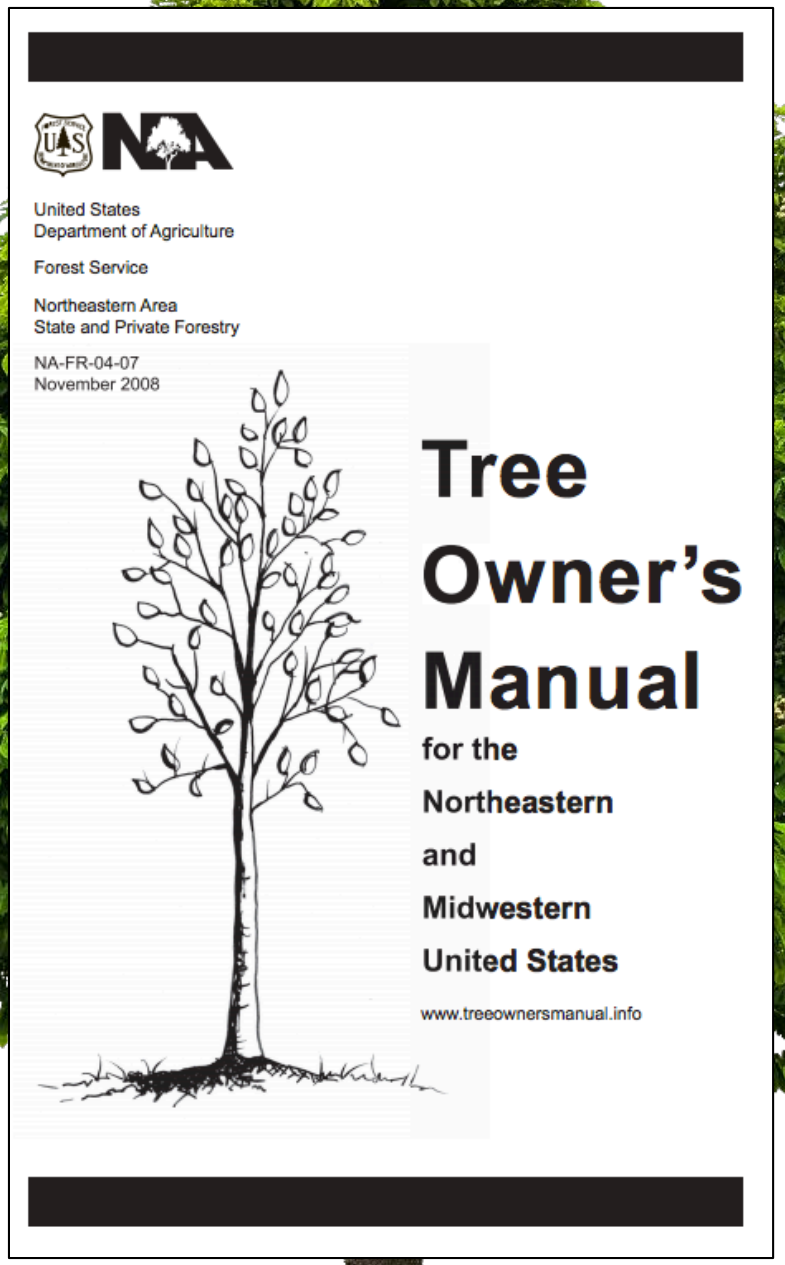
Appendix 5

How to Properly Plant a Tree

To Download

Scan this QR code with
your smart phone

or go to *www.treeownersmanual.info*
It can also be found on our website at
www.srmtenv.org along with many other
resources under the Forestry Project



Appendix 6

How NOT to Kill a Tree

1.Do not top trees. Tree heights can be lowered by proper crown reduction that doesn't stimulate watersprout production.

2. When a tree is young, select one or the other of the competing upright branches to be the main branch and cut the other off.

