

*The City of Monroe, Georgia*

# *City Tree Inventory*

## *Summary Report*



*August 29, 2008*



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# *City Tree Inventory Summary Report*

*August 29, 2008*

*Prepared by*

*Connie Head*

*Consulting Urban Forester*

*Technical Forestry Services*

*Commerce, Georgia*

*706.202.5279 / tfshead@aol.com*

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*All photographs in this report were taken in the City of Monroe by Connie Head, Technical Forestry Services, during the summer of 2008.*

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## PROJECT SUMMARY

A city tree inventory was completed in the City of Monroe during the summer of 2008. Only trees growing on city property were inventoried. All trees and tree groups found in the city cemeteries, around city offices and facilities, in the downtown business district, at certain parks, and along street rights-of-way in the central city area were inventoried.

A total of 1,529 data entries are included in the inventory, representing 1,088 trees, 44 tree groups, and 397 tree planting recommendations. Most city trees in the inventory area were found growing on the street rights-of-way (647 trees), but substantial numbers were also found around city offices and facilities (179 trees) and in the parks (161 trees). Most tree planting recommendations were made for vacant planting sites along city street rights-of-way (380 recommendations).

There are 94 different species represented in the inventory showing good diversity. Trees in the arboretum in Matthews Park were inventoried and added substantially to this diversity. There are four (4) predominate species that make up the city tree population—water oak, crapemyrtle, flowering dogwood, and willow oak—which account for 42 percent of all city trees inventoried.

The largest tree inventoried is 58 inches in trunk diameter at 4.5 feet measured at 4.5 feet above the ground. The average diameter of all trees is 13.2 inches, and the largest diameter trees are growing along street rights-of-way, averaging 16.3 inches.

The table shows that 321 trees (30 percent of all trees) are in excellent condition (greater than 88%), and 606 trees (56 percent of all trees) are in at least good condition (greater than 78%).

There were 18 dead trees inventoried, all recommended for removal, and 120 live trees recommended for removal for various reasons. There were 51 trees given a hazard rating.

The primary management needs identified in the inventory are:

- Removal of 18 dead trees and 120 live trees.
- Removal, pruning or cabling and bracing of 51 trees in hazardous condition.
- Pruning of 634 trees for clearance, correction, crown cleaning, training, risk reduction.
- Annual inspections of 110 trees in marginal condition.

- Soil aeration for 13 trees.
- Cabling and bracing for 10 trees.
- Elimination of the practice of topping crapemyrtles and corrective pruning of those that have been topped.
- Establishment of a routine tree planting program to fill 822 vacant tree planting sites over the next 20 to 30 years.
- Increasing species diversity by choosing high quality native and non-native tree species that are proven performers in Monroe and urban environments.
- Mulching 154 trees and all trees where possible using correct techniques and quality materials.

A conservative estimate of the total value of the city's 1,088 trees using a modified trunk formula method from the 9<sup>th</sup> Edition of the *Guide for Plant Appraisal* is \$3.4 MM dollars, or an average of \$3,125 per tree.

For more information on the city's tree inventory, contact Mr. Steve Worley, Public Works Director, at (770)267-6933, or [sworley@monroega.gov](mailto:sworley@monroega.gov).

## INTRODUCTION

### BACKGROUND

The City of Monroe's tree inventory was conducted from May through August of 2008. This report summarizes the results of this inventory. Inventory results, and other input provided by project partners, have been used to develop a Community Forest Management Plan for the City of Monroe, a separate document.

The tree inventory and management plan project was funded in part by an Urban and Community Forestry Assistance Program grant to the Oconee River Resource Conservation and Development Council (RCDC) from the Georgia Forestry Commission<sup>1</sup> and in part by City of Monroe funds and in-kind services from the Oconee River RCDC, the City of Monroe and the city's Public Works Department, Monroe Utilities, the Monroe Tree Board, the Monroe Downtown Development Authority, the Walton County Soil and Water Conservation District, the Georgia Soil and Water Conservation Commission, Keep Walton Beautiful, the USDA Natural Resource Conservation Service (NRCS), the Historical Society of Walton County, and the Monroe and Evergreen Garden Clubs. Luther Jones with the Oconee River RCDC and Crista Carrell with the Monroe Tree Board were the primary leaders of the project. The tree inventory was conducted by Connie Head, Consulting Urban Forester with Technical Forestry Services of Commerce, Georgia. David Berle, Associate Professor at the University of Georgia, Department of Horticulture, School of Agriculture and Environmental Sciences provided software development, hardware, and data management services for the project. Monroe Tree Board members provided regular input at regular tree board meetings throughout the project. Georgia Tech student and USDA NRCS intern Kerry Caslow assisted in the identification and inventory of arboretum trees at Matthews Park.

The tree inventory data, this report, a *Community Forest Management Plan* have been submitted electronically to the City of Monroe, and are also included on a project CD submitted to the city. The report was developed in Microsoft Word, and was converted to an Adobe

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<sup>1</sup> Georgia Forestry Commission IS the statewide agency responsible for "providing leadership, service, and education in the protection and conservation of Georgia's forest resources" (from the Commission's website at [www.gfc.state.ga.us](http://www.gfc.state.ga.us))

Acrobat PDF file. There are two (2) tree inventory database files—one in an ESRI ArcMap shapefile and another in an Excel spreadsheet file.

While much of the tree inventory information has been summarized in this report, there is much more information in the databases that volunteers and city staff can access for educational purposes and day-to-day management and planning of field operations. The inventory data can be sorted, analyzed, viewed, printed out, and displayed graphically. Requests for maps and data should be made to the Director<sup>2</sup> of the city's Public Works Department. The consultant, Connie Head, is also available to assist the city at any time in interpreting, understanding, and utilizing this data and can be reached at (706)202-5279, or tfshead@aol.com.

### TERMS AND ACRONYMS

Throughout this report certain terms and acronyms are used. These are listed below along with their meanings or definitions.

- CRZ = Critical Root Zone; a portion of the rooting area around the tree (radiating out from the trunk) equal to 1.5 feet for every 1 inch in trunk diameter where it is critical that tree roots be protected to preserve the tree's structural integrity and health
- DBD = Downtown Business District of the City of Monroe; for the purposes of this inventory, only Broad Street and Court Street are included in the DBD
- DBH = Diameter at Breast Height; a standard measurement of tree trunk diameter at 4.5 feet above the ground, or in cases of tree trunks forked below 4.5 feet, the measurement is made at the narrowest point below the fork
- GIS = Geographic Information System; software that utilizes geographic coordinates to display location information
- GPS = Global Positioning System; technology that utilizes a handheld device that communicates with satellites to determine a location on the ground

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<sup>2</sup> Steve Worley, Public Works Director, (770)267-6933, sworley@monroega.gov

- ISA = International Society of Arboriculture; a professional arboricultural education organization, ISA publishes standards for arboricultural practices ([www.isa-arbor.com](http://www.isa-arbor.com))
- ROW = Right-of-way; refers to the city-owned street right-of-way, the width of which includes the street pavement and some distance beyond the pavement on either side

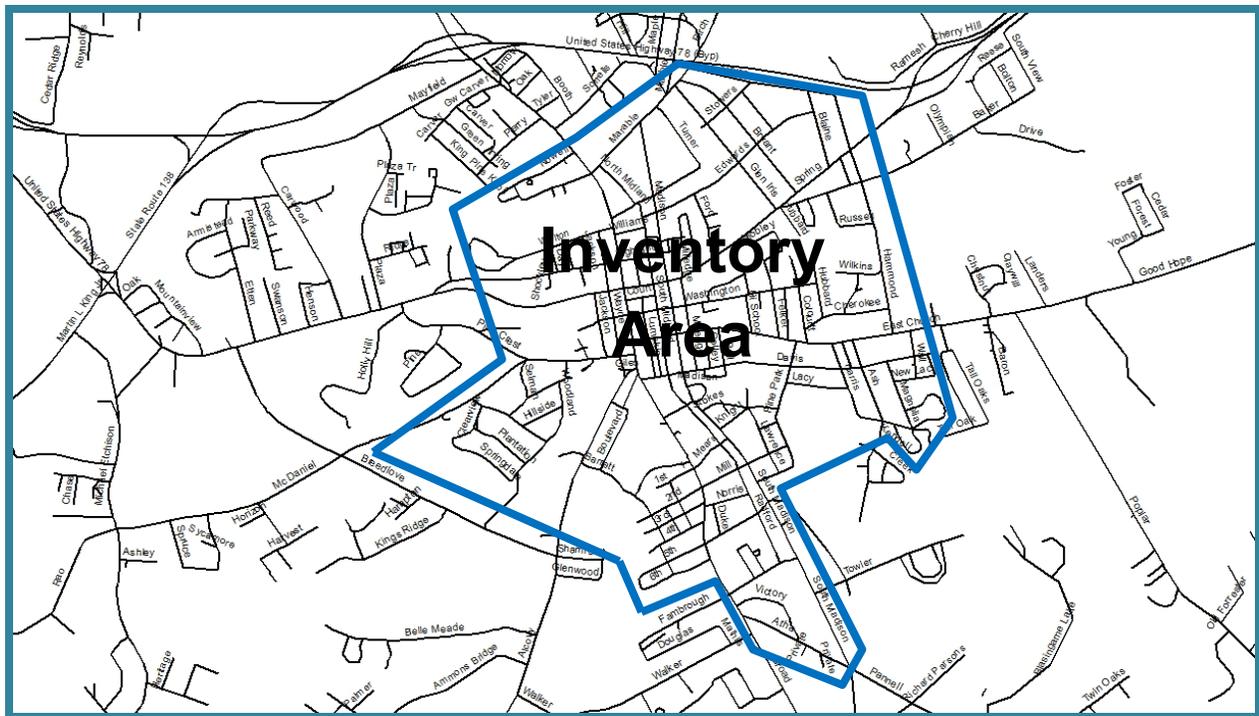
## PROJECT METHODOLOGY

The tree inventory methodology, including the data collection procedures used during the inventory, is described in this section. Trees were evaluated by the consultant from the ground only and no aerial inspections or root collar excavations were done.

## SITE AND TREE SELECTION

The inventory area encompassed all of the historic districts in Monroe and the neighborhoods with a significant number of large trees growing along street rights-of-way within the central city area. The generalized inventory area is shown in Figure 1.

**Figure 1. Tree Inventory Area**



Also included were trees at Dennis Coker Park in the south part of the city and arboretum trees at Matthews Park in the north part of the city.

Only city-owned trees within the inventory area were included, with the exception of the arboretum trees in Walton County's Matthews Park, which were also included. No trees on private property were inventoried, except those considered to be boundary line trees.

Trees in the inventory area growing around City offices and facilities, along City street rights-of-way, and in the parks were inventoried. All individually growing trees (not within a group as determined by the consultant) 2 inches DBH and greater were inventoried. Fence rows, unmanaged wooded areas, wooded borders, screen plantings, and other groups of the similar trees were inventoried together with a single data entry; they were given an average DBH and condition. The primary characteristics and management needs of the tree group were recorded.

Trees growing within fenced yards were not inventoried even if they were growing on the right-of-way. Woody plants commonly considered shrubs, such as althea, privet, ligustrum, and photinia (red-tip), were not inventoried.

The property types, sites, and tree selection criteria are listed in Table 1.

**Table 1. Sites and Trees Inventoried**

<b>SITE TYPES</b>	<b>FACILITY NAME</b>	<b>TREE SELECTION CRITERIA</b>
<i>City Cemeteries</i>	<ul style="list-style-type: none"> <li>▪ Rest Haven Cemetery</li> <li>▪ Westview Cemetery</li> </ul>	Trees 2 inches DBH and greater Tree groups
<i>City Offices and Facilities</i>	<ul style="list-style-type: none"> <li>▪ City Hall</li> <li>▪ Community Center</li> <li>▪ Fire Department</li> <li>▪ Monroe Utilities and Water Works</li> <li>▪ Old City Hall</li> <li>▪ Public Library</li> <li>▪ Public Works Department</li> </ul>	Trees 2 inches DBH and greater Tree groups Trees at risk
<i>Downtown Business District</i>	<ul style="list-style-type: none"> <li>▪ Broad Street North and South</li> <li>▪ Court Street</li> </ul>	Trees 2 inches DBH and greater Vacant planting sites
<i>Parks</i>	<ul style="list-style-type: none"> <li>▪ Dennis Coker Park on South Madison Street</li> <li>▪ Triangle Park at Alcovy and Giles Streets</li> </ul>	Trees 2 inches DBH and greater Arboretum trees

**Table 1. Sites and Trees Inventoried**

<b>SITE TYPES</b>	<b>FACILITY NAME</b>	<b>TREE SELECTION CRITERIA</b>
	<ul style="list-style-type: none"> <li>▪ Matthews Park Arboretum</li> <li>▪ Spring Street Park (Planned)</li> </ul>	Tree groups
<i>Street Rights-of-way</i>	<ul style="list-style-type: none"> <li>▪ Streets within the inventory area</li> </ul>	Trees 2 inches DBH and greater Tree groups Vacant planting sites

Street trees growing in the DBD are analyzed separately and are not included in the Street Rights-of-Way site type.

## **EQUIPMENT**

The data was collected by the consultant using the University of Georgia's Trimble GeoXH 2005 Series Pocket PC with global positioning capabilities. With input from the consultant on content, UGA Associate Professor of Horticulture David Berle and horticulture student Patrick Perry developed a tree inventory database template using ArcPad software. Periodically (every week or few days of inventorying) the consultant sent the tree inventory shapefiles to Professor Berle for geographic correction. The files were returned to the consultant and the shapefiles combined into a single tree inventory database. The final tree inventory database was returned to the City in an ArcMap shapefile and a Microsoft Excel spreadsheet.

## **DATA COLLECTED**

For a single tree or a tree group it was possible to record information in up to 157 data fields. Appendix A contains a table of the data fields and their descriptions.

For all trees and tree groups at least the following information was recorded, except where indicated.

