



## Chapter 2: Goshen's Public Tree Population

The urban forest, as a municipal asset, is as important to Goshen's economic and political viability as are water and sewage facilities, transportation systems, and community support services. The quality and availability of all these assets are indicators of Goshen's ability to encourage people to live and support businesses to prosper within the City limits. Goshen's urban forest is a complex system of trees, site conditions, and maintenance recommendations. Understanding this system is important for proper decision-making regarding species selection and tree care practices. This section of the Urban Forest Management Plan provides statistics and insight about the current composition, condition, and sustainability of Goshen's inventoried tree population. Specific information detailed in this chapter includes:

- Public Tree Totals
- Species Richness and Distribution
- Relative Age Distribution
- General Health and Condition
- Tree Maintenance
- Stocking Level
- Canopy Cover
- Replacement Value

It is important to have comprehensive information about the public tree population. Tree species, diameter, and condition provide much information about the tree population's composition, relative age, and health. Species identification is essential to the population because species vary considerably in life expectancy, maintenance needs, and are targeted by different pests and diseases. The variety, maturity, and health of trees present along the streets and in parks greatly affects tree maintenance activities and budgets. All data for the following analysis were collected during the tree inventory conducted by Goshen's Parks and Recreation Department, Forestry Division, under direction of the City Forester.

### Public Tree Totals

Goshen's inventory was started in 2008 and completed in 2010. It includes all trees within the street rights-of-way and park and public space developed areas. Goshen's urban forest is composed of 12,797 public trees; 10,464 are street trees, 1,277 are park and public space trees, and 1,056 trees on Goshen College's campus. Park and public spaces inventoried include Abshire, Bakersfield, Burdick, Church, Dykstra, Five Points, Hay, McFarland, Mercer Street Bike Path, Millrace, Millrace Bike Path, Mullet, Oakridge, Pringle, Reith, Rogers, Shanklin, Shoup-Parsons, Walnut, and water tower. Goshen has 47 tree management zones, which allow them to break their street tree population into more manageable sections.

Goshen's public tree population is dominated by broadleaf-deciduous trees (encompassing 88.2% of the total population). There are 11,284 broadleaf-deciduous trees, 2 (0.0%) broadleaf-evergreen trees, and 1,511 (11.8%) coniferous trees in the population. Broadleaf trees usually have larger canopies than coniferous trees, and because most of the benefits provided by trees are related to leaf surface area, large, broadleaf trees usually provide the highest level of benefit. Table 1 provides a look into the distribution of tree type within Goshen's inventoried tree population.



**Table 1. Distribution of Tree Type**

Tree Type	# of Trees	% of Trees
broadleaf-deciduous	11,284	88.2
broadleaf-evergreen	2	0.0
coniferous	1,511	11.8

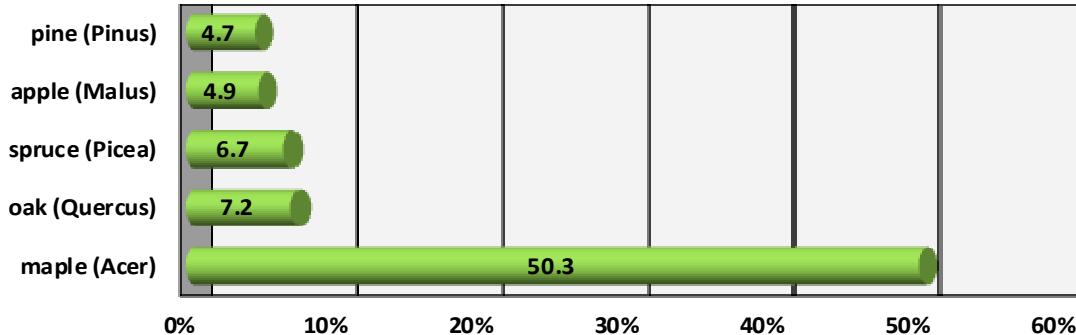
## Species Richness and Distribution

Goshen's public tree population includes a mix of more than 98 species and 54 genera. These range from large-growing, high-benefit producing species (encompassing 68.4% of the population) to small-growing species (encompassing 8.7% of the population) which are better suited for restricted growing spaces. Medium-growing trees encompass 22.9% of the population (Table 2). Numerous considerations drive species choice including planting site restrictions, potential conflicts with infrastructure, maintenance, water availability, and design. In some cases, only small-growing species are best for certain sites. Nonetheless, the results of the i-Tree Streets analysis will emphasize that large-growing, broadleaf species will produce greater benefits than small-growing species; therefore, large-growing species should be planted wherever possible to maximize the potential benefit. The population frequency report in Appendix C provides a detailed list of species found in Goshen distributed by their respective tree type.