3. Remove branches that cross and rub in order to prevent bark wounds.

4. Monitor for insects and diseases and treat appropriately if they are found.

5. Do not use anything to cover pruning cuts or wounds – trees seal their own wounds.

6. Cut broken branches off at the branch bark collar.

7. Spray the lawn with herbicides that will not damage trees.

8. Mulch around the tree to avoid hitting the tree trunk with lawn or edging equipment and to protect surface roots.

9. Dig around roots whenever possible but when not, make a clean pruning cut on the tree side of the root.

10. Know how big a tree will grow (height and width) and space accordingly away from houses and other obstacles.

11. Insert a nail or screw into your tree to which a wire or line can be attached. The tree will seal around the small wound made by the nail or screw.

12. Cut branches back to laterals so you don't leave stubs to which the branches will die back.

13. Do not make flush cuts. Cut on the outside of the branch bark collar.

14. Stakes generally aren't needed on small residential trees, but if they are, remove them after one year to avoid any damage.

15. Do not wrap the trunk with anything except a wide wire cage if animals are a problem.

16. Do not put mulch in contact with the trunk, and then pile mulch only 2 to 3 inches over the roots.

17. Do not put any type of fabric or plastic material under your mulch.

18. Do not stack items atop the roots; it causes soil compaction.

19. Take the ball roping off around the tree trunk. If the tree is in a container, remove the container before planting.

20. Divert water from the roots of trees that don't like wet soil, but when you water, water deeply to encourage deep root growth.

21. Remove the top horizontal round of wire from the basket. It is not necessary to remove the entire basket.

22 Remove the burlap, regardless of type, from atop the ball and down several inches on the ball side. It is not necessary to remove all the burlap.

23. Dig the hole at least twice as wide as the root system to encourage lateral root growth out of the root ball. Do not amend backfill for individual tree holes. Only amend if the entire planting area can be equally amended.

24. Dig your hole only as deep as the root system and do not put gravel in the bottom of the planting hole unless you install a drain to actively pull extra water away.

Appendix 7

Tree Species List: Suggested Selections for Akwesasne

Species for Selected Functions
St. Regis Mohawk Tribe

County: Franklin
State: New York

i-Tree Species

Trees 30 - 100 feet tall

Common Name	Scientific Name	Hardiness Zone	Max Height (feet)	Max Spread (feet)
RED MAPLE	*ACER RUBRUM*	4 ~ 10	70	50
SUGAR MAPLE	*ACER SACCHARUM*	3 ~ 8	80	60
OHIO BUCKEYE	*AESCULUS GLABRA*	4 ~ 7	40	40
HORSECHESTNUT	*AESCULUS HIPPOCASTANUM*	4 ~ 7	75	65
BLACK BIRCH	*BETULA LENTA*	3 ~ 7	70	60
RIVER BIRCH	*BETULA NIGRA*	4 ~ 9	70	60
EUROPEAN WHITE BIRCH	*BETULA PENDULA*	3 ~ 6	70	50
BITTERNUT HICKORY	*CARYA CORDIFORMIS*	4 ~ 9	80	50
NORTHERN HACKBERRY	*CELTIS OCCIDENTALIS*	3 ~ 9	60	60
ATLANTIC WHITE CEDAR	*CHAMAECYPARIS THYOIDES*	4 ~ 9	50	40
GINKGO	*GINKGO BILOBA*	4 ~ 8	80	40
HONEYLOCUST	*GLEDITSIA TRIACANTHOS*	4 ~ 8	80	70
KENTUCKY COFFEETREE	*GYMNOCLADUS DIOICUS*	4 ~ 8	80	55
EASTERN RED CEDAR	*JUNIPERUS VIRGINIANA*	4 ~ 9	65	25

