i-Tree Ecosystem Analysis City of Mandeville, Louisiana

Urban Forest Effects and Values

September 1, 2011

Abstract

An analysis of trees in the city of Mandeville, LA, reveals that this area has about 151,347 trees with tree and shrub canopies that cover 54% percent of the city. The most common tree species are loblolly pine, bald cypress, water oak and live oak. Trees in the City of Mandeville currently store about 8,609.82 tons of carbon per year with an associated estimated value of $ 1.5 million per year. In addition, these trees remove about 428,117.18 of carbon dioxide per year. Mandeville's trees are estimated to reduce annual residential energy costs by $81,753 annually. The structural value of the trees is estimated at $766 million. Information on the structure and functions of the urban forest can be used to inform urban forest management programs and to integrate urban forests within plans to improve environmental quality in the city of Mandeville.

Authored by: Dr. Thomas N. Legiandenyi and Dr. Kamran K. Abdollahi

Acknowledgments
Our heartfelt thanks go to David J. Nowak, research forester and project leader and Robert E. Hoehn U.S. Forest Service, Pacific Southwest Research Station for their help with this project and in analysis of data.

Executive Summary

Trees in cities can made a significantly contribution to human health and environmental quality. Regrettably, relatively little is known about the urban forest resource and its contribution to the local and regional society and economy. To better understand the urban forest resource and its numerous values, the U.S. Forest Service, Northern Research Station, developed the Urban Forest Effects (UFORE) model, which is now known and distributed as i-Tree Eco at www.itreetools.org. Results from this model are used to advance the understanding of the urban forest resource, improve urban forest policies, planning and management, provide data to support the potential inclusion of trees within environmental regulations, and determine how trees affect the environment and consequently enhance human health and environmental quality in urban areas.

Forest structure is a measure of various physical attributes of the vegetation, including tree species composition, number of trees, tree density, tree health, leaf area, biomass, and species diversity. Forest functions, which are determined by forest structure, include a wide range of environmental and ecosystem services such as air pollution removal and cooler air temperatures. Forest values are an estimate of the economic worth of the various forest functions.

To help determine the vegetation structure, functions, and values of trees in the City of Mandeville, a vegetation assessment was conducted during the summer of 2011. For this assessment, 0.1-acre field plots were sampled and analyzed using the UFORE model. This report summarizes results and values of:

- Forest structure
- Potential risk to forest from insects or diseases
- Air pollution removal
- Carbon storage
- Annual carbon removal (sequestration)
- Changes in building energy use

Map of City of Mandeville i-Tree Ecosystem Analysis Plots

City Mandeville Urban Forest Summary (Trees)	
Feature	Measure
Number of trees	151,347
Tree cover	41.42%
Shrub cover	12.04
Most common species	Loblolly pine , Bald cypress, Sweet gum, Water oak , Live Oak ,
Percentage of trees < 6-inches diameter	38%
Pollution removal - trees	
Tree and shrubs*	428,117.18 million tons/year()428,117.18
Carbon storage	8,609.8 million tons/year
Carbon sequestration	$ 1.5 million
Building energy reduction	$81,753
Reduced carbon emissions	8,609.82 tons
Structural value	$766 million

*Shrub removal estimate is approximate as shrub leaf area parameters were not measured

Ton – short ton (U.S.) (2,000 bs)

Urban Forest Effects Model and Field Measurements

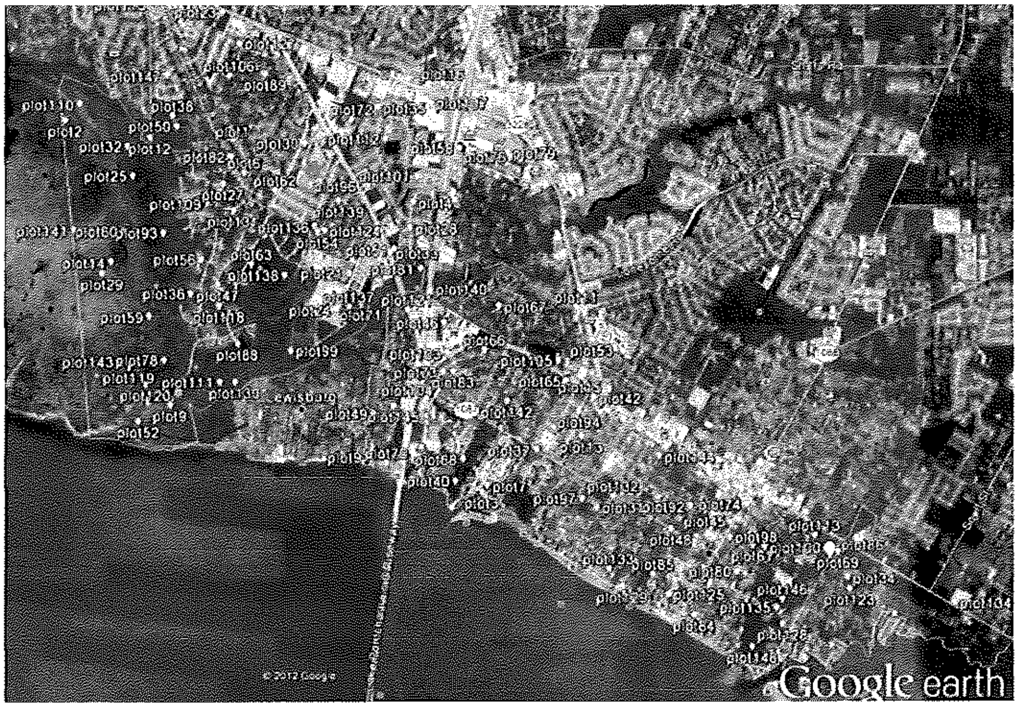
Though urban forests have many functions and values, currently only a few of these attributes can be assessed due to a limited ability to quantify all of these values through standard data analyses. To help assess the city's urban forest, data from 150 field plots located throughout the city of Mandeville were analyzed using the Forest Service's Urban Forest Effects (UFORE) model.

UFORE is designed to use standardized field data from randomly located plots and local hourly air pollution and meteorological data to quantify urban forest structure and its numerous effects, including:

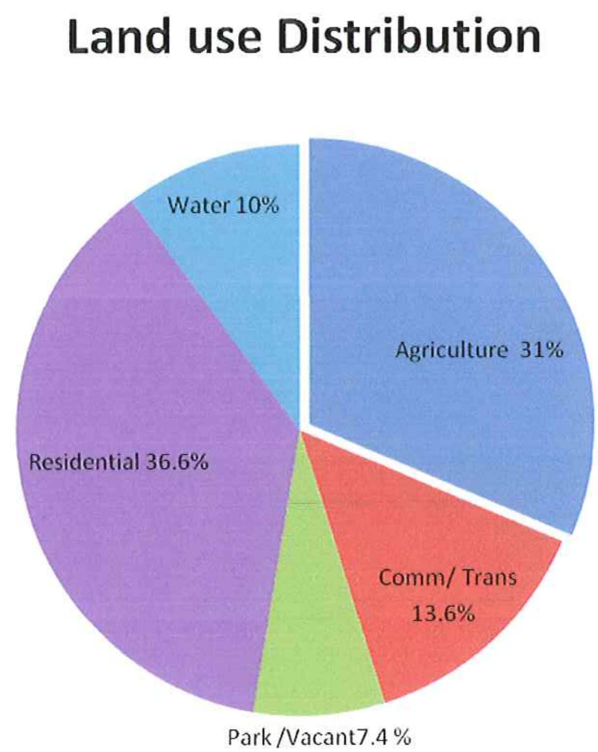
- Urban forest structure (e.g., species composition, tree density, tree health, leaf area, leaf and tree biomass, species diversity, etc.).
- Amount of pollution removed hourly by the urban forest, and its associated percent air quality improvement throughout a year. Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter (<10 microns).
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power plants.
- Compensatory value of the forest, as well as the value of air pollution removal and carbon storage and sequestration.
- Potential impact of infestations by Asian longhorned beetles, emerald ashborers, gypsy moth, or Dutch elm disease.

For more information go to http://www.ufore.org or www.itreetools.org

In the field, 0.1-acre plots were selected based on a randomized grid with an average density of approximately 1 plot for every 865 acres. Based on these criteria the city of Mandeville is divided into 150 plots which are used for this study. See the Map bellow.



Field data were collected by the Southern University A and M university, Urban forestry graduate students; data collection took place during the leaf-on season to properly assess tree canopies. Within each plot, data included land-use, ground and tree cover, shrub characteristics, and individual tree attributes of species, stem diameter at breast height (d.b.h.; measured at 4.5 ft), tree height, height to base of live crown, crown width, percentage crown canopy missing and dieback, and distance and direction to residential buildings. Trees were recorded as woody plants with a d.b.h. greater than or equal to 1 inch. As many species are classified as small tree/large shrub, the 1-inch minimum d.b.h. of all species means that many species commonly considered as shrubs will be included in the species tallies when they meet the minimum d.b.h. requirement. In addition, monocot plants that reached minimum d.b.h. were also tallied in Mandeville (e.g. palm trees).



To calculate current carbon storage, biomass for each tree was calculated using equations from the literature and measured tree data. Open-grown, maintained trees tend to have less biomass than predicted by forest-derived biomass equations (Nowak, D.J. 1994). To adjust for this difference, biomass results for open-grown urban trees are multiplied by 0.8.[3] No adjustment was made for trees found in natural stand conditions. Tree dry-weight biomass was converted to stored carbon by multiplying by 0.5.[3]

To estimate the gross amount of carbon sequestered annually, average diameter growth from appropriate genera and diameter class and tree condition was added to the existing tree diameter (year x) to estimate tree diameter and carbon storage in year $x+1$.