- Location in Georgia State Plane Coordinates (easting, northing) calculated and recorded by the global positioning system (GPS) unit (not listed in the Excel spreadsheet)
- Property type and site name
- Tree species
- Tree Size as DBH (average estimated for tree groups)

- ISA condition ratings for health and structure (average estimated for tree groups)

And, where appropriate, information in the following categories was also recorded:

- Additional location, site, and facility information
- Additional species information
- Root and soil (rooting zone) conditions
- Trunk conditions
- Scaffold limb conditions
- Crown conditions
- Pest signs and symptoms
- Abiotic injuries
- Hardscape conditions
- Tree and infrastructure conflicts
- Utilities
- ISA hazard ratings
- Potential targets
- Management recommendations and priorities

For vacant planting sites only the following information was recorded:

- Location (coordinates)
- Other location information (address, street)
- Recommended mature tree height (small, medium, or large)
- Rooting zone conditions
- Utilities
- Number of trees recommended

A unique point ID was assigned to all data points (trees, tree groups, tree planting recommendations) after data correction in a separate field. Several other data fields were added, including condition rating and hazard rating which were calculated and entered as appropriate.

Some additional descriptions of data collection and entry procedures follow.

## TREE LOCATIONS

On many sites tree ownership was not easily identifiable. Where property corner pins or stakes were found, the boundary between city and private property was definite. But in many cases water meters, utility poles, fences, walls, or other structures were used alone or in combination to determine the approximate boundary between city and private property. The primary features used by the consultant to define the boundary between city right-of-way and private property were water meters and utility poles.

On public street rights-of-way where sidewalks were present, the trees growing between the sidewalk and the curb were always considered to be city trees. In many cases, however, water meters were found farther back behind the sidewalk and then the trees between the back of the sidewalk and the water meters were also inventoried as city trees. In some cases, trees appeared to be growing on the boundary line and were also inventoried.

## BOUNDARY TREES

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When street trees were growing on or near the boundary between city and private property they were inventoried and a notation made in the entry that the tree was a possible boundary line tree. For some trees it seemed more probable that the tree was a private property tree, but since ownership could not definitely be determined by the consultant, the tree was included and a notation made that it was possibly a private property tree. Before any work is done on any tree listed in this inventory, ownership should be verified by the city.

## ADDRESSES

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Even though locations were mapped using the GPS unit, where addresses were visible or available for a site they were entered into a separate address field in the database, either during the inventory or during data processing. In some cases where an address was not visible, an assumed address that fit within the general addressing sequence on the street was recorded.

When trees were growing along the street on the side of a property, the address for the front of the property was still used. In these cases a notation of whether the tree is growing on the left, right, or back yard of the property was made.

## GEOGRAPHIC LOCATION

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In most cases adequate satellite coverage was available and a precise position could be recorded using the GPS. The consultant stood as close to the tree as possible to get the most accurate position and in most cases the recorded position is within 1-3 feet of the actual tree trunk location. In a few cases where noted in the database, a position a number of feet away from the tree was recorded instead because the tree canopy was too thick or the satellite configuration too poor to receive a good signal under the tree; i.e., an opening was necessary to receive satellite signal. Tree positions can be adjusted in ArcMap using the offset information provided by the consultant in the database if so desired by the city.

## TREE SPECIES

For every tree, a species or tree variety was entered using the common name, with the genus listed first (holly, maple, oak, etc.) For example, “Holly, American” would be the common name of that species with holly being the genus and American indicating the species. In some cases only the genus would have been listed, for example, Holly Variety. If the cultivar or other additional information about a tree species was definitely known, that information was entered in the database.

Trees part of a group of trees not individually managed, or nearly identical and part of landscape group, and natural wooded areas were entered into the inventory as a tree group—either as fence row, a mixed hardwood stand, a mixed pine and hardwood stand, or a pine stand. In some cases a row of identical trees, such as a Leyland cypress screen planting, may be entered as Leyland cypress instead of as a tree group, but still only one (1) entry was made. For tree groups and rows of trees the average diameters and conditions of the group were entered. Tree management recommendations for tree groups usually include clearance pruning or occasionally removal of a dead tree within the group.

In some cases an individual tree (usually a large tree) within the tree group was individually inventoried if it was dead or at risk for failure, near a recreational facility or other target and recommended for immediate pruning or removal. In a few cases a tree was so dominant or outstanding within the group (usually a fence row) that it seemed to warrant entry on an individual basis, even though it did not have a need for high priority pruning or removal.

The species entered for vacant planting sites was the size of tree recommended for planting at that location—small, medium, or large maturing.

## TREE SIZE

Tree trunk size—DBH—was measured or estimated for every tree in the inventory. When the tree was accessible and not covered in vines or surrounded by brush, the DBH was measured using a 50 foot combination logger's and diameter tape which measures distance on one side and converts to trunk diameter on the other side. Diameters were measured to the nearest inch.

When trees were covered in vines, especially poison ivy vines, or were growing within thick brush or surrounded by volunteer saplings, or were located on a steep slope the DBH was estimated.

Where trees are forked below 4.5 feet (the standard measurement point) diameter was measured at the smallest point below the fork. A notation was made in the data if it was forked below, or above, 4.5 feet.

Only trees 2 inches DBH and greater were to be included in the inventory. In some cases, however, a tree with a 1 inch DBH was included if it was a well-established volunteer that could be pruned into a viable tree, or within a row of trees 2 inches and greater, or a well-established multi-stemmed tree such as a crapemyrtle, or a recently planted tree that appeared to have a good chance of survival at the time of the inventory. Recently planted saplings less than 1 inch DBH were usually not included.

## TREE CONDITION AND RISK RATING

As mentioned previously, condition ratings were assigned using methodology published by ISA. As the list of data fields in Table A of Appendix A shows, ratings of 0 to 4 are given for eight (8) different tree components—for root, trunk, and scaffold limb health and structure, and for branches and leaf health<sup>3</sup>. An additional condition field was added—condition percent—during data processing that contains the result of converting the ratings described above to a percent condition.

With the ISA condition rating system, if one of the condition components, such as root or trunk structure, is rated very low due to an extreme condition or defect, while all other components are rated very high, a tree may still end up with a high condition percent or class. Some trees

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<sup>3</sup>CONDITION RATINGS: 4 = no apparent problem, 3 = minor problem, 2 = major problem, 1 = extreme problem, 0 = dead

with a relatively high overall condition might have a high hazard rating and have to be removed. Some trees may be in good, very good, or excellent condition but have hazards that can be eliminated with risk reduction pruning. Some trees may have a single condition, such as trunk cankers, that reduce its health and longevity, but may still be rated high as the roots, limbs, branches, and leaves are still in very good condition.

Trees were assessed for their risk of whole or partial tree failure and a hazard rating assigned when the risk was greater than for the average tree. The hazard rating results from adding up the 1 to 4 point ratings for three (3) aspects of the risk—size of part, failure potential, and target frequency.<sup>4</sup> An additional data field added during data processing—hazard rating—contains the results of adding these three (3) components.

An extensive list of soil, root, trunk, limb, and crown conditions were available in the database to enter for a single tree. These conditions are listed in Table A in Appendix A. Only the most important conditions affecting tree health or those that revealed the need for education or changes in maintenance practices were recorded.

### **MANAGEMENT RECOMMENDATIONS**

Management recommendations were made as appropriate for each tree. Recommendations might be included for regular maintenance activities such as soil aeration, mulching, cabling and bracing, or pruning, as well as more management oriented activities such as planting, inspecting, protection, or removal.

### **AERATE CRZ**

Where soils appeared to be severely compacted, a recommendation of soil aeration was made. Soil aeration techniques include trenching between major roots using a compressed air tool or ditch-witch type equipment and, more commonly, drilling holes 12 inches deep on an 18 by 18 inch grid within the tree's CRZ, after which holes are backfilled with pea gravel, compost, sand, or other natural, well-aerated material.

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<sup>4</sup> HAZARD RATINGS: Size of Part, 1 = <6 inches diameter, 2 = 6 to 18 inches, 3 = 18 to 30 inches, 4 = >30 inches; Failure Potential, 1 = low, 2 = medium, 3 = high, 4 = severe; Target Rating, 1 = occasional use, 2 = intermittent use, 3 = frequent use, 4 = constant use

**MULCH**

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Mulch is beneficial for all trees and this recommendation could have been included in the database for every tree that is currently not mulched, or as a reminder to refresh the mulch, or to reconfigure mulch to arboricultural standards. However, it was only entered for those cases where tree condition was such that mulch is critical to improving tree health and survival. All mulching should be done according to arboricultural standards.

**FERTILIZE**

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Recommendations to fertilize trees were made in only a few cases where fertilization might be critical to improving tree health and condition. Before these trees or any trees are fertilized, soil samples should be taken to determine the amount of nutrients (and organic matter) existing in the soil and the soil pH, and a fertilizer prescription developed to meet the tree's needs. All fertilization should be done according to arboricultural standards.

**INSPECT ANNUALLY**

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Trees in marginal condition, especially large trees with some signs of decline, are recommended for inspection on an annual basis. The purpose of these inspections is to monitor tree condition and take appropriate management action at the right time to insure public health and safety.

For all trees recommended for removal and pruning for risk reduction, if action is not taken in the near term, the city should include them on the list of trees to be annually inspected even though this recommendation was not recorded in the inventory. These and all inspections should take place no less than once per year.

**CABLING AND BRACING**

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Cabling and bracing to strengthen tree structure when they have co-dominant (forked) stems and included bark, is recommended in some instances where it might be possible to improve structure with tree support systems. An ISA Certified Arborist should perform an aerial inspection on these trees first to determine if cabling and bracing is feasible and recommended. The installation of all tree support systems should be done according to arboricultural standards.

## PRUNING RECOMMENDATIONS

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When pruning is recommended, it is directed at achieving a very specific goal. More than one (1) type of pruning might be recommended for a single tree. Explanations of the various pruning goals follow.

- **Clearance pruning** indicates the need for pruning around a building, over a walkway or sidewalk for pedestrian clearance, or over a roadway for vehicle clearance; it may also indicate a need to improve sight clearance or in some cases to provide clearance around utility lines
- **Corrective pruning** is recommended to remove stub cuts, improve structure especially after tree topping, or remove a co-dominant leader from an established tree
- **Crown cleaning pruning** is recommended to remove dead, diseased, dying, crossed, broken, rubbing, or otherwise objectionable limbs greater than 2 inches in diameter; it is also recommended for mistletoe removal
- **Risk reduction pruning** is recommended to remove large limbs or co-dominant stems with an increased risk of failure due to decay or a structural defect
- **Training pruning** is recommended for recently planted or young trees to establish or improve their trunk and limb structure and eliminate structural defects that could cause limb or trunk failure in the future
- **Utility clearance pruning** is recommended to provide minimum clearance around overhead utility lines and other utility infrastructure

**Tree topping is not an accepted pruning method.** All pruning should be done according to arboricultural standards.

## MANAGEMENT PRIORITY

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The consultant assigned a pruning or removal priority of “high” during data collection to those trees with a risk of whole or partial tree failure. However, the priority data did not display properly in the attribute table after the files were downloaded and this data was lost. All trees with a risk of whole or partial tree failure should be considered high priorities for pruning or removal, and tree size, condition, and hazard rating considered in assigning pruning and removal priorities.

**TREE PLANTING RECOMMENDATIONS**

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Tree planting recommendations were made at locations where vacant planting sites exist. Recommendations were made by the mature height of the tree. A small tree has a potential mature height of 25 feet or less, a medium tree has a potential mature height of 25 to 50 feet, and a large tree has a potential mature height of 50 feet or greater. The entry includes the number of trees recommended for planting at that location in the height category.

While for each data entry only one (1) size was recommended, multiple trees might be recommended and therefore the total number of trees recommended for planting is greater than the number of recommendations (data points).

**REMOVAL RECOMMENDATIONS**

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Tree removal was recommended for trees in poor condition, trees growing in severely restricted growing spaces, trees that were in severe and irresolvable conflict with infrastructure (or will be in the near future), and trees at risk for failure where no options exist for reducing the risk.

Trees in poor condition may have visible, advanced decay at the trunk flare or root collar (no root collar excavations were done), trunk cavities and decay, or crown dieback greater than 50 percent. If a tree has a structural defect, such as included bark or a splitting trunk or limb that increases the tree's chance of whole or partial tree failure, and no feasible maintenance or management action (such as removal of the target) exists that would decrease the risk, then the tree was recommended for removal.

Recommendations for the removal of other things affecting the tree or public health and safety, such as stakes and guy wires, poison ivy, other vines and woody saplings growing around the tree were made as appropriate.

## GENERAL OVERVIEW OF RESULTS

Within the inventory area, the City of Monroe has an extensive, varied, and highly valuable tree resource. There are many trees growing along the street rights-of-way, around city offices and facilities, in the DBD, and in city parks. Many recently planted trees were found at City Hall, and the trees growing in the DBD are well-established and providing substantial benefits. Vacant planting sites were found throughout the neighborhoods along the street rights-of-way. The inventory data and this overview provide detailed information about all of these city-owned trees and tree planting opportunities.

It should be noted that city trees, while abundant, are only a small portion of the community's overall tree canopy. The private property resource, also extensive, varied, and highly valuable, accounts for at least 90 percent of the total tree canopy.

General descriptions of each type of site included in the inventory follow and precede the detailed summaries of the tree inventory data.

## CITY CEMETERIES

The trees within Rest Haven Cemetery (and Alma Knight Allen Memorial Park) on Madison Avenue North at Spring Street East, and Westview Cemetery on Nowell Way were inventoried. Neither cemetery had a lot of trees, but there were several large, old oak trees located in Rest Haven Cemetery. The trees in Westview Cemetery are relatively small and many are volunteers.

These volunteer saplings are recommended for removal since most are in conflict with headstones or gravesite walls. These conflicts, and the potential for damage, will only increase as the trees get larger.

The primary management need in Rest Haven Cemetery is crown cleaning pruning of trees of all sizes, and clearance pruning of some of the larger trees.



There are tree planting opportunities in both of these cemeteries, especially at the entranceways and along the entrance drives. Planting should otherwise be restricted around the gravesites to avoid future conflicts.