OSAGE ORANGE	*MACLURA POMIFERA*	4 ~ 9	60	60
CUCUMBER TREE	*MAGNOLIA ACUMINATA*	4 ~ 8	75	35
SIBERIAN CRABAPPLE	*MALUS BACCATA*	2 ~ 7	40	40
EASTERN HOPHORNBEAM	*OSTRYA VIRGINIANA*	4 ~ 9	40	30
SWAMP WHITE OAK	*QUERCUS BICOLOR*	4 ~ 8	60	60
BUR OAK	*QUERCUS MACROCARPA*	3 ~ 8	80	80
PIN OAK	*QUERCUS PALUSTRIS*	4 ~ 8	70	60
NORTHERN RED OAK	*QUERCUS RUBRA*	4 ~ 8	75	75
SASSAFRAS	*SASSAFRAS ALBIDUM*	4 ~ 8	60	40
BALDCYPRESS	*TAXODIUM DISTICHUM*	4 ~ 10	70	45
NORTHERN WHITE CEDAR	*THUJA OCCIDENTALIS*	3 ~ 7	40	15
LITTLELEAF LINDEN	*TILIA CORDATA*	4 ~ 7	70	50
YELLOW BUCKEYE	*AESCULUS FLAVA*	4 ~ 8	75	50
ALSAKA CEDAR	*CHAMAECYPARIS NOOTKATENSIS*	4 ~ 8	35	12
EUROPEAN BIRD CHERRY	*PRUNUS PADUS*	4 ~ 6	40	40
BLACK GUM	*NYSSA SYLVATICA*	4 ~ 9	75	35
PIGNUT HICKORY	*CARYA GLABRA*	5 ~ 9	80	40
CHINKAPIN OAK	*QUERCUS MUEHLENBERGII*	4 ~ 7	60	70
CATALPA	*CATALPA SPECIOSA*	4 ~ 8	70	50
RED MULBERRY	*MORUS RUBRA L.*	5 ~ 9	50	40
SYCAMORE	*PLATANUS OCCIDENTALIS*	4 ~ 9	100	100

Trees 10 - 30 feet tall

AMERICAN LICORICE	*GLYCYRRHIZA LEPIDOTA*	3 ~ 8	12	12
HOBBLEBUSH	*VIBURNUM LANTANOIDES*	3 ~ 8	12	12
AMERICAN WITCHHAZEL	*HAMAMELIS VIRGINIANA L.*	3 ~ 8	20	20
PAW PAW	*ASIMINA TRILOBA*	5 ~ 9	30	30
BLACK ELDERBERRY	*SAMBUCUS CANADENSIS*	4 ~ 7	12	12
MANCHU CHERRY	*PRUNUS TOMENTOSA*	3 ~ 7	10	10
WILD PLUM	*PRUNUS AMERICANA*	3 ~ 6	25	25
AMUR CHOKECHERRY	*PRUNUS MAACKII*	3 ~ 6	30	25
NEW YORK HAWTHORN	*CRATAEGUS DESUETA*	4 ~ 8	30	30
SIBERIAN HAZELNUT	*CORYLUS HETEROPHYLLA*	4 ~ 8	16	13
PAPERBARK MAPLE	*ACER GRISEUM*	4 ~ 7	30	25
SARGENT CHERRY	*PRUNUS SARGENTII*	4 ~ 7	30	30
DOWNY HAWTHORN	*CRATAEGUS MOLLIS*	3 ~ 6	30	30
WASHINGTON HAWTHORN	*CRATAEGUS PHAENOPYRUM*	4 ~ 8	30	30

Hardiness zone derived from Horticopia database based on USDA Hardiness zones. For hardiness zones with decimal (e.g., 4.5) values were rounded down for maximum hardiness (e.g., 4) and up for minimum hardiness zone (e.g., 5)
* Some uncertainty to hardiness zone - hardiness zone estimates derived from Dirr (M.A. Dirr, 1975, Manual of Woody Landscape Plants. Stipes Publ. Co. Champaign IL. 1007 p.) and Sunset (1985, New Western Garden Book, Lane Publ. Co. Menlo Park, CA. 512 p.). As hardiness estimates or maps did not always exactly match USDA Hardiness zone ranges, some extrapolations were made to the closest hardiness zone.
** Moderate uncertainty to hardiness zone - hardiness zone estimate based on genera average of minimum and maximum hardiness zone based on Horticopia database and information from Dirr (1997) and Sunset (1985). Average value was rounded to nearest hardiness zone class (1 -11).
*** High uncertainty to hardiness zone - hardiness zone estimate based on family average of minimum and maximum hardiness zone based on Horticopia database and information from Dirr (1997) and Sunset (1985). Average value was rounded to nearest hardiness zone class (1 -11).
Sensitivity - "S" indicates sensitive to pollutant; "I" indicates intermediate rating between sensitive and tolerant to pollutant; and "S/I" indicates a mix of sensitive and intermediate ratings in the literature.