**Table 2. Distribution of Mature Tree Size**

Mature Tree Size	# of Trees	% of Trees
large-growing	8,753	68.4
medium-growing	2,932	22.9
small-growing	1,112	8.7

The top 10 occurring species account for approximately 64.3% of the total population. These predominant tree species are silver maple (*Acer saccharinum*, 18.0%), sugar maple (*Acer saccharum*, 12.5%), Norway maple (*Acer platanoides*, 9.2%), red maple (*Acer rubrum*, 5.2%), apple (*Malus* spp., 4.5%), blue spruce (*Picea pungens*, 3.6%), eastern white pine (*Pinus strobus*, 3.1%), honeylocust (*Gleditsia triacanthos*, 2.9%), callery pear (*Pyrus calleryana*, 2.8%), and northern red oak (*Quercus rubra*, 2.5%). **A widely accepted management rule states that no single species should represent more than 10% of the total population and no single genus should represent more than 20% of the total population.** Silver maple and sugar maple exceed the species rule, and Figure 1 shows that the entire genus of maple (*Acer*) accounts for approximately 50.3% of the City's total inventoried tree population.



**Figure 1. Goshen's Distribution of Trees by Genus**

## Species Susceptible to Pests and Diseases

Tree populations with well-developed species richness and composition can decrease the impact of species-specific pests and diseases by limiting the number of trees that are susceptible. Managing species composition and establishing a wide variety of species that perform well in Goshen will help spread the contribution of benefits across the population. This, in turn, reduces the time and money spent on mitigating problems resulting from any such episodes.

The inventory illustrates that past tree planting efforts in Goshen have resulted in a skewed species distribution. Planting a large number of trees of the same species (monoculture) can lead to catastrophic results. A good example of this situation is the dominance of American elm (*Ulmus americana*) in American cities in the 20th century. When Dutch elm disease (caused by fungi *Ophiostoma ulmi* or *Ophiostoma novo-ulmi*) arrived in the United States in the 1930s, the resulting tree losses were devastating for many communities, both economically and environmentally. Similar scenarios are now foreseeable for Asian longhorned beetle (*Anoplophora glabripennis*) and emerald ash borer (*Agrilus planipennis*). Species diversification can limit the effect of specialized tree-killing pests and diseases and other major threats on public tree populations.

By further analyzing the inventory, we can group species and genus populations that would be most affected by a certain pest or disease outbreak. Pests and diseases can be specialist or generalist. A pest or disease specialist only thrives on a narrow range of tree species and a pest or disease generalist thrives on a wide variety of tree species. The USDA Forest Service has identified 10 pests and diseases of most concern in the Northeastern Area. Those pests and diseases and the tree species or genus they thrive on include:

### Specialists

Beech Bark Disease – American beech (*Fagus grandifolia*)

Dutch Elm Disease – American elm

Emerald Ash Borer – all species of ash (*Fraxinus spp.*)

Hemlock Woolly Adelgid (*Adelges tsugae*) – eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga caroliniana*)

Oak Wilt – all species of oak (*Quercus*), but generally the red oak family is much more susceptible than the white oak family

Thousand Canker Disease – black walnut (*Juglans nigra*)

Sirex Woodwasp (*Sirex noctilio*) – all species of pine (*Pinus*)



## Generalists

Asian Longhorned Beetle – boxelder (*Acer negundo*), Norway maple, red maple, silver maple, sugar maple, Ohio buckeye (*Aesculus glabra*), horsechestnut (*Aesculus hippocastanum*), mimosa (*Albizia julibrissin*), all species of birch (*Betula* spp.), all species of ash, London planetree (*Platanus x acerifolia*), all species of poplar (*Populus* spp.), all species of willow (*Salix* spp.), European mountain ash (*Sorbus aucuparia*), and all species of elm (*Ulmus* spp.).

Bacterial Leaf Scorch – red maple, sugar maple, all species of dogwood (*Cornus* spp.), sweetgum (*Liquidambar styraciflua*), all species of mulberry (*Morus* spp.), all species of sycamore (*Platanus* spp.), scarlet oak (*Quercus coccinea*), southern red oak (*Quercus falcata*), shingle oak (*Quercus imbricaria*), bluejack oak (*Quercus incana*), turkey oak (*Quercus laevis*), laurel oak, (*Quercus laurifolia*), bur oak (*Quercus macrocarpa*), water oak (*Quercus nigra*), pin oak (*Quercus palustris*), northern red oak, and American elm.

