January 2022

STANDARD INVENTORY ANALYSIS AND MANAGEMENT PLAN

Village of Sackets Harbor, New York

Prepared for:

Village of Sackets Harbor
112 North Broad Street
Sackets Harbor, NY 13685

Prepared by:

Davey Resource Group, Inc.
10 Mitchell Street
Sinclairville, NY 14782

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ACKNOWLEDGMENTS

This project supports the Village of Sackets Harbor's vision to promote and enhance community well-being through public tree conservation and improved forestry management practices. This *Standard Inventory Analysis and Management Plan* offers expertise in preserving and expanding urban canopy so the environmental, economic, and social benefits it provides continue for generations.

Sackets Harbor funded this inventory through the village's budget and recognizes the support of its Mayor and Village Council:

Mayor Alex Morgia

Trustee Mark Pacilio

DPW Superintendent Lynn Martin

Kelly Reinhardt, Tree Committee Chair

Tree Committee Members: Brenda Scordo, Sherry Derouin, Debby Manning, Mike Smith, Amy Loomis.

Ten-year Tree Resource Maintenance Schedule

EXECUTIVE SUMMARY

The Village of Sackets Harbor *Standard Inventory Analysis and Management Plan*, written by Davey Resource Group, Inc. "DRG", focuses on quantifying the benefits provided by the inventoried tree resource and addressing its maintenance needs. DRG completed a tree inventory for Sackets Harbor in October 2021 and analyzed the inventory data to understand the structure of the village's inventoried tree resource. DRG also estimated the economic values of the various environmental benefits provided by this public tree resource by analyzing inventory data with i-Tree Eco. DRG provided a prioritized management program for future tree care in the plan.

The 2021 inventory included 785 trees, 13 stumps, and 293 vacant planting sites, for a total of 1,091 sites in the public right-of-way (ROW), parks, and one cemetery located in the village. Maple, particularly Freeman maple, were overabundant along streets. Young trees comprised 42% of the tree population, with established and maturing trees falling short of ideal age distributions in the population. The factor of having low species diversity could lead to significant consequences in the event of a major forest disturbance such as pest or disease infestation. Invasive pests with the potential to cause the greatest harm to Sackets Harbor's urban forest include spotted lanternfly, Asian longhorned beetle, and Lymantria dispar. However, 93% of the inventoried trees were rated in Fair or better condition, indicating the urban forest is currently stable and young trees have the potential to reach maturity if they are well maintained.

The functions of Sackets Harbor's inventoried tree population provide benefits with an estimated total value of $2,685 annually. In 2021, the village spent $8,100 on tree planting, pruning, and removals. With this budget, Sackets Harbor's inventoried tree resource provides an annual 33% return on investment.

The replacement value of Sackets Harbor's inventoried tree population is estimated at over $1.6 million, and its carbon storage capacity is valued at over $162,969. Supporting and funding proactive maintenance of the public tree resource is a sound long-term investment that will reduce tree management costs over time and increase the benefits provided to village residents.

High priority tree removal and pruning is costly, accounting for the larger budget in the first years of the ten-year schedule, as shown in Figure 1. After high priority work has been completed, budgets are expected to decrease and stabilize as tree management transitions from reactive to proactive maintenance.

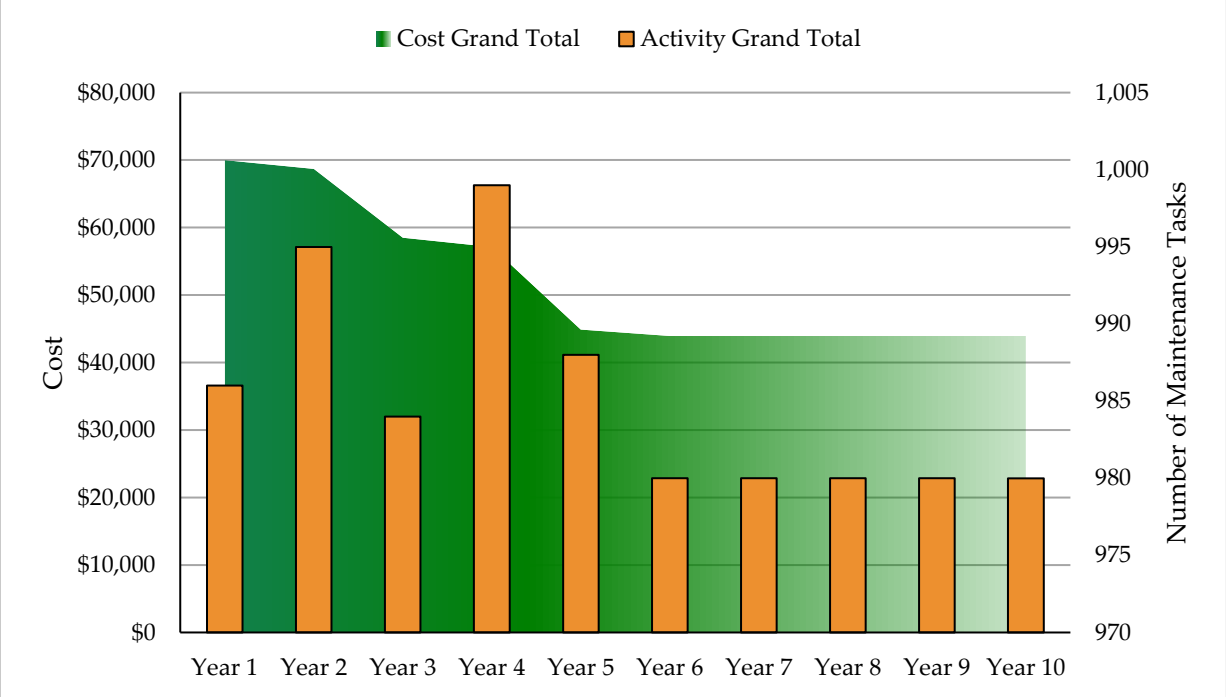


Figure 1. Ten-year annual maintenance budget and tasks.

Recommended Maintenance Types

Tree Removal

Trees designated for removal have defects that cannot be cost-effectively or practically corrected. Most of the trees in this category have a large percentage of dead crown.

Total = 44 trees

High Priority = 4 trees

Moderate Priority = 22 trees

Low Priority = 18 trees

Stumps = 13

Priority Pruning

Priority pruning removes defects such as Dead and Dying Parts or Broken and/or Hanging Branches. Pruning the defected branch(es) can lower risk associated with the tree while promoting healthy growth.

Total = 45 trees

High Priority = 1 tree

Moderate Priority = 44 trees

Routine Pruning Cycle

Over time, routine pruning of Low and Moderate Risk trees can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Total = 418 trees

Number in cycle each year = at least 42 trees

Young Tree Training Cycle

Younger trees can have branch structures that lead to potential problems as the tree ages, requiring training to ensure healthy growth. Training is completed from the ground with a pole pruner or pruning shear.

Total = 266 trees

Number in cycle each year = at least 88 trees

Tree Planting

Planting new trees in areas that have poor canopy continuity is important, as is planting trees where there is sparse canopy, to ensure that tree benefits are distributed evenly across the village.

Total replacement plantings = 57 trees to replace; removed trees due to poor health

Total new plantings = 10 trees/year over 10 years

Routine Tree Inspection

Routine inspections are essential to uncovering potential problems with trees and should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees.

Total = 728 existing trees + 157 new trees

Number in walk-by assessment cycle each year = near 89 trees (ten-year cycle)

INTRODUCTION

The Village of Sackets Harbor is home to 1,674 residents benefitting from public trees in their community. The village's Department of Public Works (DPW) manages all trees, stumps, and planting sites along the street rights-of-way (ROW) and throughout public parks. Sackets Harbor has celebrated Arbor Day as an annual event for 12 years and has been a Tree City USA for three years. The village has been practicing arboriculture or has had someone responsible for managing street trees for over 10 years, with planting and maintenance goals established by the community tree board.

Citizens can request street trees to be planted in the right-of-way adjacent to their properties, which are included in Sackets Harbor's annual tree planting program. The village typically purchases balled and burlapped trees from local nurseries, and contractors often perform the physical planting. The village has a routine young tree training program but does not have a routine mature tree pruning program. Tree maintenance work includes weekly supplemental watering and annual mulching performed by the Village DPW and contractors. The village performs under 25 tree removals and fewer than 25 stump removals annually.

Sackets Harbor has taken an important first step in developing a maintenance plan for the village trees with this inventory, the first conducted for the village. A volunteer program has planted 260 trees over 12 years and is one example of the potential for volunteer activity in public tree-related efforts. Another example is the training through a New York State Department of Environmental Conservation (DEC) tree pruning class, provided by the Tree Committee chair. Because Sackets Harbor is a historic village and tourist destination, the visual aesthetic has the potential for further enhancement with the planting of new trees, particularly native species that reflect these historic qualities.

The village's urban forestry program is well on its way to creating a sustainable and resilient public tree resource. It is important to sustain the program by having a robust and diverse funding program and routinely updating the tree inventory to address any changes in the health of the trees.

RECOMMENDED APPROACH TO TREE MANAGEMENT

An effective approach to tree resource management follows a proactive and systematic program that sets clear and realistic goals, prescribes future action, and periodically measures progress. A robust urban forestry program establishes tree maintenance priorities and utilizes modern tools, such as a tree inventory accompanied by TreeKeeper® or other asset management software.

In October 2021, Sackets Harbor worked with DRG to inventory its public trees and develop this management plan. Consisting of three sections, this plan considers the diversity, distribution, and condition of the inventoried tree population and provides a prioritized system for managing the village's public tree resource.

- *Section 1: Structure and Composition of the Public Tree Resource* summarizes the inventory data with trends representing the current state of the tree resource.
- *Section 2: Functions and Benefits of the Public Tree Resource* summarizes the estimated value of benefits provided to the community by public trees' various functions.
- *Section 3: Recommended Management of the Public Tree Resource* details a prioritized management program and provides an estimated budget for recommended maintenance activities over a ten-year period.

Section 1:

Structure and Composition

of the Public Tree Resource

SECTION 1: STRUCTURE AND COMPOSITION OF THE PUBLIC TREE RESOURCE

In October 2021, DRG arborists collected site data on trees, stumps, and planting sites along the entire street ROW, public parks, and Lakeside Cemetery. While both broadleaf and coniferous trees were collected in Lakeside Cemetery, the many cedar (*Juniperus* spp.) were not at this time, with the intent the additional trees can be added at a later time. Figure 2 breaks down the total sites inventoried by type for the total tree population collected. See Appendix A for details about DRG's methodology for collecting site data.

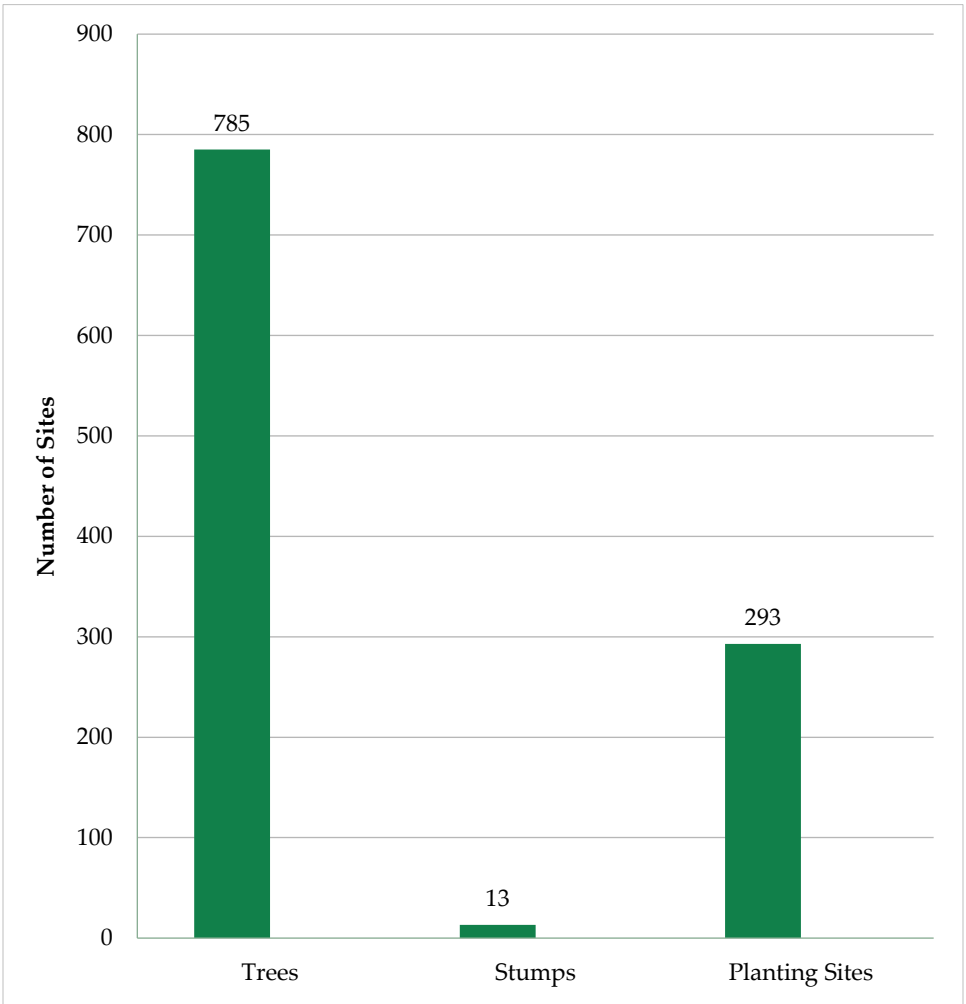


Figure 2. Number of inventoried sites by location and type.

SPECIES, GENUS, AND FAMILY DISTRIBUTION

The 10-20-30 rule is a common standard for tree population distribution, in which a single species should compose no more than 10% of the tree population, a single genus no more than 20%, and a single family no more than 30% (Santamour 1990).

Figure 3 shows Sackets Harbor's distribution of the most abundant tree species inventoried compared to the 10% threshold. Apple (*Malus* spp.) are the most abundant species, and while 9% of the population is fairly close to the 10% threshold, it is not immediately concerning from this data alone.

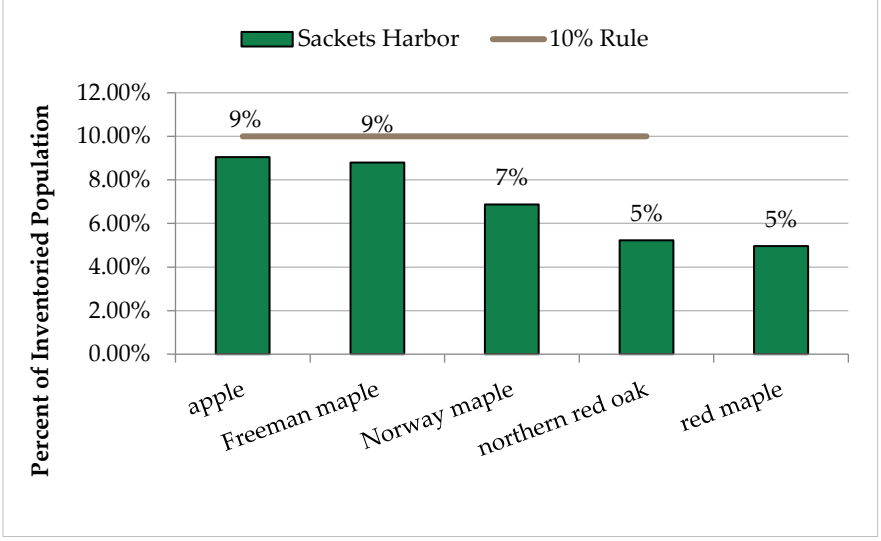


Figure 3. Species distribution of inventoried trees.

However, Figure 4 shows the village's distribution of the most abundant tree genera inventoried, and maple (*Acer*) is significantly higher than the 20% threshold. This means that while apple species combined are more abundant than any individual species, the combined number of maple species is concerning, because maple compose 30% of the inventoried population. For this reason, it is recommended the Village of Sackets Harbor should limit planting any maple species until this distribution becomes more ideal.

RESILIENCE THROUGH DIVERSITY

The Dutch elm disease epidemic of the 1930s provides a key historical lesson on the importance of diversity (Karnosky 1979). The disease killed millions of American elm trees, leaving behind enormous gaps in the urban canopy of many communities. In the aftermath, ash trees became popular replacements and were heavily planted along city streets. History repeated itself in 2002 with the introduction of the emerald ash borer into America. This invasive beetle devastated ash tree populations across the United States. Other invasive pests spreading across the country threaten urban forests, so it is vital that we learn from history and plant a wider variety of tree species and genera to develop a public tree resource that is both resistant to and resilient after disturbances.

Ash trees in an urban forest killed by emerald ash borer.

USDA Forest Service (2017)

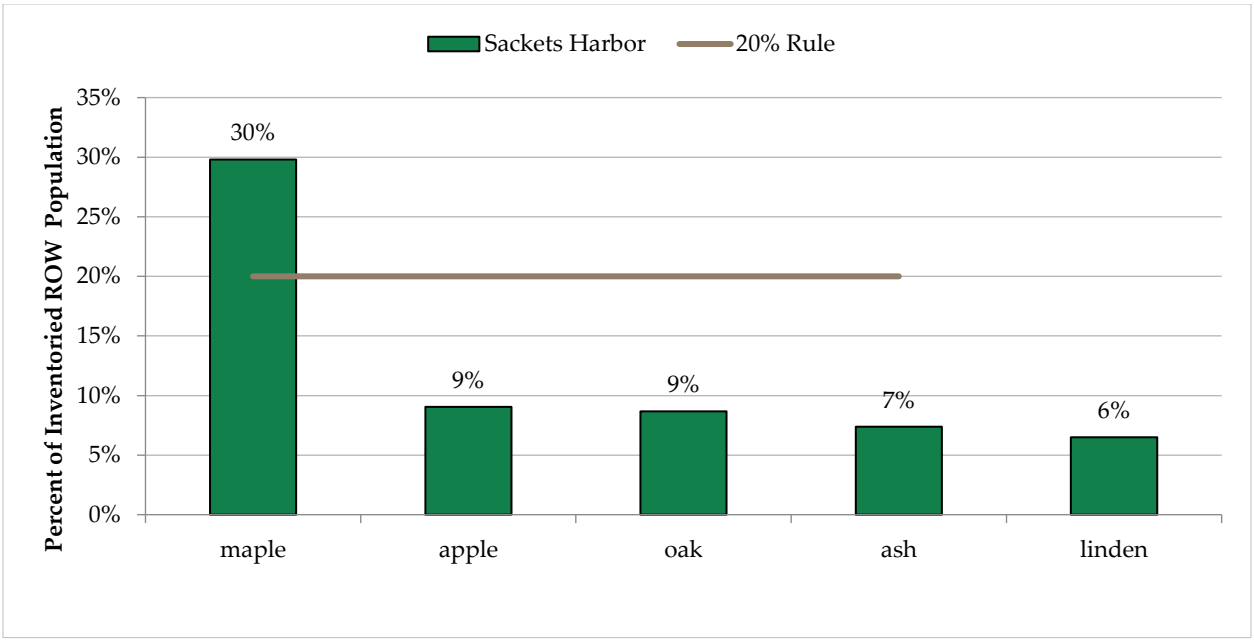


Figure 4. Genus distribution of inventoried trees.