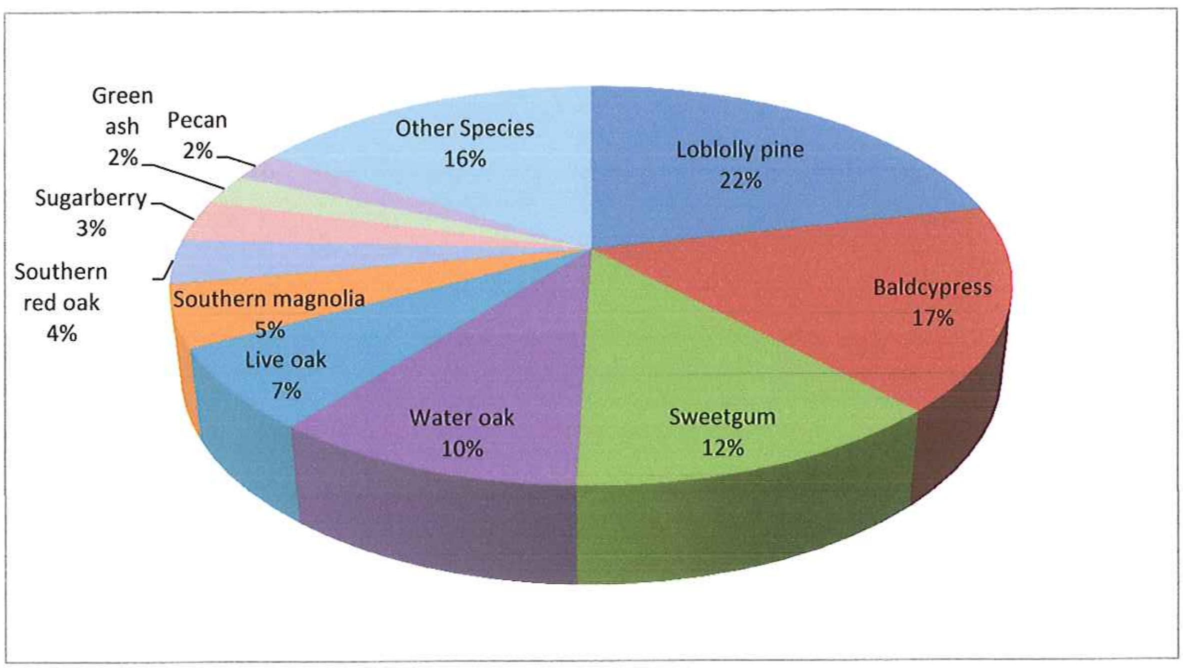
Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multi-layer canopy deposition models (Baldocchi, D. 1988) and (Baldocchi, D.D.; Hicks, B.B.; Camara, P. 1987). As the removal of carbon monoxide and particulate matter by vegetation is not directly related to transpiration, removal rates (deposition velocities) for these pollutants were based on average measured values from the literature, Bidwell, R.G.S.; Fraser, D.E. 1972 and Lovett, G.M. 1994, that were adjusted depending on leaf phenology and leaf area. Particulate removal incorporated a 50-percent resuspension rate of particles back to the atmosphere.

Seasonal effects of trees on residential building energy use was calculated based on procedures as described in the literature by McPherson, E.G.; Simpson, J.R. 1999 . Distance and direction of trees from residential structures, tree height, and tree condition data was used to make the calculations. Compensatory values were based on valuation procedures of the Council of Tree and Landscape Appraisers, which uses tree species, diameter, condition, and location information (Nowak, D.J.; Crane, D.E.; Dwyer, J.F. 2002).To learn more about UFORE methods visit: http://nrs.fs.fed.us/tools/ufore/, www.itreetools.org, or http://www.ufore.org

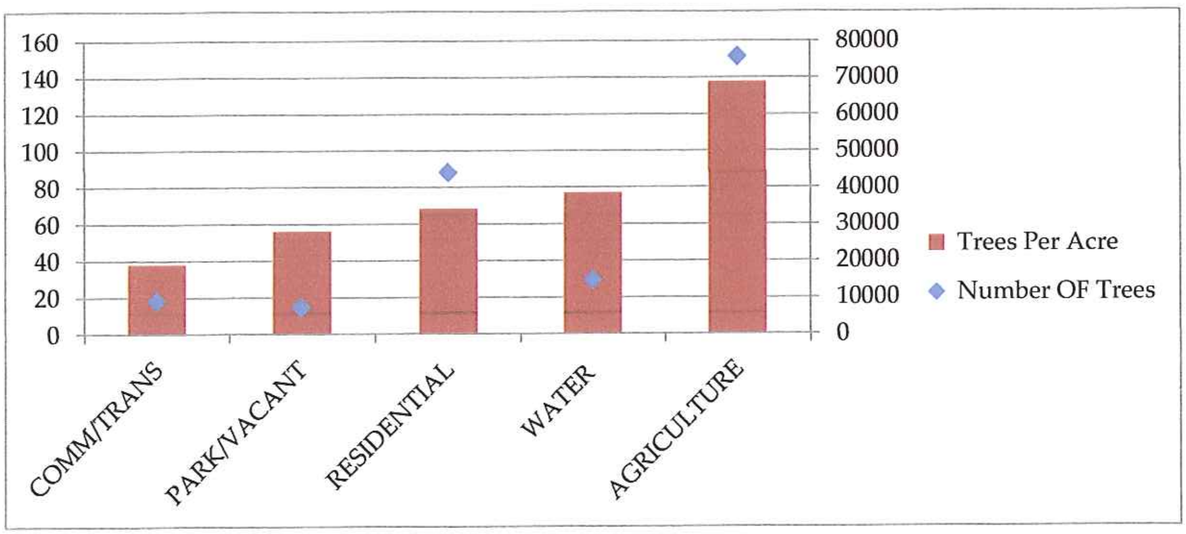
Tree Characteristics of the Urban Forest

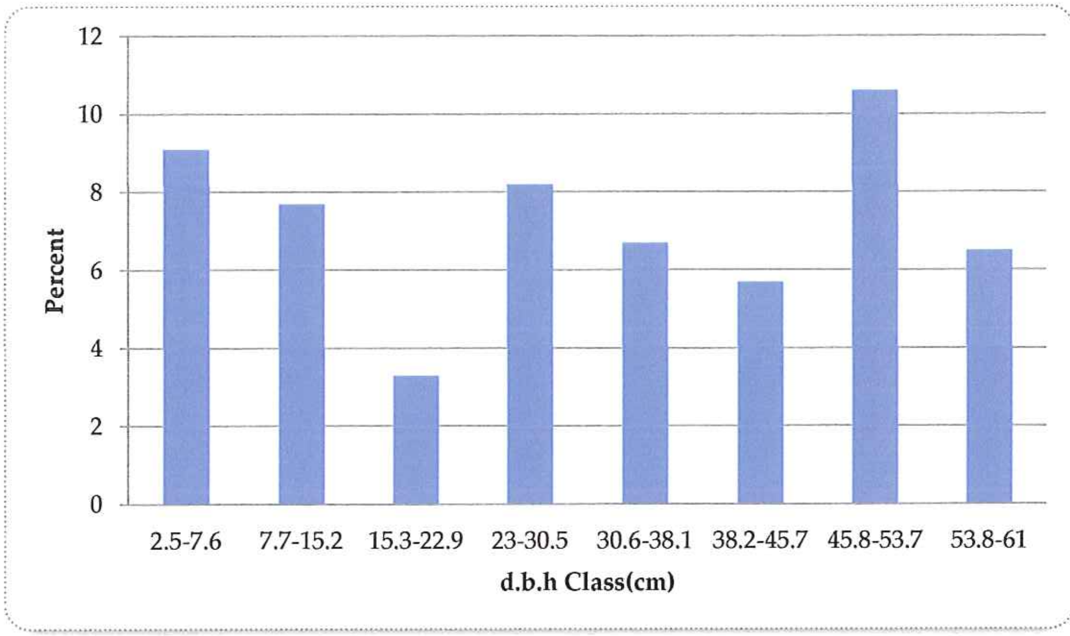
City of Mandeville has an estimated 151, 348 trees with a standard error (SE) of 7373. Tree and shrub cover in City of Mandeville is estimated to cover 41.42 percent. The five most common species in the urban forest were Loblolly pine (22.5 percent), Bald cypress (17.1 percent), Sweet gum (12.9 percent), Water oak (10 percent) and Live Oak (6.9 percent).

The 10 most common species account for over 80 percent of all trees; their relative abundance is illustrated below.

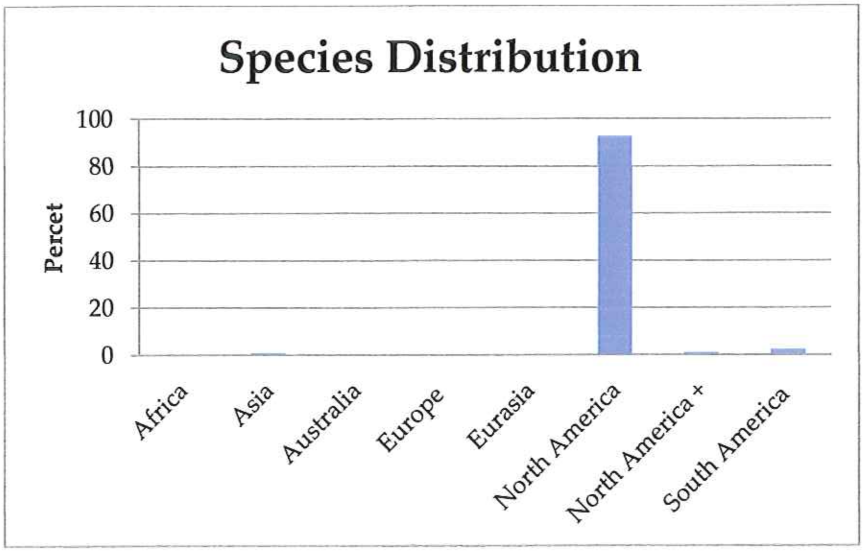


The highest density of trees occurs in agricultural lands (137.6 trees/acre), followed by residential (68.4 trees/acre) and vacant land (56.2 trees/acre). The overall tree density in the city of Mandeville is 86.0 trees/ acre, which compared well to other city tree densities which range between 9.1 and 119.2 trees/acre (Appendix III). Trees that have diameters less than 6 inches account for 25.0 percent of the population. Land uses that contain the most leaf area are agricultural land and residential lands (30.0 percent of total tree leaf area)





Urban forests are a mix of native tree species that existed prior to the development of the city. For the city of Mandeville, 93% of the tree species are native to North America. The exotic species that were introduced by residents or other means make up a very small percentage of the urban forestry here. Often a city has a tree diversity that is higher than surrounding native landscapes. Increased tree diversity can minimize the overall impact or destruction by a species-specific insect or disease, but the increase in the number of exotic plants can also pose a risk to native plants if exotic species are invasive and out-compete and displace native species. Trees with a native origin outside of North America are mostly from South America (3 percent of the species). Trees from other areas of the world make up a very small percentage of trees in the City of Mandeville. One observation make was that there were very few from Asia unlike in the neighboring towns where there is a lot of Chinese Tallow. There is a need for research to investigate the factors in making it hard for the growth of invasive species such as Chinese Tallow and this could hold the key to solving the problem of invasive species in other areas.