### *CITY OFFICES AND FACILITIES*

Trees growing around city offices and facilities were inventoried. The offices and facilities included are City Hall, the Community Center, the Fire Department, Monroe Utilities and Water Works, the Monroe-Walton Public Library, and Public Works.

City Hall is well-landscaped with many recently planted trees. One (1) existing tree, a large willow oak, was retained along Broad Street North and partially shades the parking lot, but it has trunk decay and crown dieback, signs of decline from construction damage, and should be removed as soon as possible.

The remaining trees in the City Hall landscape are healthy and are diverse in terms of species composition, with Southern magnolia, crapemyrtles, hollies, and Chinese elms included. These trees will require substantial pruning over the next several years to improve and train their structure. They should be properly mulched at least annually.



There is a long row of crapemyrtle trees located in front of the Monroe Utilities complex. These trees have been repeatedly topped, have sooty mold, and at the time of the inventory were infested with whiteflies. Corrective pruning is needed for these trees as well as the application of an insecticide to control the whiteflies. The other trees within the Monroe Utilities yard are showing signs of decline as a result of soil compaction and root damage from parking on tree roots within the trees' CRZs and from the storage of materials and equipment. If the city desires to maintain these trees in as good of a condition as possible, then parking and materials storage should be eliminated from beneath these trees, the soils aerated, and the trees mulched. Without this, the trees will continue to decline and their life spans will be shortened.



One (1) post oak tree has had numerous large limb failures and is recommended for removal. It is the only tree included in the inventory within the utility yard.

The oak, pine, and Bradford pear trees in front and around the Public Works Department office are all in good condition, although some have mistletoe. They would all benefit from an application of mulch within their CRZs. The Bradford pears all have forked stems with included bark, and will begin to lose large limbs due to this defect over the next 5 to 10 years.

There are very few trees at the Community Center, and very good opportunities to plant more trees on this site. These trees should be planted at the same time trees are planted along Church Street East.

There are only a few trees growing around the Fire Department on Madison Avenue South and around the old City Hall building on Broad Street South.

There are a number of red maple trees, and a few other trees, planted at the Public Library. These maple trees have severe girdling and wounded roots. They are being overtaken by kudzu. The kudzu needs to be controlled and the trees should be mulched and pruned to improve their health and form.



### *DOWNTOWN BUSINESS DISTRICT*

The City of Monroe's downtown business district is located primarily along Broad Street north and south, but extending on either side of Broad Street along Spring, Court, Washington, Church, and Davis streets, and Jackson, Wayne, and Lumpkin streets and Midland, Madison, and Milledge Avenues. For the purposes of this inventory, the trees along Broad Street north and south and Court Street were analyzed



separately as the Downtown Business District (DBD) trees, as the majority of the tree canopy in this area is located along these streets. Trees growing on other streets within the DBD were included with the street rights-of-way for analysis. Trees on the historic Courthouse Square were not inventoried.

The majority of trees in the DBD are Chinese elms. Trees in the DBD share space with the sidewalk and street pavement, buildings, awnings, signs, benches, and the people that frequent this area. The trees are planted in close proximity to the infrastructure and as a result require frequent pruning, which it appears is being done in a quality manner.

These Chinese elm trees along Broad Street, and the standard form crapemyrtles on Court Street, are very well suited to this environment. These are tough urban trees that are growing in tough conditions. They can be pruned around the hardscape and infrastructure. They provide a lot of shade. They decrease summer temperatures. They absorb particulate matter. They buffer the traffic noise as this is a very busy



street. They soften the view while still allowing exposure of the historic architecture. And they are now getting large enough where signage can be seen through, and below, them.

These trees are planted in tree wells, essentially planting containers, and because of this they need supplemental watering. There are irrigation lines installed throughout these tree wells, but they are not currently active. These trees **MUST** have supplemental water, especially during drought periods, and the irrigation system should be renovated with drip instead of spray nozzles, and the irrigation turned on regularly. The mulch should also be removed from the base of the tree trunk, exposing the root flare. No additional plants are recommended in the tree wells to compete for water with the trees already existing there.

The only other needs of these trees are regular pruning to maintain pedestrian, traffic, and building clearance.

## PARKS

Within the inventory area there are only a few parks. Trees within Dennis Coker Park, Matthews Park, the planned Spring Street Park (west) and the Triangle Park at Alcovy and Giles streets were inventoried.

### DENNIS COKER PARK

Dennis Coker Park includes three (3) facility areas—a ballpark, a wooded picnic and playscape area, and a picnic shelter (in disrepair) surrounded by large trees. The tree canopy is extensive here and in good condition overall. There are some large oak trees located near the service

entrance to the park that need regular inspections. One of the trees, near the public restrooms, has some wounds on exposed roots with decay.

There are a number of recently planted white oak trees located toward the back of the park, adjacent to the airport property. Many of these trees are in good condition and only need mulching and young tree training pruning, but some have been run over and severely wounded by heavy equipment that has obviously been working in the area. These trees are leaning and have crown dieback and should be removed.



### **MATTHEWS PARK**

The only trees inventoried in Matthews Park, a Walton County facility, were the trees planted over the last 15 to 20 years within the northern portion of the park as an arboretum. This is a very valuable and diverse collection of native trees that needs considerable maintenance. The trees need training pruning, crown cleaning pruning, corrective pruning, and in some cases, mulching. Tree identification markers were present at the base of many of the trees, but some markers need to be replaced. The renovation of this arboretum is currently a project of the USDA NRCS.

### **SPRING STREET PARK (PLANNED)**

The consultant met with McKay Johnson representing the Friends of Walton County Parks organization to discuss plans for the development of the site west of the Public Library where an electric substation is located into a city park. The site is currently mostly covered in kudzu, but has some natural wooded areas that could be used for passive recreation.



The trees in front of the substation, along Spring Street West, were inventoried. The remainder of the trees on the site will be surveyed by volunteers after the kudzu is eradicated in the fall and winter of 2008/2009.

**TRIANGLE PARK**

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This is a small park with only three (3) trees located on the site. It is situated between Alcovy, Giles, and Broad streets, and adjacent to the CVS Pharmacy. There is room here for additional tree planting although no recommendations were included in the inventory. The trees need training and crown cleaning pruning.



### STREET RIGHTS-OF-WAY

There trees growing along city street rights-of-way are diverse in species, size, age, and condition. The character of the right-of-way trees varies from neighborhood to neighborhood. Most of these trees are flowering dogwoods, water oaks, or willow oaks, with a variety of other species found.

Many of these trees are in decline due to the fact that infrastructure—

streets, overhead and underground utility lines, sidewalks, and buildings—have been encroached into the growing space of these trees, both for roots and the crowns. The loss of a healthy rooting zone due to pavement and compaction by vehicles and pedestrian traffic over many years is the primary cause of decline.

As a result of the decline, many of these trees have crown dieback. Some have large dead limbs that need pruning, while others are simply showing dieback of the small branches at the outer edges of the crown. In addition, many of these trees are forked either low, or more commonly, high in the trunk, and have included bark. This defect may cause an otherwise healthy tree to fail. While this problem cannot be corrected late in a tree's life, cabling and bracing which was recommended for some of these trees, can strengthen tree structure.

Many of the large oak and other large trees are growing on property boundaries. These trees were still included in the inventory but a notation was made that questions the property ownership.

The Mill Village area in southwest Monroe is unique in that it has small lots with small houses, but many very large trees. Most of these trees are located within private property, but a



significant number are located on city property. There are also a lot of vacant tree planting sites here, but the soils are very compacted and would need preparation (aeration) before planting.

Private property trees throughout the neighborhoods inventoried are in general very large and contribute greatly to the community tree canopy cover. As a result, education of residents in how to properly care for and protect these large, old, and in many cases, historic trees is very important.



**DATA SUMMARIES**

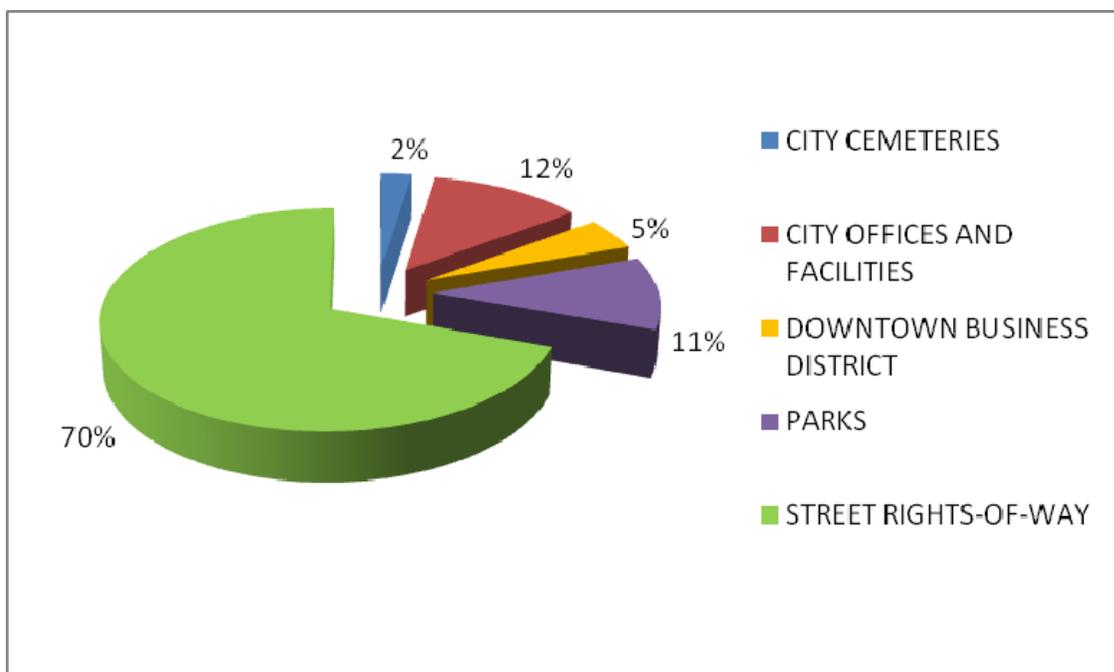
The tree inventory data is summarized and discussed for the entire inventory area and in some cases by site type. While not all of the data collected have been summarized in this report, the most important and revealing data are presented and discussed. As the need arises, any and all fields can be summarized by staff using the tree inventory databases that accompany this report on the project CD.

A total of 1,529 data points are included in the inventory. This includes 1,088 individual trees, 44 groups of trees and fence rows, and 397 tree planting recommendations.

**GEOGRAPHIC DISTRIBUTION**

The distribution of points by site type is shown in Figure 2 and further details of the various categories of data points by site type are located in Table 2.

**Figure 2. Distribution of Data Points by Site Type**



**Table 2. Distribution of Data Points by Site Type and Data Category**

Site Type	Total Data Points	Individual Trees	Tree Groups	Vacant Planting Sites
City Cemeteries	38	35	2	1
City Offices and Facilities	190	179	1	10
Downtown Business District	72	66	0	6
Parks	165	161	4	0
Street Rights-of-Way	1064	647	37	380
<b>TOTAL</b>	<b>1,529</b>	<b>1,088</b>	<b>44</b>	<b>397</b>

The trees and planting sites are well distributed throughout the inventory area, as shown in Figure 3. Trees are shown in green and tree planting locations in yellow.

**Figure 3. Distribution of Trees (green) and Planting Sites (yellow) in the Inventory Area**



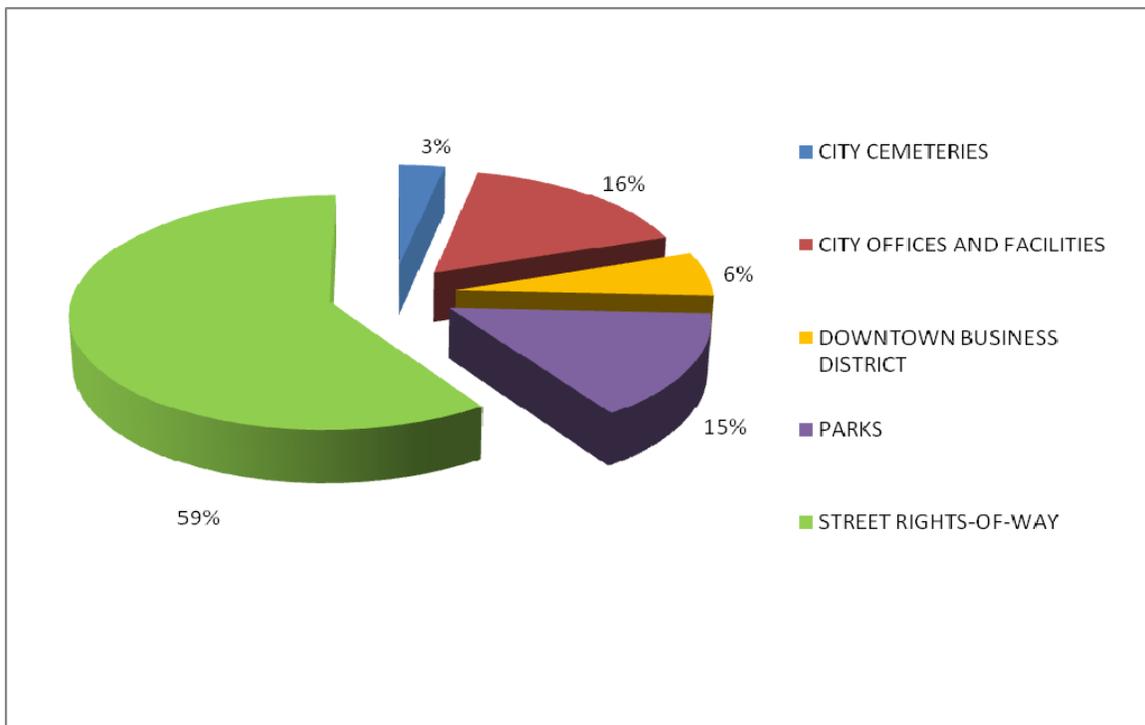
No tree planting recommendations were made for city parks since they have abundant trees. But, as Table 3 shows, there were 380 tree planting recommendations made for city streets. Greater detail will be provided later in this overview on the size and total number of trees recommended.