This illustrates how species distribution alone does not completely represent tree population diversity. Genus distribution is an important consideration because some pests, such as emerald ash borer (EAB, *Agrilus planipennis*), target a single genus as its host. Some pests also target a single family as its host, such as the bacterium *Erwinia amylovora*, commonly known as fireblight. Fireblight only affects plants in the rose family (*Rosaceae*), such as serviceberry, hawthorn, apple/crabapple, hawthorn, cherry/plum, and pear.

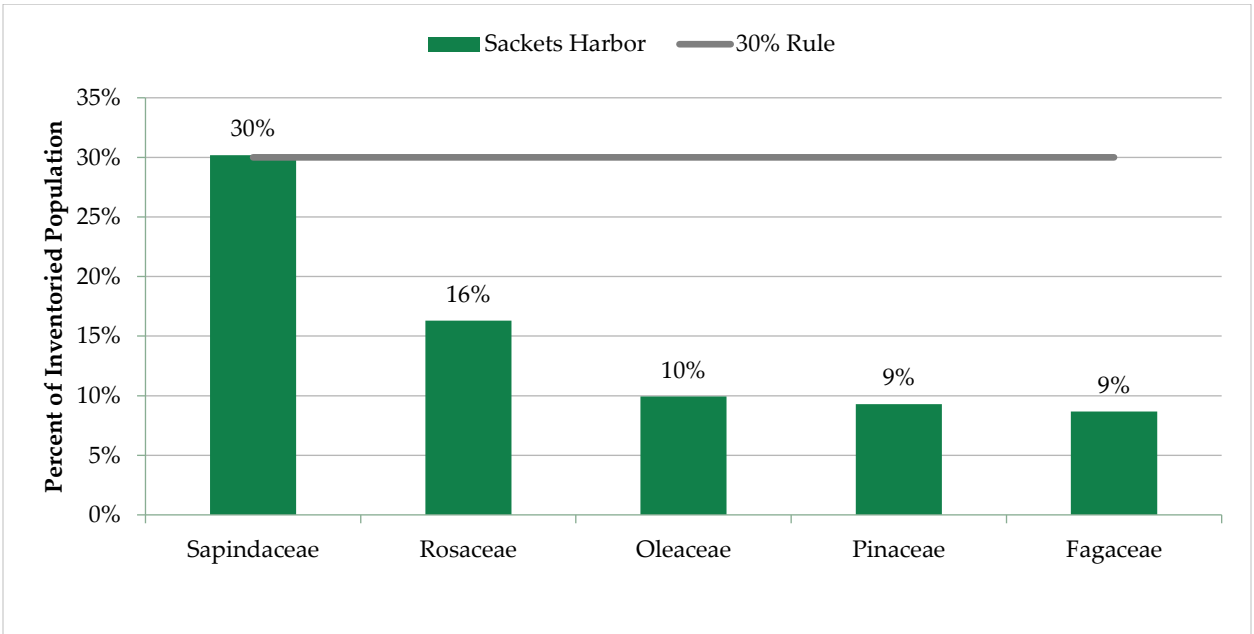


Figure 5. Family distribution of inventoried trees.

Figure 5 shows the village's distribution of the most abundant tree families inventoried compared to the 30% threshold. While Rosaceae (16%) is far from the threshold and not an immediate concern, Sapindaceae family composes a greater proportion of the inventoried population, at the 30% threshold.

PEST SUSCEPTIBILITY

Early diagnosis of disease and infestation is essential to ensuring the health and continuity of Sackets Harbor's public tree resource. See Appendix B for some information about the pests listed below and websites where additional information can be found.

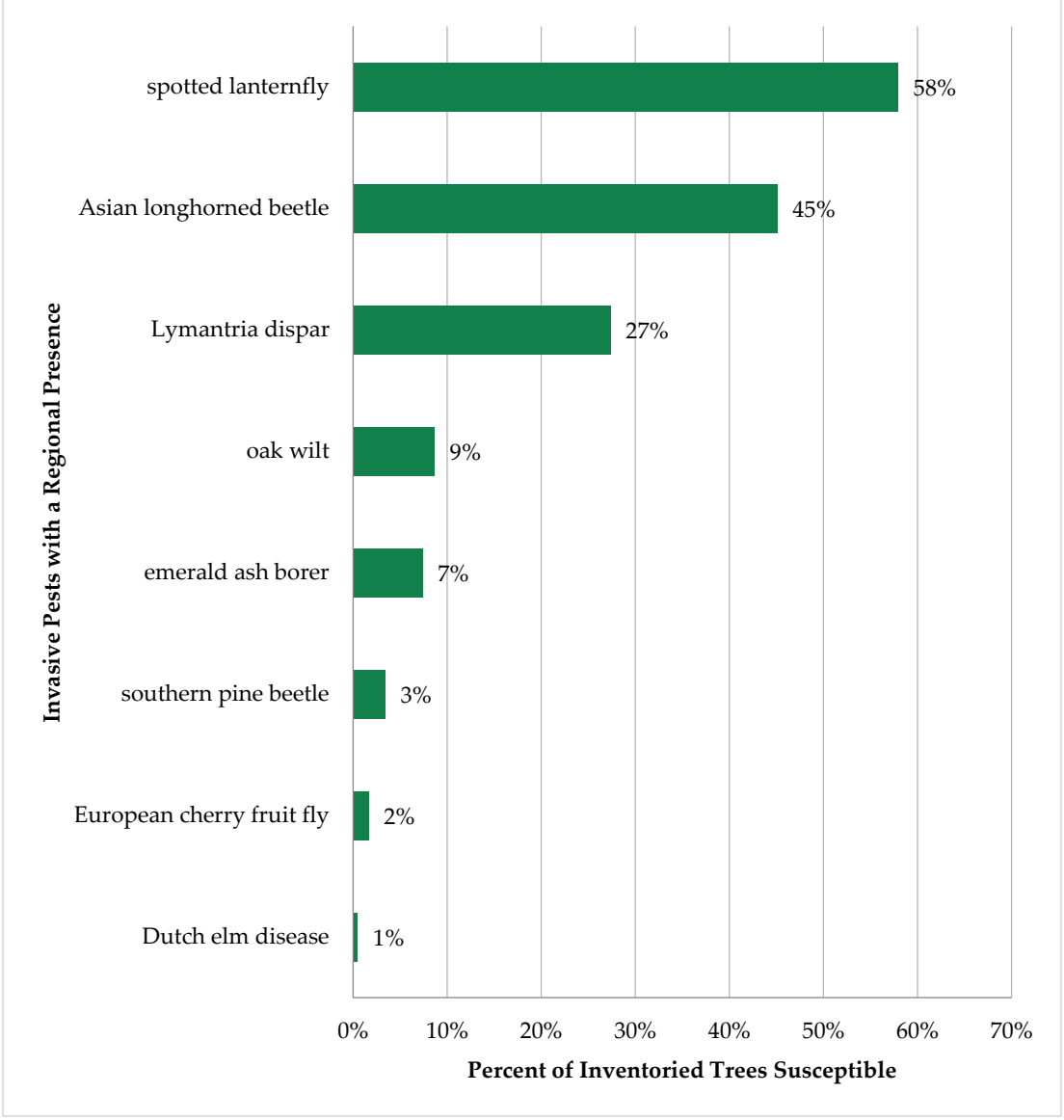


Figure 6. Tree resource susceptibility to invasive pests that have a regional presence.

Figure 6 shows the percent of inventoried trees susceptible to some of the known pests in and around New York. It is important to remember that this figure only represents data collected during the inventory. Many more trees throughout Sackets Harbor, especially those on private property, may be susceptible to hosting these invasive pests. Spotted lantern fly (SLF, *Lycorma delicatula*) and Asian longhorned beetle (ALB, *Anoplophora glabripennis*) are known threats to a large percentage of the inventoried tree resource, 58% and 48%, respectively. *Lymantria dispar* (LDD), and *Lymantria dispar asiatica*, formerly known as European gypsy moth and Asian gypsy moth, and oak wilt (caused by *Bretziella fagacearum*), also pose a risk to many oak and other trees in the population.

Pest Susceptibility Recommendations

The overabundance of maple in Sackets Harbor's tree resource is a management concern because it creates unnecessary risk in the event of an invasive pest outbreak. This abundance is not only a concern for the loss of a tree resource, but it also creates more habitat for the pests it is susceptible to, such as SLF or ALB, making it easier for them to spread. The village is recommended to inspect trees in the *Acer* genus for signs of infestation on a routine basis, so affected trees can be removed or treated to contain the pest before a larger infestation starts. Increasing species diversity is another critical goal that will help Sackets Harbor's tree resource be resilient in the event of future pest invasions.

While no beech (*Fagus* spp.) or hemlock (*Tsuga* spp.) trees were inventoried in Sackets Harbor in 2021, these are hosts to potential pests in this area, and may be at risk if considered in future plantings. The European cherry fruit fly (ECFF, *Rhagoletis cerasi*) is not yet reported from Jefferson County, but several counties in New York are under quarantine to prevent this pest from establishing in the state. ECFF's main host trees are fruiting cherry (*Prunus* spp.), which only account for 2% of the inventoried population. Elm (*Ulmus* spp.) only account for 1% of the inventoried population, yet planting cultivars resistant to Dutch elm disease (DED) may be one way to achieve the village's historical aesthetic. Similarly, restoration efforts of the American chestnut (*Castanea dentata*) could be incorporated into the planting plan in the future, with disease-resistant varieties.

DEFECT OBSERVATIONS

For each tree inventoried, DRG assessed conditions indicating the presence of structural defects and recorded the most significant condition. Defects were limited to the following categories:

- Dead and dying parts
- Broken and/or hanging branches
- Cracks
- Weakly attached branches and codominant stems
- Missing or decayed wood
- Tree architecture
- Root problems
- Other

Table 1. Tree defect categories recorded during the inventory

Defect	Street Trees	Percent of Street Trees
Weakly Attached Branches and Codominant Stems	355	45%
Dead and Dying Parts	259	33%
None	91	12%
Missing or Decayed Wood	35	4%
Broken and/or Hanging Branches	20	3%
Tree Architecture	12	2%
Root Problems	5	1%
Cracks	4	1%
Other	4	1%
Total	**785**	**100%**

The most frequently recorded defect category was weakly attached branches and codominant stems, at 45% of inventoried trees (Table 1). However, only 3 trees in this category were recommended for removal. The second most frequently recorded defect category, at 33%, was dead and dying parts, with 35 trees recommended for removal. It is worth noting that the third highest category is 'none,' indicating that the tree had no major defect present at the time of the inventory, and other defects only account for small percentages of the inventoried population.

Defect Observation Recommendations

When considering the defect recorded for each tree, there are two important qualifiers to keep in mind. First, the categories are broadly inclusive. For example, the "dead and dying parts" category can include trees with just one or two smaller diameter dead limbs as well as trees found with large-diameter dead limbs or entire sections of dead canopy. Therefore, inferences on overall tree condition or risk rating cannot be derived solely from the presence or absence of a defect recorded during the inventory. Second, an inventoried tree may have multiple defects; the 2021 Sackets Harbor inventory recorded only the most significant defect observed for each tree.

Trees recorded with a defect and recommended for priority pruning or removal should be pruned or removed as soon as possible to eliminate the risk associated with a tree with defective parts, or, in the case of trees with pests or diseases present, to reduce the chances of further spread of the pests or diseases. Trees recorded with a defect and recommended for further inspection should be assessed by qualified personnel equipped with suitable tools and knowledge to determine the next steps needed to mitigate risk or salvage the tree. Trees recorded with a defect but not recommended for further monitoring, priority pruning, or removal should be inspected as part of a routine assessment program designed to identify potentially hazardous trees and emerging disease or pest outbreaks. Routine assessments by qualified arborists or other qualified personnel can aid in identifying potentially hazardous tree defects before they become significant dangers to people or property.

CONDITION

Several factors affecting condition were considered for each tree, including root characteristics, branch structure, trunk, canopy, foliage condition, and the presence of pests. The condition of each inventoried tree was rated by an arborist as Good, Fair, Poor, or Dead. The general health of the inventoried tree population was characterized by the most prevalent condition assigned during the inventory.

Figure 7 shows most of the inventoried trees were recorded in Good or Fair condition, 57% and 36%, respectively. Sackets Harbor has a low percentage of Dead trees and trees in Poor condition. Based on these data, the general health of the inventoried tree population is Good.

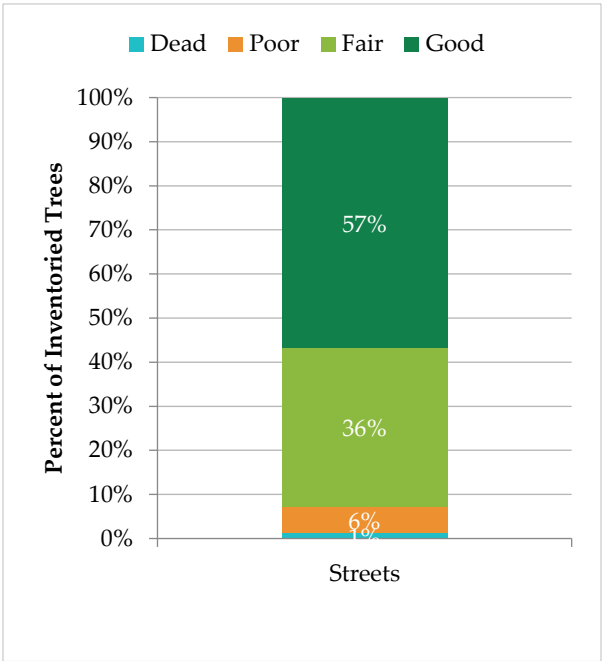


Figure 7. Condition of inventoried trees.

Condition Recommendations

- Dead trees should be removed as soon as possible, because the health of these trees is unlikely to recover even with increased care and may present an elevated risk to people or property.
- Younger trees rated in Fair or Poor condition may benefit from structural pruning to improve their health over time. Pruning should follow *ANSI A300 (Part 1)* guidelines.
- Poor condition ratings among mature trees were generally due to visible signs of decline and stress, including decay, dead limbs, sparse branching, or poor structure. These trees will likely require corrective pruning and intensive plant health care to improve their vigor and should be monitored for worsening conditions.
- Trees in Fair condition may benefit from pruning to remove dead or defective limbs and may return to Good condition with time and care.

RELATIVE AGE DISTRIBUTION

Analysis of a tree population's relative age distribution is performed by assigning age classes to the size classes of inventoried trees. Size is used as a proxy for age because of the difficulty of accurately and rapidly measuring tree age in the field. Since tree species have different lifespans and mature at different diameters, actual tree age cannot be determined from diameter size class alone, but size classifications can be extrapolated into relative age classes which can offer insight into the maintenance needs of Sackets Harbor's tree resource. The inventoried trees were grouped into the following relative age classes:

- Young trees (0–8 inches diameter at breast height (DBH))
- Established trees (9–17 inches DBH)
- Maturing trees (18–24 inches DBH)
- Mature trees (greater than 24 inches DBH)

These size classes were chosen so that the inventoried tree resource can be compared to the ideal relative age distribution, which holds that the largest proportion of the inventoried tree population (approximately 40%) should be young trees, while a smallest proportion (approximately 10%) should be mature trees (Richards 1983).

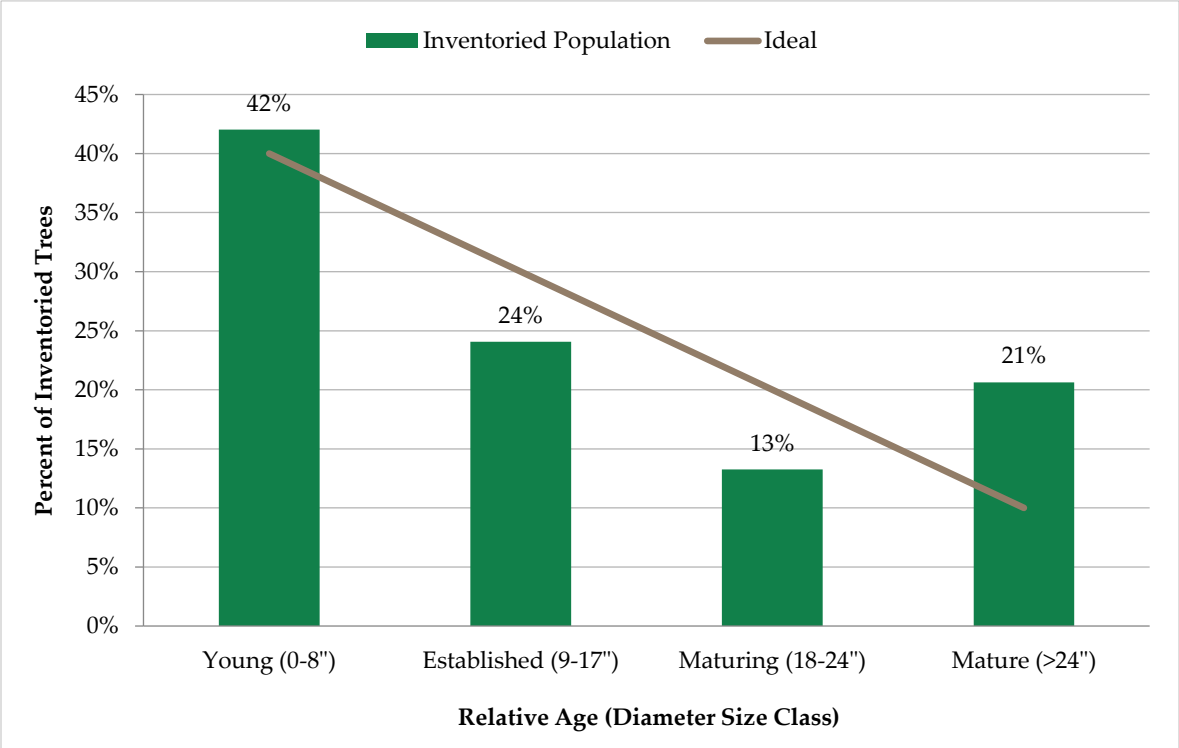


Figure 8. Relative age distribution of inventoried trees.