Gypsy Moth (*Lymantria dispar*) – alder (*Alnus* spp.), poplar, gray birch (*Betula populifolia*), white birch (*Betula papyrifera*), chestnut (*Castanea* spp.), hawthorn (*Crateagus* spp.), beech (*Fagus* spp.), witch-hazel (*Hamamelis* spp.), red cedar (*Juniperus* spp.), larch (*Larix* spp.), blue spruce, pine, cherry/plum (*Prunus* spp.), Lombardy poplar (*Populus nigra*), oaks, willows, mountain ash (*Sorbus* spp.), linden (*Tilia* spp.), and hemlock (*Tsuga* spp.).

Table 3 provides a quick look at how much of Goshen's inventoried tree population would be affected by these 10 pests and diseases. It is reported that an outbreak of Asian longhorned beetle will have the most effect (53.1%) on the City's public tree population. Generalists will typically have more impact than specialists because they feed on a broader range of species. In comparing the specialists only, it is reported that the impact from oak wilt will pose the most management difficulties; 6.6% of the inventory is oak. The high impact reported from Asian longhorned beetle and bacterial leaf scorch is due to the skewed distribution of maples among Goshen's public tree population.

Three specialists currently threaten Goshen's public tree population. Emerald ash borer has been found just outside of Goshen city limits and gypsy moth and oak wilt have been found in Elkhart County. If emerald ash borer and oak wilt are not monitored and controlled, Goshen could see a potential loss of 492 ash trees (3.8% of the population) and 851 oak trees (6.6% of the population). Gypsy moth would not cause immediate death, but depending on the severity and consecutive years of defoliation, the City could experience compromised health and potential death of 2,541 public trees (19.8% of the population). For more specific information about emerald ash borer in Indiana, pesticides to control outbreaks, emerald ash borer cost calculator, Neighbors Against Bad Bugs, and information for homeowners, visit the Purdue Extension, Emerald Ash Borer website ([www.extension.entm.purdue.edu/EAB/](http://www.extension.entm.purdue.edu/EAB/)). For more specific information about oak wilt and gypsy moth and how to participate in cooperative prevention and suppression projects, visit the Forest Health Protection page at the USDA Forest Service, Northeastern Area's website ([www.na.fs.fed.us/fhp/ow](http://www.na.fs.fed.us/fhp/ow) for oak wilt and [www.na.fs.fed.us/fhp/gm](http://www.na.fs.fed.us/fhp/gm) for gypsy moth). See the section about emerald ash borer and oak wilt in Chapter 3 for further discussion about the threat to Goshen's beneficial resource. Also see Chapter 4 for a discussion of a needed Integrated Pest Management program.

**Table 3. Public Tree Species Impacted by Pests or Diseases**

Pest or Disease	Total # of Trees	% of Total Population
Asian longhorned beetle	6,791	53.1
bacterial leaf scorch	3,330	26.0
beech bark disease	5	0.0
Dutch elm disease	14	0.1
emerald ash borer	492	3.8
gypsy moth	2,541	19.8
hemlock woolly adelgid	41	0.3
oak wilt	851	6.6
sirex woodwasp	552	4.3
thousand canker disease	169	1.3