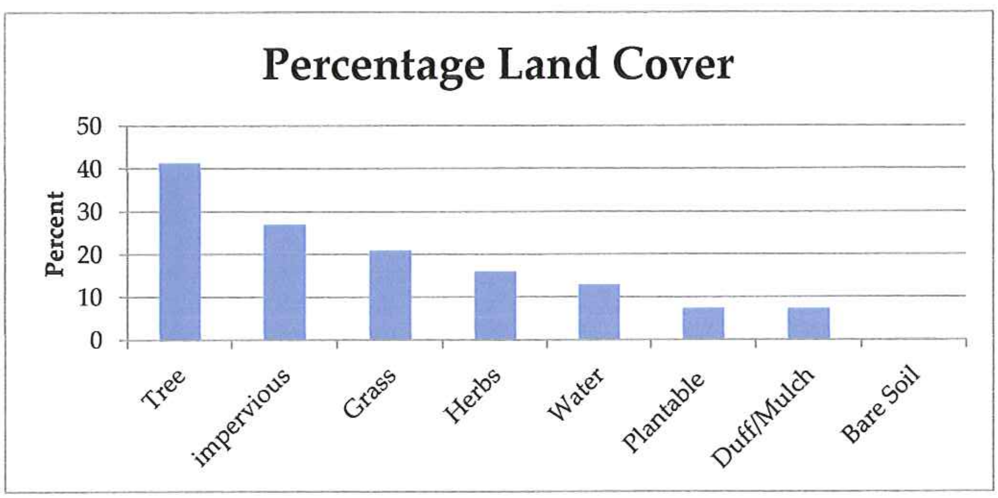


+ native to North America and one other continent, excluding South America

**

Urban Forest Cover and Leaf Area

Tree cover in the City of Mandeville is about 41.4 percent, with shrub cover occupying approximately 12.0 percent. Other ground cover types include impervious (27.0 percent), bare soil (0.3 percent), and herbaceous (16 percent).



Many tree benefit s are linked directly to the amount of healthy leaf surface area of the plant. In Mandeville, trees that dominate in terms of leaf area are bald cypress, loblolly pine, sweet gum, water oak and live oak.

Common Name	% Pop[a]	% LA[b]	IV[c]
Loblolly pine	22.5	19.5	42
Baldcypress	17.1	26	43.1
Sweetgum	12.9	11	23.9
Water oak	10.6	10	20.6
Live oak	6.9	6.4	13.3
Southern magnolia	5.2	4.6	9.8
Southern red oak	3.7	3.2	6.9
Sugarberry	3.5	6.2	9.7
Green ash	2.5	1.7	4.2
Pecan	2.4	1.7	4.1

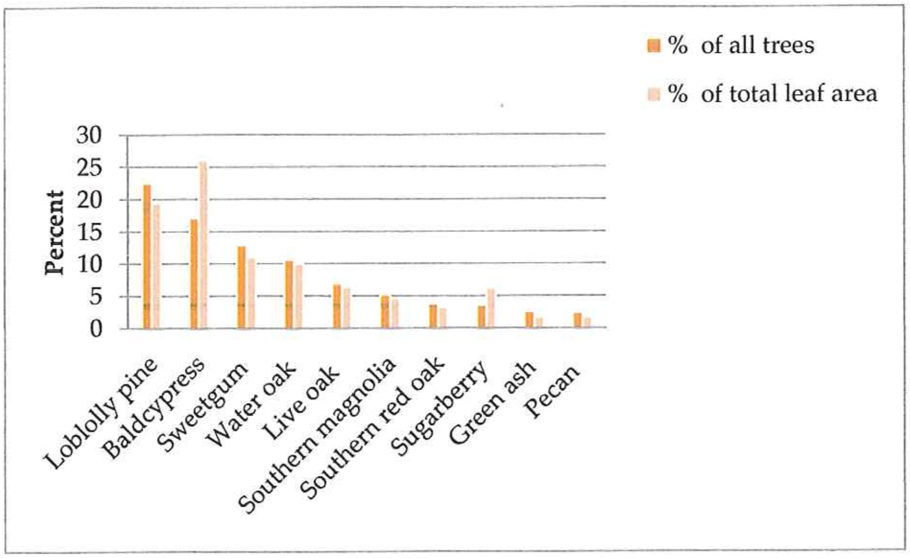
[a] percent of population

[b] percent of leaf area

[c] Percent Pop + Percent LA

Tree species with relatively large individuals contributing leaf area to the population (Species with percent of leaf area much greater than percent of total population) are bald cypress with a total percentage population of 17.1 percent and sugarberry 3.5% consequently t with a total leaf area of 26% and 6.2%. Smaller trees in the population are green ash and pecan (species with percent of leaf area much less than percent of total population). The species must also have constituted at least 2 percent of the total population to be considered as relatively large or small trees in the population.

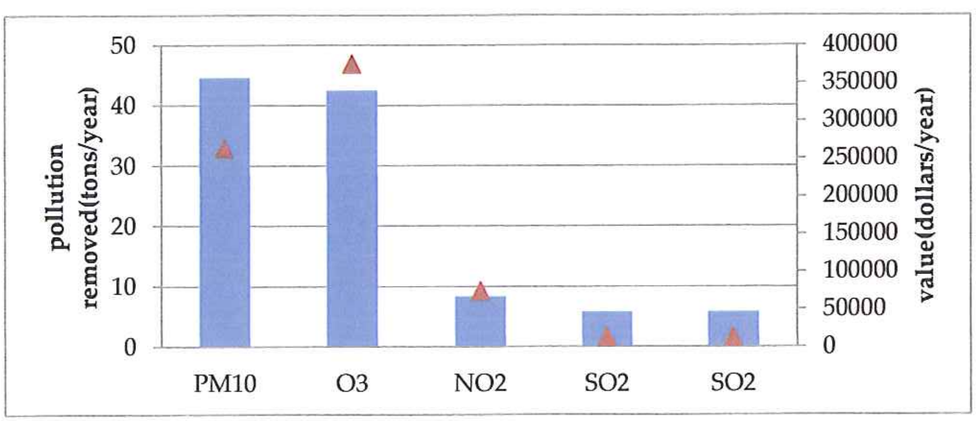
The importance values (IV) are calculated using a formula that takes into account the relative leaf area and relative abundance. The most important species in the urban forest, according to calculated IVs, are bald cypress, loblolly pine sweet gum, water oak, live oak and sugar berry. High importance values do not mean that these trees should necessarily be used in the future, rather that these species currently dominate the urban forest structure.

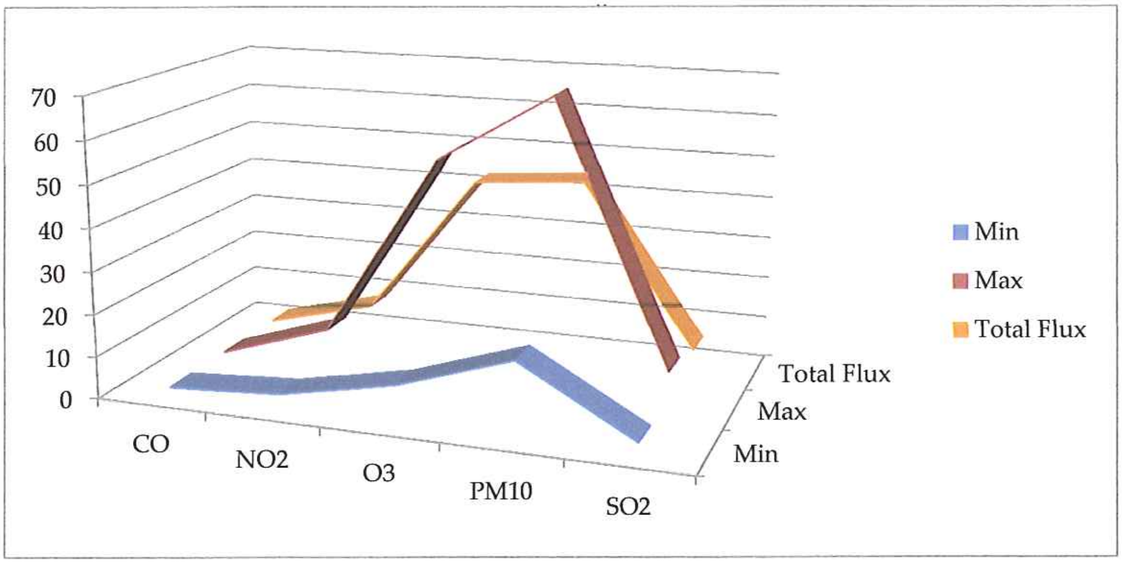


Air Pollution Removal by Urban Trees

Poor air quality is a common problem faced in many urban areas. This can lead to human health problems, destroy landscape materials and interfere with ecosystem processes, and could result in reduced visibility. Urban forest can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings and this intern reduce air pollutant emissions from power plants.

Trees also emit volatile organic compounds that can contribute to ozone formation. However the benefits of trees out weight this. Integrative studies carried out have revealed that an increase in tree cover leads to reduced ozone formation. (Nowak D.J.; Dwyer, J.F. 2000.)





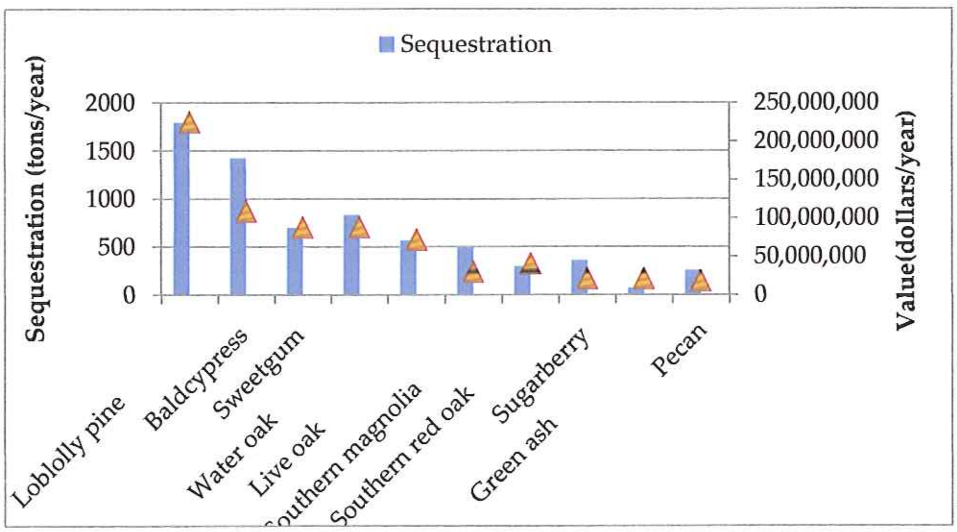
Pollution removal by trees (41.42 percent tree cover) in the city of Mandeville was estimated using the UFORE model in conjunction with field data and hourly pollution and weather data for the year 2000.