Figure 8 compares Sackets Harbor's relative age distribution of the inventoried tree population to the ideal. The village's inventoried tree resource is starting to trend towards the ideal; however, young trees exceed the ideal by 2%, while established trees and maturing trees all short by 6% and 7%, respectively. The greatest difference from the ideal is in the population of mature trees, which exceeds by 11%.

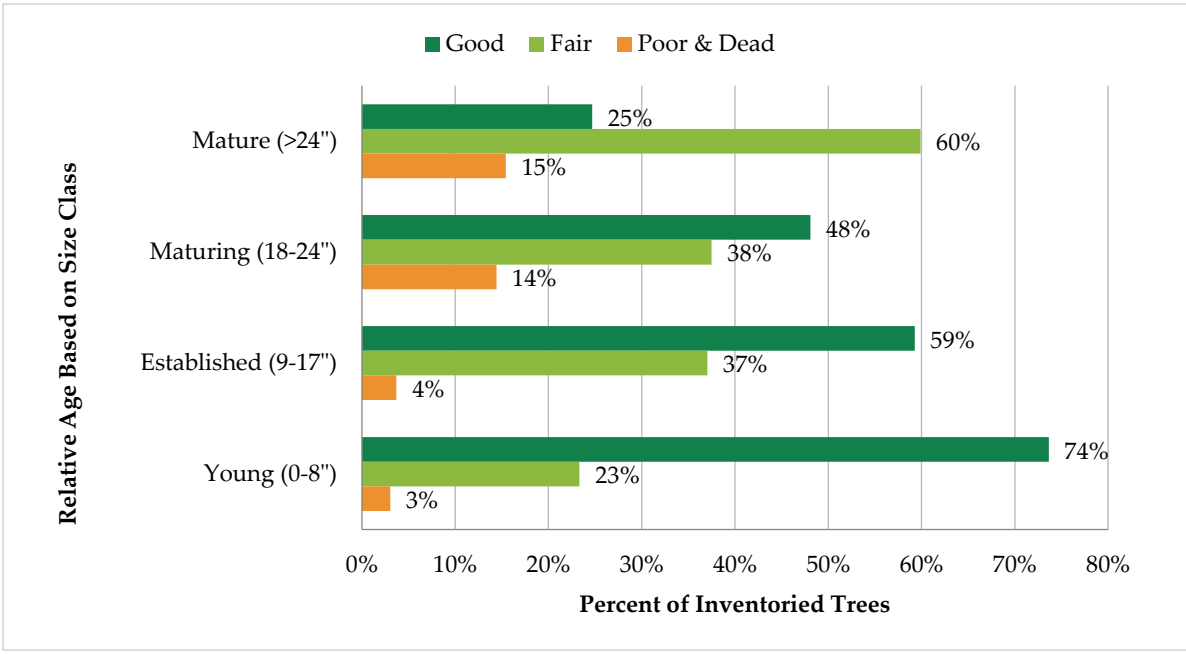


Figure 9. Condition of inventoried trees by relative age class.

Figure 9 cross analyzes the condition of the inventoried tree resource with its relative age distribution, providing insight into the inventoried population's stability. 60% of mature trees are rated in Fair condition, which matters because these larger trees would have a more damaging impact in the event of failure and would impact budget costs if they should need to be removed in the near future. However, Good condition ratings exceed Fair condition ratings in maturing, established, and young age categories. While the percentages of trees with Good condition ratings decrease with age, and Fair or worse condition ratings increase with increasing tree age, this is a common trend not unique to Sackets Harbor's inventoried population, as older and larger trees have had more time than younger to accrue defects, which reduce their condition rating.

Relative Age Recommendations

While Sackets Harbor has an excess of young trees and a shortage of established and maturing trees, the village has a low percentage of trees in Poor condition, indicating that young trees have the potential of reaching maturity if they are well maintained. With time, these trees will grow, shifting the age distribution closer to the ideal, while new plantings will supplement the changing population of young trees. The village should also focus on tree preservation and proactive care, to protect the higher proportion of mature trees from unnecessary removal and to prevent them from succumbing to treatable defects.

INFRASTRUCTURE CONFLICTS

In an urban setting, space is limited both above and below ground. Trees in restricted growing spaces may conflict with infrastructure, such as buildings, sidewalks, utility wires, and pipes, which could pose risks to public safety and require significant investments of time and money to mitigate. In the 2021 Sackets Harbor inventory, only the presence or absence of overhead utilities was recorded.

Photographs 1 and 2. Examples of overhead utilities conflicting with trees.

Table 2. Presence or absence of overhead infrastructure recorded during the inventory

Overhead Utilities	Trees	Percent of Trees
Present	300	38%
Not Present	485	62%
Total	**785**	**100%**

Table 2 shows that 300 trees were recorded with overhead utilities present, which may or may not be an infrastructure conflict, or have the potential to become such a conflict. By contrast, 485 trees were recorded with overhead utilities not present, indicating an absence of conflict or potential future conflict at these sites. Of the trees with overhead utilities present, only 65 (22%) had a DBH of 24" or larger. The larger diameter trees have a greater chance of being in conflict with the wires and will need to be pruned in the future to allow for adequate clearance.

Infrastructure Recommendations

Planting only small-growing trees within 20 feet of overhead utilities, medium-size trees within 20–40 feet, and large-growing trees outside 40 feet will help improve future tree conditions, minimize future utility line conflicts, and reduce the costs of maintaining trees under utility lines.

When planting around hardscape, it is important to give the tree enough growing room above ground. Guidelines for planting trees among hardscape features are as follows: give small-growing trees 4–5 feet, medium-growing trees 6–7 feet, and large-growing trees 8 feet or more between hardscape features. In most cases, this will allow for the spread of a tree's trunk taper, root collar, and immediate larger-diameter structural roots.

STOCKING LEVEL

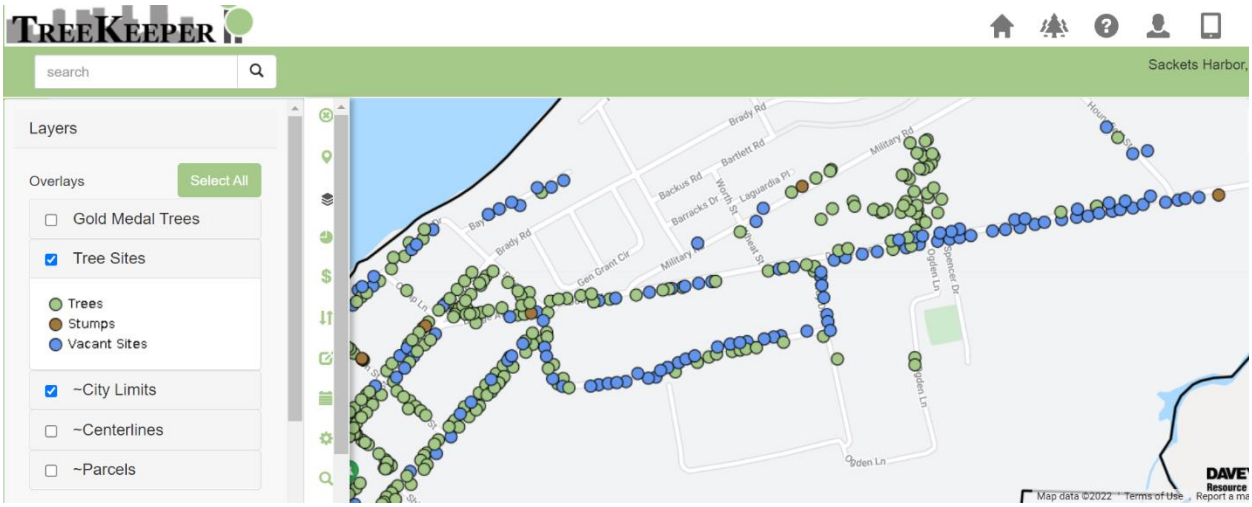
Stocking is a traditional forestry term used to measure the density and distribution of trees. For an urban/community forest, stocking level is used to estimate the total number of sites along the street ROW that could contain trees. Stocking level is the ratio of street ROW spaces occupied by trees to the total street ROW spaces suitable for trees. Park trees and other non-ROW public property trees are excluded from this measurement.

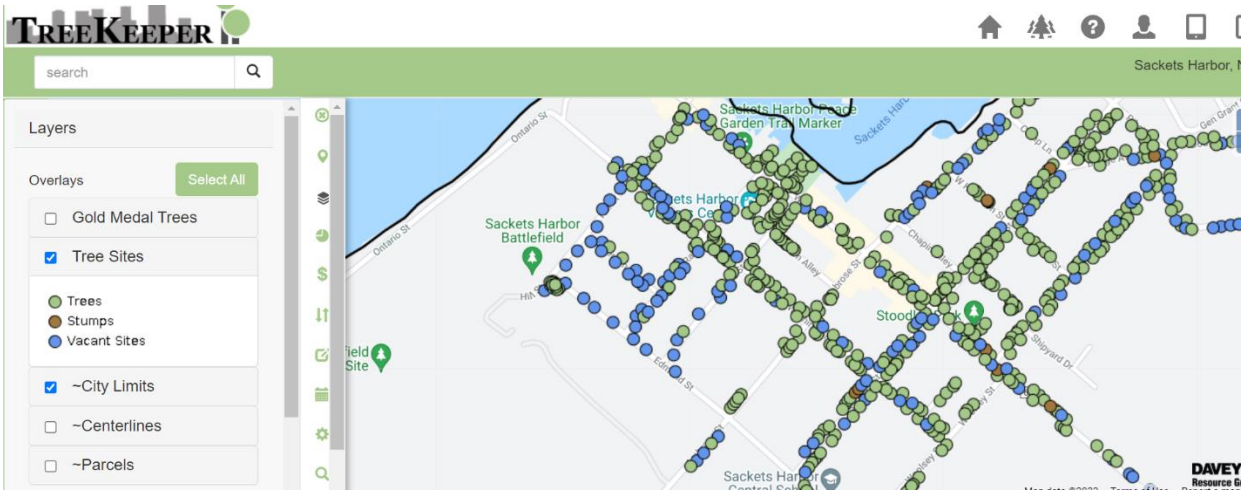
DRG found that the inventoried portions of the village had 293 planting sites and 13 stumps, which can be considered potential planting sites because they will become vacant after stumps are removed. Based on the data collected during this inventory, the current street ROW tree stocking level for Sackets Harbor is 72%.

Stocking Level Recommendations

At the current stocking level of 72%, the village needs 306 additional trees to be fully stocked (stocking level 100%), assuming Sackets Harbor's tree resource experiences zero loss, which is unlikely. Over the course of the ten-year program, a total of 44 existing trees are recommended for removal. Additionally, the tree resource is susceptible to various threats, including storms, invasive pests, and disease. Typical annual mortality rates range from 1–3% of the population. Given the inventoried population's overall condition rating of Good, Sackets Harbor's tree resource is more likely to be on the lower end of the given annual mortality range. Using a 1% annual mortality rate of 8 trees per year, the village can anticipate removing an additional 80 trees over a ten-year period. When accounting for scheduled removals and annual mortality, Sackets Harbor would need to plant 430 trees over the course of ten years to have a fully stocked tree resource.

Fully stocking the ROW is an ambitious goal that may not be feasible or desirable for the village. However, strategically increasing the number of street tree plantings in neighborhoods with low canopy cover may be an achievable goal which will help distribute the benefits trees provide more evenly over the village, beautify currently barren areas, and raise the overall stocking level of the village over time. An example of an understocked area is the East end of Dodge Street as well as the neighborhood south of Sackets Harbor Battlefield as is demonstrated by the maps below.





Section 2:

Functions and Benefits

of the Public Tree Resource

SECTION 2: FUNCTIONS AND BENEFITS OF THE PUBLIC TREE RESOURCE

Trees occupy a vital role in the urban environment by providing of a wide array of economic, environmental, and social benefits far exceeding the investments in planting, maintaining, and removing them. Trees reduce air pollution, improve public health outcomes, reduce stormwater runoff, sequester and store carbon, reduce energy use, and increase property value. A better understanding of the importance of trees to a community can be gained by using advanced analytics such as i-Tree Eco and other models in the i-Tree software suite which provide tools to estimate the monetary values of the various benefits provided by a public tree resource.

Environmental Benefits

- Trees decrease energy consumption and moderate local climates by providing shade and acting as windbreaks.
- Trees act as mini reservoirs, helping to slow and reduce the amount of stormwater runoff that reaches storm drains, rivers, and lakes. One hundred mature tree crowns intercept roughly 100,000 gallons of rainfall per year (U.S. Forest Service 2003a).
- Trees help reduce noise levels, cleanse atmospheric pollutants, produce oxygen, and absorb carbon dioxide.
- Trees can reduce street-level air pollution by up to 60% (Coder 1996). Lovasi (2008) suggested that children who live on tree-lined streets have lower rates of asthma.
- Trees stabilize soil and provide a habitat for wildlife.

Economic Benefits

- Trees in a yard or neighborhood increase residential property values by an average of 7%.
- Commercial property rental rates are 7% higher when trees are on the property (Wolf 2007).
- Trees moderate temperatures in the summer and winter, saving on heating and cooling expenses (North Carolina State University 2012, Heisler 1986).
- On average, consumers will pay about 11% more for goods in landscaped areas, with this figure being as high as 50% for convenience goods (Wolf 1998b, Wolf 1999, and Wolf 2003).
- Consumers also feel that the quality of products is better in business districts surrounded by trees than those considered barren (Wolf 1998b).
- The quality of landscaping along the routes leading to business districts had a positive influence on consumers' perceptions of the area (Wolf 2000).

Social Benefits

- Tree-lined streets are safer; traffic speeds and the amount of stress drivers feel are reduced, which likely reduces road rage/aggressive driving (Wolf 1998a, Kuo and Sullivan 2001a).
- Chicago apartment buildings with medium amounts of greenery had 42% fewer crimes than those without any trees (Kuo and Sullivan 2001b).
- Chicago apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees (Kuo and Sullivan 2001a).
- Employees who see trees from their desks experience 23% less sick time and report greater job satisfaction than those who do not (Wolf 1998a).
- Hospital patients recovering from surgery who had a view of a grove of trees through their windows required fewer pain relievers, experienced fewer complications, and left the hospital sooner than similar patients who had a view of a brick wall (Ulrich 1984, 1986).
- When surrounded by trees, physical signs of personal stress, such as muscle tension and pulse rate, were measurably reduced within three to four minutes (Ulrich 1991).

i-TREE ECO ANALYSIS

i-Tree Eco utilizes tree inventory data along with local air pollution and meteorological data to quantify the functional benefits of a community's tree resource. By framing trees and their benefits in a way that everyone can understand, dollars saved per year, i-Tree Eco helps a community to understand trees as both a natural resource and an economic investment. Knowledge of the composition, functions, and monetary value of trees helps to inform planning and management decisions, assists in understanding the impact of those decisions on human health and environmental quality, and aids communities in advocating for the necessary funding to manage their vested interest in the public tree resource appropriately.

ANNUAL RETURN ON INVESTMENT FROM THE PUBLIC TREE RESOURCE

The i-Tree Eco analysis of the Village of Sackets Harbor's inventoried trees quantified the functional benefits of three critical ecosystem services that they provide: air pollution removal, carbon sequestration, and avoided surface runoff. The village's 2021 tree maintenance expenses of $8,100 make Sackets Harbor's return on investment almost 33% annually.

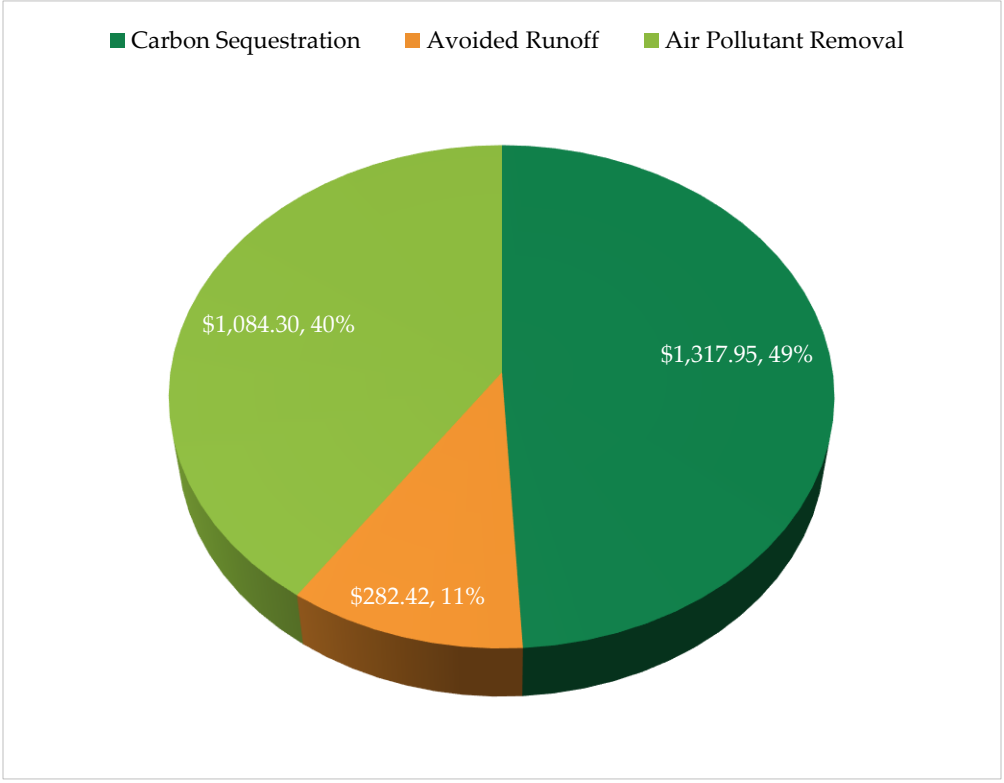


Figure 10. Estimated value of the benefits provided by inventoried trees.