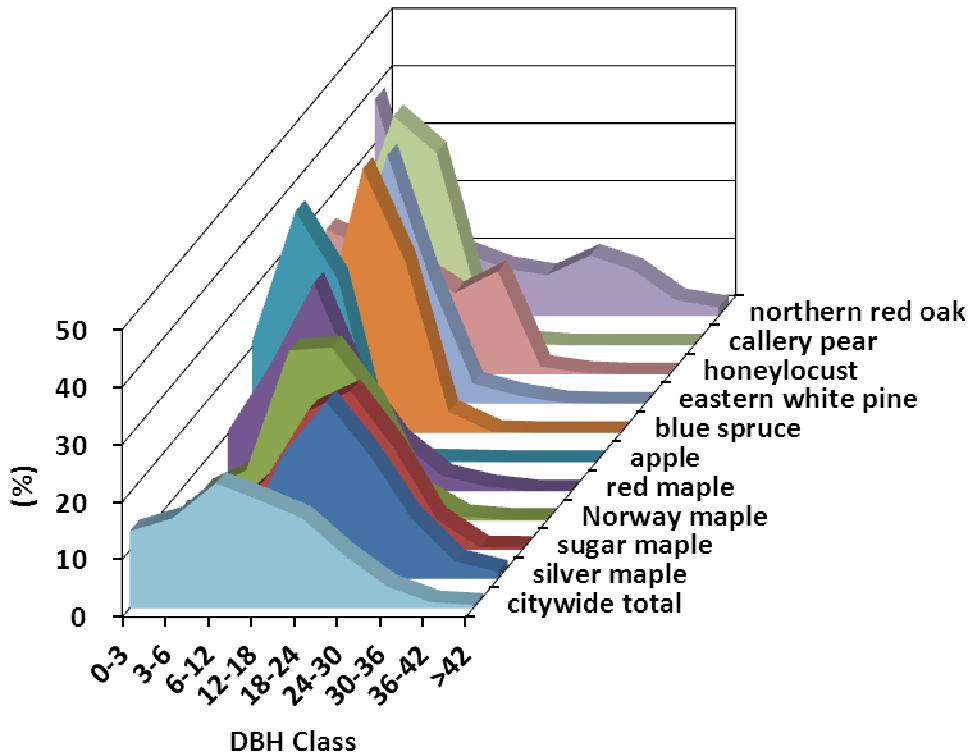
In light of the potential future impact of emerald ash borer and oak wilt, Davey Resource Group recommends the City begin utilizing a wider range of species to reforest the community by including both native and non-native, urban-tolerant species. This could include northern hackberry (*Celtis occidentalis*), honeylocust, and Japanese zelkova (*Zelkova serrata*) for large-growing shade trees; American holly (*Ilex opaca*) and yellowwood (*Cladrastis kentukea*) for medium-growing trees; and eastern redbud (*Cercis canadensis*) and pagoda dogwood (*Conus alternifolia*) for small-growing trees. There needs to be an accelerated effort to find pest-resistant trees at all levels, including genus, species, and cultivar that are currently under-represented in commonly available nursery stock. See Appendix I for a list of other suggested species.

**Increased diversity will not happen immediately. It must be made an integral part of a well-planned and executed tree planting program that will lead to desired results over a period of several years or decades. Long-term planning is mandatory for any tree planting program to be effective. Tree planting is an excellent investment in the future of Goshen and one that future residents and visitors will appreciate many years from now. See the Replacement Value section in this Chapter and the Summary of Benefits section in Chapter 3 for further discussion about tree investment and annual benefits.**

## Relative Age Distribution

Tree ages cannot be assumed from the diameter at breast height (DBH) alone because tree species have different lifespans and mature at different diameters, heights, and crown spreads. However, general classifications of size, such as *young*, *established*, *maturing*, and *mature*, can be used to describe the general characteristics of a tree population and can provide a general idea of the overall variability in the population. Young trees have 0- to 6-inch diameters, established trees have 6- to 12-inch diameters, maturing trees have 12- to 24-inch diameters, and mature trees have 24-inch and greater diameters. Figure 2 and Appendix C show the size class distribution of Goshen's inventoried tree population.

**The distribution of ages within a tree population influences present and future costs as well as the flow of benefits. An uneven-aged population, skewed towards young trees, allows managers to allocate annual maintenance costs uniformly over many years and helps to maintain overall tree canopy cover. A sustainable tree population has a higher percentage of young trees (40%) with a stair-stepped distribution of established (30%), maturing (20%), and mature (10%) trees to minimize fluctuations in maintenance costs and functional benefits. As trees mature and begin to decline, a tree population skewed towards young trees will allow urban forest managers to allocate annual maintenance costs uniformly over many years and assure continuity in overall tree canopy cover and associated benefits.**



**Figure 2. Diameter Size Class Distribution of Goshen's Public Tree Population**

Goshen's public tree population displayed in Figure 2 shows a relatively good, even-aged population as reflected by size class distribution. The City's current relative age distribution is 29:22:34:15 (percentages of young; established; maturing; and mature trees). As the current tree population continues to mature, the City will need to plant more trees and replant poor conditioned trees which are removed in efforts to maintain a sustainable age distribution. Size distribution percentages will change with time as trees are planted, mature, die, and are subsequently removed. As like increased species diversity, relative age sustainability will not happen immediately. It must be made an integral part of a well-planned and executed management program that will lead to desired results over a period of several years or decades. Long-term planning is mandatory for any management program to be effective.