Pollution removal was greatest for particulate matter less than 10 microns (PM10), followed by ozone (O3), nitrogen dioxide (NO2), carbon monoxide (CO), and sulfur dioxide (SO2). It is estimated that trees remove 103 tons of air pollution (CO, NO2, O3, PM10, SO2) per year with an associated value of $726, 289.3264 thousands (based on estimated 2007 national median externality costs associated with pollutants14). The effects of shrub cover in the City of Mandeville (12.8 percent cover) would remove an additional estimated 30 tons per year ($211,540.5/year). Thus, tree and shrub cover combined remove approximately 133 tons of pollution per year ($1 million per year). The shrub removal estimate is approximate and assumes a removal rate that is 0.95 of the tree removal rate per unit area of cover based on average shrub-tree removal ratio from 23 cities.

Carbon Storage and Sequestration

Today climate change is an issue of global concern. Urban trees can mitigate climate change by sequestering atmospheric carbon (from carbon dioxide) in tissue and by reducing energy use in buildings, and thereby reducing carbon dioxide emissions from fossil-fuel based power plants (Abdollahi, K.K.; Ning, Z.H.; Appeaning, A., eds.2000).

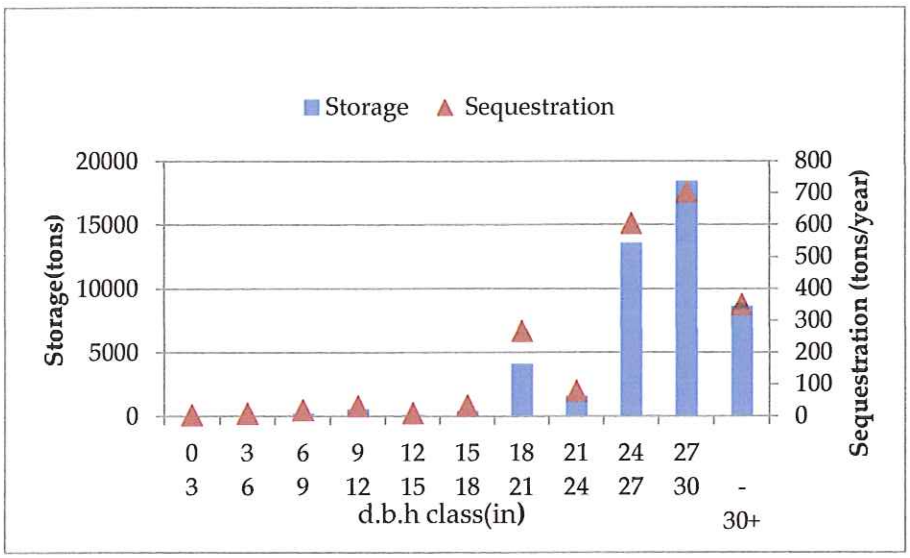
Trees reduce the amount of carbon in the atmosphere by sequestering carbon in new tissue growth every year. The amount of carbon annually sequestered is increased with healthier and larger diameter trees. Gross sequestration by City of Mandeville's trees is about 8,609.82 tons of carbon per year (428,117.18 tons per year of carbon dioxide) with an associated value of $ 1.5 million per year. Net carbon sequestration in City of Mandeville is estimated at about 7,947.84 tons per year, based on estimated carbon loss due to tree mortality and decomposition.



Carbon storage by trees is another way in which trees can influence global climate change. As trees grow, they store more carbon by holding it in their accumulated tissue. As trees die and decay, they release much of the stored carbon back to the atmosphere. Therefore, carbon storage is an indication of the amount of carbon that can be released if trees are allowed to die and decompose.

Maintaining healthy trees will keep the carbon stored in trees, but tree maintenance can contribute to carbon emissions (Nowak, D.J.; Stevens, J.C.; Sisinni, S.M.; Luley, C.J. 2002). Once the trees die, making use of the wood in long-term wood products or to help heat buildings or produce energy will help reduce carbon emissions from wood decomposition or from fossil-fuel-based power plants. Carbon storage by trees is another way trees can influence global climate change.

Trees in Mandeville are estimated to store 428,117.18 tons of carbon (1.55 million tons of carbon dioxide) ($8.6 million). Of all the species sampled, loblolly pine accounts for the highest percentage of total carbon stored followed by bald cypress.



Trees Affect Energy Use in Buildings

Trees influence energy consumption by shading buildings, providing evaporative cooling, and blocking winter winds. They tend to reduce building energy consumption in the summer months and can either increase or decrease building energy use in the winter months, depending on the location of trees around the building. To enhance or sustain evaporative cooling from trees in Los Angeles, many trees are or may need to be irrigated. Estimates of tree effects on energy use are based on field measurements of tree distance and direction to space-conditioned residential buildings (McPherson, E.G.; Simpson, J.R. 1999).

Based on average energy costs in 2009 in New Orleans; 11. Cents/kWh and $10.50 per MMBtu (http://www.entergy-neworleans.com/news_room/newsrelease.aspx?NR_ID=1656) trees in the City of Mandeville are estimated to reduce energy costs from residential buildings by $81,753 annually. Trees also provide an additional 171 tons in value per year by reducing amount of carbon released by fossil-fuel based power plants (a reduction of 86 tons of carbon emissions or 309 tons of carbon dioxide).

Annual energy savings due to trees near residential buildings

	Heating	Cooling	Total
MBTU[a]	-7786	n/a	-7786
MWH[b]	-334	4266	3932
Carbon avoided	-171	257	86

[a]Million British Thermal Units

[b]Megawatt-hour

Structural and Functional Values

Urban forests have a structural value based on the tree itself (e.g., the cost of having to replace the tree with a similar tree).

The structural value (Nowak, D.J.; Crane, D.E.; Dwyer, J.F. 2002) of the trees and forests in the City of Mandeville is about $766,293,094. The structural value of an urban forest tends to increase with a rise in the number and size of healthy trees. Urban forests also have functional values (either positive or negative) based on the functions the tree performs. Annual functional values also tend to increase with increased number and size of healthy trees, and are usually on the order of several million dollars per year. There are many other functional values of the urban forest, though they are not quantified here (e.g., reduction in air temperatures and ultra-violet radiation, improvements in water quality, aesthetics, wildlife habitat, etc.). Through proper management, urban forest values can be increased. However, the values and benefits also can decrease as the amount of healthy tree cover declines.

Structural values:

• Structural value: $770 million

• Carbon storage: $ 9,761071

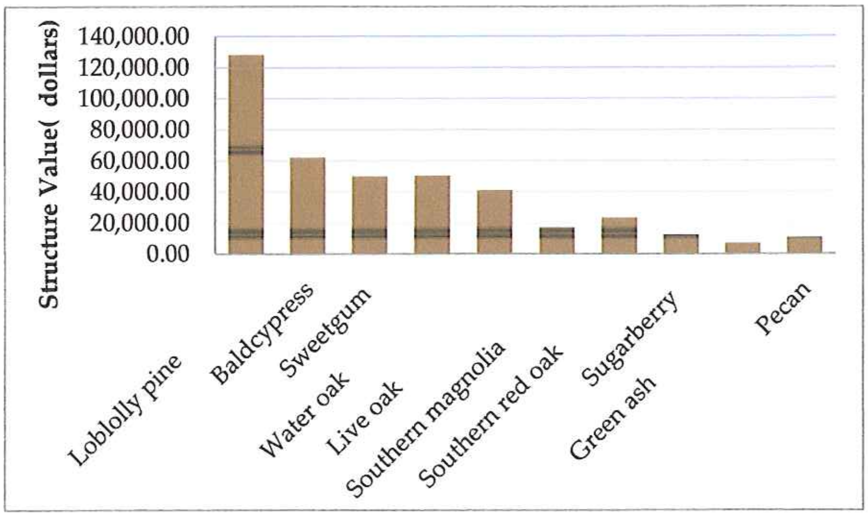
Annual functional values:

• Carbon sequestration: $2,625,070

• Pollution removal: $ 726,289.3

• Reduced energy costs: $ 81,753

Monetary estimates of ecosystem services are based on literature estimates of values per ton of pollution or carbon. Monetary values associated with urban tree carbon storage and sequestration is based on the 2001–2010 projected marginal social cost of carbon dioxide emissions, $22.8/t C (Fankhauser 1994). Pollution-removal dollar value estimates were calculated using 1994 national median externality values used in energy decision making (Murray et al. 1994, Ottinger et al. 1990). The 1994 values were adjusted to 2007 dollars based on the producer price index (U.S. Dept. of Labor 2008). These values, in dollars/metric ton (t) are as follows: nitrogen dioxide (NO2) = $9,906/t, particulate matter less than 10 microns (PM10) = $6,614/t, sulfur dioxide (SO2) = $2,425/t, carbon monoxide (CO) = $1,407/t. Externality values for ozone (O3) were set to equal the value for NO2. Externality values can be considered the estimated cost of pollution to society that is not accounted for in the market price of the goods or services that produced the pollution.

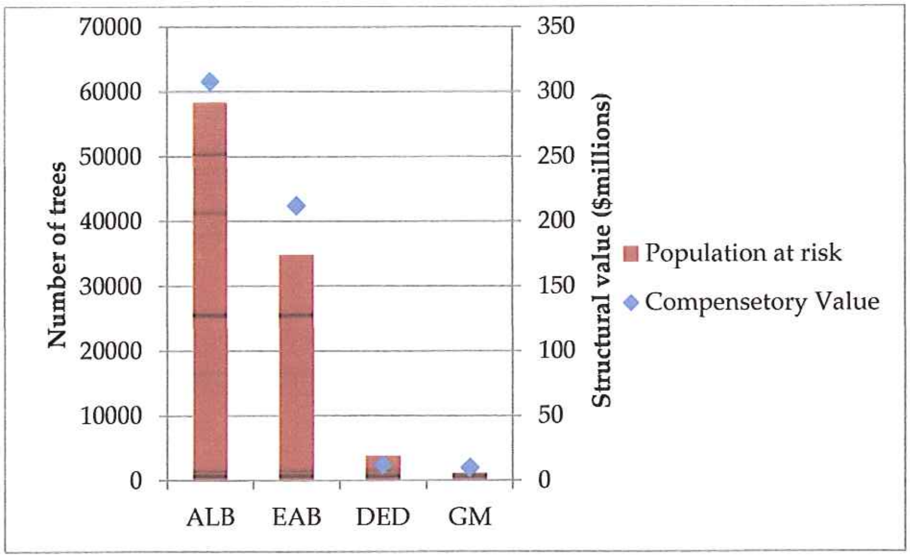


Structural value of the 10 most valuable tree species in the City of Mandeville

Potential Insect and Disease Impacts

Various insects and diseases can infest urban forests, potentially killing trees and reducing the health, value and sustainability of the urban forest. As various pests have differing tree hosts, the potential damage or risk of each pest will differ. Four exotic pests/diseases were analyzed for their potential impact: Asian long horned beetle (ALB), gypsy moth (GM), emerald ash borer (EAB), and Dutch elm disease (DED). Species hosts lists used for these pests/diseases can be found at http://nrs.fs.fed.us/tools/ufore/.