Urban environments have unique challenges that make the estimated $2,685 of functional benefits provided by Sackets Harbor's inventoried tree population an essential asset to the village (Figure 10). Compared to rural landscapes, urban landscapes are characterized by high emissions in a relatively small area. The inventoried trees in Sackets Harbor remove around 380 lbs. of airborne pollutants each year, a service that is valued at $1,084. Reducing stormwater runoff decreases the risk of flooding and combined sewer overflow, both of which impact people, property, and the environment. The village's inventoried trees help to divert 121,341 gals. of runoff annually, a service valued at $282. Carbon dioxide ($CO_2$) also impacts people, property, and the environment as the primary greenhouse gas driving climate change. The inventoried trees sequester around 7.7 tons (15,460 lbs.) of carbon derived from airborne CO_2 every year, a service valued at $1318.

The replacement value of the village's inventoried tree population is estimated to be $1,687,870. In Sackets Harbor, nine species account for almost half of the public tree resource and 60% and 68% of the functional benefits it provides (see Table 3). This includes the population of Norway maple (*Acer platanoides*) with Crimson King Norway maple (*Acer platanoides* 'Crimson King'). If any of these species were lost to invasive pests, disease, or other threats, the loss would have significant costs. It is therefore critical to routinely inspect village trees for signs of emergent disease, insect, or other problems and take steps to prevent widespread loss of valuable tree species. Promoting species diversity with future plantings will also help to increase the inventoried tree resource's resistance to and resilience after disturbances. Planting large-statured broadleaf tree species wherever possible to maximize potential environmental and economic benefits. See Appendix C for a tree species list recommended by DRG.

SEQUESTERING AND STORING CARBON

Trees are carbon sinks, which are the opposite of carbon sources. While carbon is emitted from cars and smokestacks, carbon is absorbed into trees during photosynthesis and stored in their tissue as they grow. The i-Tree Eco model estimates both the carbon sequestered each year and total carbon stored by the inventoried tree resource. Sackets Harbor's inventoried trees have stored 956 tons (1,911,100 lbs.) of carbon, which is all the carbon each tree has amassed throughout their lifetimes and is valued at $162,969. The population of Freeman maple (*Acer* × *freemanii*) stores the most carbon, at 350 tons, followed by those of sugar maple (*A. saccharum*) and red maple (*A. rubrum*), which store 83.5 tons and 74.2 tons, respectively. On a per-tree basis, the five willow (*Salix* spp.) in the inventory store the most carbon, at almost 7 tons per tree, valued at almost $1,193 per tree. When looking at the annual carbon sequestration of Sackets Harbor's trees, the populations of Freeman maple (*Acer* × *freemanii*) and red maple (*A. rubrum*) sequester the most carbon (1.58 tons per year and 0.94 ton per year, respectively). On a per-tree basis, red maple (*Acer rubrum*) sequesters the most carbon annually, at approximately 48 lbs. per tree per year, a service valued at around $4 per tree per year.

Table 3. Summary of benefits provided by inventoried trees ranked by species importance value

Most Common Trees Inventoried		Count	Percent of Total	Benefits Provided by Street Trees				
				CO_2 Stored	CO_2 Sequestered	Avoided Runoff	Air Pollution Removed	Replacement Value
Common Name	Botanical Name		%	tons	tons/year	gal/year	lbs/year	dollars
apple species	*Malus*	71	9.1%	3.9	0.2	903	0	$25,394
Freeman maple	*Acer × freemanii*	69	8.8%	350.2	1.6	32,019	100	$331,504
northern red oak	*Quercus rubra*	41	5.2%	42.6	0.4	8,659	20	$145,439
red maple	*Acer rubrum*	39	5.0%	74.2	0.9	10,394	40	$165,374
Norway maple	*Acer platanoides*	36	4.6%	25.8	0.4	3,427	20	$61,811
sugar maple	*Acer saccharum*	33	4.2%	83.5	0.4	5,946	20	$171,875
white ash	*Fraxinus americana*	29	3.7%	26.4	0.3	3,819	20	$50,764
green ash	*Fraxinus pennsylvanica*	29	3.7%	16.4	0.2	4,291	20	$61,119
bigleaf linden	*Tilia platyphyllos*	27	3.4%	1.3	0.1	1,003	0	$14,953
thornless honeylocust	*Gleditsia triacanthos v. inermis*	24	3.1%	3.5	0.1	792	0	$14,291
littleleaf linden	*Tilia cordata*	23	2.9%	6.1	0.1	2,416	0	$35,908
eastern cottonwood	*Populus deltoides*	22	2.8%	71.4	0.5	5,589	20	$41,864
Norway spruce	*Picea abies*	21	2.7%	9.7	0.1	3,208	20	$42,781
blue spruce	*Picea pungens*	20	2.6%	5.1	0.1	2,123	0	$27,664
Japanese tree lilac	*Syringa reticulata*	20	2.6%	2.4	0.1	447	0	$11,911
All Other Trees Inventoried		280	35.7%	233	2.3	36,305	60	$485,219
Total		**784**	**100%**	**956**	**7.7**	**121,341**	**380**	**$1,687,870**

CONTROLLING STORMWATER

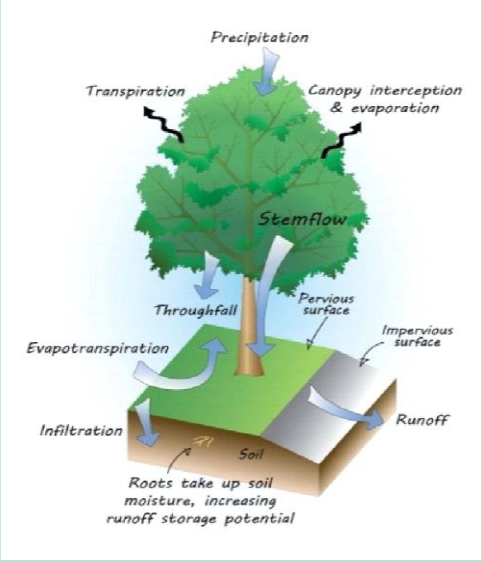
Trees intercept rainfall with their leaves and branches, helping lower stormwater management costs by avoiding runoff. The inventoried trees in the Village of Sackets Harbor avoid 121,341 gals. of runoff annually. Avoided runoff accounts for 11% of the annual functional benefits provided by Sackets Harbor's public tree resource (Figure 10).

The most abundant trees in the inventoried population, apple and crabapple (*Malus* spp.) (9% of inventoried trees), only avoided approximately 903 gals. of runoff; the second most abundant species, Freeman maple (*Acer* × *freemanii*) (8.8%), diverted 32,019 gals. of runoff annually (Table 3). This species also provided the greatest benefit on a per-tree basis by diverting 464 gals. of runoff annually. Despite a difference of only 2 trees in census count, the Freeman maple (average DBH of 29.2") avoided over 35 times the amount of runoff of the apple population (average DBH of 4.7"). This illustrates how large-statured trees with wide canopies provide significantly greater benefits.

IMPROVING AIR QUALITY

The inventoried tree population annually removes 380 lbs. of air pollutants, including sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and particulate matter ($PM_{2.5}$). The i-Tree Eco model estimated the value of this benefit at $1,084, which is 40% of the value of all annual benefits. As shown in Figure 11, a small reduction of $PM_{2.5}$ is the more valuable than any of the other pollutants removed. The trees that provided the highest annual air quality benefits were Freeman maple (*Acer* × *freemanii*) and red maple (*A. rubrum*), which removed 100 lbs. of pollutants and 40 lbs. of pollutants per year, respectively. On a per-tree basis, the Freeman maple removed 1.45 lbs. of pollutants per tree per year, and the Crimson King Norway maple (*Acer platanoides* 'Crimson King') removed 1.25 lbs. of pollutants per tree per year, respectively.

CANOPY FUNCTIONS



Trees provide many functions and benefits all at once simply by existing, such as:

- Catching rainfall in their crown so it drips to the ground with less of an impact or flows down their trunk.
- Helping stormwater soak into the ground by slowing down runoff.
- Creating more pore space in the soil with their roots, helping stormwater to move through the ground.
- Cooling the surrounding landscape by casting shade with their canopy and releasing water from their leaves.
- Catching airborne pollutants on their leaves and absorbing them with their roots when they wash off in the rain.
- Transforming some pollutants into less harmful substances and preventing other pollutants from forming.

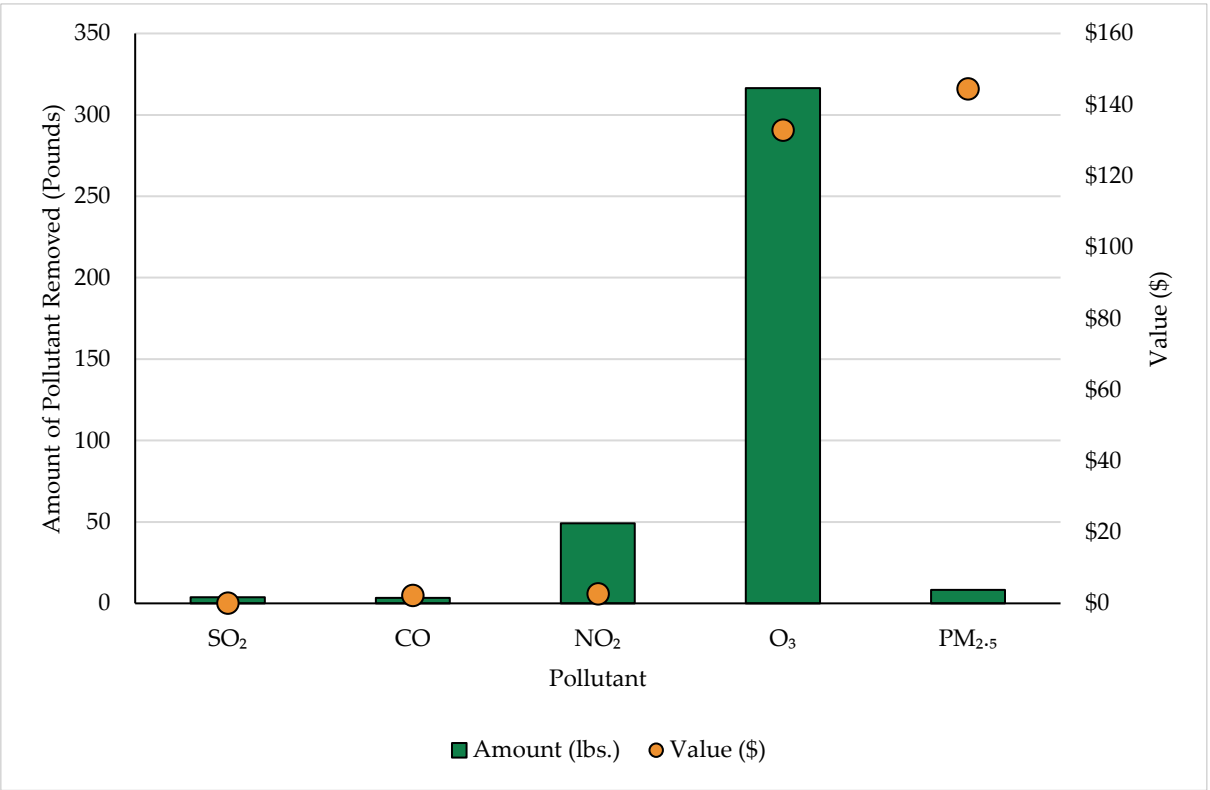


Figure 11. Annual removal of five common airborne pollution by Sackets Harbor's inventoried tree resource.

REPLACEMENT VALUE

Replacement value is an estimate of the local cost of replacing an existing tree with a similar tree. It can help provide an estimate of the overall value of a tree population or individual tree. Collectively, Sackets Harbor's inventoried population has a replacement value of $1,687,870, which averages out to around $2,150 in replacement value per tree. The populations of Freeman maple (*Acer* × *freemanii*) and sugar maple (*A. saccharum*) were the most valuable ($331,504 and $171,875, respectively), which is at least partially due to the size of these two tree populations. On a per tree basis, white oak (*Quercus alba*) were the most valuable inventoried trees in Sackets Harbor, with a replacement value of $7,050 per tree. By comparison, each individual apple or crabapple (*Malus* spp.) has an average replacement value of only $358.

CONCLUSIONS

Overall, Sackets Harbor's populations of white oak (*Quercus alba*), sugar maple (*Acer saccharum*), and Freeman maple (*Acer* × *freemanii*) provide the largest share of the benefits enjoyed by the village. This is due, at least in part, to the number of individuals of these species included in the 2021 inventory. Apple and crabapple were the most common trees in the inventory (9.0% of the inventoried trees), followed by Freeman maple (8.8%). Northern red oak (5.2%) and red maple (5.0%) were the third and fourth most common trees in the inventory and provided the eighth and fourth largest shares of the benefits, respectively. Norway maple (*Acer platanoides*) when combined with its 'Crimson King' cultivar, made up 6.6% of the inventoried population, but the benefits provided by these trees are $1,717 per Norway maple and $1,856 per Crimson King Norway maple, compared to the $7,050, $5,208, and $4,804 per-tree value, respectively, provided by white oak, sugar maple, and Freeman maple. Sackets Harbor should make sure to check these high-value tree populations frequently for signs of pests or disease. When it is necessary to remove individuals of these species, they should be replaced with other large-stature, broadleaf trees, aiming to increase the diversity of plantings in the village over time, ideally with native plants that will showcase the historic aesthetic appeal of the village.

SECTION 3: RECOMMENDED MANAGEMENT OF THE PUBLIC TREE RESOURCE

During the inventory, both a risk rating and a recommended maintenance activity were assigned to each tree. DRG recommends prioritizing and completing each tree's recommended maintenance activity based on the assigned risk rating. This ten-year tree management program takes a multi-faceted and proactive approach to tree resource management.

High Priority

- All High Priority tree removals and pruning should be completed as soon as possible, because these trees have significant defects that will become severe over time.

Moderate Priority

- Moderate Priority tree removals and pruning should only start after most High Priority tree maintenance has been completed, and be performed concurrently.

Low Priority

- Low Priority tree maintenance should be performed after all High and Moderate Priority maintenance has been completed.

Stump Removal

- Stump removals should be performed either when a tree is removed or before a planting season begins, so planting sites become vacant for replacement trees.

Routine Inspection

- Routine Inspection from a drive-by perspective is important for detecting major defects before they worsen, and a walk-by perspective is important for updating inventory data.

Young Tree Training

- Young Tree Training Cycles improve tree structure so defects do not worsen and become more costly to correct as they grow, and should begin as soon as possible.

Routine Pruning

- Routine Pruning Cycles correct defects before they worsen, which is crucial for maintaining the overall condition of the inventoried tree resource over the long term.

Replace Trees

- Removed trees should be replaced so there is no net loss of the tree resource, and new trees should enter the Young Tree Training Cycle immediately.

Tree Planting

- Planting new trees is important for increasing population size and urban canopy, but can wait until higher priority maintenance is complete or at least in progress.

RISK MANAGEMENT AND RECOMMENDED MAINTENANCE

Although tree removal is usually considered a last resort, and may sometimes create a reaction from the community, there are circumstances in which removal is necessary. Trees fail from natural causes such as diseases, insects, and weather conditions, and from physical injury due to vehicles, vandalism, and root disturbances. DRG recommends that trees be removed when corrective pruning will not adequately mitigate risk or when correcting problems would be cost-prohibitive. DRG recommends that tree maintenance activities are prioritized and completed based on the risk rating that was assigned to each tree during the inventory. The following section describes recommended maintenance for each risk rating category.

Trees that cause obstructions or interfere with power lines or other infrastructure should be removed when their defects cannot be corrected through pruning or other maintenance practices. Diseased and nuisance trees also warrant removal. Even though large short-term expenditures may be required, it is important to secure the funding needed to complete priority tree removals. Expedient removal reduces risk and promotes public safety. Figures 12 and 13 present tree pruning and tree removals by risk rating and diameter size class. The following sections briefly summarize the recommended removals identified during the inventory.