## Species Sustainability

Relative age should also be considered between species. If young trees of similar size and structure are not planted to improve the age distribution of this species, the return of valuable benefits may be disrupted for future generations. Figure 2 illustrates the relative age distribution for the ten most inventoried public trees in Goshen. Callery pear and apple have ideal age distributions. Red maple, eastern white pine, honeylocust, and northern red oak are all approaching ideal age distributions and populations of silver maple, sugar maple, Norway maple, and blue spruce are currently unsustainable. To achieve an ideal age distribution among species, there should be at least four young trees for every one mature tree.

**Planning for tree planting in Goshen will require careful consideration of species selection. The young size class should be composed of both large-growing species and small- and medium-growing species. Species considerations in a well-developed tree planting program should address the need for less maintenance and the desire for characteristics such**



as spring flowers and fall color. However, widely used in the past, it is suggested that maples should be restricted to small numbers for future plantings and other suitable species should become the focus of future plantings. Davey Resource Group recommends constructing planting projects so that each year all plantings meet the 10% species and 20% genus rule. This may take a decade or two of transitioning. See Appendix I for a list of large-, medium-, and small-growing suggested species.

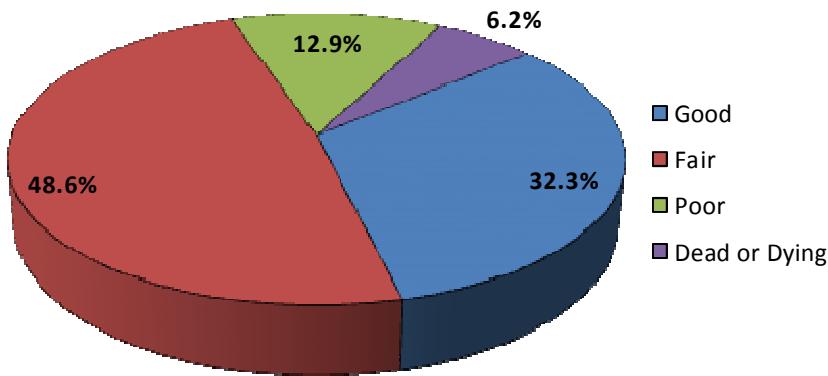


*Goshen is “The Maple City” and the City should play on their character by highlighting prominent areas of town with their beloved maple trees.*

## General Health and Condition

Tree condition indicates both how well trees are managed and how well they perform given site-specific conditions. Good condition trees are performing at their peak, meaning they have the ability to withstand pest or disease problems and their functional capability is greatest. Only when trees are in good condition are they performing at their peak, meaning their functional capability is greatest and the benefits they provide are maximized. Fair and Poor condition ratings are generally due to visible signs of stress, including, but not limited to, decay, dead limbs, sparse branching, or poor structure. If and where these physical observations occurred, these trees may become more susceptible to failure and/or decline. Certain stresses can also make these trees more prone to pest and disease problems by providing access to internal wood tissue. If a tree is already stressed, the additional pest injury can substantially reduce the tree’s ability to sustain defense mechanisms and maintain its health.

Figure 3 illustrates a significant proportion of Goshen’s tree population is in Fair condition. There are 972 trees with no recorded condition. Only considering the 11,825 trees with condition information, there are 5,747 (48.6%) public trees in Fair condition, 3,822 (32.3%) public trees in Good condition, 1,525 (12.9%) public trees in Poor condition, and 731 (6.2%) public trees are Dead or Dying. Davey had to make necessary changes in tree condition during the inventory format conversion for i-Tree Streets. Changes to inventory categories in the i-Tree Streets analysis are listed in Appendix A. Goshen should work to improve its tree population’s overall condition by mitigating all poor performing trees and replacing all dead or dying trees. Silver maple (648 trees), sugar maple (453 trees), Norway maple (299 trees), red maple (115 trees), and apple (75 trees) have the highest number of trees listed as Poor or Dead and Dying, see Appendix C. The maintenance of these 1,590 trees (12.4% of the entire population) will help improve Goshen’s overall condition.



**Figure 3. Goshen's Public Tree Population Condition**

When maintaining trees in the municipal environment, the potential for loss is an important factor in prioritizing treatments and making effective use of available funds. The loss of trees over time is an inevitable natural process; however, the goal of the management process is to control the decline, removal, and replacement of trees in a timely and cost-effective manner. Monitoring the condition of trees, and making efforts to maintain their health, is essential to cost-effective tree management.