The Asian longhorned beetle (ALB) (Northeastern Area State and Private Forestry. 2005) is an insect that bores into and kills a wide range of hardwood species. ALB poses a threat to 20.1 percent of the City of Mandeville urban forest, which represents a loss of $ 211 million in damage to the structure.



The gypsy moth (GM)[Northeastern Area State and Private Forestry. 2005] is a defoliator that feeds on many species causing wide spread defoliation and tree death if outbreak conditions last several years. This pest threatens 33.5 percent of the population, which represents a loss of $308 million in structural value.

Ever since being discovered in Detroit in 2002, emerald ash borer (EAB) has killed millions of ash trees in Illinois, Indiana, Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Ontario, Pennsylvania, Quebec, Virginia, West Virginia, and Wisconsin(USDA Forest Service et al. 2010). EAB has the potential to affect 1.7 percent of the population ($12 million in structural damage).

American elm was one of the most important street trees in the twentieth century; however it has been devastated by the Dutch elm disease (DED. Since first reported in the 1930s, it has killed over 50 percent of the native elm population in the United States (Stack, R.W.; McBride, D.K.; Lamey, H.A. 1996). Although some elm species have shown varying degrees of resistance, the city of Mandeville could possibly lose 1.1 percent of its trees to this pest ($10.1 million in structural value).

General Recommendations for Air Quality Improvement

Urban vegetation can directly and indirectly affect local and regional air quality by altering the urban atmospheric environment. Four main ways that urban trees affect air quality are:

Temperature reduction and other microclimatic effects
Removal of air pollutants
Emission of volatile organic compounds (VOC) and tree maintenance emissions
Energy conservation in buildings and consequent power plant emissions

The cumulative and interactive effects of trees on climate, pollution removal, and VOC and power plant emissions determine the overall impact of trees on air pollution. Cumulative studies involving urban tree impacts on ozone have revealed that increased urban canopy cover, particularly with low VOC emitting species, leads to reduced ozone concentrations in cities. Local urban forest management decisions also can help improve air quality.

Urban forest management strategies to help improve air quality include:

Strategy	Reason
Increase the number of healthy trees	Increase pollution removal
Sustain existing tree cover	Maintain pollution removal levels
Maximize use of low VOC-emitting trees	Reduces ozone and carbon monoxide formation
Sustain large, healthy trees	Large trees have greatest per-tree effects
Use long-lived trees	Reduce long-term pollutant emissions from planting and removal
Use low maintenance trees	Reduce pollutants emissions from maintenance activities
Plant trees in energy conserving locations	Reduce pollutant emissions from power plants
Plant trees to shade parked cars	Reduce vehicular VOC emissions
Supply ample water to vegetation	Enhance pollution removal and temperature reduction
Plant trees in polluted or heavily populated areas	Maximizes tree air quality benefits
Avoid pollutant-sensitive species	Improve tree health
Utilize evergreen trees for particulate matter	Year-round removal of particles

Conclusion

Data from this report provide the basis for a better understanding of the urban forest resource and the ecosystem services and values provided by this resource. Managers and citizens can use these data to help develop improved long-term management plans and policies to sustain a healthy urban tree population and ecosystem services for future generations. Improved planning and management to sustain healthy tree populations can lead to improved environmental quality and quality of life for the City of Mandeville residents.

Appendix I. itree Model and Field Measurements

UFORE/itree is designed to use standardized field data from randomly located plots and local hourly air pollution and meteorological data to quantify urban forest structure and its numerous effects [Nowak, D.J., and D.E. Crane. 2000.], including:

• Urban forest structure (e.g., species composition, tree health, leaf area, etc.).

• Amount of pollution removed hourly by the urban forest, and its associated percent air quality improvement throughout a year. Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter (<10 microns).

• Total carbon stored and net carbon annually sequestered by the urban forest.

• Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power plants.

• Structural value of the forest, as well as the value for air pollution removal and carbon storage and sequestration.

• Potential impact of infestations by Asian longhorned beetles, emerald ash borers, gypsy moth, and Dutch elm disease.

In the field 0.1 acre plots were randomly distributed. Typically, all field data are collected during the leaf-on season to properly assess tree canopies. Within each plot, typical data collection (actual data collection may vary depending upon the user) includes land use, ground and tree cover, individual tree attributes of species, stem diameter, height, crown width, crown canopy missing and dieback, and distance and direction to residential buildings[Nowak, D.J.; Crane, D.E.; Stevens, J.C.; Hoehn, R.E. 2005].

To calculate current carbon storage, biomass for each tree was calculated using equations from the literature and measured tree data. Open-grown, maintained trees tend to have less biomass than predicted by forest-derived biomass equations [Nowak, D.J. 1994]. To adjust for this difference, biomass results for open-grown urban trees were multiplied by 0.8. No adjustment was made for

Cont. Appendix I itree Model and Field Measurements

trees found in natural stand conditions. Tree dry-weight biomass was converted to stored carbon by multiplying by 0.5.

To estimate the gross amount of carbon sequestered annually, average diameter growth from the appropriate genera and diameter class and tree condition was added to the existing tree diameter (year x) to estimate tree diameter and carbon storage in year x+1.

Air pollution removal estimates are derived from calculated hourly tree-canopy resistances for ozone, and sulfur and nitrogen dioxides based on a hybrid of big-leaf and multilayer canopy deposition models [Baldocchi, D. 1988 and Baldocchi, D.D.; Hicks, B.B.; Camara, P. 1987]. As the removal of carbon monoxide and particulate matter by vegetation is not directly related to transpiration, removal rates (deposition velocities) for these pollutants were based on average measured values from the literature [Bidwell, R.G.S.; Fraser, D.E. 1972 and Lovett, G.M. 1994] that were adjusted depending on leaf phenology and leaf area. Particulate removal incorporated a 50 percent resuspension rate of particles back to the atmosphere [Zinke, P.J. 1967].

If appropriate field data were collected, seasonal effects of trees on residential building energy use were calculated based on procedures described the literature [McPherson, E.G. and J. R. Simpson 1999] using distance and direction of trees from residential structures, tree height and tree condition data.

Structural values were based on valuation procedures of the Council of Tree and landscape Appraisers [Northeastern Area State and Private Forestry. 2005], which uses tree species, diameter, condition and location information.

Appendix II Relative Tree Effects

The urban forest in the city of Mandeville provides benefits that include carbon storage and sequestration, and air pollutant removal. To estimate the relative value of these benefits, tree benefits were compared to estimates of average municipal carbon emissions [Total city carbon emissions were based on 2003], average passenger automobile emissions [Total city carbon emissions were based on 2003], and average household emissions [Average passenger automobile emissions per mile were based on dividing total 2002].

Carbon storage is equivalent to:

- Amount of carbon emitted in Mandeville in 43 days
- Annual carbon (C) emissions from 260,000 automobiles
- Annual C emissions from 131,000 single-family houses

Carbon monoxide removal is equivalent to:

- Annual carbon monoxide emissions from 21 automobiles
- Annual carbon monoxide emissions from 89 single-family houses

Nitrogen dioxide removal is equivalent to:

- Annual nitrogen dioxide emissions from 4,250 automobiles
- Annual nitrogen dioxide emissions from 2,830 single-family houses

Sulfur dioxide removal is equivalent to:

- Annual sulfur dioxide emissions from 49,800 automobiles
- Annual sulfur dioxide emissions from 834 single-family houses

Particulate matter less than 10 micron (PM10) removal is equivalent to:

- Annual PM10 emissions from 342,000 automobiles
- Annual PM10 emissions from 33,000 single-family houses

Annual carbon sequestration is equivalent to:

- Amount of carbon emitted in Milwaukee in 1.6 days
- Annual C emissions from 9,300 automobiles
- Annual C emissions from 4,700 single-family houses

Note: estimates above are partially based on the user-supplied information on human population total for study area