**Table 3. Distribution of Tree Planting Recommendations by Site Type**

SITE TYPE	NUMBER OF TREES
City Cemeteries	1
City Offices and Facilities	10
Downtown Business District	6
Street Rights-of-way	380
<b>ALL SITES</b>	<b>397</b>

The distribution of trees among the site types is shown in Figure 4. Further details on the geographic distribution of the data points within the DBD and the parks are located in Table 4.

**Figure 4. Distribution of Trees by Site Type**



**Table 4. Distribution of Trees by Site Type and Facility**

<b>SITE TYPE AND FACILITY</b>	<b>NUMBER OF TREES</b>
<b>City Cemeteries</b>	<b>35</b>
Rest Haven Cemetery	24
Westview Cemetery	11
<b>City Offices and Facilities</b>	<b>179</b>
City Hall	74
Community Center	6
Fire Department	7
Monroe Utilities and Water Works	35
Old City Hall	7
Public Library	16
Public Works	30
<b>Downtown Business District</b>	<b>66</b>
<b>City Parks</b>	<b>161</b>
Dennis Coker Park	38
Matthews Park Arboretum	83
Spring Street Park (Planned)	37
Triangle Park	3
<b>Street Rights-of-way</b>	<b>647</b>
<b>ALL TREES</b>	<b>1,088</b>

The distribution of the 713 trees growing along streets (647 on street rights-of-way and 66 in the DBD) is summarized in Table 5, arranged by street in descending number of trees.

**Table 5. Number of Trees Inventoried by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
Broad Street South	86
Church Street East	68
Broad Street North	43
3rd Street	26
Madison Avenue South	26
5th Street	25
6th Street	22
Woodland Road	21
Cherokee Avenue	16
Walton Circle	15

**Table 5. Number of Trees Inventoried by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
Davis Street East	13
Indian Creek Drive	11
4th Street	10
Bold Springs Avenue	10
Magnolia Street	10
Pine Park Street	10
Atha Road	9
Glen Iris Drive	9
Jackson Street South	9
Walton Street	9
Boulevard	8
Davis Street	8
Hillside Drive	8
Marable Street West	8
Springdale Road	8
Court Street	7
Lacy Street	7
Lawrence Street	7
Marable Street East	7
McDaniel Street	7
Selman Drive	7
Walker Street	7
Wall Street	7
Ash Street	6
Bryant Street	6
Colquitt Street	6
Felker Street	6
Midland Avenue	6
Plantation Drive	6
Victory Drive	6
Colley Street	5
Ford Street	5
Mobley Circle	5
Sherwood Drive	5
Spring Street East	5
Turner Street	5

**Table 5. Number of Trees Inventoried by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
Unnamed	5
Wilkins Drive	5
3rd Avenue	4
Bell Street	4
Edwards Street	4
New Lacy Street	4
Norris Street	4
Washington Street	4
Washington Street East	4
2nd Street	3
Baker Street	3
Fambrough Street East	3
Greenwood Road	3
Harris Street	3
Highland Avenue	3
Lumpkin Street South	3
Mill Street	3
Nowell Street	3
Radford Street	3
Stokes Street	3
Westridge Avenue	3
Alcovy Street	2
Barrett Street	2
High School Street	2
Hubbard Street South	2
Knight Street	2
Mears Street	2
Spring Street West	2
Church Street East	1
Duke Street	1
Hammond Drive South	1
Jackson Street North	1
Madison Avenue North	1
Nowell Way	1
Page Street	1
Union Street	1

**Table 5. Number of Trees Inventoried by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
Washington Street West	1
<b>TOTAL ALL STREETS</b>	<b>713</b>

The greatest number of street trees is located along Broad Street South, but Church Street East and Broad Street North also have considerable numbers of trees. There were also a lot of trees found growing in the Avondale Mills village area, along Madison Avenue South, and along Woodland Road south of McDaniel Street.

Most of the trees growing along Broad Street north and south were planted by the city in years past, with the youngest trees found in the DBD. Along most other streets in the inventory area no evidence of recent tree planting by the city was seen; however, a lot of tree planting opportunities exist.

In the following analyses, trees groups and tree planting recommendations are not included in the summaries. Tree planting recommendations are summarized in the discussion of management recommendations.

## TREE SPECIES

Table 6 shows that there were 94 different species, varieties, and cultivars inventoried. Much of this diversity results from the extensive variety of native trees planted in the arboretum at Matthews Park. The table also shows that there are four (4) predominate species—water oak, crapemyrtle, flowering dogwood, and willow oak—that account for 42 percent of all city trees inventoried.

**Table 6. Distribution of Trees by Species**

<b>SPECIES COMMON NAME</b>	<b>NUMBER OF TREES</b>	<b>PERCENT OF ALL TREES</b>
Oak, Water	203	18.7%
Crapemyrtle	201	18.5%
Dogwood, Flowering	127	11.7%
Oak, Willow	106	9.7%
Hickory, Pecan	48	4.4%
Elm, Chinese	45	4.1%
Oak, White	32	2.9%

Table 6. Distribution of Trees by Species

<b>SPECIES COMMON NAME</b>	<b>NUMBER OF TREES</b>	<b>PERCENT OF ALL TREES</b>
Holly Variety	25	2.3%
Maple, Red	23	2.1%
Cherry, Black	18	1.7%
Magnolia, Southern	17	1.6%
Pine, Loblolly	17	1.6%
Sweetgum	15	1.4%
Oak, Post	13	1.2%
Redcedar, Eastern	13	1.2%
Pear, Bradford	11	1.0%
Redbud, Eastern	9	0.8%
Yellowpoplar	8	0.7%
Cypress, Leyland	7	0.6%
Chamaecyparis Variety	6	0.6%
Pine, Shortleaf	6	0.6%
Cherry, Flowering	5	0.5%
Oak, Southern Red	5	0.5%
Persimmon	5	0.5%
Crabapple, Flowering	4	0.4%
Crabapple, Southern	4	0.4%
Elm, Winged	4	0.4%
Golden Raintree	4	0.4%
Magnolia, Southern Little Gem	4	0.4%
Blackgum	3	0.3%
Catalpa	3	0.3%
Cherry, Carolina Laurel	3	0.3%
Chinaberry	3	0.3%
Holly, American	3	0.3%
Juniper Variety	3	0.3%
Oak, Chestnut	3	0.3%
Oak, Pin	3	0.3%
Oak, Sawtooth	3	0.3%
Peach, Flowering	3	0.3%
Pine, White	3	0.3%
Ash, Green	2	0.2%
Baldcypress	2	0.2%
Hawthorne Variety	2	0.2%

Table 6. Distribution of Trees by Species

SPECIES COMMON NAME	NUMBER OF TREES	PERCENT OF ALL TREES
Hickory, Pignut	2	0.2%
Juniper, Common	2	0.2%
Maple, Japanese	2	0.2%
Maple, Silver	2	0.2%
Maple, Sugar	2	0.2%
Mimosa	2	0.2%
Oak, Black	2	0.2%
Oak, Live	2	0.2%
Pine, Slash	2	0.2%
Pine, Virginia	2	0.2%
Sourwood	2	0.2%
Whitecedar	2	0.2%
Zelkova, Japanese	2	0.2%
Basswood, American	1	0.1%
Beech, American	1	0.1%
Birch, River	1	0.1%
Chaste Tree	1	0.1%
Cherry, Yoshino	1	0.1%
Chinafir	1	0.1%
Cryptomeria, Japanese	1	0.1%
Devil's Walking Stick	1	0.1%
Elm, American	1	0.1%
Farkleberry	1	0.1%
Fringe Tree	1	0.1%
Ginkgo	1	0.1%
Hemlock, Eastern	1	0.1%
Hickory, Mockernut	1	0.1%
Honeylocust, Thornless	1	0.1%
Locust, Black	1	0.1%
Maple, Mountain Sugar	1	0.1%
Maple, Southern Sugar	1	0.1%
Maple, Trident	1	0.1%
Mulberry Variety	1	0.1%
Mulberry, Red	1	0.1%
Oak, Blackjack	1	0.1%
Oak, Cherrybark	1	0.1%

**Table 6. Distribution of Trees by Species**

<b>SPECIES COMMON NAME</b>	<b>NUMBER OF TREES</b>	<b>PERCENT OF ALL TREES</b>
Oak, Georgia	1	0.1%
Oak, Northern Red	1	0.1%
Oak, Overcup	1	0.1%
Oak, Scarlet	1	0.1%
Oak, Shumard	1	0.1%
Plum, Chickasaw	1	0.1%
Plum, Flowering	1	0.1%
Sassafras	1	0.1%
Sumac, Smooth	1	0.1%
Sycamore	1	0.1%
Viburnum Variety	1	0.1%
Viburnum, Possumhaw	1	0.1%
Walnut, Black	1	0.1%
Whitebud, Eastern	1	0.1%
Witchhazel	1	0.1%
<b>TOTAL ALL SPECIES</b>	<b>1,088</b>	<b>100.0%</b>

Table 7 shows the number of and percent of trees by species and site type for the four (4) most common species. The table shows that most of the crapemyrtles are located at city offices and facilities (City Hall, Monroe Utilities), and that most of the flowering dogwoods, water oaks, and willow oaks are located along street rights-of-way.

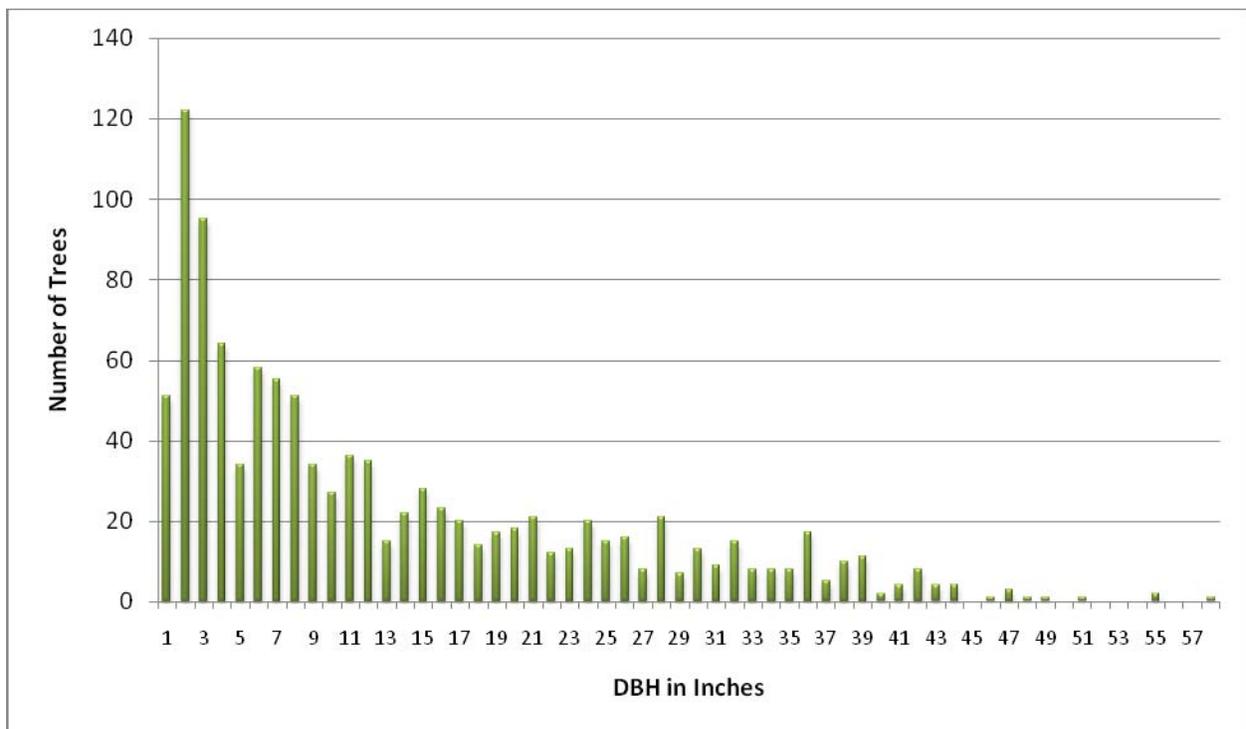
**Table 7. Number of Trees of Common Species by Site Type**

<b>SPECIES COMMON NAME</b>	<b>CITY CEMETERIES</b>	<b>CITY OFFICES AND FACILITIES</b>	<b>DOWNTOWN BUSINESS DISTRICT</b>	<b>PARKS</b>	<b>STREET RIGHTS-OF-WAY</b>
Crapemyrtle	2	90	28	15	66
Dogwood, Flowering	7	2	2	2	114
Oak, Water	5	14	6	3	175
Oak, Willow	1	3	4	3	95

**DBH**

Figure 5 shows that many trees are small in trunk diameter, there are a considerable number of large-sized trees. In fact, nearly half (49 percent) of all trees are larger than 9 inches DBH. Most of these are located along street rights-of-way.

**Figure 5. Distribution of All Trees by DBH**



Just over one-half (51 percent) of the 1,941 trees inventoried are 9 inches DBH or less. This is a result of the many flowering dogwood and crapemyrtle trees growing throughout town, and the many recently planted trees at City Hall.

The largest tree inventoried is a 58 inch DBH cherrybark oak inventoried on Colquitt Street. It is actually two (2) separate trees that fused together over time. The tree is in good condition and is very likely a boundary line tree. Crown cleaning pruning and annual inspections are recommended for the tree. There is a 55 inch willow oak located at 310 Broad Street North in poor condition that should be inspected annually. There is a 51 inch water oak located at 865 Church Street East; clearance pruning and annual inspections are recommended for this tree.

The average DBHs of the trees by site type and facility are shown in Table 8. The average DBH of all trees is 13.2 inches. The average DBH of the trees in the DBD is 9.5 inches, the average

DBH of the trees inventoried in the parks is 9.2 inches (many large trees in tree groups were not individually inventoried), and the average DBH of the trees inventoried along the street rights-of-way outside the DBD is 16.3 inches.