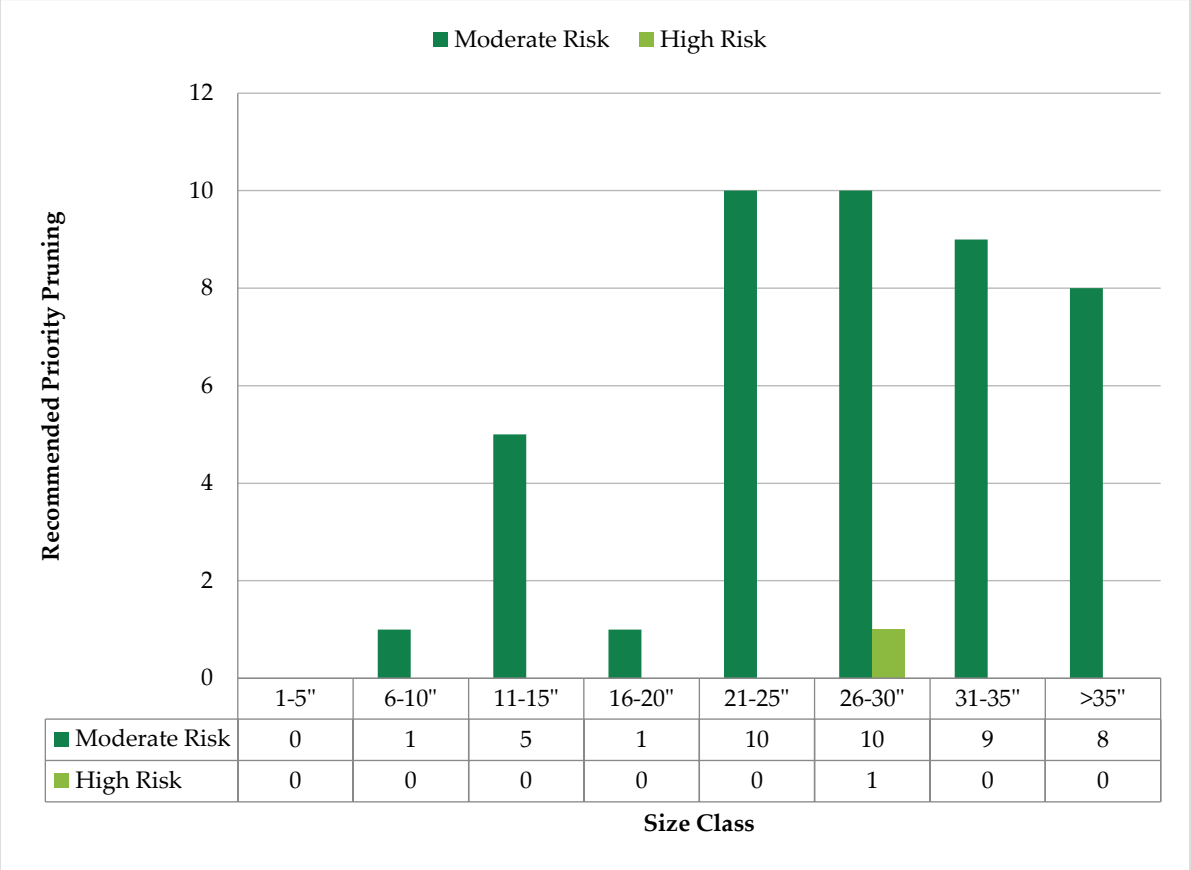
EXTREME AND HIGH PRIORITY RECOMMENDED MAINTENANCE

Pruning or removing Extreme and High Risk trees is strongly recommended to be prioritized and completed as soon as possible. In general, maintenance activities should be completed first for the largest diameter trees (>25") that pose the greatest risk. Once addressed, recommended tree maintenance activities should be completed for smaller diameter trees (<25") that pose the greatest risk. Addressing Extreme and High Risk trees in a timely and proactive manner often requires significant resources to be secured and allocated. However, performing this work expediently will mitigate risk, improve public safety, and reduce long-term costs.

High Priority Pruning Recommendations

Extreme and High Risk trees should be pruned immediately based on assigned risk rating, which generally requires removing defects such as dead and dying parts, broken and/or hanging branches, and missing or decayed wood that may be present in tree crowns, even when most of the tree is sound. In these cases, when pruning the defected branch(es) can correct the problem, risk associated with the tree is reduced while promoting healthy growth.

The inventory identified one High Risk tree requiring Pruning maintenance. This maintenance should be performed immediately based on assigned risk rating and may be performed concurrently with other High Risk removals.



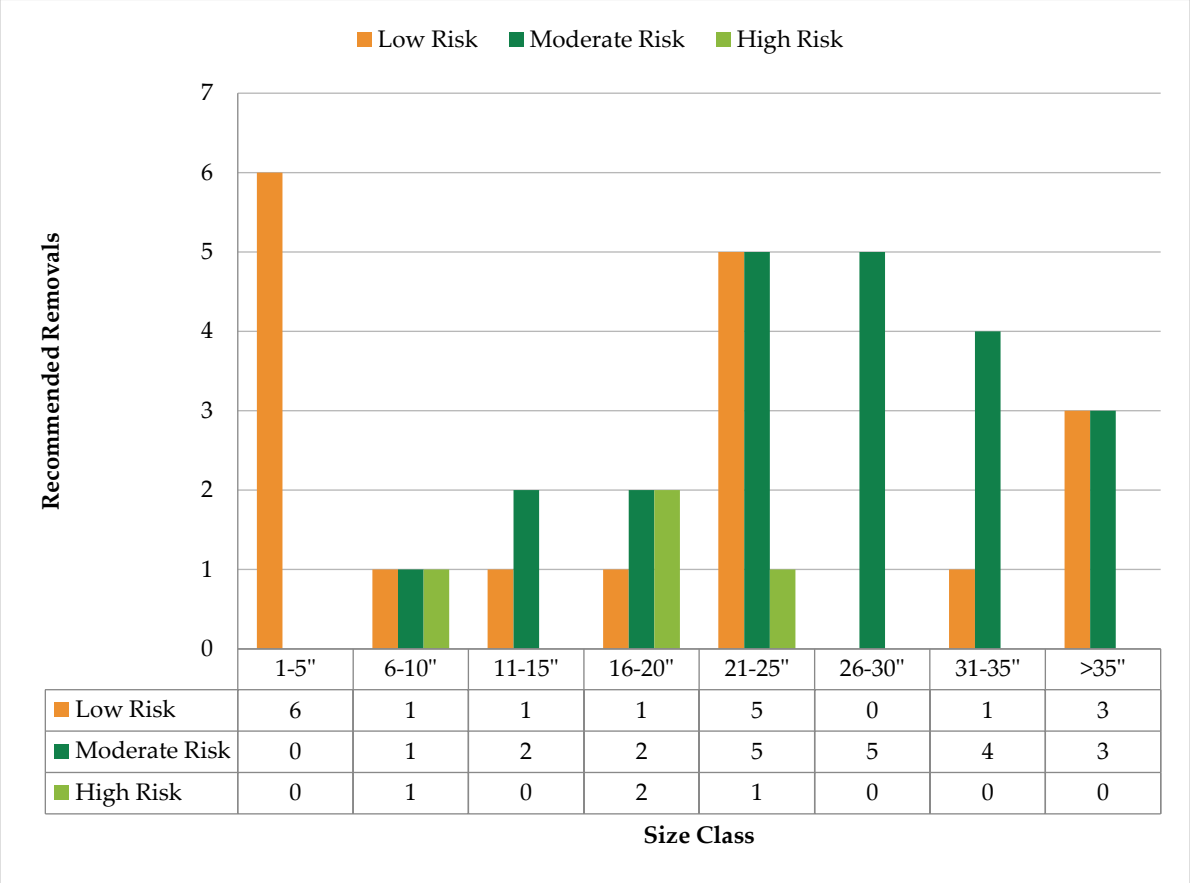
	1-5"	6-10"	11-15"	16-20"	21-25"	26-30"	31-35"	>35"
Moderate Risk	0	1	5	1	10	10	9	8
High Risk	0	0	0	0	0	1	0	0

Figure 12. Recommended pruning by size class and risk rating.

High Priority Removal Recommendations

DRG identified four High Risk tree recommended for removal. The diameter size classes for High Risk trees ranged from 10 to 21 inches DBH.

DRG recommends that trees be removed when pruning will not correct their defects, eliminate the risks that their defects cause, or when corrective pruning would be cost-prohibitive. These trees should be removed immediately based on their risk rating and size class.



	1-5"	6-10"	11-15"	16-20"	21-25"	26-30"	31-35"	>35"
Low Risk	6	1	1	1	5	0	1	3
Moderate Risk	0	1	2	2	5	5	4	3
High Risk	0	1	0	2	1	0	0	0

Figure 13. Recommended removals by size class and risk rating.

FURTHER INSPECTION

In the ANSI A300 system, there are three levels of risk assessment. Each level is built on the one before it. The lowest level is designed to be a cost-effective approach to quickly identifying tree risk concerns; whereas, the highest level is intended to provide in-depth information to decide about a tree. These levels are:

- **Level 1** inspection is defined as a Limited Visual assessment, which is often conducted as a walk-through or windshield survey designed to identify obvious defects or specified conditions.
- **Level 2** inspection is defined as a Basic assessment and is a detailed, 360-degree visual inspection of a tree and its surrounding site, and a synthesis of the information collected.
- **Level 3** inspection is an Advanced assessment and is performed to provide detailed information about specific tree parts, defects, targets, or site conditions. A Level 3 inspection may use specialized tools or require the input of an expert.

The Further Inspection data field indicates whether a tree requires additional and/or future inspections to assess and/or monitor conditions that may cause it to become a risk to people, property, or other trees. The inventory identified 67 requiring one of three inspection types. Further Inspections are beyond the scope of a standard tree inventory, and can be one of the following:

- Recent Damage OR Multi-year Annual Inspection (e.g., a healthy tree that has been impacted by recent construction, weather, or other damage).
- Level 3 Risk Assessment (e.g., a tree with a defect requiring additional or specialized equipment for investigation).
- Insect/Disease Monitoring (e.g., a tree that appears to have an emerging insect or disease problem).
- No further inspection required.

A Level 3 inspection was recommended for trees in which a defect was observed during the inventory and it warranted a closer inspection by a TRAQ qualified arborist. These trees were inspected utilizing an aerial bucket to provide the inspector access to the canopy of the tree in which most of the defects are located. Trees with a Further Inspection requirement should be assessed by an ISA certified arborist as soon as possible, because the longer serious defects are left unaddressed, the greater a risk that a tree becomes. For the same reason, the management that the arborist recommends should be performed as soon as possible to minimize risk.

Further Inspection Recommendations

The inventory found no (zero) trees recommended for an advanced Level 3 Risk Assessment, 35 trees recommended for Annual/Multi-year Inspections, and 32 trees noted for insect and disease monitoring. Unless already designated for removal, the 35 trees noted as having "Missing or Decayed Wood" and the 17 trees noted as having decay should be inspected on a regular basis. Corrective action should be taken as soon as possible unless it will not adequately eliminate the defect, in which case tree removal is likely to be the safest and most cost-effective management.

MODERATE AND LOW PRIORITY RECOMMENDED MAINTENANCE

Pruning or removing Moderate and Low Risk trees are generally the next priorities for maintenance activities. For efficiency, Moderate and Low Risk removals may also be addressed when removing adjacent higher risk trees. Most trees recommended for pruning with these risk levels can be maintained during proactive, routine pruning cycles. DRG recommends implementing proactive maintenance programs incrementally over time as the backlog of risk is reduced.

Moderate Risk Pruning Recommendations

Moderate Risk pruning should be performed after all Extreme and High Risk recommended maintenance is complete and may be performed concurrently with other Moderate Risk removals. The inventory identified 44 Moderate Risk trees recommended for pruning. The DBH for Moderate Risk trees ranged from 9 inches to 48 inches.

Moderate Risk Removal Recommendations

DRG identified 22 Moderate Risk trees recommended for removal, with a DBH range from 10 to 39 inches. If corrective pruning cannot correct a tree's defects and/or adequately mitigate risk, then the tree should be removed. A total of seven Moderate Risk trees with a DBH of 31 inches or larger were recommended for removal. These trees should be removed as soon as possible after all High Risk removals and pruning have been completed.

Low Priority Pruning Recommendations

There were 183 Low Risk trees recommended for pruning. Low Risk trees with the assigned maintenance of either "Prune" or "Routine prune" should be included in a proactive Routine Pruning cycle after all the higher risk trees are addressed.

Low Priority Removal Recommendations

DRG identified 18 Low Risk trees recommended for removal. Low Risk removals pose little threat; these trees are generally small, dead, invasive, or poorly formed trees that need to be removed. Eliminating these trees will reduce breeding site locations for insects and diseases and will increase the aesthetic value of the area. Healthy trees growing in poor locations or undesirable species are also included in this category. If pruning cannot correct a tree's defects and/or adequately mitigate risk, then the tree should be removed. All Low Risk trees should be removed when convenient after all higher risk pruning and removals have been completed and may be performed concurrently with routine pruning.

ROUTINE INSPECTIONS

Inspections are essential to uncovering potential problems with trees. They should be performed by a qualified arborist who is trained in the art and science of planting, caring for, and maintaining individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care. Ideally, the arborist will be ISA Certified and also hold the ISA Tree Risk Assessment Qualification credential.

Routine Inspection Recommendations

All trees along the street ROW should be regularly inspected and attended to as needed. When trees require additional or new work, they should be added to the maintenance schedule. The budget should also be updated to reflect the additional work. Utilize computer management software such as TreeKeeper® to make updates, edits, and keep a log of work records. In addition to locating trees with unidentified defects, inspections also present an opportunity to look for signs and symptoms of pests and diseases. Sackets Harbor has a large population of trees that are susceptible to pests and diseases, including ash, maple, and oak.

DRG recommends that Sackets Harbor perform routine inspections of inventoried trees by windshield survey (inspections performed from a vehicle) in line with *ANSI A300 (Part 9)* annually and after all severe weather events, to identify defects with heightened risk, signs of pest activity, and symptoms of disease. When trees need additional maintenance, they should be added to the work schedule immediately. Use asset management software such as TreeKeeper® to update inventory data and schedule work records.

ROUTINE PRUNING CYCLE

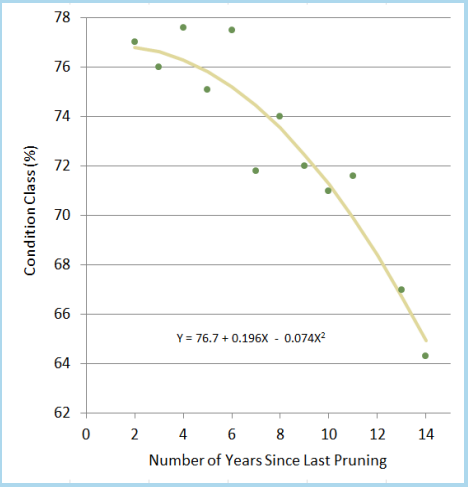
The routine pruning cycle includes all Low Risk trees that received a "Prune", "Discretionary Prune", or "None" maintenance recommendation. These trees pose some risk but have a smaller defect size and/or a lower probability of impacting a target. Over time, routine pruning can minimize reactive maintenance, limit instances of elevated risk, and provide the basis for a robust risk management program.

Based on Miller and Sylvester's research, DRG recommends five-year Routine Pruning cycles to maintain the condition of the inventoried tree resource. However, not all municipalities are able to remain proactive with a five-year cycle based on budgetary constraints, the size of the public tree resource, or both. In these cases, extending the length of the Routine Pruning cycle is an option; however, it is in the municipality's best interest to not approach or exceed a 10-year pruning cycle. The reason is that this is around when tree condition deteriorates significantly without regular pruning, because their once-minor defects have worsened, reducing tree health and potentially increasing risk (Miller and Sylvester 1981).

Routine Pruning Cycle Recommendations

Sackets Harbor's inventory has 418 trees that should be routinely pruned, approximately 53% of the inventoried tree population. DRG recommends a ten-year Routine Pruning cycle, with approximately 42 trees pruned each year, to help keep costs lower. If this work can be done in-house, costs will be lower than if contracted out. Figure 14 shows the distribution of trees recommended for pruning over a variety of size classes.

PROACTIVE PRUNING



Relationship between tree condition and years since previous pruning.

(adapted from Miller and Sylvester 1981)

Miller and Sylvester studied the pruning frequency of 40,000 street trees in Milwaukee, Wisconsin. Trees that had not been pruned for more than 10 years had an average condition rating 10% lower than trees that had been pruned in the previous several years. Their research suggests that a five-year pruning cycle is optimal for urban trees.

Routine pruning cycles help detect and correct most defects before they reach higher risk levels. DRG recommends that pruning cycles begin after all Extreme and High Risk tree maintenance has been completed.

DRG recommends two pruning cycles: a Young Tree Training cycle and a Routine Pruning cycle. Newly planted trees will enter the Young Tree Training cycle once they become established and will move into the Routine Pruning cycle when they reach maturity. A tree should be removed and eliminated from the Routine Pruning cycle when it outlives its usefulness.

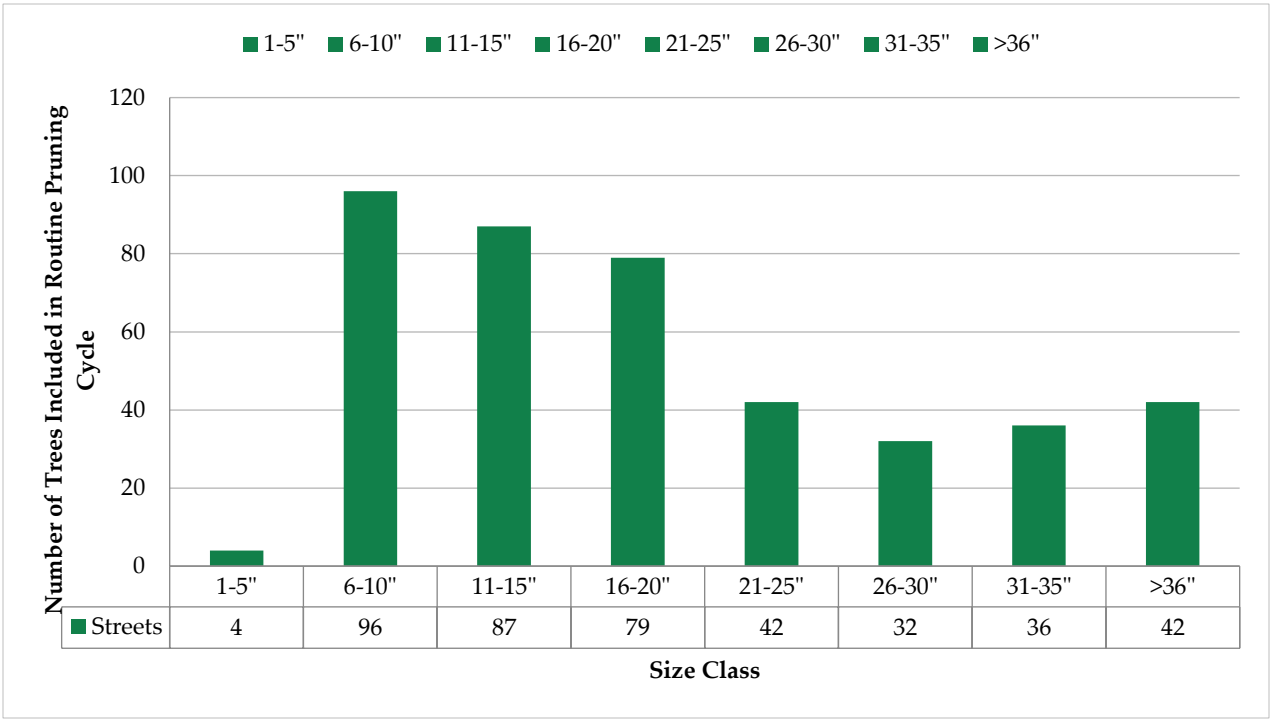


Figure 14. Routine pruning cycle by size class.