Appendix III. Inventory of trees Samples by Plot in the City of Mandeville

INVENTORY OF TREES SAMPLED BY PLOT IN THE CITY OF MANDEVILLE

PLOT	NUMBER	SCIENTIFIC NAME	DBH (cm)	HEIGHT (m)	CROWN GROUND AREA (m2)	TREE CONDITION	LEAF AREA (m2)	LEAF BIOMASS (kg)	LEAF AREA INDEX	CARBON STORAGE (kg)	GROSS CARBON SEQ (kg/yr)	TREE VALUE (U.S. $)	STREET TREE	NATIVE TO STATE
1	73	Liquidambar styraciflua	113.4	12.4	47	Excellent	750.24	12.59	3.89	5875.90	45.56	10,411	NO	NO
1	76	Pinus taeda	107.8	20.3	42	Good	335.60	27.31	8.2	3234.53	46.37	9,459	NO	NO
1	75	Pinus taeda	117.8	15.5	62.3	Excellent	305.37	9.55	4.76	2309.13	45.91	10,847	NO	NO
1	72	Pinus taeda	114.3	19.4	59.1	Excellent	303.46	24.81	5.17	3075.52	42.81	11,735	NO	NO
1	74	Pinus taeda	105.8	14.4	22.6	Excellent	169.74	24.93	5.5	2874.75	52.46	11,474	NO	NO
1	78	Quercus laurifolia	41	13.3	35.3	Excellent	165.32	15.75	4.74	344.85	15.49	4,629	NO	NO
1	77	Quercus nigra	79.2	13.3	13.3	Excellent	170.05	15.58	5.35	2051.21	94.15	5,666	NO	NO
		PLOT TOTAL			337		1912.05	127.42		15956.17	402.36	62,119		
2	258	Liquidambar styraciflua	114.3	18.6	7.3	Excellent	14.51	3.58	2.54	3258.76	24.1	3,290	NO	NO
2	257	Liquidambar styraciflua	177.2	21.3	15.0	Good	120.79	5.54	6.76	2735.54	67.57	3,143	NO	NO
2	254	Taxodium distichum	177	19.3	35.7	Excellent	471.73	75.44	8.74	3107.3	76.66	4,711	NO	NO
2	255	Taxodium distichum	129.7	18.6	45.5	Excellent	427.29	71.27	10.76	2715.75	86.54	4,175	NO	NO
2	256	Taxodium distichum	135.7	18.4	14.1	Excellent	145.74	23.48	10.26	5777.54	86.81	4,175	NO	NO
		PLOT TOTAL			140.7		1273.15	177.00		14507.95	341.55	20,771		
4	374	Pinus taeda	91.4	13.7	25.3	Excellent	240.61	23.57	6.82	2914.41	55.56	5,573	NO	NO
4	373	Taxodium distichum	85.9	13.7	14.3	Excellent	170.07	25.77	13.29	3056.96	37.4	6,463	NO	NO
		PLOT TOTAL			39.5		410.67	49.33		[illegible]	92.96	12,040		
5	341	Celtis laevigata	127	19.3	35.7	Excellent	699.5	47.42	10.92	9458.24	78.94	3,532	NO	NO
5	340	Pinus taeda	192.4	17.4	105.6	Excellent	990.11	47.65	9.4	4014.41	89.55	5,799	NO	NO
5	339	Pinus taeda	165.1	17.6	140.7	Excellent	595.51	49.55	5.01	4636.79	77.59	5,452	NO	NO
		PLOT TOTAL			260.8		1255.41	143.65		24128.38	244.08	14,870		
6	61	[illegible]	43.5	4.1	25	Excellent	175.55	3.54	4.55	349.46	16.49	1,187	NO	NO
6	58	Liquidambar styraciflua	51	13.2	18.3	Excellent	107.63	12.5	6.34	378.85	16.83	1,501	NO	NO
6	57	Liquidambar styraciflua	51	12.2	48.3	Excellent	369.53	15.95	7.49	378.85	16.83	1,501	NO	NO
6	79	Liquidambar styraciflua	76.2	17.2	51.2	Excellent	724.92	13.71	4.35	776.47	31.44	5,333	NO	NO
6	66	[illegible]	50.6	5.5	12.4	Excellent	85.11	2.99	3.2	582.78	69.05	2,790	NO	NO
6	93	Pinus taeda	111.8	20.3	43.8	Good	187.22	15.17	4.27	2697.64	49.43	10,334	NO	NO
		PLOT TOTAL			237		1723.2	63.47		5025.3	185.16	28,675		
7	262	Celtis laevigata	76.5	12.1	72.6	Excellent	355.56	21.5	4.97	1114.5	60.27	4,175	NO	NO
7	263	Celtis laevigata	68.5	10.1	72.4	Excellent	325.54	31.5	4.77	1115.2	66.12	4,175	NO	NO
7	261	Juniperus virginiana	58.9	11	55.2	Excellent	99.40	3.92	1.8	2999.72	1.28	5,540	NO	NO
		PLOT TOTAL			209		780.55	67.91		5626.62	145.25	13,890		
8	110	Pinus taeda	127	21.3	30.3	Excellent	200.95	15.3	5.94	2757.86	90.87	10,551	NO	NO
		PLOT TOTAL			30.3		200.95	15.3		2757.86	90.87	10,551		
9	354	[illegible]	76.2	15.2	12.2	Excellent	127.34	5.08	3.96	2550.35	34.42	3,558	NO	NO
9	352	Taxodium distichum	66.4	16.2	16.4	Excellent	175.43	76.31	12.65	1295.94	46.9	1,566	NO	NO
9	353	Taxodium distichum	142.1	16.4	45.7	Excellent	253.44	47.14	3.46	4741.13	30.65	4,498	NO	NO
		PLOT TOTAL			80.1		556.08	91.30		8755.64	111.52	9,550		
10	52	Celtis laevigata	16.5	3.7	13.3	Good	41.94	5.50	3.16	134	4.77	185	NO	NO
10	50	Pinus taeda	52.9	15.3	7.3	Fair	14.54	1.21	1.55	954.57	26.82	4,181	NO	NO
10	53	Pinus taeda	114.3	18.3	28.2	Fair	128.93	31.27	0.75	3770.28	50.81	7,628	NO	NO
10	51	Quercus nigra	27.9	3.3	15.2	Fair	27.53	5.93	1.33	150.75	11.37	489	NO	NO
10	54	Quercus virginiana	127	15.3	48.3	Fair	309.14	41.3	4.34	5334.35	13.46	9,250	NO	NO
		PLOT TOTAL			119		517.48	65.52		9470.6	107.22	22,122		
11	265	Quercus phellos	10.2	2.4	2.1	Excellent	17.56	1.47	2.15	15.1	4.56	174	NO	NO
11	266	Quercus phellos	10.3	7.6	2.1	Excellent	16.52	1.64	3.34	13.1	3.54	179	NO	NO
11	264	Quercus phellos	12.7	7.6	2.1	Excellent	15.57	1.37	2.27	12.45	4.33	271	NO	NO
		PLOT TOTAL			6.3		49.67	4.53		40.76	11.4	627		
12	227	Liquidambar styraciflua	91.4	12.2	13.9	Good	170.01	7.8	1.25	952.12	35.14	2,451	NO	NO
12	258	Liquidambar styraciflua	114.3	10.6	7.3	Good	14.51	3.58	2.54	3258.78	24.1	3,135	NO	NO
12	263	Magnolia grandiflora	95.5	12.5	33.7	Excellent	277.61	37.49	8.33	3859.75	113.19	2,711	NO	NO
12	259	Quercus virginiana	75.4	14.4	5.5	Good	24.16	4.59	1.74	2141.46	1.75	2,277	NO	NO
12	262	Taxodium distichum	129.2	21.4	68.5	Excellent	475.73	73.63	5.51	2235.46	38.55	2,579	NO	NO
12	260	Taxodium distichum	174.3	12.3	50.7	Excellent	356.65	34.65	7.75	2187.72	67.94	3,391	NO	NO
12	261	Triadica sebifera	116.7	10.5	35.3	Excellent	345.38	18.41	6.35	4841.42	132.95	3,563	NO	NO
		PLOT TOTAL			221		1463.61	173.89		27887.43	408.72	24,859		
13	272	Fraxinus pennsylvanica	161.5	15.2	130.6	Excellent	315.13	20.3	5.33	1393.82	73.85	2,002	NO	NO
13	274	Liquidambar styraciflua	103.5	11.7	35.7	Excellent	673.75	15.5	6.54	1247.96	67.75	7,812	NO	NO
13	273	Liquidambar styraciflua	116.6	15.9	71.1	Excellent	359.11	15.57	4.4	4116.74	58.75	2,361	NO	NO
13	276	Pinus taeda	139.7	19.2	38.9	Excellent	200.59	16.3	5.44	3450.25	82.36	4,675	NO	NO
13	277	Pinus taeda	127.7	17.8	36.3	Excellent	200.75	16.3	5.54	2440.5	82.5	4,475	NO	NO
13	275	Quercus falcata	116.8	15.5	22.3	Excellent	127.54	4.95	3.7	4507.8	25.99	3,340	NO	NO
		PLOT TOTAL			192.1		1507.58	91.71		15139.48	365.56	21,475		
17	312	Liquidambar styraciflua	68.6	11.9	20.1	Excellent	79.68	10.96	3.91	646.57	14.07	3,241	NO	NO
17	314	Pinus taeda	64	17.1	5.1	Good	11.58	0.92	3.37	3111.72	15.12	3,161	NO	NO
17	313	Pinus taeda	115.5	15.5	33.3	Good	72.06	5.55	1.32	3792.73	50.86	16,500	NO	NO
		PLOT TOTAL			116.9		163.12	17.79		9575.19	104.25	23,202		
15	48	Celtis laevigata	81.3	15.2	32.3	Excellent	141.37	9.06	6.33	2051.66	82.37	3,671	NO	NO
15	49	Cinnamomum camphora	75.2	15.2	25.3	Fair	73.99	5.45	1.48	1756.27	77.94	4,495	NO	NO
16	50	Pinus taeda	[illegible]	[illegible]	11.4	Good	[illegible]	5.5	[illegible]	[illegible]	22.81	4,894	NO	NO
16	51	Pinus taeda	107.5	14.4	12.6	Fair	54.77	4.4	4.76	1171.6	44	2,814	NO	NO
16	47	Pinus taeda	105.7	18.1	18.6	Excellent	11.79	6.8	5.1	3577.48	26.11	16,794	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