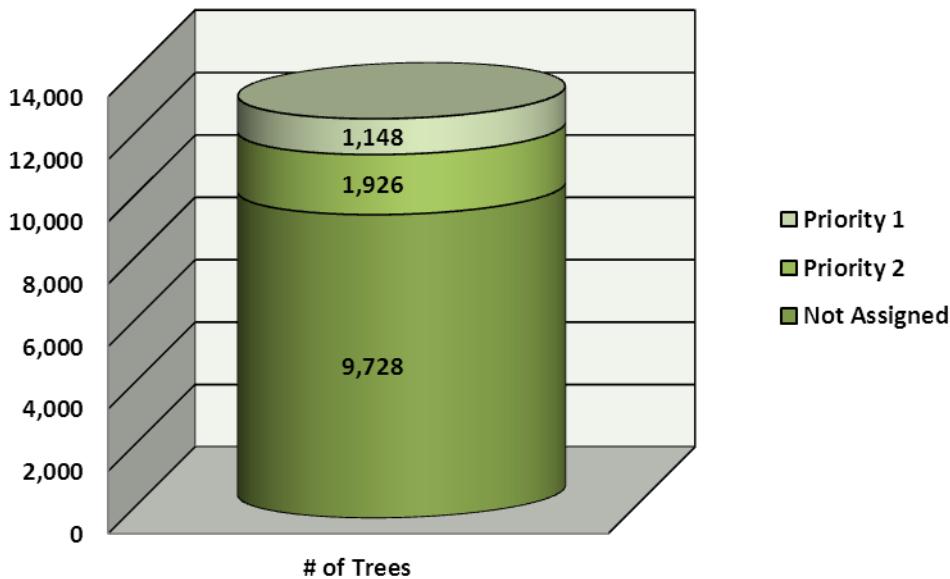
## Tree Maintenance

One objective of the tree inventory was to determine the current appropriate maintenance recommendations for the tree population. This section analyzes the removal and pruning recommendations noted during the inventory and generally discusses the prioritization of maintenance work. Chapter 4 discusses, in detail, the specific prioritization of maintenance work and provides a detailed ten-year estimated budget for the maintenance of Goshen's public tree population.

The Maintenance Recommendations and Priority Tasks identified during the inventory pertain to protecting the City's safety first and foremost. Maintenance Recommendations are classifications related to an elevated-risk and Priority Tasks are practices directed at improving the overall health, stability, and aesthetics of the street and park trees as well as the cost-effectiveness of Goshen's tree management program. All Recommendations and Tasks summarized here in this analysis are conversions made in i-Tree Streets based on the inventory data collected by the City of Goshen. Appendix A provides a reference of needed conversions.

Trees and tree limbs fail from natural causes, such as disease, insects, and weather conditions, and from physical injury due to vehicles, vandalism, poor structure, and root disturbances, among others. There are three main reasons why public trees should be removed or pruned: (1) to reduce safety risks to persons and/or property; (2) to eliminate breeding sites for insects and diseases; and (3) to improve tree health and aesthetics. The City of Goshen evaluated each tree and determined the level of urgency needed among their public tree population.

The first step in maintaining Goshen's public tree population is to attend to all Priority 1 and Priority 2 concerns identified during the inventory. The identification of tree maintenance needs based on risk allows Goshen to project budgets and address these maintenances quickly. Figure 4 illustrates that there are 1,148 trees (9.0%) classified as Priority 1 and 1,926 trees (15.0%) classified as Priority 2 concern. Trees that are classified as Priority 1 and Priority 2 concern pose an unacceptable amount of risk and should be attended to as soon as possible to increase safety city-wide for the residents and visitors of Goshen.



**Figure 4. Goshen's Public Tree Population Maintenance Recommendations**

Table 4 tallies all Priority Tasks recommended in Goshen's public tree inventory. Only looking at the tasks which require that trees be pruned or removed, there are 2,268 (17.1%) trees which need their Crown Cleaned, 769 (6.0%) trees which need to be Removed, 200 (1.6%) trees which need their Crown Thinned, and 43 (0.3%) trees which need a their Crown Reduced. The prompt removal and pruning of these trees will reduce liability through the decreased likelihood of tree failure and the thinning and reduction of tree crowns will help with overhead wire conflicts and better the aesthetics of the area. The first priority is the safety of the City's residents, visitors, and public and private property; therefore, the order of removal and pruning activities should be based on the Maintenance Recommendation associated with each tree and its recommended Priority Task.