YOUNG TREE TRAINING CYCLE

Trees included in the Young Tree Training cycle are generally less than 8 inches DBH. These younger trees sometimes have branch structures that can lead to potential problems as the tree ages. Potential structural problems include codominant leaders, multiple limbs attaching at the same point on the trunk, or crossing/interfering limbs. If these problems are not corrected, they may worsen as the tree grows, increasing its risk rating and creating potential liability.

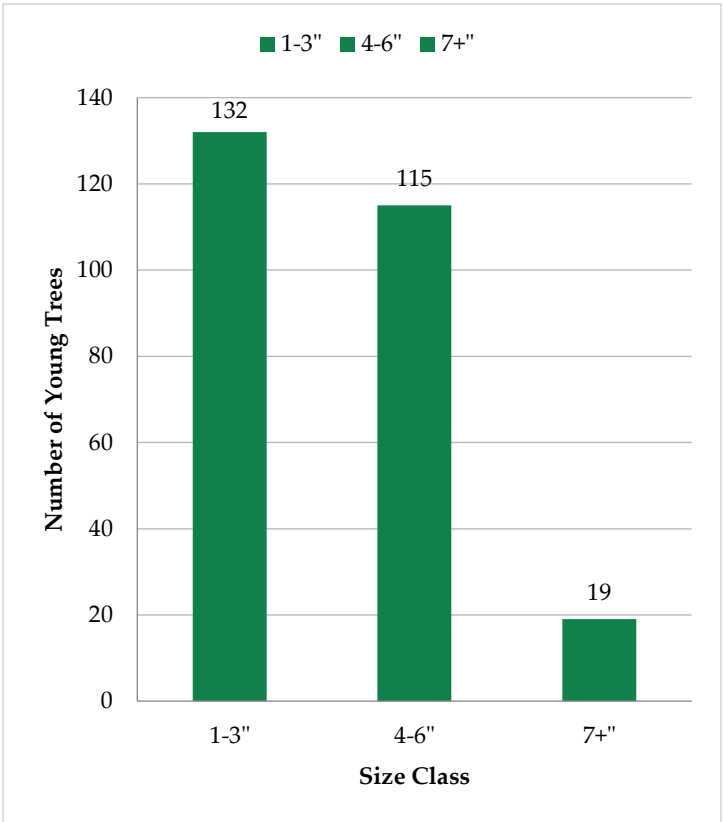


Figure 15. Three-year Young Tree Training cycle by size class.

The recommended length of a Young Tree Training cycle is three years because young trees tend to grow at faster rates than mature trees. The Young Tree Training cycle differs from the Routine Pruning cycle in that the Young Tree Training cycle generally only includes trees that can be pruned from the ground with a pole pruner or pruning shear.

Young Tree Training Cycle Recommendations

DRG recommends that Sackets Harbor implement a three-year Young Tree Training cycle beginning after the completion of all Extreme and High Risk Recommended Maintenance activities. During the inventory, 266 trees less than or equal to 8 inches DBH were inventoried and recommended for young tree training. Since Sackets Harbor has so many young trees, the Young Tree Training cycle is vital for the future condition of the inventoried tree population. DRG recommends that an average of 88 trees be trained with structural pruning each year over three years, beginning in Year One of the management program.

When new trees are planted, they should enter the Young Tree Training cycle after establishment, typically within 2–3 years after planting. In future years, the number of trees in the Young Tree Training cycle will be based on tree planting efforts and growth rates of young trees. The village should strive to training prune approximately one-third of its young trees each year.

TREE PLANTING AND STUMP REMOVAL

Planting new trees in areas where there is sparse canopy already is the most important. It is also important to plant more trees in areas with poor canopy continuity or gaps in existing canopy. While Sackets Harbor as a whole receives value from the ecosystem services provided by the public tree resource, those benefits usually are not distributed evenly across the village.

The Right Tree in the Right Place is a mantra for tree planting used by the Arbor Day Foundation and many utility companies nationwide. Trees come in many different shapes and sizes, and often change dramatically over their lifetimes. Before selecting a tree for planting, make sure it is the right tree—know how tall, wide, and deep it will be at maturity. Equally important to selecting the right tree is choosing the right spot to plant it. Blocking an unsightly view or creating some shade may be a priority, but it is important to consider how a tree may impact existing utility lines and hardscape as it grows taller, wider, and deeper. If the tree at maturity will reach overhead lines, or conflict with sidewalks and curbs, it is best to choose another tree or a different location.

Tree Planting and Stump Removal Recommendations

Creating larger growing sites for trees in the municipal ROW can be the single most beneficial management practice to improve the survival rate of planted and developing trees. Increasing planting space can also reduce the amount of tree-related infrastructure conflicts, as the trees will be planted further from curbs and sidewalks. Depending on the site, there are several methods available to create and/or increase the growing space for newly planted trees:

- Install or enlarge tree wells/pits in existing sidewalks of sufficient width. Ideally, the minimum growing space of a small-sized tree is 32 square feet. Where Sackets Harbor has sidewalks of a sufficient width and length, the village could install tree pits with enough space remaining for the sidewalk to still comply with American Disability Act (ADA) standards.

- Planting trees 4 feet behind a curb without a sidewalk, or 4 feet behind an existing sidewalk, can be a low-cost alternative to more construction intensive methods. This can result in less damage to the sidewalk and give tree roots room to grow into the open soil.
- Re-routing the sidewalk around an area to create designated large tree sites is a relatively cost-effective method to increase growing spaces. This method can also be applied to existing large tree sites, where tree roots have already come in conflict with the sidewalk.
- A landscape bump-out/curb extension is a vegetative area that protrudes into the parking lane of a street, to provide a growing space for plants or trees. These spaces can be used quite effectively by municipalities to beautify a streetscape, provide greater storm water retention, along with the added benefit of slowing car speeds at the bump-out location.

The inventory identified 13 stumps recommended for removal, with a wide range of sizes from 4" to 49" in diameter. Stump removals should occur when convenient and be included regular planting plans if the site would be feasible for planting after the stump is removed. For this reason, it is most convenient to remove all stumps in areas with scheduled tree planting work, so all feasible sites in an area are stocked at once.

A list of suggested tree species is provided in Appendix C. These tree species are specifically selected for the climate of Sackets Harbor. This list is not exhaustive but can be used as a guideline for species that meet community objectives and to enhance any existing list of approved species.

MAINTENANCE SCHEDULE AND BUDGET

Utilizing 2021 Village of Sackets Harbor tree inventory data, an annual maintenance schedule was developed detailing the recommended tasks to complete each year over a ten-year period. DRG made budget projections using industry knowledge and public bid tabulations. A complete table of estimated costs for Sackets Harbor's ten-year tree management program follows (Table 4).

This schedule provides a framework for completing the recommended inventoried tree maintenance over the next ten years. Following this schedule can shift tree maintenance activities from being reactive to a more proactive tree care program.

To implement the maintenance schedule, Sackets Harbor's tree maintenance budget should be:

- No less than $69,995 for the first year of implementation.
- No less than $68,703 for the second year.
- No less than $58,518 for the third year.
- No less than $57,098 for the fourth year.
- No less than $44,883 for the fifth year.
- No less than $43,918 for the sixth year.
- No less than $43,918 for the seventh year.
- No less than $43,918 for the eighth year.
- No less than $43,918 for the ninth year.
- No less than $43,918 for the tenth and final year of the maintenance schedule.

Annual budget funds are needed to ensure that Extreme and High Risk trees are expediently managed and that the vital Young Tree Training and Routine Pruning cycles can begin as soon as possible. If routing efficiencies and/or contract specifications allow more tree work to be completed in a given year, or if this maintenance schedule requires adjustment to meet budgetary or other needs, then it should be modified accordingly. Unforeseen situations such as severe weather events may arise and change the maintenance needs of trees. If maintenance needs change, then budgets, staffing, and equipment should be adjusted to meet the new demand.

URBAN FOREST MANAGEMENT GOALS AND TIMELINES

Introduction

This section identifies the specific goals and objectives to enhance the village's municipal tree program in the coming years. The goals are identified as ongoing, short term (1–3 years for action), medium term (3–5 years) and long term (5+ years). Specific action steps needed to reach each goal are also identified.

The goals for the Village of Sackets Harbor were developed based on the current status of the urban forestry program in the Village and the needs of the Village as identified by the Tree Committee members interviewed in the Community Urban Forestry Program Questionnaire.

Goals and Action Steps

Goal	Timeframe	Action Steps
Complete all priority tree maintenance work	1–3 years	Remove elevated risk trees recommended for removal. Prune elevated risk trees recommended for pruning.
Maintain young tree training pruning program as three-year cycle	1–3 years	Secure or set aside necessary funding. Organize volunteer teams that have been successful in prior planting efforts. Hire contractors or train staff on structural pruning techniques. Divide village into thirds and prune young trees in 1/3 of village each year.
Develop a mature tree pruning program in a routine pruning cycle	5–8 years	Identify all trees recommended for routine pruning. Update list to include trees after high priority maintenance has been performed.
Maintain planting program	Ongoing	Apply for planting grants. Secure or set aside necessary funding. Identify high priority planting locations. Identify suitable planting sites in high priority locations. Hire contractors or train staff on tree planting. Coordinate with volunteer groups to provide watering services during tree establishment. Set goals for annual planting (i.e., replace removed trees, x trees annually, x trees by set date, etc.).

Goal	Timeframe	Action Steps
Increase tree species and genus diversity	Ongoing	Routinely analyze species and genus composition of the urban forest. Identify species and genera which are overabundant. Update approved planting list and do-not-plant list to correspond to species and genus data. Plant a greater variety of tree species and genera.
Select "Right Tree for the Right Place"	Ongoing	Analyze site conditions before planting and select trees well suited to the site. Select trees which will not outgrow available space at maturity. Create and maintain approved planting lists and do-not-plant lists based on species and genera prevalence and presence of invasive threats.
Create an approved tree species planting list	1–3 years	Modify DRG-provided potential planting list using village information. Distribute list on village websites. Use list to guide tree planting decisions.
Create and enforce a do-not-plant list	1–3 years	Identify tree species and genera which are overabundant in village. Identify tree species which are susceptible to current or future invasive species threats. Identify tree species which are known to be invasive in the area. Create a list of these undesirable species. Distribute list on village websites. Use list to guide tree planting decisions. Update list as needed when species and genus distribution shift or as new information on invasive species becomes available.
Improve tree cover in public right-of-way (ROW)	Ongoing	Identify parks and public properties with greatest occupancy rates and greatest need for trees. Identify suitable planting sites in these high priority areas. Include requests from property owners for trees to be planted in ROW adjacent to their properties. Select tree species well suited to site conditions. Install trees using best practices. Maintain young trees on a regular basis.
Compensate for ash decline due to emerald ash borer (EAB).	3–5 years	Remove dead and dying ash trees on public property which pose a hazard. Replant with non-host species. Educate homeowners of treatment options.

Goal	Timeframe	Action Steps
Update tree inventory	Ongoing	Edit inventoried trees as work is completed. Add new trees as they are planted. Remove or edit trees to stumps or vacant sites as they are removed. Remove or edit stumps to vacant sites as they are removed. Plan to conduct a full re-inventory within the next 8–10 years.
Maintain and update tree-related regulations in village's zoning ordinances	1–3 years	Review and revise existing ordinances. Determine essential inclusions Present to village council. Advocate for a vote on revisions to the ordinances.
Reduce risk associated with village trees	Ongoing	Routinely inspect village trees for defects which may elevate risk. Monitor trees identified in the inventory recommended for multi-year annual inspection or insect/disease monitoring. Inspect trees after any major storms, or every spring/fall.
Reduce future conflicts with utilities and infrastructure with proper planting strategies	Ongoing	Plant only small stature trees (15–30 feet tall at maturity) below utility lines. Plant medium stature trees (30–40 feet tall at maturity) at least 20 feet from utility lines. Plant large stature trees (40+ feet tall at maturity) at least 40 feet from utility lines. Locate trees to avoid blocking important road signage. Plant trees at least: ● 5 feet from underground utilities ● 10 feet from driveways ● 15 feet from utility poles ● 15 feet from buildings ● 20 feet from stop signs ● 20 feet from fire hydrants ● 30 feet from intersections Routinely prune village trees to minimize conflicts with utilities, signs, and buildings.
Prepare for future invasive species threats	1–3 years	Draft an invasive species management plan using guidance from this *Standard Inventory Analysis and Management Plan*. Identify likely areas for invasive species establishment. Routinely monitor high-priority areas to identify new invasions early. Manage new invasive species in ways which are cost-efficient, environmentally sound, and socially acceptable. Routinely check with organizations such as the United States Department of Agriculture (USDA) and the Western New York Partnership for Regional Invasive Species Management (PRISM) for updates on invasive species in your area. Increase opportunity for tree committee members to attend local and regional tree care and pest management workshops to stay abreast of changes that might affect the village's public tree resource.

Goal	Timeframe	Action Steps
Continue Arbor Day celebrations	Ongoing	Coordinate between village departments. Provide public education (e.g., demonstrations, handouts, tabling, etc.) on tree planting, care, and benefits. Source seedlings to hand out to residents. Plant trees on village properties.
Educate citizens about trees	Ongoing	Provide free presentations or classes during Arbor Day celebrations. Post urban forestry updates to village websites. Provide approved tree planting lists and do-not-plant lists. Table or provide educational flyers at public gathering places. Evaluate the use of social media to increase public awareness of the Tree Committee's activities.
Continue to maintain Tree City USA status	Ongoing	Continue to meet the specific requirements and apply for the recognition annually.

Table 4. Estimated budget for recommended ten-year tree resource management program

Activity Cost			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10		Five-Year Cost
Activity	Diameter	Cost/Tree	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	
High Priority Removals	1-5"	$90	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	6-10"	$225	1	$225		$0		$0		$0		$0		$0		$0		$0		$0		$0	$225
	11-15"	$575	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	16-20"	$1,080	2	$2,160		$0		$0		$0		$0		$0		$0		$0		$0		$0	$2,160
	21-25"	$1,820	1	$1,820		$0		$0		$0		$0		$0		$0		$0		$0		$0	$1,820
	26-30"	$2,430	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	31-35"	$2,900	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	>35"	$3,900	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
Activity Total(s)			**4**	**$4,205**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$4,205**
Moderate Priority Removals	1-5"	$90		$0	0	$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	6-10"	$225		$0	1	$225		$0		$0		$0		$0		$0		$0		$0		$0	$225
	11-15"	$575		$0	2	$1,150		$0		$0		$0		$0		$0		$0		$0		$0	$1,150
	16-20"	$1,080		$0	2	$2,160		$0		$0		$0		$0		$0		$0		$0		$0	$2,160
	21-25"	$1,820		$0	5	$9,100		$0		$0		$0		$0		$0		$0		$0		$0	$9,100
	26-30"	$2,430		$0	5	$12,150		$0		$0		$0		$0		$0		$0		$0		$0	$12,150
	31-35"	$2,900	4	$11,600		$0		$0		$0		$0		$0		$0		$0		$0		$0	$11,600
	>35"	$3,900	3	$11,700		$0		$0		$0		$0		$0		$0		$0		$0		$0	$11,700
Activity Total(s)			**7**	**$23,300**	**15**	**$24,785**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$48,085**
Low Priority Removals	1-5"	$90		$0		$0		$0	6	$540		$0		$0		$0		$0		$0		$0	$540
	6-10"	$225		$0		$0		$0	1	$225		$0		$0		$0		$0		$0		$0	$225
	11-15"	$575		$0		$0		$0	1	$575		$0		$0		$0		$0		$0		$0	$575
	16-20"	$1,080		$0		$0		$0	1	$1,080		$0		$0		$0		$0		$0		$0	$1,080
	21-25"	$1,820		$0		$0		$0	5	$9,100		$0		$0		$0		$0		$0		$0	$9,100
	26-30"	$2,430		$0		$0	0	$0		$0		$0		$0		$0		$0		$0		$0	$0
	31-35"	$2,900		$0		$0	1	$2,900		$0		$0		$0		$0		$0		$0		$0	$2,900
	>35"	$3,900		$0		$0	3	$11,700		$0		$0		$0		$0		$0		$0		$0	$11,700
Activity Total(s)			**0**	**$0**	**0**	**$0**	**4**	**$14,600**	**14**	**$11,520**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$26,120**
Stump Removals	1-5"	$50		$0		$0		$0		$0	1	$50		$0		$0		$0		$0		$0	$50
	6-10"	$100		$0		$0		$0		$0	4	$400		$0		$0		$0		$0		$0	$400
	11-15"	$125		$0		$0		$0		$0	1	$125		$0		$0		$0		$0		$0	$125
	16-20"	$195		$0		$0		$0		$0	2	$390		$0		$0		$0		$0		$0	$390
	21-25"	$250		$0		$0		$0	2	$500		$0		$0		$0		$0		$0		$0	$500
	26-30"	$310		$0		$0		$0	1	$310		$0		$0		$0		$0		$0		$0	$310
	31-35"	$375		$0		$0		$0	0	$0		$0		$0		$0		$0		$0		$0	$0
	>35"	$425		$0		$0		$0	2	$850		$0		$0		$0		$0		$0		$0	$850
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**5**	**$1,660**	**8**	**$965**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$2,625**
High Priority Pruning	1-5"	$62	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	6-10"	$126	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	11-15"	$183	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	16-20"	$223	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	21-25"	$275	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	26-30"	$312	1	$312		$0		$0		$0		$0		$0		$0		$0		$0		$0	$312
	31-35"	$415	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	>35"	$450	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
Activity Total(s)			**1**	**$312**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$312**