Appendix 8

Energy Efficient Landscaping

To easily see the benefits provided by the trees around your home, or to find out what additional energy savings could be provided by planting more trees, go to www.itreetools.org/design

There you will find:

A free, web-based tool that allows anyone to make a simple estimation of the benefits individual trees provide. With inputs of location, species, tree size and condition, users receive an understanding of tree benefits related to greenhouse gas mitigation, air quality improvements and storm water interception. With the additional step of drawing a building footprint — and virtually "planting" a tree around it — tree effects on building energy use can be evaluated.

i-Tree Design

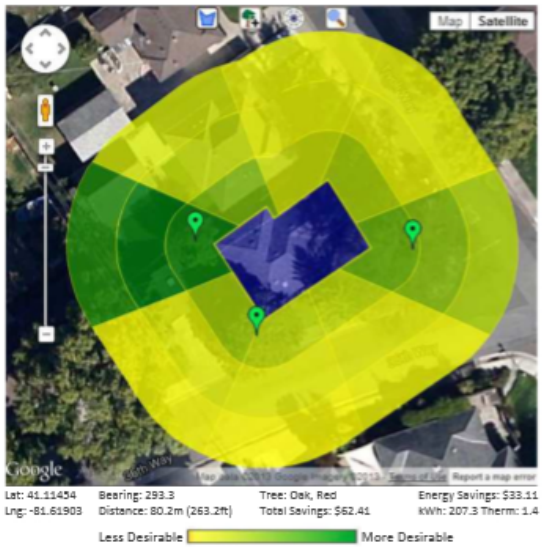
What is i-Tree Design?

i-Tree Design is a free, web-based tool that allows anyone to make a simple estimation of the benefits individual trees provide. With inputs of location, species, tree size and condition, users receive an understanding of tree benefits related to greenhouse gas mitigation, air quality improvements and storm water interception. With the additional step of drawing a building footprint — and virtually "planting" a tree around it — tree effects on building energy use can be evaluated.

Benefits are estimated cumulatively, for the current year, as well as a user-specified future year. Multiple trees can be added to compare benefits or to provide a full accounting of a property's trees. This tool is intended as a simple and accessible starting point for understanding individual trees' value to the community or local landowner.

What is needed to use i-Tree Design?

i-Tree Design is a free online tool located at: **www.itreetools.org/design**



i-Tree Design allows users to better understand optimal placement of trees to maximize energy benefits.

How do you use Design?

You can get started with four easy steps:

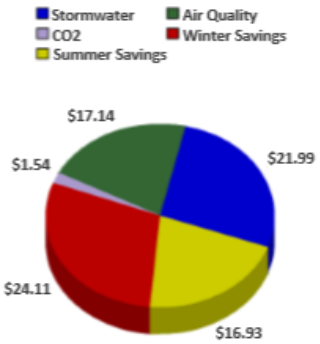
1. Start by typing in a street address.
2. Draw the outline of a house or any building of interest.
3. Select a tree and place it on the map (repeat for more trees).
4. Estimate current & future tree benefits.

i-Tree Design projects can be a simple assessment of a single tree or more complex assessments of multiple trees, buildings and their interactions

i-Tree Design

What results does i-Tree Design generate?

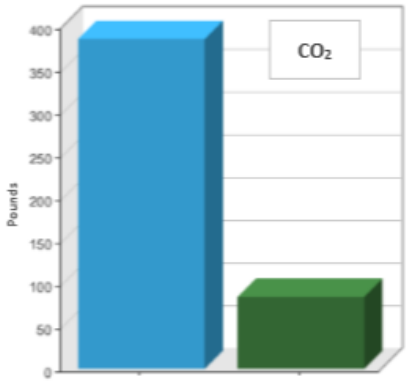
- Breakdown of the annual benefits of each tree.
- Projection of tree growth & benefits into the future.
- Gallons of storm water intercepted.
- Analysis of electricity and heating energy use.
- Air quality improvements.
- Carbon sequestered and avoided.
- Combined benefits for all trees on a parcel.



Breakdown of annual tree benefits.

What are some potential uses of i-Tree Design?