**Table 8. Average DBH by Site Type and Facility**

<b>SITE TYPE AND FACILITY</b>	<b>NUMBER OF TREES</b>
<b>City Cemeteries</b>	<b>11.4</b>
Rest Haven Cemetery	14.8
Westview Cemetery	4.0
<b>City Offices and Facilities</b>	<b>7.4</b>
City Hall	3.5
Community Center	17.8
Fire Department	4.6
Monroe Utilities and Water Works	11.0
Old City Hall	11.0
Public Library	13.1
Public Works	15.2
<b>Downtown Business District</b>	<b>9.5</b>
<b>City Parks</b>	<b>9.2</b>
Dennis Coker Park	3.3
Matthews Park Arboretum	11.3
Spring Street Park (Planned)	9.6
Triangle Park at Giles/Alcovy	21.7
<b>Street Rights-of-way</b>	<b>16.3</b>
<b>ALL TREES</b>	<b>13.2</b>

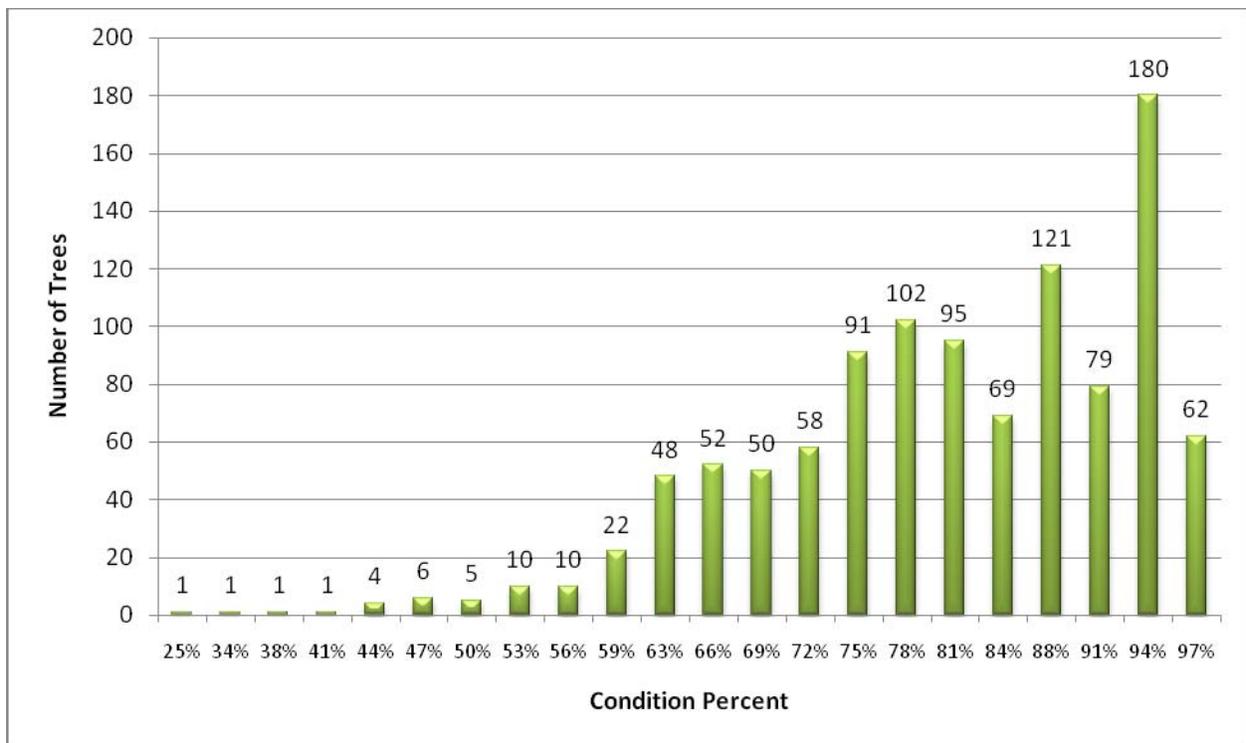
The average diameter of all flowering dogwoods across all sites is 8.2 inches. The average diameter of the crapemyrtles is 3.5 inches. The average diameter of the water oaks in the inventory is 20.5 and the average diameter of the willow oaks is 11.3 inches. The reason for the lower average diameter of the willow oaks is that many willow oaks have been planted throughout the DBD over the last 10 to 15 years. The only place where the consultant found water oaks planted in recent years was along Ivy Springs Drive SE where they were planted alongside willow oaks.

The tree species with the largest average diameters are the oaks—Northern red oak, post oak, Southern red oak, and white oak, tuliptrees (yellowpoplar or tulip poplar), and loblolly pines.

**CONDITION**

Tree condition was calculated using the ISA condition values assigned during the inventory, using methodology described in the data field table in Appendix A. The sum of the values given each of the eight (8) condition components (0 to 4) was divided by the highest possible sum, 32, to obtain a condition percent. The distribution of trees by condition percent is shown graphically in Figure 6.

**Figure 6. Distribution of Trees by Condition Percent**



The table shows that 321 trees (30 percent of all trees) are in excellent condition (greater than 88%), and 606 trees (56 percent of all trees) are in at least good condition (greater than 78%). It must be noted, though, that because of the nature of the rating system a tree might have a major or extreme defect or health problem affecting one of its components and still have a high condition rating overall. The occurrence of some of these defects and problems will be discussed later in this overview.

There are 18 dead trees, all of which are recommended for removal.

**Table 9. Number of Dead Tree Removals by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
3rd Street	1
5th Street	1
Broad Street South	5
Church Street East	3
Glen Iris Drive	1
Magnolia Street	1
Marable Street East	1
Midland Avenue	1
Spring Street West	1
Walker Street	2
Walton Circle	1
<b>ALL STREETS</b>	<b>18</b>

A total of 120 live trees are recommended for removal. The numbers of live tree removals by street are listed in Table 10.

**Table 10. Number of Live Tree Removals by Street**

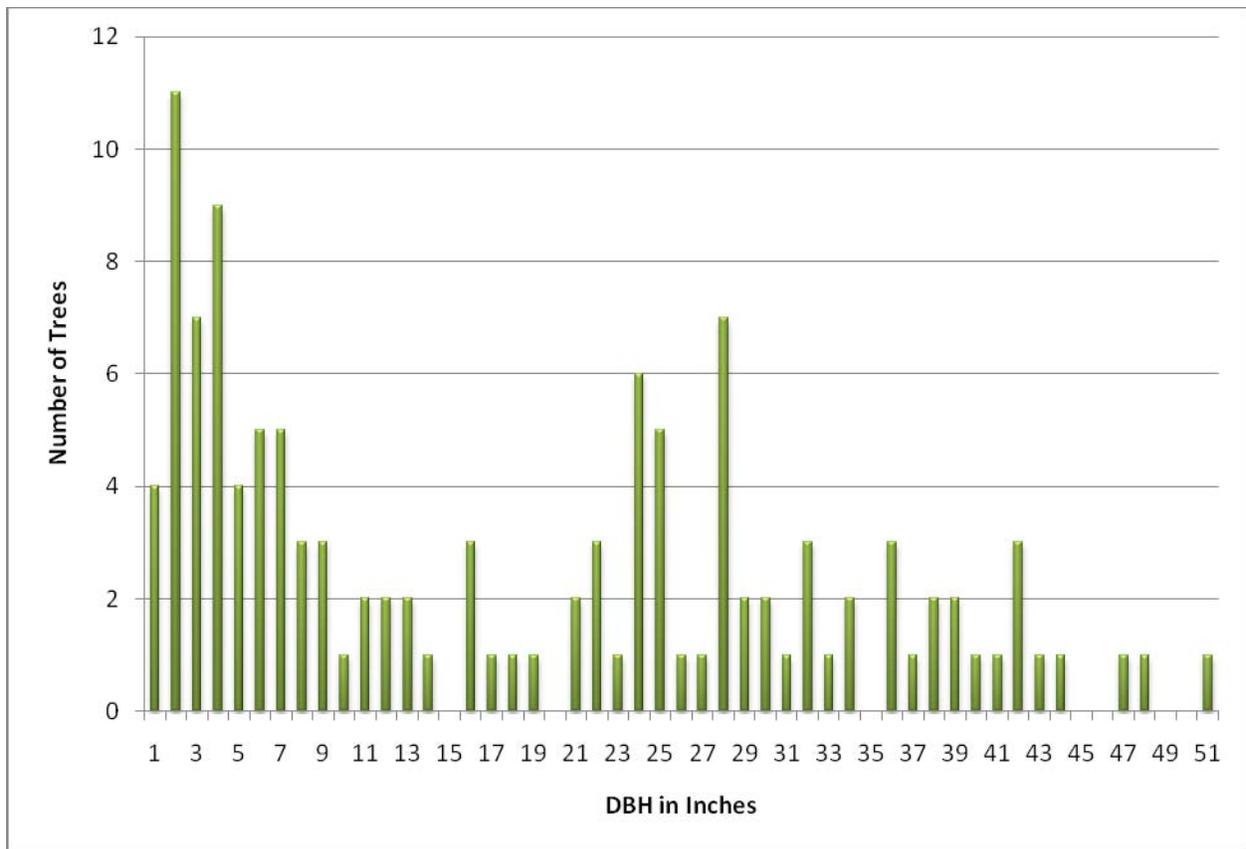
<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
2nd Street	1
3rd Street	5
4th Street	2
5th Street	2
6th Street	7
Alcovy Street	1
Ash Street	1
Atha Road	2
Barrett Street	1
Bold Springs Avenue	1
Boulevard	3
Broad Street North	6
Broad Street South	5
Church Street East	15
Colquitt Street	1
Davis Street	3
Davis Street East	5

**Table 10. Number of Live Tree Removals by Street**

<b>STREET NAME</b>	<b>NUMBER OF TREES</b>
Duke Street	1
Fambrough Street East	1
Felker Street	2
Greenwood Road	3
Lawrence Street	2
Lumpkin Street South	1
Madison Avenue North	2
Madison Avenue South	11
Magnolia Street	2
Marable Street East	1
McDaniel Street	3
Midland Avenue	1
Mill Street	1
Mobley Circle	1
New Lacy Street	1
Nowell Street	1
Nowell Way	5
Pine Park Street	3
Radford Street	1
Spring Street West	1
Springdale Road	1
Turner Street	2
Union Street	1
Unnamed	1
Victory Drive	2
Walker Street	1
Wall Street	2
Walton Circle	1
Washington Street East	2
Woodland Road	2
<b>TOTAL ALL STREETS</b>	<b>120</b>

Figure 7 shows live tree removals by DBH. The largest tree recommended for removal is 39 inches. There is one (1) tree 34 inches DBH and one (1) tree 36 inches DBH recommended for removal also. The majority of the trees recommended for removal are less than 8 inches DBH.

**Figure 7. Number of Live Tree Removals by DBH**



The average condition of the most common species with at least 10 trees found in the city tree population is shown in Table 11. The table shows that willow and Nuttall oaks have the highest average condition values (90% or greater), along with the Chinese elms, and some varieties of holly. The species with the lowest average conditions (less than 80%) are Leyland cypress, the Callery pears (growing around the library), silver maple, Southern red oak, flowering dogwood, black cherry, and crapemyrtle.

**Table 11. Average Condition of Most Common Species**

SPECIES COMMON NAME	NUMBER OF TREES	AVERAGE CONDITION
Elm, Chinese	45	93%
Holly Variety	25	93%
Magnolia, Southern	17	89%
Redcedar, Eastern	13	88%
Sweetgum	15	86%
Hickory, Pecan	48	84%

**Table 11. Average Condition of Most Common Species**

SPECIES COMMON NAME	NUMBER OF TREES	AVERAGE CONDITION
Crapemyrtle	201	82%
Oak, White	32	82%
Pine, Loblolly	17	82%
Oak, Willow	106	81%
Pear, Bradford	11	78%
Cherry, Black	18	78%
Oak, Post	13	75%
Maple, Red	23	73%
Oak, Water	203	73%
Dogwood, Flowering	127	68%

Many of the flowering dogwood trees have been affected by the persistent drought conditions in Monroe. Many have been repeatedly attacked by borers. Many have crown dieback and are in advanced decline. Many of the water oak trees are reaching the end of their life span, generally 80 to 100 years under urban conditions. The red maples have thin bark and several have significant cankers and wounds along their trunks. The average condition of willow oaks is higher than for water oaks and these trees are hardier and more tolerant of urban conditions. Chinese elms and the holly varieties have the highest average conditions.

There are many crapemyrtles in poor condition due to topping, but some are in very good condition. Most of the crapemyrtles planted along Broad Street South and those at Monroe Utilities have been topped—an incorrect practice that causes trunk decay, weak branch attachments, and a decrease in the life span of these trees. Condition ratings for the trunk, scaffold limbs, and branches of these trees were lower as a result. The crapemyrtles at Monroe Utilities not only had sooty mold, but were infested with whiteflies.

Tree condition was affected in some cases by another pest—mistletoe, a common parasite. It was noted on 14 trees.

No other major or any catastrophic insect or disease problems were found. The occurrences of other site and tree conditions harmful to trees are listed in Table 12. Those that are causing widespread damage to city trees are highlighted in bold type.

**Table 12. Occurrences of Harmful Site and Tree Conditions**

<b>SITE OR TREE CONDITION</b>	<b>NUMBER OF TREES</b>	<b>PERCENT OF ALL TREES</b>
Decay at the root/trunk flare	44	4%
Girdling roots	91	8%
Wounds on exposed surface roots	143	13%
Soil backfill, planting too deep, or over mulching around trunk	60	6%
Soil compaction	590	54%
Soil excavation	13	1%
Trunk decay	163	15%
Trunk failure risk	43	4%
Trees with forked (co-dominant) stems	649	60%
Trees with included bark	252	23%
Splitting trunk	4	0%
Trunk wounds	90	8%
Scaffold limb decay	99	9%
Limb failure risk	35	3%
Asymmetrical crown	67	6%
Crown dieback	169	16%
Topped trees	166	15%
Utility side pruning	38	3%
Trunk diseases	45	4%

The table shows that the soil was compacted around over half of the trees inventoried. There were 60 percent of the trees that had a forked stem. And, 23 percent of trees have included bark. The presence of included bark within a forked stem can be a serious defect and often results in co-dominant stem failure, especially on larger trees. Large trees with this condition should be considered for cabling and bracing to strengthen the fork, or removed if the condition is severe and cabling and bracing is not feasible.