Activity Cost			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10		Five-Year Cost
Activity	Diameter	Cost/Tree	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	Count	Cost	
Moderate Priority Pruning	1-5"	$62	0	$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
	6-10"	$126	1	$126		$0		$0		$0		$0		$0		$0		$0		$0		$0	$126
	11-15"	$183	5	$915		$0		$0		$0		$0		$0		$0		$0		$0		$0	$915
	16-20"	$223	1	$223		$0		$0		$0		$0		$0		$0		$0		$0		$0	$223
	21-25"	$275	10	$2,750		$0		$0		$0		$0		$0		$0		$0		$0		$0	$2,750
	26-30"	$312	10	$3,120		$0		$0		$0		$0		$0		$0		$0		$0		$0	$3,120
	31-35"	$415	9	$3,735		$0		$0		$0		$0		$0		$0		$0		$0		$0	$3,735
	>35"	$450	8	$3,600		$0		$0		$0		$0		$0		$0		$0		$0		$0	$3,600
Activity Total(s)			**44**	**$14,469**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$14,469**
Routine Inspection	Drive-by Assessment	$1	785	$785	785	$785	785	$785	785	$785	785	$785	785	$785	785	$785	785	$785	785	$785	785	$785	$7,850
	Walk-by Assessment	$5		$0		$0		$0		$0		$0		$0		$0		$0		$0		$0	$0
Activity Total(s)			**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**785**	**$785**	**$7,850**
Young Tree Training (3-year Cycle)	all sizes	$45	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	88	$3,960	$39,600
Activity Total(s)			**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**88**	**$3,960**	**$39,600**
Routine Pruning (10-year Cycle)	1-5"	$62	4	$248	4	$248	4	$248	4	$248	4	$248	4	$248	4	$248	4	$248	4	$248	4	$248	$2,480
	6-10"	$126	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	9	$1,134	$11,340
	11-15"	$183	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	8	$1,464	$14,640
	16-20"	$223	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	7	$1,561	$15,610
	21-25"	$275	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	4	$1,100	$11,000
	26-30"	$312	3	$936	3	$936	3	$936	3	$936	3	$936	3	$936	3	$936	3	$936	3	$936	3	$936	$9,360
	31-35"	$415	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	3	$1,245	$12,450
	>35"	$450	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	4	$1,800	$18,000
Activity Total(s)			**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**42**	**$9,488**	**$94,880**
Replacement Tree Planting and Maintenance	Purchasing & Planting	$550	3	$1,650	6	$3,300	6	$3,300	6	$3,300	6	$3,300	6	$3,300	6	$3,300	6	$3,300	6	$3,300	6	$3,300	$31,350
	Watering	$30	3	$90	6	$180	6	$180	6	$180	6	$180	6	$180	6	$180	6	$180	6	$180	6	$180	$1,710
Activity Total(s)			**6**	**$1,740**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**12**	**$3,480**	**$33,060**
New Tree Planting and Maintenance	Purchasing & Planting	$550	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	10	$5,500	$55,000
	Watering	$30	10	$300	10	$300	10	$300	10	$300	10	$300	10	$300	10	$300	10	$300	10	$300	10	$300	$3,000
Activity Total(s)			**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**20**	**$5,800**	**$58,000**
Natural Mortality (1%)	Tree Removal	$1,080	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	11	$11,880	$118,800
	Stump Removal	$195	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	11	$2,145	$21,450
	Replacement Tree	$580	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	11	$6,380	$63,800
Activity Total(s)			**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**33**	**$20,405**	**$204,050**
Activity Grand Total			**986**		**995**		**984**		**999**		**988**		**980**		**980**		**980**		**980**		**980**		**$9,852**
Cost Grand Total				**$69,995**		**$68,703**		**$58,518**		**$57,098**		**$44,883**		**$43,918**		**$43,918**		**$43,918**		**$43,918**		**$43,918**	**$518,787**

CONCLUSION

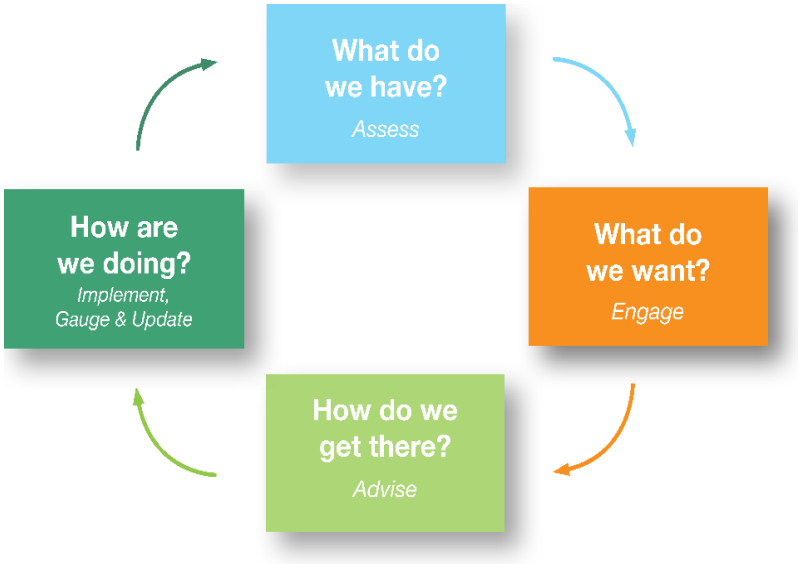
When properly maintained, the valuable benefits trees provide over their lifetime far exceed the time and money invested in planting, pruning, and inevitably removing them. The 785 public trees inventoried provide $2,685 in estimated annual economic value, which is over 33% of the village's 2021 tree expenditures of $8,100. Successfully implementing the ten-year program may increase Sackets Harbor's ROI over time, or at least maintain it over the years.

The program is ambitious and is a challenge to complete in ten years but becomes easier after all high priority tree maintenance is completed. This *Standard Inventory Analysis and Management Plan* could potentially help the village advocate for an increased urban forestry budget to fund the recommended maintenance activities. Getting started is the most difficult part because of the expensive maintenance in the first year, which represents the transition from reactive maintenance to proactive maintenance. Significant investment early on can reduce tree maintenance costs over time.

As the urban forest grows, the benefits enjoyed by the Village of Sackets Harbor and its residents will increase as well. Inventoried trees are only a fraction of the total trees in Sackets Harbor when including private property, which is why it is important to also incentivize private landowners to care for their trees and to plant new ones. The village's urban forestry program is well on its way to creating a sustainable and resilient public tree resource, and can stay on track by setting goals, updating inventory data to check progress, and setting more ambitious goals once they are reached.

EVALUATING AND UPDATING THIS PLAN

This Standard *Inventory Analysis and Management Plan* provides management priorities for the next ten years, and it is important to update the tree inventory using TreeKeeper® as work is completed, so the software can provide updated species distribution and benefit estimates. This empowers Sackets Harbor to self-assess the village's progress over time and set goals to strive toward by following the adaptive management cycle. Below are some ways of implementing the steps of this cycle:



- Prepare planting plans well enough in advance to schedule and complete stump removal in the designated area, and to select species best suited to the available sites.
- Annually comparing the number of trees planted to the number of trees removed and the number of vacant planting sites remaining, then adjusting future planting plans accordingly.
- Annually comparing the species distribution of the inventoried tree resource with the previous year after completing planting plans to monitor recommended changes in abundance.
- Schedule and assign high-priority tree work so it can be completed as soon as possible instead of reactively addressing new lower priority work requests as they are received.
- Include data collection such as measuring DBH and assessing condition into standard procedure for tree work and routine inspections, so changes over time can be monitored.

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APPENDIX A
DATA COLLECTION AND SITE LOCATION METHODS

DATA COLLECTION METHODS

DRG collects tree inventory data using their proprietary GIS software, called Rover, loaded onto pen-based field computers. At each site, the following data fields were collected:

- Address
- Comments
- Condition
- Date of Inventory
- Maintenance Recommendation
- Multi-stem Tree
- Notes
- Relative Location
- Size*
- Species and Identification Confidence Level
- Utility Interference
- X and Y Coordinates

* measured in inches in diameter at 4.5 feet above ground or diameter at breast height (DBH]).

The knowledge, experience, and professional judgment of DRG's arborists ensure the high quality of inventory data.

SITE LOCATION METHODS

Equipment and Base Maps

Inventory arborists use FZ-G1 Panasonic Toughpad® units with internal GPS receivers. Geographic information system (GIS) map layers are loaded onto these units to help locate sites during the inventory. This table lists these base map layers, along with each layer's source and format information.

Type	Source	Date	Projection
Centerlines	NY GIS Clearninghouse	2021	NAD_1983_StatePlane_New_York_Central_FIPS_3102_Feet WKID: 2261 Authority: EPSG
Centerlines	NY GIS Clearinghouse	2021	NAD_1983_StatePlane_New_York_Central_FIPS_3102_Feet WKID: 2261 Authority: EPSG
Parcels	Jefferson County, NY	2021	NAD_1983_StatePlane_New_York_Central_FIPS_3102_Feet WKID: 2261 Authority: EPSG
Centerlines	NY GIS Clearinghouse	2015	NAD_1983_New_York_Central_ftUS Authority: Custom
Address Points	NY GIS Clearinghouse	2021	NAD_1983_StatePlane_New_York_Central_FIPS_3102_Feet WKID: 2261 Authority: EPSG

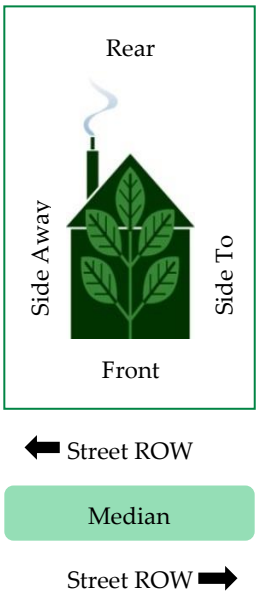
STREET ROW SITE LOCATION

Individual street ROW sites were located using a methodology that identifies sites by *address number*, *street name*, *side*, and *on street*. This methodology was used to help ensure consistent assignment of location.

Address Number and Street Name

Where there was no GIS parcel addressing data available for sites located adjacent to a vacant lot, or adjacent to an occupied lot without a posted address number, the arborist used their best judgment to assign an address number based on nearby addresses. An "X" was then added to the number in the database to indicate that it was assigned, for example, "37X Choice Avenue."

Sites in medians were assigned an address number by the arborist in Rover using parcel and streets geographical data. Each segment was numbered with an assigned address that was interpolated from addresses facing that median and addressed on that same street as the median. If there were multiple medians between cross streets, each segment was assigned its own address. The *street name* assigned to a site was determined by street centerline information.



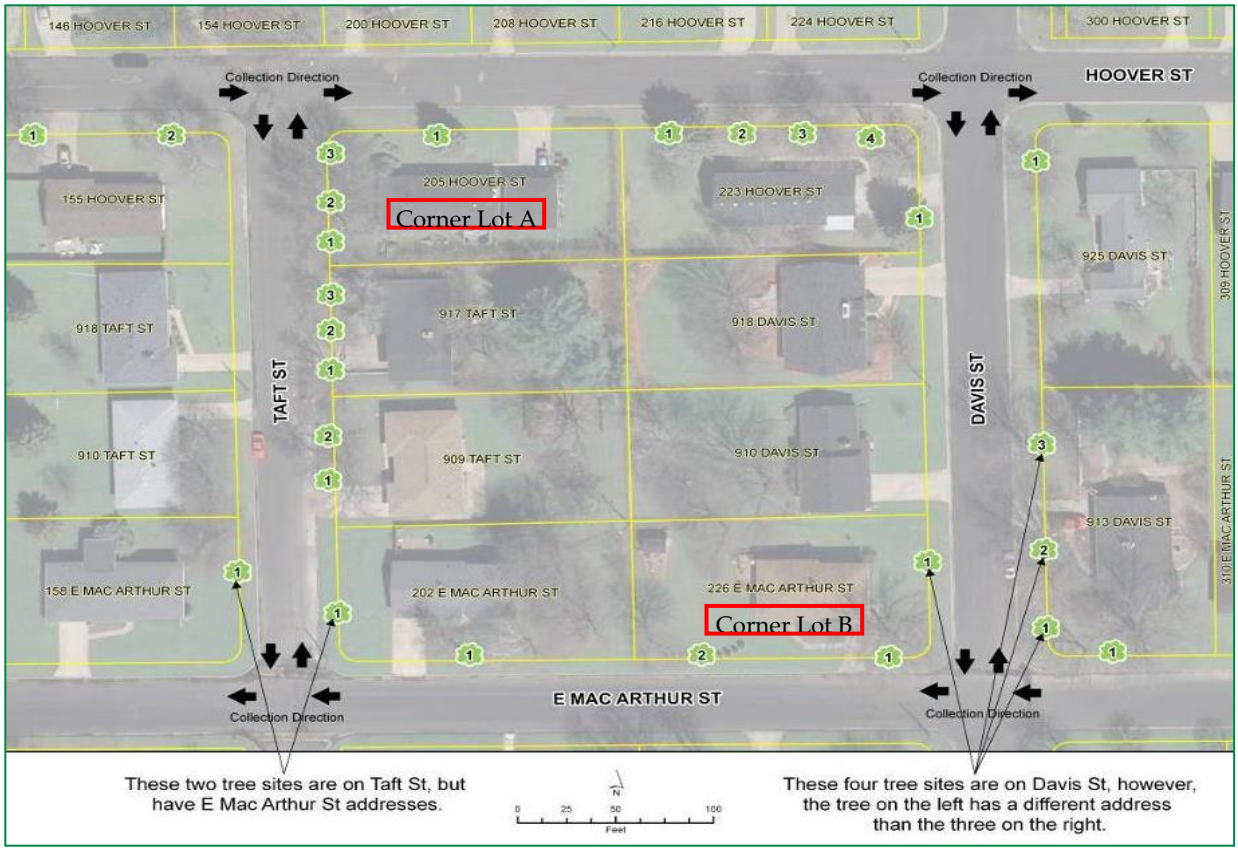
Side Value

Each site was assigned a *side value*, including *front*, *side*, *median*, or *rear* based on the site's location in relation to the lot's street frontage. The *front* is the side facing the address street. *Side* is either side of the lot that is between the front and rear. *Median* indicates a median or island surrounded by pavement. The *rear* is the side of the lot opposite of the address street.

PARK AND PUBLIC SPACE SITE LOCATION

Park and/or public space site locations were collected using the same methodology as street ROW sites, however nearly all of them have the "Assigned Address" field set to 'X' and have the "Park Name" data field filled.

Site Location Example



Corner Lot A

Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Side
On Street:	Taft St.
Address/Street Name:	205 Hoover St.
Side:	Front
On Street:	Hoover St.

Corner Lot B

Address/Street Name:	226 E Mac Arthur St.
Side:	Side
On Street:	Davis St.
Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.
Address/Street Name:	226 E Mac Arthur St.
Side:	Front
On Street:	E Mac Arthur St.

i-TREE ECO METHODOLOGY

Replacement value (also called structural value) is a compensatory value calculated based on the local cost of having to replace a tree with a similar tree. In other words, it is a measurement of the value of the resource itself. The structural value of an urban forest is the sum of the structural values of all the individual trees contained within. Monetary values are assigned based on valuation procedures of the Council of Tree and Landscape Appraisers using information on species, diameter, condition, and location (McPherson 2007) and (Nowak et al. 2008).

Carbon sequestration refers to the capture and storage of carbon from the earth's atmosphere. i-Tree Eco analysis reports on the gross annual amount of carbon sequestered as well as the total amount of carbon stored over the lifetime of the tree. For this analysis, carbon storage and sequestration values are calculated at a rate of $170.55 per ton.

Air pollution removal refers to the removal of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter less than 2.5 microns ($PM_{2.5}$). For this analysis, the pollution removal value is calculated based on the prices of $2.39 per pound of ozone, $0.09 per pound of sulfur dioxide, $0.30 per pound of nitrogen dioxide, $0.66 per pound carbon monoxide, and $100.82 per pound of particulate matter less than 2.5 microns.

Avoided runoff measures the amount of surface runoff avoided when trees intercept rainfall during precipitation events. Surface runoff from rainfall contributes to the contamination of streams, rivers, lakes, and wetlands by washing oils, pesticides, and other pollutants, either directly into waterways or into drainage infrastructure that ultimately empties into waterways. For this analysis, annual avoided runoff is calculated based on the estimated amount of intercepted rainfall and the local weather station at the Albany International Airport, where annual precipitation in 2016 equaled 34.5 inches. The monetary value of avoided runoff is based on the U.S. Forest Service's Community Tree Guide Series at a rate of $0.067 per cubic foot.

APPENDIX B
INVASIVE PESTS AND DISEASES

In today's worldwide marketplace, the volume of international trade brings increased potential for pests and diseases to invade our country. Many of these pests and diseases have seriously harmed rural and urban landscapes and have caused billions of dollars in lost revenue and millions of dollars in cleanup costs. Keeping these pests and diseases out of the country is the number one priority of the USDA's Animal and Plant Inspection Service (APHIS).

Updated pest range maps can be found at: https://www.nrs.fs.fed.us/tools/afpe/maps/ and updated pest information can be found at: https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/Pest-Tracker.

Although some invasive species naturally enter the United States via wind, ocean currents, and other means, most invasive species enter the country with some help from human activities. Their introduction to the U.S. is a byproduct of cultivation, commerce, tourism, and travel. Many species enter the United States each year in baggage, cargo, contaminants of commodities, or mail.

Once they arrive, invasive pests grow and spread rapidly because controls, such as native predators, are lacking. Invasive pests disrupt the landscape by pushing out native species, reducing biological diversity, killing trees, altering wildfire intensity and frequency, and damaging crops. Some pests may even push species to extinction. The following sections include key pests and diseases that adversely affect trees in America at the time of this plan's development. This list is not comprehensive and may not include all threats.

It is critical to the management of community trees to routinely check APHIS, USDA Forest Service, and other websites for updates about invasive species and diseases in your area and in our country so that you can be prepared to combat their attack.

ASIAN LONGHORNED BEETLE

The Asian longhorned beetle (ALB, *Anoplophora glabripennis*) is an exotic pest that threatens a wide variety of hardwood trees in North America. The beetle was introduced in Chicago, New Jersey, and New York City, and is believed to have arrived in the United States in wood pallets and other wood-packing material accompanying cargo shipments from Asia. ALB is a serious threat to America's hardwood tree species.