	PLOT TOTAL			43.9		374.44	19.3		7156.31	256.27	32,146		
19	472 Taxodium distichum	105.2	20.4	80.8	Excellent	574.88	82.2	6.04	2235.46	36.55	3,509	NO	NO
19	470 Taxodium distichum	114.3	17.7	52.7	Excellent	234.02	36.65	7.81	2182.27	62.91	3,771	NO	NO
19	471 Triadica sebifera	106.7	11.6	37.3	Excellent	293.9	18.64	7.44	4841.54	132.05	2,740	NO	NO
	PLOT TOTAL			157.8		1071.82	135.49		9254.78	231.33	9,970		
20	475 Taxodium distichum	124.5	15.8	57.8	Excellent	375.37	58.92	5.51	2817.47	41.35	4,114	NO	NO
20	476 Taxodium distichum	134.5	18.5	83.4	Excellent	514.43	60.55	5.76	3443.35	46.44	4,499	NO	NO
20	478 Taxodium distichum	150	19.8	72.4	Excellent	545.15	85.54	7.54	5005.72	73.31	5,311	NO	NO
20	477 Taxodium distichum	177.8	19.5	94.5	Excellent	547.81	85.79	5.79	5554.53	72.84	5,723	NO	NO
20	473 Taxodium distichum	182.9	19.2	55.2	Excellent	424.96	71.75	8.75	5550.8	55.57	5,858	NO	NO
20	474 Taxodium distichum	190.5	21.3	72.4	Excellent	612.78	94.1	8.24	6068.87	63.54	6,649	NO	NO
	PLOT TOTAL			431.8		3071.74	481.05		28254.06	310.2	31,644		
21	116 Pinus taeda	94	17.1	5.3	Good	11.96	0.97	2.27	1133.77	33.10	8,061	NO	NO
21	117 Pinus taeda	114.3	18.3	59.1	Excellent	303.45	24.61	5.12	1275.82	50.81	11,153	NO	NO
21	115 Pinus taeda	116.8	16.9	59.3	Good	72.06	5.85	1.22	1792.75	53.88	10,900	NO	NO
21	118 Pinus taeda	116.8	18.6	72.4	Excellent	369.14	29.95	5.1	1874.75	52.46	11,473	NO	NO
	PLOT TOTAL			196.2		756.73	61.38		6577.2	193.32	41,597		
22	58 Quercus virginiana	76.2	9.1	59.5	Excellent	212.93	44.7	3.35	2036.23	93.03	5,655	NO	NO
	PLOT TOTAL			59.5		212.93	44.7		2036.23	93.03	6,655		
23	41 Betula nigra	50.8	12.2	22.3	Excellent	89.45	6.91	4	567.35	67.12	855	NO	NO
23	46 Liquidambar styraciflua	76.2	13.3	13.5	Excellent	54.1	7.94	3.35	653.54	77.51	1,777	NO	NO
23	43 Magnolia grandiflora	75.2	12.2	13.9	Good	90.15	12.18	4.54	2174.53	95.57	3,751	NO	NO
23	44 Pinus taeda	109.2	17.1	16.7	Fair	177.74	14.38	5.78	1958.68	58.93	2,877	NO	NO
23	45 Quercus falcata	114.3	17.7	29.2	Fair	75.85	5.85	2.58	5464.82	106.58	2,510	NO	NO
23	42 Quercus nigra	101.5	15.7	51.3	Good	141.68	17.37	1.1	5301.75	110.34	2,513	NO	NO
	PLOT TOTAL			131.2		579.99	59.67		17250.11	519.25	12,733		
25	372 Liquidambar styraciflua	99.5	14.3	18.7	Excellent	181.66	8.34	9.73	1217.53	43.32	2,610	NO	NO
25	377 Magnolia grandiflora	177.8	18.1	74.7	Good	390.02	51.67	5.25	7336.13	13.44	5,041	NO	NO
25	376 Salix x pendulina wenderot	75.2	15.2	31.2	Excellent	151.21	9.58	4.7	2195.31	54.42	1,556	NO	NO
25	375 Salix x pendulina wenderot	75.2	15.2	32.2	Excellent	120.04	7.5	3.73	2195.13	54.42	1,556	NO	NO
25	373 Taxodium distichum	83.9	13.7	14.3	Excellent	200.61	21.42	14.63	1236.19	46.8	2,582	NO	NO
25	374 Taxodium distichum	132.1	18.3	33.7	Excellent	301.03	47.14	8.93	3274.11	80.45	4,408	NO	NO
	PLOT TOTAL			209.8		1344.59	156.75		17314.64	296.46	17,749		
26	434 Pinus taeda	116.3	19.8	8.8	Excellent	59.97	4.62	6.45	2281.91	65.11	3,721	NO	NO
26	431 Pinus taeda	127	21.3	55.7	Excellent	321.76	25.1	4.9	2952.22	75.84	4,221	NO	NO
26	432 Pinus taeda	127	20.1	16.4	Excellent	65.61	5.4	4.06	2871.94	74.43	4,221	NO	NO
26	433 Pinus taeda	127	19.8	40.3	Excellent	257.64	20.9	6.39	2862.17	74.02	4,221	NO	NO
26	435 Triadica sebifera	60.5	17.2	11.4	Excellent	95.54	7.71	8.47	5687.38	83.71	1,341	NO	NO
	PLOT TOTAL			142.5		799.52	64.73		12650.63	372.07	17,724		
29	390 Taxodium distichum	132.1	18.9	58.3	Excellent	453.47	72.58	7.82	3274.11	80.45	4,408	NO	NO
29	389 Taxodium distichum	147.2	14	57.2	Excellent	549.67	86.08	9.61	3674.54	84.09	4,761	NO	NO
29	388 Taxodium distichum	152.4	15.2	68.5	Excellent	491.02	76.9	7.73	4236.59	92.96	5,086	NO	NO
	PLOT TOTAL			180		1504.17	235.55		11185.24	257.51	14,255		
30	181 Quercus nigra	83.3	11.3	27.7	Excellent	95	8.98	3.42	2395.54	103.23	5,601	NO	NO
30	182 Quercus nigra	83.3	11.3	27.7	Excellent	110.06	10.41	3.97	2395.54	103.23	5,601	NO	NO
	PLOT TOTAL			55.5		205.06	19.39		4791.08	206.46	11,202		
31	285 Liquidambar styraciflua	139.7	17.1	77.1	Excellent	364.54	15.74	4.33	2707.74	66.12	4,128	NO	NO
31	286 Liquidambar styraciflua	139.7	17.1	77.1	Excellent	341.5	17.51	4.85	2707.74	66.12	4,128	NO	NO
31	287 Liquidambar styraciflua	139.7	17.1	77.1	Excellent	368.79	15.93	4.79	2707.74	66.12	4,128	NO	NO
31	284 Quercus nigra	106.7	18.3	77.1	Excellent	295.03	77.9	3.83	5864.44	133.73	2,651	NO	NO
31	288 Quercus virginiana	119.4	17.4	55.2	Excellent	220.45	46.28	4	6784.25	59.48	4,182	NO	NO
31	289 Quercus virginiana	119.4	17.4	55.2	Excellent	212.67	44.65	3.85	5787.44	59.48	4,382	NO	NO
31	290 Quercus virginiana	119.4	17.4	55.2	Excellent	297.48	41.36	1.76	6786.9	59.48	4,382	NO	NO
31	283 Quercus virginiana	157.5	15.7	154.6	Excellent	563.03	118.2	3.42	7297.6	37	5,653	NO	NO
	PLOT TOTAL			638.5		2513.47	331.75		41637.87	543.51	34,235		
32	371 Liquidambar styraciflua	111.8	17.4	29.2	Excellent	235.15	12.84	8.09	1851.91	53.34	3,198	NO	NO
32	370 Taxodium distichum	20.3	9	1.8	Excellent	14.63	7.29	8.07	41	6.52	247	NO	NO
32	369 Taxodium distichum	30.8	9.1	8.8	Excellent	90.04	14.1	10.2	353.07	22.35	550	NO	NO
	PLOT TOTAL			39.8		340.83	27.23		2256.56	82.21	4,395		
34	14 Liquidambar styraciflua	83.8	11.3	51.4	Excellent	225.14	10.34	1.87	772	17.36	2,077	NO	NO
34	15 Liquidambar styraciflua	114.3	15.8	72.3	Excellent	140.01	6.57	6.4	2171.99	59.77	3,290	NO	NO
34	11 Pinus taeda	147.3	19.2	94.5	Excellent	539.03	44.72	5.7	3849.21	88.21	4,917	NO	NO
34	10 Quercus falcata	139.7	18.3	55.7	Excellent	271.35	20.27	4.7	7054.7	31.52	4,457	NO	NO
34	12 Quercus nigra	76.2	11.6	42	Excellent	174.09	16.45	4.34	2355.83	85.57	3,659	NO	NO
34	13 Quercus nigra	111.8	11.6	36.8	Excellent	275.23	25.17	3.18	6199.59	57.95	3,070	NO	NO
	PLOT TOTAL			352.3		1515.82	123.43		22581.81	319.75	19,470		
35	177 Magnolia grandiflora	71	9.1	7.3	Good	20.58	2.78	2.82	1000.23	55.8	3,494	NO	NO
35	178 Palm species	81.8	5.7	0.7	Excellent	5.67	0.68	8.64	5.03	0.75	590	NO	NO
	PLOT TOTAL			8		26.27	3.65		1005.26	56.55	4,083		
36	125 Carya illinoinensis	63.5	9.1	29.2	Excellent	85.79	6.03	2.87	1695.77	52.55	1,301	NO	NO
36	124 Celtis laevigata	50.8	9.1	33.7	Excellent	203.7	13.65	6.04	804.85	30.05	850	NO	NO
36	121 Liquidambar styraciflua	83.8	12.2	25	Good	200.5	9.2	8.09	625.41	32.2	1,973	NO	NO
36	122 Pinus taeda	83.8	12.8	25	Good	155.58	13.43	6.61	1034.04	39.18	2,212	NO	NO
36	120 Pinus taeda	96.5	18.3	25	Good	68.91	5.53	2.76	1344.2	51.59	2,799	NO	NO
36	123 Quercus falcata	50.8	9.1	23.6	Excellent	122.56	9.54	5.19	922.84	43.84	513	NO	NO
36	119 Quercus nigra	119.4	16.8	72.4	Good	201.7	19.02	2.79	6746.64	36.72	3,124	NO	NO
	PLOT TOTAL			233.9		1049.54	76.72		13544.21	306.24	13,153		
37	270 Carya illinoinensis	101.5	17.1	102.6	Excellent	335.15	23.38	3.28	5359.47	192.2	2,885	NO	NO
37	757 Fraxinus pennsylvanica	88.4	13.2	36.9	Excellent	227.15	19.38	8.05	970.82	34.43	1,798	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