**Table 4. Goshen's Public Tree Population Summary of Priority Tasks**

Maintenance Required	Number of Trees	Percentage of Trees
Crown Clean	2,268	17.7
Crown Reduce	43	0.3
Crown Thin	200	1.6
No Maintenance Needed	9,082	71.0
Other Maintenance Needed	66	0.5
Remove	769	6.0
Remove Vines	76	0.6
Stake	11	0.1
Undefined Maintenance	282	2.2
<b>Totals</b>	<b>12,797</b>	<b>100</b>



## Stocking Level

Goshen's current tree inventory shows there are 1,492 planting sites along city streets. This does not account for all planting sites within the entire City limits. It only captures approximately 23% of the City. Of those 1,492 planting sites, there are 1,374 (92.1%) Large Vacant Sites, 67 (4.5%) Medium Vacant Sites, and 51 (3.4%) Small Vacant Sites (Appendix C).

With only partial planting site information, calculating the stocking level of Goshen's city streets is not applicable. Nevertheless, the City should strive to inventory all planting sites in the remaining areas within the City and fill all potential sites with trees of appropriate species determined by site restrictions. Inventorying the remaining areas will provide the City with information that will aid the development of a Tree Planting Program (see Chapter 4 for more information). The information collected during the inventory allows the City Forester, public officials, and citizens to make informed decisions about species selection and long-term sustainability of public trees.

Maintaining a high stocking level (approximately 90%) is essential in maximizing the potential benefits provided by Goshen's street trees. The concept "right tree for the right place" should be applied to the City's street tree planting program to help minimize maintenance costs in the future and potentially provide a greater net benefit value (benefits minus costs) and benefit-cost ratio. See the section in Chapter 3 that discusses Goshen's Net Benefits and Benefit-Cost Ratio.

Calculating street trees per capita is the most valid way to measure tree stocking at this point. Assuming that Goshen has a population of 32,425 people (2009 Census estimate) and using the street tree population of 11,464, the street tree per capita ratio for Goshen is 1 tree for every 2.8 people. Compared to the Sample Urban Statewide Inventory benchmark for a Third Class City in Indiana, Goshen has a good tree per capita ratio. The average per capita ratio for Third Class Cities in Indiana is 1 tree for every 5.7 people. All identified park trees and trees on Goshen College's campus were subtracted from the City's public tree population to obtain a street tree population estimate similar to the Statewide street tree estimate.

In 2008, Indiana Department of Natural Resources (DNR), Division of Forestry, Community and Urban Forestry (CUF) commissioned a study to assess the status of Indiana's street tree resource via a sample statewide inventory and analysis. The Sample Urban Statewide Inventory (SUSI) project utilized the U.S. Forest Service's i-Tree Street Tree Resource Analysis Tool for Urban Forest Managers (STRATUM, now called i-Tree Streets) application to capture forest resource structure, function, and value in 23 communities across Indiana. The combination of street tree inventories and STRATUM analyses has provided the state of Indiana with scientifically reliable estimations of the resource composition present throughout Indiana. The Third Class Cities, as described by Indiana Code, sampled in this study include Beech Grove, East Chicago, Greendale, Kendallville, Madison, Peru, Rushville, and Washington.