Adult Asian longhorned beetle.

Photograph courtesy of New Bedford Guide (2011)

Adults are large (3/4- to 1/2-inch long) with very long, black-and-white banded antennae. The body is glossy black with irregular white spots. Adults can be seen from late spring to fall depending on the climate. ALB has a long list of host species; however, the beetle prefers hardwoods, including several maple species. Examples include: box elder (*Acer negundo*); Norway maple (*A. platanoides*); red maple (*A. rubrum*); silver maple (*A. saccharinum*); sugar maple (*A. saccharum*); buckeye (*Aesculus glabra*); horsechestnut (*A. hippocastanum*); birch (*Betula*); London planetree (*Platanus* × *acerifolia*); willow (*Salix*); and elm (*Ulmus*).

BEECH BARK DISEASE

Beech bark disease is the result of an insect-fugus complex which begins when a non-native beech scale insect, *Cryptococcus fagisuga*, feeds on the bark of beech trees, creating lesions through which a native canker fungi, *Neonectria* spp., can enter the tree. The scale insect, which is native to Europe, was first introduced to Nova Scotia in the 1890s and has since spread west and south across Canada and the United States.

Perennial nectria cankers caused by beech bark disease on an American beech.

Photograph courtesy of Linda Haugen, USDA Forest Service, Bugwood.org

Cryptococcus fagisuga is a soft-bodied scale insect which secretes a white wooly wax during the nymph stage which can make infested trees appear to be covered in wool. The insects feed on the bark, leaving punctures through which the nectria canker fungi can enter. 50–85% of infect beech trees will die within 10 years of infestation. Even trees that do not succumb to the disease may be significantly structurally weakened by the nectria cankers and are prone to "beech snap", or trunk failure. Such trees pose a safety hazard within the urban environment.

The beech scale and resulting beech bark disease is found on both American beech (*Fagus grandifolia*) and on European beech (*F. sylvatica*).

BEECH LEAF DISEASE

Beech leaf disease (BLD) was first identified in Ohio in 2012. Since then, it has been found in Pennsylvania, New York, Rhode Island, Connecticut, and Massachusetts.

The disease complex is associated with a nematode, *Litylenchas crenatae*, and impacts American beech (*Fagus grandifolia*), European beech (*F. sylvatica*), and Oriental beech (*F. orientalis*). Early signs of the disease include dark stripes between the veins of leaves, most noticeable when looking up through the canopy on sunny days. As the disease progresses, leaves become withered, curled, or develop a leathery texture and sections of canopy may die back. Infected trees often appear to have a thin canopy, and the disease can lead to tree mortality. Research into this disease is ongoing, and the method of spread and infection, as well as potential treatments, are not yet known.

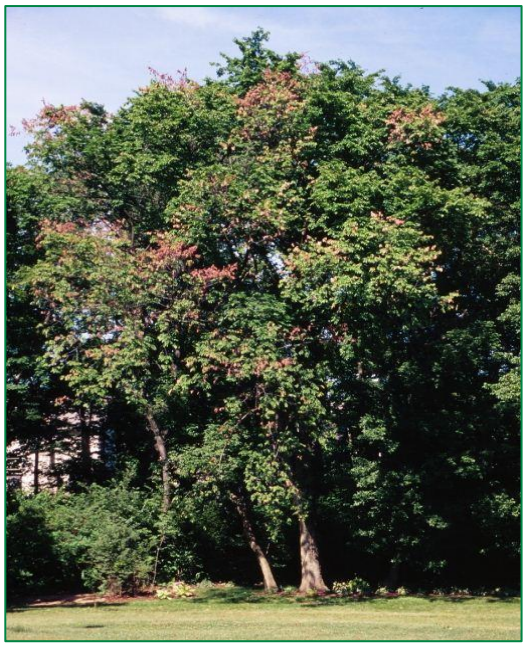
Dark stripes between leaf veins are an early symptom of BLD.

Photograph courtesy of Tom Macy, Ohio DNR Division of Forestry (2019)

DUTCH ELM DISEASE

Considered by many to be one of the most destructive invasive diseases of shade trees in the United States, Dutch elm disease (DED) was first found in Ohio in 1930. By 1933 the disease was present in several east coast cities and by 1959 it had killed thousands of elms. Today, DED is present in about two-thirds of the eastern United States and kills many of the remaining and newly planted elms annually. The disease is caused by a fungus that attacks the vascular system of elm trees, blocking the flow of water and nutrients and resulting in rapid leaf yellowing, tree decline, and death. The species most affected by DED is *Ulmus americana* (American elm).

There are two closely related fungi that are collectively referred to as DED. The most common is *Ophiostoma novo-ulmi*, which is thought to be responsible for most of the elm deaths since the 1970s. The fungus is transmitted to healthy elm by elm bark beetles. Two species of beetle carry the fungus: native elm bark beetle (*Hylurgopinus rufipes*) and European elm bark beetle (*Scolytus multistriatus)*.

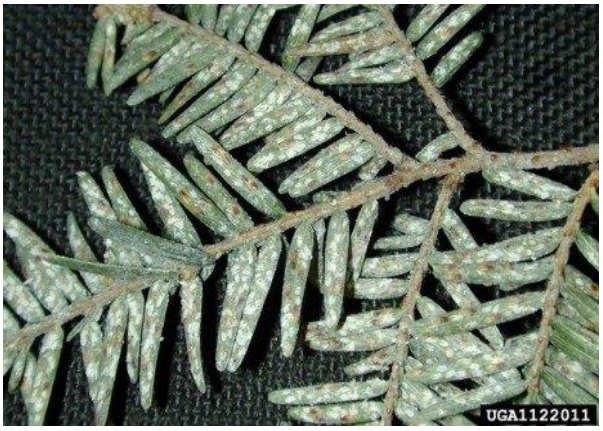


Branch death, or flagging, at multiple locations in the crown of a diseased elm.

Photograph courtesy of Steven Katovich, USDA Forest Service, Bugwod.org (2011)

ELONGATE HEMLOCK SCALE

The elongate hemlock scale (EHS, *Fiorina externa*) was introduced from Japan and was first observed in Queens, NY as early as 1908. It was not considered a major pest until the 2000s when its range and prevalence increased dramatically. This invasive scale insect has been found in 16 states to date, including Connecticut, Delaware, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, Nevada, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, and Virginia as well as the District of Colombia. The insect is thought to have been spread widely on infested conifer products, including holiday wreaths and Christmas trees.



EHS covering the undersides of hemlock needles.

Photograph courtesy of Eric R. Day, Virginia Polytechnic Institute and State University, bugwood.org (2011)

Adult female EHS are soft-bodied, amber, legless, and wingless. They are encased in a 2mm long, brown, waxy scale covered under which they feed and lay around 20 lemon-colored eggs. Males are enclosed in white, 1.5mm scales. While they have wings, they are weak fliers and travel only to mate. They do not feed. Young instars are called crawlers and are yellow and legged. They emerge from May–September and mature to later instars which feed under scales. The scales are a visible sign that a tree is infested with EHS, and needle yellowing, especially on lower branches, premature needle drop, and branch dieback are all common symptoms of EHS infestation. While these insects can kill trees outright by siphoning away nutrients and water from the tree, more commonly they weaken hosts, leaving them susceptible to other pests or environmental conditions.

EMERALD ASH BORER

Emerald ash borer (EAB, *Agrilus planipennis*) is responsible for the death or decline of tens of millions of ash trees in 14 states in the American Midwest and Northeast. Native to Asia, EAB has been found in China, Japan, Korea, Mongolia, eastern Russia, and Taiwan. It likely arrived in the United States hidden in wood-packing materials commonly used to ship consumer goods, auto parts, and other products. The first official United States identification of EAB was in southeastern Michigan in 2002.

Close-up of an emerald ash borer.

Photograph courtesy of USDA APHIS (2020)

Adult beetles are slender and 1/2-inch long. Males are smaller than females. Color varies but adults are usually bronze or golden green overall with metallic, emerald-green wing covers. The top of the abdomen under the wings is metallic, purplish-red and can be seen when the wings are spread.

The EAB-preferred host tree species are in the genus *Fraxinus* (ash). Common signs and symptoms of EAB infestation include excessive woodpecker activity, branch dieback, and characteristic D-shaped exit holes.

EUROPEAN CHERRY FRUIT FLY

The European cherry fruit fly (ECFF, *Rhagoletis cerasi*) damages the fruit of all cherry (*Prunus* spp.) trees, in addition to barberry (*Berberis* spp.), honeysuckle (*Lonicera* spp.), and common dogwood (*Cornus sanguinea*). This is of particular concern for commercial cherry fruit production. In New York State, Erie, Monroe, Niagara, Orleans, and Wayne Counties are under quarantine, as is part of Ontario County, within a 10-mile radius of the City of Rochester.

Adult European cherry fruit fly

Photograph courtesy of USDA APHIS (2021)

USDA trapping efforts are in place in these counties to monitor the spread of this pest. Adult flies, which range from 1/8 to 3/16 of an inch in length, are typically emergent from May through July.

HEMLOCK WOOLY ADELGID

The hemlock woolly adelgid (HWA, *Adelges tsugae*) was first described in western North America in 1924 and first reported in the eastern United States in 1951 near Richmond, Virginia.

In their native range, populations of HWA cause little damage to hemlock trees, as they are preyed on by on natural enemies and possible tree resistance has evolved with this insect. In eastern North America and in the absence of natural control elements, HWA attacks both eastern or Canadian hemlock (*Tsuga canadensis*) and Carolina hemlock (*T. caroliniana*), often damaging and killing them within a few years of becoming infested.

HWA is now established from northeastern Georgia to southeastern Maine and as far west as eastern Kentucky and Tennessee.

Hemlock woolly adelgids on a branch.

Photograph courtesy of Connecticut Agricultural Experiment Station, Bugwood.org (2011)

LYMANTRIA DISPAR

Lymantria dispar (LDD, formerly called European gypsy moth) is native to Europe and first arrived in the United States in Massachusetts in 1869. This moth is a significant pest because its caterpillars have an appetite for more than 300 species of trees and shrubs. LDD caterpillars defoliate trees, which makes the host trees vulnerable to diseases and other pests that can eventually kill the tree.

Male LDD are brown with a darker brown pattern on their wings and have a 1/2-inch wingspan. Females are slightly larger with a 2-inch wingspan and are nearly white with dark, saw-toothed patterns on their wings. Although they have wings, the female of the species cannot fly.

Close-up of male (darker brown) and female (whitish color) LDD moths.

Photograph courtesy of USDA APHIS (2019)

LDD prefers approximately 150 primary hosts but feeds on more than 300 species of trees and shrubs. Many preferred hosts are found in these common genera: birch (*Betula* spp.); cedar (*Juniperus* spp.); larch (*Larix* spp.); poplar (*Populus* spp.); oak (*Quercus* spp.); and willow (*Salix* spp.).

OAK WILT

Oak wilt was first identified in 1944 and is caused by the fungus *Ceratocystis fagacearum*. While considered an invasive and aggressive disease, its status as an exotic pest is debated since the fungus has not been reported in any other part of the world. This disease affects the oak genus and is most devastating to those in the red oak subgenus, such as scarlet oak (*Quercus coccinea*), shingle oak (*Q. imbricaria*), pin oak (*Q. palustris*), willow oak (*Q. phellos*), and red oak (*Q. rubra*). It also attacks trees in the white oak subgenus, although it is not as prevalent and spreads at a much slower pace in these trees.

Oak wilt symptoms on red and white oak leaves.

Photograph courtesy of USDA Forest Service (2011a)

Just as with DED, oak wilt disease is caused by a fungus that clogs the vascular system of oak and results in decline and death of the tree. The fungus is carried from tree to tree by several borers common to oak, but the disease is more commonly spread through root grafts. Oak species within the same subgenus (red or white) will form root colonies with grafted roots that allow the disease to move readily from one tree to another.

SOUTHERN PINE BEETLE

The southern pine beetle (SPB, *Dendroctonus frontalis*) is the most destructive insect pest of pine in the southern United States. It attacks and kills all species of southern white pine including eastern white pine (*Pinus strobus*). Trees are killed when beetles construct winding, S-shaped egg galleries underneath the bark. These galleries effectively girdle the tree and destroy the conductive tissues that transport food throughout the tree. Furthermore, the beetles carry blue staining fungi on their bodies that clog the water conductive tissues which transport water within the tree. Signs of attack on the outside of the tree are pitch tubes and boring dust, known as frass, caused by beetles entering the tree.

Adult southern pine beetles.

Photograph courtesy of Forest Encyclopedia Network (2012)

Adult SPBs reach an ultimate length of only 1/8 inch, similar in size to a grain of rice. They are short-legged, cylindrical, and brown to black in color. Eggs are small, oval-shaped, shiny, opaque, and pearly white.

SPOTTED LANTERNFLY

The spotted lanternfly (SLF, *Lycorma delicatula*) is native to China and was first detected in Pennsylvania in September 2014. SLF feeds on a wide range of fruit, ornamental, and woody trees, with tree-of-heaven (*Ailanthus altissima*) being one of its preferred hosts. SLF is a "hitchhiker" and can be spread long distances by people who move infested material or items containing egg masses. If allowed to spread in the United States, this pest could seriously impact the country's grape, orchard, and logging industries.

Pinned spotted lanternfly nymph.

Photograph courtesy of PA Dept of Agriculture

Symptoms of SLF include plants oozing or weeping with a fermented odor, buildup of a sticky fluid called honeydew on the plant or on the ground underneath them, and sooty mold growing on plants. The following trees are susceptible to SLF: almond, apricot, cherry, nectarine, peach, plum (*Prunus* spp.), apple (*Malus* spp.), maple (*Acer* spp.), oak (*Quercus* spp.), pine (*Pinus* spp.), poplar (*Populus* spp.), sycamore (*Platanus* spp.), walnut (*Juglans* spp.), and willow (*Salix* spp.), as well as grape vines and hop plants.

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APPENDIX C
SUGGESTED TREE SPECIES FOR USDA HARDINESS ZONE 4

Proper landscaping and tree planting are critical components of the atmosphere, livability, and ecological quality of a community's urban forest. The tree species listed below have been evaluated for factors such as size, disease and pest resistance, seed or fruit set, and availability. The following list is offered to assist all relevant community personnel in selecting appropriate tree species. These trees have been selected because of their aesthetic and functional characteristics and their ability to thrive in the soil and climate conditions throughout Zone 4 on the USDA Plant Hardiness Zone Map.

DECIDUOUS TREES

Large Trees (greater than 50 feet in height when mature)

Scientific Name	Common Name	Cultivar
Acer rubrum	red maple	'Red Sunset'
Betula papyrifera	paper birch	
Catalpa speciosa	northern catalpa	
Castanea dentata	American chestnut	hybrids or disease-resistant cultivars
Celtis occidentalis	common hackberry	'Prairie Pride'
Ginkgo biloba	ginkgo	'Autumn Gold'
Gleditsia triacanthos var. *inermis*	thornless honeylocust	'Shademaster' 'Skyline'
Gymnocladus dioicus	Kentucky coffeetree	
Juglans nigra	black walnut	'Laciniata'
Quercus macrocarpa	bur oak	
Quercus rubra	northern red oak	
Tilia americana	American linden	'Redmond'
Tilia cordata	Littleleaf linden	'Greenspire'
Ulmus americana	American elm	'Princeton' 'Valley Forge'

Medium Trees (26 to 50 feet in height when mature)

Scientific Name	Common Name	Cultivar
Aesculus glabra	Ohio buckeye	
Betula pendula	European white birch	
Fraxinus mandshurica	Manchurian ash	'Mancana'
Gleditsia triacanthos var. *inermis*	thornless honeylocust	'Imperial'
Ostrya virginiana	American hophornbeam	
Phellodendron amurense	Amur corktree	
Prunus cerasus	sour cherry	'Montmorency' 'Northstar'
Prunus maackii	Amur chokecherry	
Sorbus aucuparia	European mountainash	'Beissneri'
Sorbus decora	showy mountainash	

Small Trees (10 to 25 feet in height when mature)

Scientific Name	Common Name	Cultivar
Acer ginnala	amur maple	
Acer grandidentatum	bigtooth maple	
Acer tataricum	Tatarian maple	
Aesculus × *carnea*	red horsechestnut	'Briotii'
Crataegus ambigua	Russian hawthorn	
Crataegus crusgalli var. *inermis*	thornless cockspur hawthorn	'Crusader'
Crataegus viridis	green hawthorn	'Winter King'
Malus spp.	crabapple spp.	'Centennial' 'David' 'Harvest Gold' 'Madonna' 'Prairifire' 'Spring Snow'
Prunus cerasifera	cherry plum	'Newport'
Prunus nigra	Canada plum	'Princess Kay'
Prunus padus	European birdcherry	
Prunus virginiana	common chokecherry	'Canada Red'
Syringa reticulata	Japanese tree lilac	'Ivory Silk'

CONIFEROUS AND EVERGREEN TREES

Large Trees (greater than 50 feet in height when mature)

Scientific Name	Common Name	Cultivar
Abies concolor	white fir	'Violacea'
Larix deciduas	European larch	
Picea glauca	white spruce	
Picea pungens	Colorado spruce	
Picea pungens var. *glauca*	Colorado blue spruce	'Thompsenii'
Pinus nigra	Austrian pine	
Pinus ponderosa	ponderosa pine	
Pinus sylvestris	Scotch pine	
Pseudotsuga menziesii	Douglas-fir	
Tsuga canadensis	Canadian hemlock	

Medium Trees (26 to 50 feet in height when mature)

Scientific Name	Common Name	Cultivar
Juniperus scopulorum	Rocky mountain juniper	'Blue Heaven' 'Skyrocket'
Juniperus virginiana	eastern redcedar	
Picea glauca var. *densata*	Black Hills spruce	

Dirr's Hardy Trees and Shrubs (Dirr 2013) and *Manual of Woody Landscape Plants (5th Edition)* (Dirr 1988) were consulted to compile this suggested species list. Cultivar selections are recommendations only and are based on DRG's experience. Tree availability will vary based on availability in the nursery trade.