A lot of additional information on tree condition was collected and should be referenced in the tree inventory database provided on the CD to further understand the condition of the trees and management recommendations, and to plan for field operations.

#### **HARDSCAPE AND INFRASTRUCTURE**

The presence of certain hardscape and infrastructure components found around trees was recorded, including the presence or close proximity of electric power and other utility lines, overhead or underground, and the presence of pavement within a tree's critical root zone.

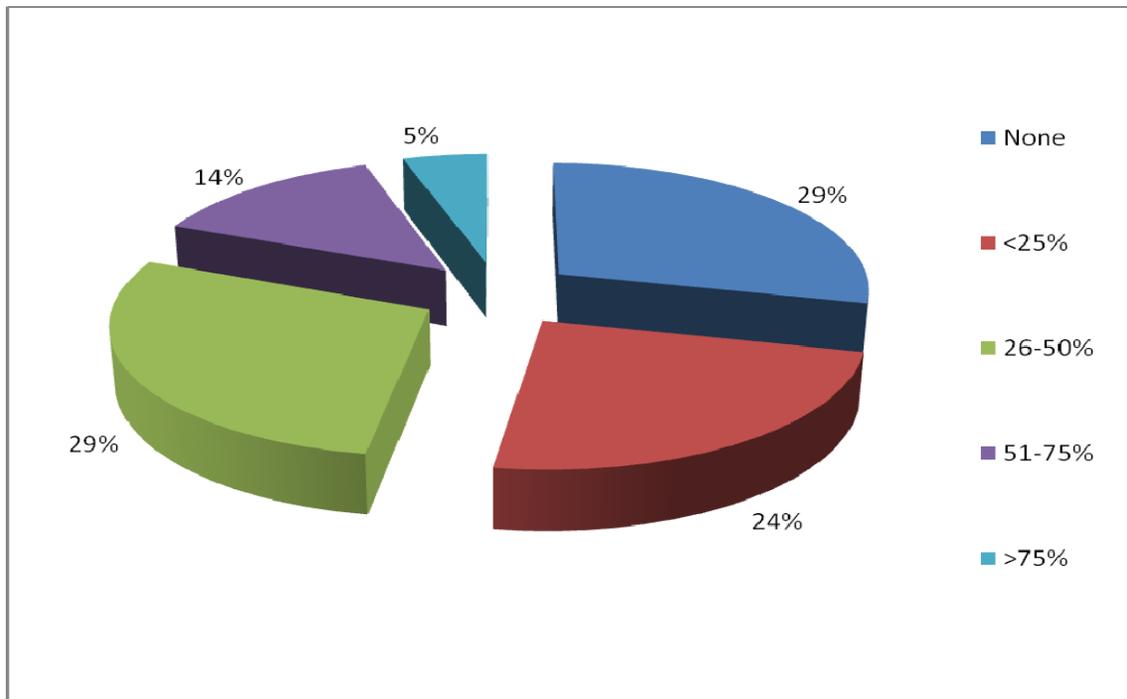
Electric power service or distribution lines were located above or within 10 lateral feet of 190 trees (17 percent), nearly all of them street trees.

If pavement or other impervious surfaces (such as buildings) existed within the critical root zone of a tree the amount was recorded in one of four (4) classes: less than 25 percent, 26 to 50 percent, 51 to 75 percent, and greater than 75 percent. The distribution of trees with pavement in the CRZ within these classes is shown in Table 13 and in Figure 8.

**Table 13. Distribution of Trees by Amount of Pavement in the CRZ**

AMOUNT OF PAVEMENT IN CRZ	NUMBER OF TREES	PERCENT OF ALL TREES
None	316	29%
<25%	256	24%
26-50%	312	29%
51-75%	148	14%
>75%	56	5%
<b>TOTAL ANY PAVEMENT</b>	<b>772</b>	<b>71%</b>

**Figure 8. Distribution of Trees by Amount of Pavement in CRZ**



Street trees and trees in the DBD have the greatest amount of pavement in the CRZ. There are 61 trees that are growing within tree wells of various sizes, most of these along Broad Street north and south.

In some cases, especially for recently planted trees and the trees in the tree wells, the trees were installed in existing pavement or concurrent with the installation of the pavement. In these situations tree roots will develop around the hard surfaces and in the interfaces between pavement and soil. While the root systems of these trees are still restricted, if the soil in which the tree is growing is well aerated and sufficient oxygen and water exist, the trees should be able to grow reasonably well. The application of new pavement within an existing tree's CRZ, and the resulting root damage and loss of amount of oxygen and water available to the tree usually lead to tree decline.

The inventory data also show that trees are in conflict with buildings in 37 cases, with fences in 3 cases, with mailboxes in 2 cases, with utility poles in 24 cases, and with overhead utility lines in 38 cases. In most of these cases, clearance pruning to reduce or eliminate the conflict was recommended. There are 51 trees growing within 10 feet of a water meter.

One memorial tree was found, but it is unfortunately dead. It is a Japanese maple planted at the library in honor of C. Wayne Shields.

### **RISK RATING**

Trees with a risk of partial (limb or co-dominant stem) or whole tree failure were given a hazard rating as described earlier using ISA methodology and as outlined in the field descriptions in Table A of Appendix A. Briefly, ratings are given for three (3) risk components—size of part, failure potential, and target—with a possible rating of 1 to 4 for each component. The result is a sum that can range from 3 to 12, representing a low to high risk.

Table 14 shows that a total of 51 trees ranging in diameter from 21 to 55 inches DBH were given a risk rating. Only one (1) of these trees is dead. Of the 50 live trees with hazard ratings, 41 are recommended for removal. The remaining 9 trees are either recommended for cabling and bracing or risk reduction pruning, or are on the annual inspection list and should be considered for removal after the highest hazard trees are removed.

Table 14. Number of Hazard Trees by DBH and Hazard Rating

DBH	HAZARD RATING 6	HAZARD RATING 7	HAZARD RATING 8	HAZARD RATING 9	HAZARD RATING 10	HAZARD RATING 12	ALL RATINGS
21			1				1
22			1				1
24				3			3
25				1	2		3
26			1	1			2
27					1		1
28	1		1	1	1		5
29				1			2
30		1	1	2			4
31							1
32				3			3
33					1	1	2
34				1			3
36				1	1		3
38				1	1		2
39			1		2		3
40							1
41			1				2
42			1	1	1		4
43							1
44				1			1
47							1
48					1		1
55			1				1
<b>ALL DBHs</b>	<b>1</b>	<b>1</b>	<b>9</b>	<b>17</b>	<b>11</b>	<b>1</b>	<b>51</b>

Table 15 contains basic information on all 51 trees with hazard ratings.

**Table 15. List of Trees with Hazard Ratings**

TREE ID	STREET NAME	ADDRESS	SPECIES COMMON NAME	DBH	HAZARD RATING
484	Walker Street	100	Oak, Water	33	12
302	3rd Street	109	Oak, Water	34	11
261	Barrett Street	138	Oak, Post	36	11
611	Broad Street North	135	Oak, Water	34	11
609	Broad Street North	210	Oak, Willow	43	11
666	Broad Street North	310	Oak, Water	47	11
1111	Church Street East	800	Oak, Water	42	11
1112	Davis Street	715	Oak, Water	29	11
435	Lawrence Street	710	Oak, Water	28	11
1437	Madison Avenue South	1203	Oak, Water	41	11
1290	Marable Street East	218	Oak, Blackjack	40	11
349	Mill Street	300	Oak, Water	31	11
278	3rd Street	112	Oak, Water	38	10
610	Broad Street North	135	Oak, Water	27	10
30	Broad Street South	0	Oak, Willow	42	10
832	Church Street East	403	Oak, Willow	39	10
833	Church Street East	403	Oak, Water	39	10
884	Church Street East	602	Oak, Water	48	10
1191	Church Street East	940	Oak, Water	25	10
1241	Davis Street East	1006	Oak, Water	36	10
1245	Davis Street East	1014	Oak, Water	28	10
1238	Magnolia Street	413	Oak, Water	25	10
750	Midland Avenue	308	Oak, Water	33	10
317	4th Street	123	Oak, Water	32	9
505	5th Street	820	Oak, Water	36	9
506	5th Street	820	Oak, Water	38	9
1416	Alcovy Street	0	Oak, Water	32	9
1136	Ash Street	423	Oak, Water	30	9
661	Broad Street North	301	Oak, Water	24	9
2	Broad Street South	221	Oak, Water	26	9
831	Church Street East	505	Oak, Willow	29	9
1188	Church Street East	940	Oak, Water	25	9
1190	Church Street East	940	Oak, Water	28	9
1192	Church Street East	1000	Oak, Water	34	9

**Table 15. List of Trees with Hazard Ratings**

TREE ID	STREET NAME	ADDRESS	SPECIES COMMON NAME	DBH	HAZARD RATING
1209	Davis Street East	1100	Oak, Water	30	9
1477	Fambrough Street East	135	Oak, Water	44	9
436	Lawrence Street	710	Oak, Water	42	9
1429	Madison Avenue South	1115	Oak, Water	24	9
1115	Pine Park Street	501	Oak, Water	32	9
1202	Wall Street	317	Oak, Water	24	9
664	Broad Street North	310	Oak, Willow	55	8
665	Broad Street North	310	Oak, Water	39	8
667	Broad Street North	325	Oak, Water	41	8
477	Broad Street South	439	Pine, Shortleaf	30	8
1484	Broad Street South	1211	Pine, Loblolly	21	8
834	Church Street East	307	Oak, Willow	42	8
1193	Church Street East	1000	Oak, Water	22	8
1194	Church Street East	1000	Oak, Water	26	8
1229	Unnamed	0	Pine, Loblolly	28	8
339	Mears Street	0	Oak, Water	30	7
521	2nd Street	0	Oak, Post	28	6

Additional details on trees with hazard ratings can be found in the tree inventory databases provided on the project CD.

## MANAGEMENT RECOMMENDATIONS

Management recommendations were made for existing trees and include a variety of field activities. The most important recommendations are summarized here and further details can be found in the tree inventory database.

### AERATION OF THE SOIL

Soil aeration within a tree's CRZ was recommended in 13 cases for trees located in areas where soils were highly compacted and no or little pavement existed within the CRZ. Aeration should be done according to arboricultural standards where pavement does not exist. Although removal of pavement and aeration of the underlying soil, with application of mulch, would be beneficial for trees with a paved CRZ, this is not possible or practical in most cases.

## CABLING AND BRACING

The installation of tree support systems—cables and bracing rods—is recommended for 10 large trees that are in relatively good health. The feasibility of cabling and bracing these trees should be determined by an ISA Certified Arborist that has experience in the installation of these support systems and can first do an aerial inspection of the tree.

## FERTILIZATION

Fertilization is recommended for two (2) trees. Soil aeration, if recommended for a tree in addition, should be done before fertilization. The amount and type of fertilizer applied should be based upon the results of a soil tests from the site and arboricultural standards.

## MULCHING

Mulch is recommended for 154 trees, 63 along street rights-of-way, 23 at Matthews Park and 21 at Dennis Coker Park, and 28 at the Public Works office. The trees in the DBD tree wells are all well-mulched although the configuration of the mulch should be adjusted so that the trunk flare is visible and the mulch kept about 6 inches from the trunk.

## TREE PRUNING

Tree pruning is the most common maintenance activity recommended, with 634 trees recommended for at least one type of pruning. More than one type of pruning recommendation might have been made for a single tree, so the 833 pruning recommendations exceed the 634 trees needing pruning. Table 16 shows the distribution of pruning recommendations by type of pruning.

**Table 16. Pruning Recommendations by Site and Pruning Type**

<b>PRUNING TYPE</b>	<b>CITY CEMETERIES</b>	<b>CITY OFFICES AND FACILITIES</b>	<b>DOWNTOWN BUSINESS DISTRICT</b>	<b>PARKS</b>	<b>STREET RIGHTS-OF-WAY</b>	<b>ALL SITES</b>
<i>Clearance Pruning</i>	5	50	27	37	118	237
<i>Corrective Pruning</i>	3	106	11	29	48	197
<i>Crown Cleaning Pruning</i>	9	17	11	35	128	200

**Table 16. Pruning Recommendations by Site and Pruning Type**

<b>PRUNING TYPE</b>	<b>CITY CEMETERIES</b>	<b>CITY OFFICES AND FACILITIES</b>	<b>DOWNTOWN BUSINESS DISTRICT</b>	<b>PARKS</b>	<b>STREET RIGHTS-OF-WAY</b>	<b>ALL SITES</b>
<i>Risk Reduction Pruning</i>	0	0	0	1	1	2
<i>Training Pruning</i>	11	78	9	42	51	191
<i>Utility Clearance Pruning</i>	0	0	0	0	6	6
<b>TOTAL ALL TYPES</b>	<b>28</b>	<b>251</b>	<b>58</b>	<b>144</b>	<b>352</b>	<b>833</b>

Tree pruning recommendations most commonly made are for clearance pruning over vehicle travel lanes and sometimes over sidewalks, around buildings, or near mailboxes, for corrective pruning to correct structure on older trees or trees that have been topped, crown cleaning pruning to remove deadwood and crossing or rubbing branches, and training pruning on young trees to create and enhance tree structure for the long-term.

While pruning is recommended for 1,245 trees, many of the smaller trees can and often are pruned by residents who often take ownership of trees on the right-of-way. The city should focus its tree pruning efforts on the largest of the trees recommended for pruning.

## **INSPECTIONS**

A total of 110 trees are recommended for annual inspections. Trees that are recommended for removal should also be inspected annually prior to their removal, especially if removal is delayed beyond the upcoming year.