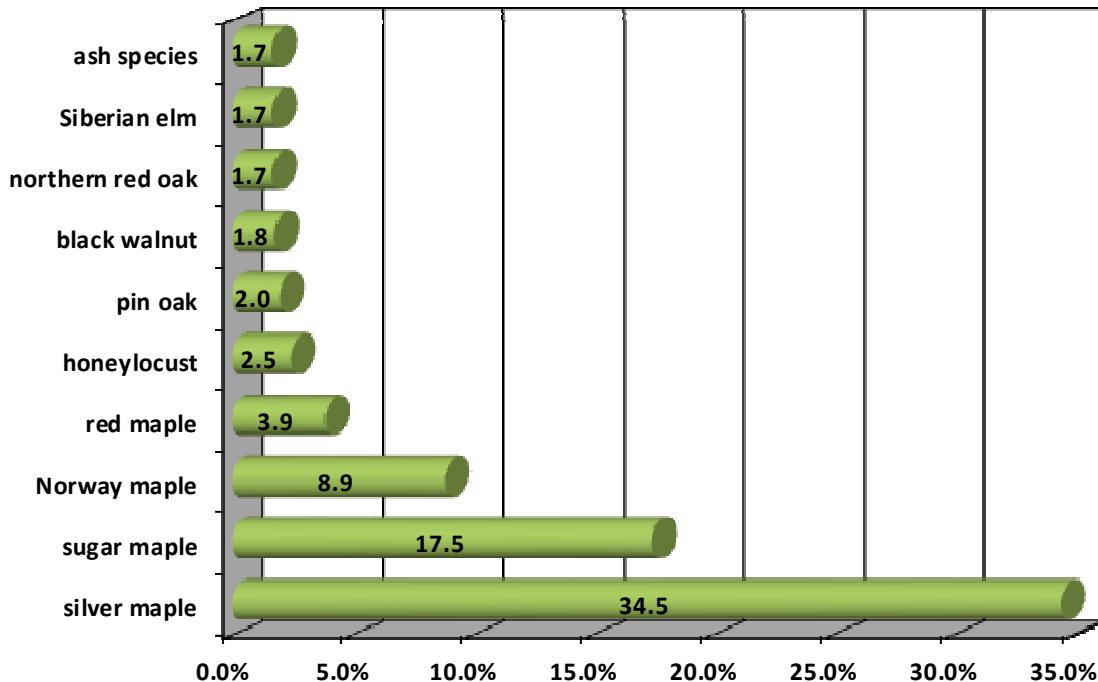
## Canopy Cover

Canopy cover directly correlates with the benefits of public trees. i-Tree Streets defines canopy cover as the amount and distribution of leaf surface area. The greater the leaf surface area exhibited by a tree, the greater its canopy cover; and, as a result, the greater the benefits that particular tree is likely to provide the community. In other words, trees with large leaves and spreading canopies tend to produce the most benefits.

i-Tree Streets estimates Goshen's inventoried public tree canopy cover to be approximately 219 acres of the total land area of 10,712 acres (16.7 square miles), or 2.0% of the City (Appendix C). By using the average canopy cover per tree (745 square feet), the street tree population alone (10,464 trees) consists of 179 acres of canopy cover and covers 1.8% of Goshen's total land area. The Statewide Urban Sample Inventory suggests that the average Third Class City has a street tree canopy cover of 1.0%.



Figure 5 shows that the total inventoried tree population's canopy cover varies greatly between species in Goshen. Silver maple is illustrated as having the largest canopy cover (76 acres). The difference in canopy cover is simply due to species maturity, tree size, leaf area, and prevalence among the City's public trees. These characteristics are the building blocks of a public tree population and influence the potential for Goshen's population to provide benefits to the community.



**Figure 5. Distribution of Goshen's Public Tree Canopy Cover**

## Replacement Value

Replacement value describes the historical investment in trees over time. Due to missing condition values, the actual replacement of Goshen's entire population is slightly more than what can be stated here. However, only considering 11,825 trees with tree conditions, Goshen's public trees are an important municipal asset valued at \$11,429,461, which can increase in value over time as the trees mature, provided they are properly maintained. The average replacement value is approximately \$967 per tree.

Replacement value on a species level gives urban forest managers a look into the landscape value of their species populations. Values will reflect species population, stature, and condition. Silver maple is shown to have the highest replacement value between species at \$3,006,936 (2,278 trees) or 26.3% of Goshen's historical investment.



More importantly, relative to potential invasive pests and diseases (including emerald ash borer, gypsy moth, and Asian longhorned beetle), the approximate replacement value of ash, oak, and maple is \$9,273,872. This estimate is based on average tree values for each group and total tree populations. The cost of replacing 5,778 (of the 5,930) maple trees as they exist in their current state is valued at \$6,513,317. The cost of replacing 397 (of the 851) oak trees as they exist in their current state is valued at \$1,029,685, and the replacement cost for 487 (of the 492) ash trees as they currently exist is valued at \$379,210. See Appendix C for a list of all species' replacement values.

**Table 5. Replacement Values of Goshen's Top 10 Species**

Species	Trees with Condition	Total	% of Total
silver maple	2,228	\$3,006,936	26.3
sugar maple	1,542	\$2,078,171	18.2
Norway maple	1,164	\$871,749	7.6
red maple	620	\$426,717	3.7
northern red oak	225	\$414,883	3.6
black walnut	168	\$283,978	2.5
pin oak	189	\$283,585	2.5
apple	509	\$241,361	2.1
blue spruce	457	\$237,608	2.1
eastern cottonwood	104	\$221,690	1.9
maple	5,778	\$6,513,317	57.0
oak	397	\$1,029,685	9.0
ash	487	\$379,210	3.3