- Estimate the benefits of the existing trees on a property.
- Estimate the benefits of planting new trees on a property.
- Estimate the benefits lost when a tree is removed.
- Evaluate different species or planting designs.
- Create an i-Tree Design website link to promote trees.



Annual atmospheric carbon dioxide (CO_2) reduction.

Who is using i-Tree Design?

- Homeowners
- Landscape architects
- Schools
- Tree advocacy organizations
- Nurseries & landscape designers
- Utility companies

Give it a try today!

www.itreetools.org/design

Appendix 9

List of Tree Species Encountered in Southern Akwesasne (urban tree inventory)

Alternate-leaved dogwood
American basswood
American elm
Balsam fir
Bitternut hickory
Black ash
Black cherry
Black locust
Black maple
Black spruce
Black walnut
Blue spruce
Boxelder
Buckthorn
Bur oak
Butternut
Cherry plum
Common apple
Common pear
Common plum
Crab apple
Crimson king norway maple
Eastern cottonwood
Eastern Hemlock
Eastern white pine
European ash
European buckthorn
European fly honeysuckle
Ginkgo
Gray birch
Green ash
Hackberry
Hawthorn
Hickory
Honey locust
Japanese snowbell
Juniper
Lilac
Little leaf linden
Locust
Northern red oak
Northern white cedar
Norway maple
Norway spruce
Paper birch
Quaking aspen
Red maple
Red oak
Red osier dogwood
Red Pine
Red spruce
River birch
Scotch pine
Serviceberry
Siberian elm
Silver maple
Speckled alder
Staghorn sumac
Sugar maple
Tamarack
White ash
White oak
White poplar
White spruce
Willow
Yellow birch

Appendix 10

Measurable goals for Akwesane's Urban Forest (by the numbers)

- Increase the currently low 8.6 trees per acre, to 100 trees per acre in the urban area.
- Maintain and improve the existing 5.5% canopy coverage. Canopy cover for this region and climate zone should be around 35% canopy cover.
- Improve the amount of annual avoided storm water runoff. Increase the 2.2 million gallons of avoided storm water runoff to 23.7 million gallons annually.
- Enhance the present $42,000 in annual building energy savings in heating and cooling to $4.4 million per year.
- Expand the total $1.5 million in annual benefits valued in avoided runoff, electricity, air quality, property value, heating, and CO_2 absorption. Potentially, a total of $16.5 million in benefits could be provided every year.

In order to achieve these potential values, approximately 250,000 trees would need to be planted and properly maintained in the urban area over the next 30 years.

Glossary

Urban and Community Forestry- Are all of the trees within a town, village, or city that make up the "community forest". The community forest can include street and yard trees, parks, cemeteries, school grounds, and undeveloped green spaces. Urban and Community Forestry is the management of community forests to establish and maintain healthy trees for air and water quality benefits, energy savings, environmental health, as well as to enhance the quality of life for urban residents. The urban and community forest also contains wildlife, waterways, built roads, structures, and people. (Urban and Community Forestry retrieved 2/13/2018 from http://www.dec.ny.gov/lands/4957.html)

Peri-Urban- Immediately adjoining an urban area: between the suburbs and the countryside. The landscape interface between town and country, or also known as the rural—urban transition zone where urban and rural uses mix and often clash. (The Dynamics of Peri-Urbanization, retrieved 2/13/2018 from http://webcache.googleusercontent.com/search?q=cache:gmA_mTcqqJ4J:www.springer.com/cda/content/document/cda_downloaddocument/9783642305283-c1.pdf%3FSGWID%3D0-0-45-1364510-p174508209+&cd=19&hl=en&ct=clnk&gl=us)

Urban Forest- Is a network of green spaces in a community where trees and other woody plants are maintained to improve air quality, stormwater management, and wildlife habitat. Urban forests may be the remnants of the natural environment preserved in the process of urbanization, or they may be manmade networks of trees in cities. Essentially, they are a vital part of a community's green infrastructure. (Urban Forests and Climate Change, retrieved 2/12/2018 from https://www.fs.usda.gov/ccrc/topics/urban-forests-and-climate-change)

Green Infrastructure- Green Infrastructure can be broadly defined as a strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings.