Most of these trees recommended for inspection are in hazard condition, but may be in marginal health and annual inspections are necessary to monitor tree health and develop appropriate management recommendations.

**Table 17. Number of Trees to Inspect by DBH**

<b>DBH</b>	<b>NUMBER OF TREES</b>
2	1
16	2
21	7
22	1
23	4
24	4
25	8
26	5
27	3
28	5
29	4
30	6
31	5
32	5
33	3
34	3
35	2
36	5
37	3
38	6
39	8
40	1
41	3
42	5
43	3
44	1
46	1
47	2
51	1
55	2
58	1
<b>ALL DBHs</b>	<b>110</b>

The trees to be inspected annually range in DBH from 16 to 58 inches DBH, although one (1) tree 2 inches DBH is also included—its survival is questionable.

## REMOVAL

Dead trees and live trees at risk for whole tree failure, in a stage of advanced decline, in constricted growing spaces, or considered a nuisance were recommended for removal. The types of removals and their distribution across the property types are shown in Table 18. There are 120 live trees and 18 dead trees recommended for removal.

**Table 18. Tree Removals by Site Type**

SITE TYPE	NUMBER OF DEAD TREES	NUMBER OF LIVE TREES	ALL REMOVALS
<i>City Cemeteries</i>	0	7	7
<i>City Offices and Facilities</i>	1	3	4
<i>Downtown Business District</i>	0	3	3
<i>Parks</i>	0	4	4
<i>Street Rights-of-way</i>	17	103	120
<b>TOTAL ALL SITES</b>	<b>18</b>	<b>120</b>	<b>138</b>

Recommendations also included in the inventory for the removal of other plants or restrictions to tree growth, such as three (3) stumps, vines on 42 trees, and various other plants and materials such as soil backfill, black plastic, landscape fabric, kudzu, poison ivy, privet, and woody saplings.

## TREE PLANTING

There are 397 recommendations for the planting of 822 vacant sites identified during the inventory, most of these located along the street rights-of-way throughout the tree inventory area.

- Small trees were recommended in 244 cases for 584 individual sites; these sites usually have overhead power, telephone, and cable lines, or otherwise restricted growing spaces.
- Medium trees were recommended in 35 cases for 54 individual sites; these sites usually have a somewhat restricted growing space, or are for locations where some trees already exist, or there are overhead utility lines within 20 feet of the site.
- Large trees were recommended in 118 cases for 184 individual sites; these sites usually have unrestricted growing space above and below ground, or are in locations where few trees currently exist and large tree canopy is needed.

All tree planting should be done in accordance with arboricultural standards.

Tree planting recommendations were not made where the tree lawn was narrow, less than three (3) feet wide. Tree planting recommendations were also not made in areas where there are ditches in the right-of-way, construction activity on adjacent property, or where residents use the right-of-way for parking their vehicles.

### **TREE VALUE**

Using a modified trunk formula method as developed by the Council of Tree and Landscape Appraisers and published by the International Society of Arboriculture, the consultant estimates the value of the 1,088 city trees included in the inventory to be more than \$3.4 MM. The average dollar value per tree is \$3,125.

## CONCLUSIONS

Based upon the tree inventory data and the consultant's observations during the inventory, the following conclusions about the state of the City of Monroe's city-owned tree resource are made.

1. The city owns a highly valuable tree resource.
2. The citizens of Monroe value and appreciate their city, neighborhood, and yard trees. They appreciate the shade that trees provide, at home, while shopping, and while working.
3. City trees are well-distributed throughout the tree inventory area.
4. Large, mature canopy trees are not actively protected from damage to their tree roots throughout the inventory area. Education on effective tree protection methods is needed.
5. The drought has significantly reduced tree health for some recently planted trees, especially flowering dogwoods, and has precipitated or exacerbated decline in some larger trees.
6. The pruning or cabling and bracing of large trees at risk for limb failure and the removal of large trees at risk for whole tree failure are the highest priority tree management needs found.
7. Young tree training pruning, corrective pruning, and clearance pruning are otherwise the greatest needs for city trees. Education on young tree training pruning would be beneficial.
8. More trees need mulching and mulching techniques need improvement to increase tree health and longevity.
9. Most tree care practices are being conducted according to standards, but comprehensive standards for tree care practices need to be adopted and implemented to further improve tree health. Education on tree care standards, including mulching and pruning, would be beneficial.
10. A valuable and abundant resource of young trees exists as the result of tree planting efforts in recent years in the DBD and at City Hall.
11. The population of the City's trees is very diverse; species choices for new tree plantings have been good, however some sites have small or medium trees planted in areas where large trees would have been a better choice to increase tree canopy cover, such as at City Hall.

12. There are many opportunities for planting additional trees on all sites throughout the inventory area, but especially along city street rights-of-way.

An extra educational benefit of the inventory was the conversations that the consultant had with many residents within the inventory area, informing them of the purpose of the inventory, the existence of the tree board, and the desire by the city to begin a more comprehensive approach to community tree management. Without exception, residents expressed their support for trees and for the inventory project.

City trees are a valuable community asset, an important part of City's infrastructure, and provide a major contribution to the overall community forest. As a result of this tree inventory, the City now has detailed information on the condition and maintenance needs of at least a portion of the trees that make up this asset. This information has been incorporated into the City's *Community Forest Management Plan*.

While the goal of this inventory has been met—to gather information on the current condition of city trees to use in improving the management of the city-owned component of the community forest—the information in the database and this summary report is only a snapshot of the condition of the city's trees taken at the moment each was evaluated. In the time since the data was gathered, trees have grown or declined further, some have been struck by lightning or dropped dead limbs or been damaged in storms or removed. Because trees are living entities, and constantly changing, it is imperative that the information presented here be utilized as soon as possible while it is still relevant. Also, to keep the tree inventory up-to-date one person should be given the responsibility to update trees in the database weekly, or as soon as changes occur. This will keep the information relevant and useful.

Connie Head, Consulting Urban Forester with Technical Forestry Services, is committed to helping the city staff and the Monroe Tree Board in interpreting and utilizing this information, and can be contacted at [tfshead@aol.com](mailto:tfshead@aol.com) and at (706)202-5279 for assistance.

## APPENDIX

## APPENDIX A: DATA FIELDS

The following table includes the field names used within each of the two (2) databases provided with the inventory summary report and descriptions of the possible entries within the fields. The data entry form and shapefile database (dBase format) was developed using ArcPad by the University of Georgia. The tree inventory data was converted to a spreadsheet (Microsoft Excel format) by the consultant for data analysis. Some additional fields were inserted into the Excel spreadsheet as indicated.

In the shapefile attribute table and in the spreadsheet, an entry of 1 or T (true) indicates “yes” or “present” and 0 or F (false) indicates “no” or “not present” in all fields other than the numeric fields of DBH, the condition rating fields, the risk rating fields, and tree planting fields.

The fields in this table are arranged according to the order in which they appear in the spreadsheet.

**Table A1. Data Fields and Their Descriptions**

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
<b>UNIQUE TREE ID NUMBER</b>		
TREE ID	FID	Sequential number given each data entry in the ArcMap shapefile attribute table; the data entry assigned a 0 in the attribute table was given number 2488 in the spreadsheet
<b>SITE AND LOCATION INFORMATION</b>		
SITE TYPE	Not included in the shapefile attribute table	Broad category of growing site type, for example: street right-of-way, park, cemeteries, city offices and facilities, central business district
LOCATION ON SITE	SITE_DESCR	Generic area within the site, for example: right yard, left yard, parking lot, building perimeter, site perimeter; right, left, back yard and so on refers to the side of the property on which the tree is located
FACILITY NAME	Not included in the shapefile attribute table	Name of specific facility, such as City Hall, Community Center, etc.
STREET NAME	ST_NAME	Adjacent or closest street to tree
ADDRESS	ST_NUMBER	Visible or assumed address of site or adjacent private property; tree may be located on one side or the other of a property and therefore not on the

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
		same street the address refers to
<b>TREE SPECIES INFORMATION</b>		
SPECIES COMMON NAME	SPID	Species or species group of the tree, listed with genus (maple for example) first, and species (maple, red for example) second
Not included in the spreadsheet database	SPDES	Not used
<b>TREE SIZE MEASUREMENT</b>		
DBH	DBH	Standard measurement of trunk diameter at 4.5 feet above the ground, known as "diameter at breast height", or DBH; entered to the nearest whole number
CROWN WIDTH	CROW_WIDTH	Not used
TREE HEIGHT	TR_HEIGHT	Not used
<b>ROOT AND ROOTING ZONE CONDITIONS</b> Conditions visible without excavation found around the trunk/root flare and on exposed roots; also, conditions of the soil within the tree's CRZ that can affect tree health, structure, and growth, and that may have an impact on public safety.		
DECAY AT FLARE	RTDECAY	Decay at the base of the trunk where trunk transitions to roots
GIRDLING ROOT	RTGIRDLING	Root girdling (compressing) the stem or a large root)
ROOT WOUNDS	RTWOUND	Wounds found on exposed roots likely due to mower damage or traffic over roots
RTOTHER	ROOTS OTHER	Any other condition affecting the soil or tree roots
SOIL BACKFILL	BACKFILL	Deposition of fill soil or deep mulch around trunk
SOIL COMPACTION	COMPACTION	Compaction of soil
SOIL CONTAMINATION	CONTAMANAT	Contamination of the soil with oil, paint, or other chemical substance
SOIL EROSION	EROSION	Erosion of the soil, exposing roots
SOIL EXCAVATION	EXCAV	Excavation or otherwise disturbing the soil
SOIL TRENCHING	TRENCHING	Trenching for installation or repair of underground utilities
SLOPE	SLOPE	Significant slope at tree's location
<b>TRUNK CONDITIONS</b> Conditions of the trunk visible from the ground that can affect tree health, structure, and growth, and that may have an impact on public safety.		
BEEHIVE	BEE	Presence of beehive within the tree
CABLED/STAKED TREE	CABLED	Tree that has guy wires attached to stakes (most common use), or has had bracing cables installed
TRUNK CAVITY	TRCAVITY	Presence of a cavity anywhere along the trunk
TRUNK FAILURE PREVIOUS	CODOMINANT	Evidence of previous failure of a portion of the trunk or a co-dominant (forked) stem
TRUNK DECAY	TRDECAY	Evidence of decay anywhere on the trunk, including the presence of fruiting bodies

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
		(mushrooms)
TRUNK FAILURE RISK	FAILRSISK	Defect present that increases the potential for the trunk to fail
FORKED TRUNK	FORKEDSTEM	Entry indicates if trunk is forked above or below 4.5 feet above ground
GIRDLING WIRE	GIRDLEWIRE	Presence of wire, string, strap, or other material that is girdling the tree's trunk
INCLUDED BARK	INCLUDEDBR	Bark included between forked stems or in narrow branch attachments
LEANING TRUNK	LEANING	Tree trunk leaning, either long-term or sudden
LIGHTNING STRIKE	LIGHTNING	Evidence of previous lightning strike
MULTI-STEMMED	MULTISTEM	Tree with multiple stems, or a number of trees of the same species growing very close to one another
SPLITTING TRUNK	SPLIT	Trunk splitting, often at a fork with included bark
TRUNK PROTECTOR	TRUNKPROTE	Tree trunk protector present
TRUNK WOUNDS	TRWOUNDS	Indication of the presence of a trunk wound and the percent of the circumference of the trunk that is covered by the wound, as <25%, 26-50%, 51-75%, or <75%
TRUNK OTHER	TROTHER	Any other condition of the trunk
<b>SCAFFOLD LIMB CONDITIONS</b>		
Conditions visible from the ground of the large, scaffold limbs that support the entire crown that can affect tree health, structure, and growth, and that may have an impact on public safety.		
LIMB CAVITY	SCCAV	Presence of a cavity in a large limb
LIMB DECAY	SCDECAY	Presence of decay in a large limb
LIMB FAILURE RISK	SCFAILRSK	Increased potential of limb failure due to decay, asymmetry, included bark or other factor
LIMB FAILURE PREVIOUS	LIMBFAIL	Evidence of previous large limb failure
SPLITTING LIMB	SCSPLIT	Limb splitting, often at attachment with trunk
LIMB WOUNDS	SCWOUND	Presence of a wound on a large limb
LIMB OTHER	SCOTHER	Any other condition of the large limbs
<b>CROWN CONDITIONS</b>		
Conditions visible from the ground of the tree's smaller branches, twigs, and leaves that can affect tree health, structure, and growth, and that may have an impact on public safety.		
ASYMMETRICAL CROWN	CRASSYMERT	Crown unbalance as the result of light conditions, limb failure or utility clearance pruning
DEAD LEADER	DEADLEADER	Presence of a dead leader in the top of the tree
CROWN DIEBACK	CRDIEBCK	Significant dieback of the outer branches or major limbs
HANGER IN CROWN	CRHANGER	A detached limb hung up in the tree crown
TOPPED TREE	CRTOPPED	Purposeful and indiscriminate removal of the top of a tree's crown without regard to the location of branch nodes
UTILITY SIDE PRUNING	CRUTILTYPR	Evidence that the tree has been pruned on one

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
		side to provide utility line clearance
CROWN OTHER	CROTHER	Any other condition of the tree limbs, branches, leaves, or overall crown
<b>PEST SIGNS AND SYMPTOMS</b>		
Visible signs (physical evidence) and symptoms (physiological reaction) of tree insects, diseases, and parasites.		
ROOT DISEASE and ROOT DISEASE OTHER	RTDISEASE and RTDIOOTHER	Diseases affecting the root system
TRUNK DISEASE 1, TRUNK DISEASE 2, TRUNK DISEASE 3, and TRUNK DISEASE OTHER	TRUNKDISE, RTDISESE2, RTDISES3, and TRDIOOTHER	Diseases affecting the trunk such as hypoxylon often found on dying oaks, or fusiform cankers found on pines
CROWN DISEASE and CROWN DISEASE OTHER	CROWNDISE and CRDISOTHER	Diseases affecting the limbs and twigs or overall crown of the tree, such fire blight
LEAF DISEASE and LEAF DISEASE OTHER	LEAVEDISE and LEADISOTHE	Diseases affecting the leaves, such as powdery mildew or sooty mold
VASCULAR DISEASE and VASCULAR DISEASE OTHER	VASCULAR and VAASCULARO	Diseases affecting a tree's vascular system
INSECT and INSECT OTHER	INSECT and INSECTOTH	Insects affecting the tree
DAMOTHER	INJURY/DAMAGE OTHER	Other signs of tree damage
<b>ABIOTIC INJURIES</b>		
Injuries caused by weather, chemicals, or other abiotic (non-living) agents.		
CHLOROSIS	CHLOROSIS	Yellowing of foliage due to nutrient deficiency or other cause
DROUGHT INJURY	DRTINJURY	Signs of damage caused directly by drought conditions, such as early leaf color, wilting, crown dieback
FIRE INJURY	FIREINJY	Signs of injury due to fire
FLOOD INJURY	FLOODINJY	Signs of injury due to flooding
FREEZE INJURY	FREEZEINJY	Signs of injury due to below freezing temperatures
HAIL DAMAGE	HAILDAMAGE	Signs of injury by hail
HERBICIDE DAMAGE	HERBICIDE	Signs of injury by herbicides, including abnormal growth, leaf discoloration, and dieback
MISTLETOE	MISTLETOE	Mistletoe observed in tree crown
VANDALISM	VANDALISM	Intentional damage to a tree's roots, trunk, or crown
INJURY/DAMAGE OTHER	DAMOTHER	Other signs of tree damage
<b>HARDSCAPE CONDITIONS</b>		
Information on the types of hardscape and infrastructure that surround the tree, generally within 10 feet of the tree trunk, or within the CRZ where indicated, that may now or in the future affect tree health, structure, and growth; or, hardscape that is physically impacted by some portion of the tree itself.		
DITCH/CULVERT <10	DITCH	Tree is near a ditch, culvert, other water drainage

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
FEET		system feature
FENCE <10 FEET	FENCE	Tree is near a fence or wall
HYDRANT <10 FEET	HYDRANT	Tree is near a fire hydrant
HEADSTONE <5 FEET	HEADSTONE	Tree is in close proximity to a headstone or grave marker
PAVEMENT IN CRZ	PAVEINCRZ	Indicates the amount of pavement in the CRZ, entered as <25%, 26-50%, 51-75%, >75% or left blank
SIDEWALK CRACKED	SWALKCRK	The sidewalk adjacent to the tree is cracked
SIDEWALK UPLIFTED	SWALKUPL	The sidewalk adjacent to the tree is uplifted
CURB/STREET CRACKED/UPLIFTED	CURB	The curb or street pavement is cracked or uplifted
PLANTING CONTAINER	PLANTCONTA	The tree roots are confined to a rigid structure or planting container
TREE WELL	TREEWELL	The tree is located in a cut-out in the sidewalk or other pavement
SIGN <10 FEET	SIGN	Tree is near a sign
UTILITY POLE <10 FEET	LITEPOLE	Tree is near a utility or light pole
HARDSCAPE OTHER	HARDOTHER	Other hardscape within the tree's growing space
<b>TREE AND INFRASTRUCTURE CONFLICTS</b>		
Infrastructure that is currently being impacted by trees or that are impacting trees, where tree pruning, tree removal, or infrastructure removal is required to resolve the conflict.		
BUILDING CONFLICT	CBUILDING	Tree branches are, or will be in the near future, in conflict with a building
FENCE CONFLICT	CFENCE	Tree trunk is, or will be in the near future, in conflict with a fence
HEADSTONE CONFLICT	CHEDSTONE	Tree trunk or lower branches are, or will be in the near future, in conflict with a headstone
MAILBOX CONFLICT	CMBOX	Tree branches are, or will be in the near future, in conflict with a mailbox or the mail carrier's access to the mailbox
PAVEMENT CONFLICT	CPMENT	Tree trunk is in conflict with the pavement
OVERHEAD UTILITY CONFLICT	CPLINE	Tree branches are in conflict with an overhead utility line
STAIRS/STEPS CONFLICT	CSTAIRS	Tree trunk is in conflict with stairs or steps or tree branches are limiting access to the stairs or steps
UTILITY POLE CONFLICT	CUTILITYPO	Tree trunk or branches are in conflict with a utility pole
SIDEWALK CONFLICT	CWALKWAY	Tree is in conflict with the sidewalk
WALL CONFLICT	CWALL	Tree trunk or branches are in conflict with a wall
CONFLICT OTHER	CONOTHER	Any other conflicts between trees and infrastructure
<b>UTILITIES</b>		
Information on the types of utility lines that are present above and below ground, where evidence is visible in the field.		

Table A1. Data Fields and Their Descriptions

<b>EXCEL SPREADSHEET FIELD NAME</b>	<b>ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME</b>	<b>DATA ENTRY DESCRIPTION</b>
OVERHEAD CABLE	OHCABLE	Presence of cable lines overhead within 10 lateral feet of the tree trunk
OVERHEAD POWER	OHPOWER	Presence of power lines (transmission or distribution) within lateral distance of tree trunk as indicated, <10 feet, 11-20 feet, or 21-30 feet
OVERHEAD TELEPHONE	OHTELEPHON	Presence of telephone lines overhead within 10 lateral feet of the tree trunk
UNDERGROUND CABLE	UGCABLE	Presence of underground cable line within 10 lateral feet of the tree trunk as visible from evidence above ground
UNDERGROUND GAS	UGGAS	Presence of underground gas line within 10 lateral feet of the tree trunk as visible from evidence above ground
UNDERGROUND POWER	UGPOWER	Presence of underground gas line within 10 lateral feet of the tree trunk as visible from evidence above ground
UNDERGROUND TELEPHONE	UGTELE	Presence of underground telephone line within 10 lateral feet of the tree trunk as visible from evidence above ground
SEWER <10 FEET	SEWER	Presence of sewer line within 10 lateral feet of the tree trunk as visible from evidence above ground
WATER METER <10 FEET	UWATERMET	Presence of a water meter within 10 lateral feet of the tree trunk
UTILITY OTHER	UOTHER	Presence of any other utilities
<b>OTHER SITE AND TREE INFORMATION</b>		
Other information about the tree or site pertinent to tree location or management.		
ADJACENT TO VACANT LOT	VACANTLOT	Tree growing adjacent to a vacant lot
FENCE ROW	FENCEROW	Tree growing within a fence row
UNMANAGED WOODED AREA	UNMANAGED	Trees growing as an unmanaged, natural wooded area or within such an area
LOCATION OTHER	OTHEROTHER	Any other additional location or tree information
TREE GROUP INFORMATION	Not included in the shapefile attribute table	Details of tree group characteristics, such as primary species or number of trees
SPECIAL TREE INFORMATION	Not included in the shapefile attribute table	Details on special character or designation of tree, such as a tree planted in honor or memory of someone

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
<b>ISA CONDITION RATINGS</b>		
Ratings entered for each component using methodology in the <i>Guide for Plant Appraisal</i> <sup>5</sup> ; a rating of 4 indicates no apparent problems, 3 indicates minor problems, 2 indicates major problems, and 1 indicates extreme problems; a rating of 0 indicates a dead tree.		
ROOT HEALTH	RH	Number Entry 0 to 4
ROOT STRUCTURE	RS	Number Entry 0 to 4
TRUN HEALTH	TRHEALTH	Number Entry 0 to 4
TRUNK STRUCTURE	TRSTRUCTUR	Number Entry 0 to 4
SCAFFOLD LIMB HEALTH	SCAFHEALTH	Number Entry 0 to 4
SCAFFOLD LIMB STRUCTURE	SCAFSTRUCT	Number Entry 0 to 4
BRANCH HEALTH	BRANCHEALT	Number Entry 0 to 4
LEAVES HEALTH	LEAVESHEAL	Number Entry 0 to 4
CONDITION PERCENT	Not included in the shapefile attribute table	Calculated post-data collection by adding the 8 ratings above and dividing by the highest possible sum of 32, converted to percent and ranging from 0% (dead) to 100% (perfect)
<b>ISA HAZARD RATINGS</b>		
Rating system for trees at risk for failure from <i>A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas</i> <sup>6</sup> ; each component is rated on a scale of 1 to 4; a higher rating indicates a greater hazard.		
SIZE OF PART	SIZOPART	Number Entry 1 to 4
PROBABILITY OF FAILURE	PROFOFFAIL	Number Entry 1 to 4
TARGET FREQUENCY	TTARGET	Number Entry 1 to 4
HAZARD RATING	Not included in the shapefile attribute table	Calculated sum of above three (3) components; Hazard Rating ranges from 3 to 12, with ratings 8 to 12 representing an elevated and significant risk
<b>POTENTIAL TARGETS</b>		
Structures that are targets for trees at risk of whole or partial (limbs and co-dominant stems) failure; people are targets wherever they are present near these facilities.		
BUILDING TARGET	TABUIL	Building within falling distance of part of tree at risk for failure
PARK BENCH TARGET	TABENCH	Park bench, swing, spectator stands, or other seating area within falling distance of part of tree at risk for failure
PICNIC TABLE TARGET	TATABLE	Picnic table or shelter within falling distance of part of tree at risk for failure
PLAYSCAPE TARGET	TAPLAYSCAP	Playscape or playground feature within falling distance of part of tree at risk for failure

<sup>5</sup>Council of Tree & Landscape Appraisers, *Guide for Plant Appraisal*, 9<sup>th</sup> Edition, 2000, published by the International Society of Arboriculture, Champaign, IL.

<sup>6</sup> Matheny, Nelda P. and Clark, James R., *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas*, 2<sup>nd</sup> Edition, 1994, International Society of Arboriculture, Savoy [now Champaign], IL.

Table A1. Data Fields and Their Descriptions

EXCEL SPREADSHEET FIELD NAME	ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME	DATA ENTRY DESCRIPTION
ROADWAY/VEHICLES TARGET	TAPARKING	Street, parking lot, driveways, or vehicles in other locations within falling distance of part of tree at risk for failure
WALKING TRAIL TARGET	TATRAIL	Sidewalk or walking trail within falling distance of part of tree at risk for failure
WALL TARGET	TARWALL	Brick, stone, or other type of wall within falling distance of part of tree at risk for failure
TARGET OTHER	TAR_OTHER	Other targets within falling distance of part of tree at risk for failure
<b>MANAGEMENT RECOMMENDATIONS</b>		
Recommendations for tree management, including general maintenance, pruning, protection, planting, and removal		
<b>GENERAL</b>		
AERATE CRZ	AERATECRZ	Aeration of the CRZ recommended to increase available oxygen and water
CABLE/BRACE	CABLEBRACE	Cabling and bracing of co-dominant stems with included bark to increase strength and reduce risk of failure
FERTILIZE	FERTILIZE	Fertilize according to soil test results and arboricultural standards
INSPECT ANNUALLY	INSPECTREG	Inspect tree annually
INSTALL LIGHTNING PROTECTION	INSTALLPRO	Tree is a good candidate for the installation of lightning protection
MULCH	MULCH	Mulch or remulch tree according to arboricultural standards
<b>PRUNE</b>		
Pruning recommendations that indicate the reasons for pruning; more than one pruning recommendation may be made for a single tree		
CLEARANCE PRUNE	PRUNECLEAR	Prune for clearance over roadways, sidewalks, walkways, mailboxes, around buildings, signs, and utility lines or equipment, or raise crown to allow pedestrian, vehicle, or mower access
CORRECTIVE PRUNE	PRUNCORREC	Prune established and mature trees to correct results of improper pruning or poor form
CROWN CLEANING PRUNING	PRUNCROWN	Prune to remove dead, diseased, dying, crossed, broken, rubbing and otherwise objectionable branches
RISK REDUCTION PRUNE	PRUNERISK	Prune to reduce risk of limb or partial tree failure
TRAINING PRUNE	PRUNETRAI	Prune young trees to remove co-dominant stems and train structure
UTILITY CLEARANCE PRUNE	PRUNEUTIL	Prune trees to provide clearance for overhead utility lines
PRUNING PRIORITY	PRU_PRIOR	Standard priority unless otherwise noted
<b>PROTECT</b>		
Entered only for especially large, old trees that may or may not be showing some signs of decline		

Table A1. Data Fields and Their Descriptions

<b>EXCEL SPREADSHEET FIELD NAME</b>	<b>ARCMAP SHAPEFILE ATTRIBUTE TABLE NAME</b>	<b>DATA ENTRY DESCRIPTION</b>
PROTECT ROOTS	PROROOT	Protect roots within the CRZ from damage
PROTECT TRUNK	PROTECTTRU	Protect the trunk from damage
PROTECT CROWN	PROTECTCRO	Protect the entire crown from damage
PROTECT SCAFFOLD LIMBS	PROTECTSCA	Protect the scaffold limbs from damage
PROTECT WHOLE TREE	PROTECTWHO	Protect the entire tree, above and below ground, from damage
<b>PLANT</b>		
The number of trees recommended for planting at the location by mature height		
PLANT LARGE TREE(S)	LGTREE	Number of large trees the site can accommodate
PLANT MEDIUM TREE(S)	MEDTREE	Number of medium trees the site can accommodate
PLANT SMALL TREE(S)	SMTREE	Number of small trees the site can accommodate
<b>REMOVE</b>		
Removal recommendations		
REMOVE DEAD TREE	REMOVDEAD	Remove dead tree
REMOVE LIVE TREE	REMOVELIVE	Remove live tree
REMOVE STAKES/GUY WIRES	REMOVESTAK	Remove stakes and guy wires from the tree and the base of the tree
REMOVE STUMP	REMOVSTUMP	Remove (grind) a tree stump
REMOVE TARGET	REMOVETARG	Remove a target to reduce risk due to failure
REMOVE VINE	REMOVEVINE	Remove vines from the tree trunk or from around the base of the tree; may include English ivy, kudzu, poison ivy, or other vine
REMOVE OTHER	REMOVEOTHE	Remove other things from around the tree; often used to indicate the need to remove volunteer woody saplings around the tree