More specifically, it is a spatial structure providing benefits from nature to people, which aims to enhance nature's ability to deliver multiple valuable ecosystem goods and services, such as clean air or water.

Green infrastructure:

• Fosters a better quality of life and human well-being, for instance by providing a high quality environment in which to live and work.

• Improves biodiversity, by reconnecting isolated nature areas and increasing the mobility of wildlife across the wider landscape.

• Protects us against climate change and other environmental disasters, such as alleviating floods, storing carbon or preventing soil erosion.

• Encourages a smarter, more integrated approach to development to ensure that limited space is utilized as efficiently and coherently as possible. (Building a Green Infrastructure for Europe, retrieved 2/13/2018 from http://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_broc.pdf)

Canopy Cover- is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.

The principal aim of a canopy cover assessment is to help decision makers understand the urban forest resource, particularly the amount of tree canopy that currently exists and the potential amount that could exist.

Measuring canopy cover has helped city planners, urban foresters, mayors, councils, local authorities, and communities see trees and forests in a new way, focusing attention on green infrastructure as a key component of community planning, sustainability and resilience. (Urban Forest Cover, retrieved 2/13/2018 from http://www.urbantreecover.org/urban-forest-cover/)

Biodiversity- Is the shortened form of two words "biological" and "diversity." It refers to all the variety of life that can be found on Earth (plants, animals, fungi and micro-organisms) as well as to the communities that they form and the habitats in which they live.

Biodiversity is not only the sum of all ecosystems, species and genetic material. Rather, it represents the variability within and among them. It can be distinguished from the expression "biological resources", which refer to the tangible components of ecosystems. Biological resources are real entities (a particular species of bird, a wheat variety growing in a field, oak wood, etc.) while biological diversity is rather an attribute of life (the variety of bird species, the genetic variability of wheat around the world, forest types, etc.). (What is biodiversity? retrieved 2/13/2018 from http://www.biodiv.be/biodiversity/about_biodiv/biodiv-what)

Ecosystem- A system involving the interactions between a community of living organisms in a particular area and its nonliving environment; or a community of organisms together with their physical environment, viewed as a system of interacting and interdependent relationships and including such processes as the flow of energy through trophic levels and the cycling of chemical elements and compounds through living and nonliving components of the system. (ecosystem. (n.d.). *The American Heritage® Science Dictionary*. retrieved 2/12/2018 from http://www.dictionary.com/browse/ecosystem)

Ecosystem services- Ecosystem goods and services produce the many life-sustaining benefits we receive from nature—clean air and water, fertile soil for crop production, pollination, and flood control. These ecosystem services are important to environmental and human health and well-being. (EPA, Ecosystem Services, retrieved 2/13/2018 from https://www.epa.gov/eco-research/ecosystem-services)

Early Successional Ecological State- is a forest ecosystems that develops after a disturbance, they are diverse in species, processes, and structure. Post-disturbance ecosystems are also often rich in biological legacies, including surviving organisms and organically derived structures, such as woody debris. Early succession is the only period when tree canopies do not dominate the forest site, and so this stage can be characterized by high productivity of plant species (including herbs and shrubs), complex food webs, large nutrient fluxes, and high structural and spatial complexity. An example of this would be an abandoned farm field growing back after it has laid fallow or inactive for some time. (The forgotten stage of forest succession: early-successional ecosystems on forest sites, retrieved 2/13/2018 from http://nysenvirothon.homestead.com/Referencesandother/Early_Successional_Forest_Ecosystems.pdf)

Trees per acre- Is the number of standing trees that are found on an acre of land. It is based on the distance between or the spacing of trees on a site. (Basal Area: A measure made for management, retrieved 2/13/2018 from http://www.aces.edu/pubs/docs/A/ANR-1371/ANR-1371.pdf)

DBH- Diameter at breast height or DBH refers to the tree diameter measured at 4.5 feet above the ground. (How to Measure a Tree, retrieved 2/13/2018 from https://www.portlandoregon.gov/trees/article/424017)

Carbon sequestration- is the process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils. The sink of carbon sequestration in forests and wood products helps to offset sources of carbon dioxide to the atmosphere, such as deforestation, forest fires, and fossil fuel emissions. (Carbon Sequestration, retrieved 2/13/2018 from https://www.fs.fed.us/ecosystemservices/carbon.shtml)

Lacustrine Soils- Are sedimentary rock formations which formed in the bottom of a lake. A common characteristic of lacustrine deposits is that a river or stream channel has carried sediment into the basin. Soils formed on or from lacustrine deposits, i.e. material deposited in lake water and later exposed. (Soil Formation and Parent Material retrieved 2/13/2018 from http://landscape.soilweb.ca/lacustrine-environment/)

Watershed- is an area of land that catches rainfall and other precipitation and funnels it into a marsh, stream, river, lake or groundwater. There is a direct link between what we do on the land and the health of our watersheds and the quality of the water in our waterways. Those watersheds that are forested offer a wide array of benefits. Healthy urban and rural forested watersheds absorb rainfall and snow melt, slow storm runoff, recharge aquifers, sustain stream flows, filter pollutants from the air and runoff before they enter the waterways; and provide critical habitat for fish and wildlife. In addition, forested watersheds provide abundant recreational opportunities, help support local economies, provide an inexpensive source of drinking water, and improve the quality of our lives. (Watershed forestry, retrieved 2/13/2018 from https://www.fs.fed.us/spf/coop/programs/wf/)

Invasive species- any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health. (Invasive and Exotic Species of North America. Retrieved 2/13/2018 from https://www.invasive.org/)

Impervious Surface- Is a surface that inhibits the natural infiltration of rainwater into the ground, which leads to more stormwater runoff and higher stormwater peak flows. Streets, parking lots, and other transportation-related structures comprise the bulk of impervious surfaces within a watershed and, as such, collect pollution like heavy metals, grease, and oils. Runoff generated by early-season rains can mobilize and transport these pollutants and other contaminants, like harmful bacteria, to streams. These pollutants impact the health of receiving streams as well as the coastal waters into which these streams flow. (EVALUATION OF RAINFALL-RUNOFF RELATIONSHIPS TO DEVELOP STORMWATER REDUCTION STRATEGIES IN SOUTH COAST WATERSHEDS retrieved 2/13/2018 from http://www.esm.ucsb.edu/research/documents/StormwaterBrief.pdf)

Energy Efficient Landscaping- is a type of landscaping designed for the purpose of conserving energy. Methods include; Planting trees for the purpose of providing shade, which reduces cooling costs. Planting or building windbreaks to slow winds near buildings, which reduces heat loss. Wall sheltering, where shrubbery or vines are used to create a windbreak directly against a wall. Earth sheltering and positioning buildings to take advantage of natural landforms as windbreaks. Green roofs that cool buildings with extra thermal mass and evapotranspiration. Reducing heat island effects with pervious paving, high albedo paving, shade, and minimizing paved areas. (Energy-efficient landscaping, retrieved 2/13/2018 from https://en.wikipedia.org/wiki/Energy-efficient_landscaping)

Greenhouse gas emissions- A greenhouse gas is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. By increasing the heat in the atmosphere, greenhouse gases are responsible for the greenhouse effect, which ultimately leads to global warming. The most significant greenhouse gases are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Before industrial revolution, CO_2 fluctuated between about 180 ppm during ice ages and 280 ppm during interglacial warm periods. Since the Industrial Revolution, the amount of CO_2 has dramatically increased at a rate of 100 times faster since the last ice age ended. (Greenhouse Gas Emissions: Causes & Sources, retrieved 2/13/2018 from https://www.livescience.com/37821-greenhouse-gases.html)

Bioclimatic changes- Relating to the interrelation of climate and the activities and distribution of living organisms. (Oxford Dictionaries, retrieved 2/13/2018 from https://en.oxforddictionaries.com/definition/bioclimatic)

Resilience- The capacity to recover quickly from difficulties; toughness. (Oxford Dictionaries, retrieved 2/13/2018 from https://en.oxforddictionaries.com/definition/resilience)

AKWESASNE COMMUNITY FOREST MANAGEMENT PLAN

Saint Regis Mohawk Tribe
Environment Division
Forestry Resources