37	259	Liquidambar styraciflua	119.4	15.8	55.2	Excellent	209.53	9.62	3.8	1928.32	30.15	3,470	NO	NO
37	258	Magnolia grandiflora	50.8	12.2	36.9	Excellent	278.04	37.55	7.53	815.92	54.59	885	NO	NO
37	271	Quercus falcata	150	22.3	102.6	Excellent	392.48	30.6	3.61	7500	12.5	5,061	NO	NO
37	272	Quercus nigra	94	14.3	22.3	Excellent	135.51	12.81	6.06	4353.81	161.78	2,378	NO	NO
		PLOT TOTAL			356.6		1548.89	133.35		11159.35	485.71	16,477		
38	70	Carya illinoinensis	35.6	7	16.4	Fair	26.48	1.84	1.51	312.86	17.44	1,206	NO	NO
38	59	Liquidambar styraciflua	66	12.2	7.3	Good	31.49	1.45	4.32	415.85	11.4	3,890	NO	NO
38	64	Liquidambar styraciflua	94	17.4	11.4	Fair	65.17	3.01	5.76	1100.35	35.06	6,156	NO	NO
38	51	Magnolia grandiflora	106.7	15.8	45.6	Good	241.08	33.5	5.44	3353.68	107.15	8,908	NO	NO
38	57	Pinus taeda	66.4	13.4	16.4	Good	149	12.09	9.08	859.33	32.91	7,034	NO	NO
38	66	Pinus taeda	91.4	13.7	29.2	Good	137.55	15.23	6.43	891.06	35.55	7,721	NO	NO
38	55	Pinus taeda	109.2	15.8	16.4	Good	63.73	6.79	5.1	1552.73	45.82	9,959	NO	NO
38	71	Quercus falcata	88.9	15.8	29.2	Excellent	130.24	12.16	4.46	3070.47	120.21	7,412	NO	NO
38	53	Quercus nigra	119.4	15.8	26.3	Fair	135.13	12.79	5.31	5355.83	47.25	8,088	NO	NO
38	58	Quercus phellos	58.6	13.4	7.3	Good	26.48	2.35	3.63	755.71	30.31	4,723	NO	NO
		PLOT TOTAL			205.6		1083.65	99.18		16439.59	475.15	65,139		
39	61	Pinus taeda	76.2	12.8	11.4	Excellent	70.92	5.75	6.22	815.06	34.86	1,959	NO	NO
39	60	Pinus taeda	88.9	12.2	29.2	Excellent	225.06	18.26	7.71	1172.3	41.51	2,528	NO	NO
39	59	Pinus taeda	99.1	14.9	35.3	Excellent	221.43	17.96	6.27	1515.68	50.21	3,062	NO	NO
39	58	Pinus taeda	106.7	15.8	9.6	Good	45.93	3.73	4.76	1935.25	55.94	3,230	NO	NO
39	57	Pinus taeda	114.3	16.8	45.6	Excellent	262.68	21.31	5.76	2165.8	61.9	3,721	NO	NO
		PLOT TOTAL			131.2		826.02	67		7405.13	244.52	14,598		
40	318	Celtis laevigata	91.4	18	65.7	Excellent	304.47	20.7	4.64	3437.35	70.98	2,779	NO	NO
40	320	Pinus taeda	132.1	20.4	53.2	Excellent	334.4	27.12	6.29	3151.44	78.47	4,408	NO	NO
40	321	Pinus taeda	137.2	20.7	45.6	Excellent	264.56	21.46	5.8	3431.34	82.59	4,588	NO	NO
40	322	Quercus nigra	144.8	19.5	92	Excellent	355.87	33.65	3.87	7165.29	33.49	4,050	NO	NO
40	319	Quercus virginiana	139.7	18.9	89.4	Excellent	238.41	60.55	3.23	7114.11	32.06	5,221	NO	NO
40	317	Salix x pendulina wendeloc	81.3	15.2	81.9	Excellent	397.34	24.54	4.73	2561.83	106.71	1,719	NO	NO
		PLOT TOTAL			427.7		1935.05	188.02		26650.45	404.31	22,265		
41	350	Pinus taeda	137.2	18.3	17.5	Excellent	88.55	7.22	5.07	2509.57	63.66	13,764	NO	NO
41	351	Pinus taeda	137.2	18.3	16.4	Excellent	79.36	6.44	4.83	2509.28	63.66	13,764	NO	NO
41	349	Quercus falcata	119.4	16.2	51.2	Excellent	171.55	13.41	3.36	5381.55	29.29	11,231	NO	NO
41	348	Quercus nigra	147.3	19.2	89.4	Excellent	280.52	25.51	3.14	5745.54	18.77	12,354	NO	NO
		PLOT TOTAL			174.6		520.78	53.59		16345.92	175.28	51,114		
42	16	Pyrus species	50.8	9.1	19.9	Excellent	92.98	6.95	4.68	643.91	43.16	2,977	NO	NO
42	17	Ulmus parvifolia	76.2	12.2	16.4	Excellent	62.52	7.1	3.81	1451.76	63.47	5,570	NO	NO
		PLOT TOTAL			36.3		155.5	14.05		2095.66	106.63	8,547		
43	211	Liquidambar styraciflua	106.7	14.5	53.2	Excellent	226.11	10.11	4.14	1181.24	20.51	9,074	NO	NO
43	212	Magnolia grandiflora	94	14	77.4	Excellent	474.4	55.96	5.72	2119.21	104.53	2,803	NO	NO
43	214	Pyrus species	55.9	9.1	26.3	Excellent	148.8	11.12	5.65	810.04	49.36	2,801	NO	NO
43	213	Quercus falcata	119.4	17.4	68.4	Excellent	317.38	24.36	3.6	5412.09	47.58	11,231	NO	NO
43	210	Quercus falcata	121.9	17.4	51.2	Excellent	253.65	19.73	4.94	5471.65	22.25	11,517	NO	NO
		PLOT TOTAL			250		1348.54	121.29		15254.78	244.72	42,382		
44	228	Carya illinoinensis	109.2	16.8	65.7	Excellent	278.53	15.89	3.48	5350.21	171.63	9,534	NO	NO
44	230	Celtis laevigata	25.4	4.5	11.4	Excellent	39.16	2.66	3.43	112.62	8.86	892	NO	NO
44	229	Liquidambar styraciflua	50.8	10.1	55.2	Excellent	264.66	12.15	4.6	237.92	14.03	2,577	NO	NO
		PLOT TOTAL			132.3		582.35	30.71		5700.75	194.52	13,023		
45	302	Liquidambar styraciflua	76.2	12.8	55.7	Excellent	322.24	14.75	5.84	734.09	30.72	1,777	NO	NO
45	301	Liquidambar styraciflua	127	18.3	58.3	Excellent	277.07	12.72	4.58	2434.72	62.52	3,729	NO	NO
45	298	Quercus falcata	86.9	14.3	36.5	Excellent	167.2	13.04	4.53	3734.30	149	2,473	NO	NO
45	299	Quercus nigra	96.5	13.1	55.7	Excellent	173.2	16.38	3.14	4275.22	157.51	2,479	NO	NO
45	300	Quercus nigra	127	18.3	58.3	Excellent	237.19	22.43	4	6310.77	29.33	3,532	NO	NO
		PLOT TOTAL			265.8		1176.9	79.36		18504.44	438.58	13,984		
46	337	Pinus taeda	114.3	18.3	21.1	Excellent	68.31	7.16	4.19	2211.18	35.55	3,721	NO	NO
46	334	Pinus taeda	116.8	19.2	23.6	Excellent	122.39	9.93	5.19	2353.45	66.23	3,824	NO	NO
46	333	Pinus taeda	119.4	19.2	16.4	Excellent	79.36	6.44	4.83	2472.11	58	3,926	NO	NO
46	335	Pinus taeda	119.4	18.3	16.4	Excellent	79.36	6.44	4.83	2425.18	66.99	3,926	NO	NO
46	336	Pinus taeda	121.9	20.1	26.3	Excellent	142.81	11.58	5.42	2615.54	72.8	4,026	NO	NO
46	335	Pinus taeda	121.9	19.5	15.3	Excellent	58.11	7.15	5.74	2601.87	70.12	4,026	NO	NO
		PLOT TOTAL			119.2		500.35	48.7		14712.34	377.58	23,450		
47	140	Carya illinoinensis	71.1	11.3	18.7	Excellent	37.17	2.58	1.99	2258.89	49.09	1,502	NO	NO
47	141	Magnolia grandiflora	53.5	9.1	17.5	Excellent	39.66	5.36	2.26	1380.84	32.42	1,316	NO	NO
47	139	Quercus virginiana	144.8	17.4	108.2	Excellent	341.22	31.63	3.15	7105.71	31.76	5,413	NO	NO
		PLOT TOTAL			144.4		418.65	39.57		10745.44	113.77	8,331		
48	226	Carya illinoinensis	139.7	17.1	94.6	Excellent	236.83	15.47	2.5	7500	12.5	4,233	NO	NO
48	224	Quercus nigra	172.8	19.8	151.8	Excellent	431.71	45.35	3.66	7500	12.5	4,815	NO	NO
48	225	Quercus virginiana	144.8	18	111.8	Excellent	453.57	97.39	3.92	7145.18	32.76	5,413	NO	NO
		PLOT TOTAL			358.2		1122.46	158.41		22145.18	57.76	14,470		
51	434	Pinus taeda	127	21.3	65.7	Excellent	321.36	26.1	4.9	2952.72	75.34	4,225	NO	NO
51	436	Pinus taeda	139.7	19.2	36.9	Excellent	200.55	16.3	5.44	3450.27	87.56	4,575	NO	NO
51	437	Pinus taeda	139.7	19.2	36.9	Excellent	200.55	16.3	5.44	3450.27	87.56	4,575	NO	NO
51	435	Quercus falcata	116.8	15.8	22.3	Excellent	127.54	9.95	5.71	6507.6	75.99	3,547	NO	NO
		PLOT TOTAL			161.9		851.39	58.64		16450.08	316.96	17,219		
52	165	Liquidambar styraciflua	157.6	19.8	92	Excellent	373.63	17.15	4.06	4241.78	87.06	4,897	NO	NO
52	168	Salix x pendulina wendeloc	134.6	17.4	88.4	Excellent	345.90	22.14	3.91	6751.5	56.31	3,442	NO	NO
52	167	Taxodium distichum	132.1	18.3	94.6	Excellent	831.26	108.75	7.31	3274.11	80.45	4,408	NO	NO
52	166	Taxodium distichum	144.8	20.1	94.6	Excellent	538.26	99.95	6.75	4092.93	91.91	4,845	NO	NO
		PLOT TOTAL			370.5		2032.65	247.5		18359.97	315.74	17,590		
55	109	Liquidambar styraciflua	96.5	15.2	43.8	Excellent	222.4	10.44	5.19	1528.14	34.07	6,525	NO	NO
55	111	Platanus occidentalis	38.1	6.1	7.3	Excellent	72.4	1.38	3.89	315.08	15.8	1,212	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

55	110	Platanus occidentalis	50.8	10.7	29.2	Excellent	124.36	6.02	4.26	649.25	43.42	1,913	NO	NO
55	109	Platanus occidentalis	127	13.3	89.4	Excellent	553.06	28.25	6.52	5166.59	61.55	8,093	NO	NO
55	107	Quercus nigra	63.5	11.3	53.2	Excellent	244.13	23.08	4.59	1294.79	71.55	3,077	NO	NO
55	105	Quercus virginiana	106.7	10.7	45.6	Excellent	197.24	41.43	4.33	4612.31	101.19	9,478	NO	NO
55	108	Quercus virginiana	114.3	17.1	65.7	Excellent	265.56	55.83	4.05	5196.15	85.02	10,379	NO	NO
		PLOT TOTAL			334.1		1670.65	166.43		19273.32	414.57	40,632		
55	138	Magnolia grandiflora	33.1	7.6	8.8	Good	21.52	2.96	2.68	430.71	15.53	573	NO	NO
55	135	Pinus taeda	75.2	12.8	11.4	Excellent	70.92	5.75	6.22	816.06	34.85	1,983	NO	NO
55	134	Pinus taeda	83.9	12.2	29.2	Excellent	200.05	15.23	6.65	1121.29	41.61	2,589	NO	NO
55	133	Pinus taeda	99.1	14.9	35.3	Excellent	221.43	17.96	6.27	1315.59	50.21	3,062	NO	NO
55	132	Pinus taeda	106.7	15.8	9.6	Good	45.53	3.73	4.76	1806.75	55.94	3,230	NO	NO
55	131	Pinus taeda	114.3	15.8	45.6	Excellent	253.82	20.6	5.57	2145.55	51.9	3,721	NO	NO
55	136	Quercus nigra	127	15.2	42	Excellent	147.03	13.9	3.5	6812.28	19.75	3,532	NO	NO
55	137	Rhus species	127	15.8	18.7	Good	196.38	20.03	10.51	6435.1	75.31	3,223	NO	NO
		PLOT TOTAL			200.7		1157.59	101.15		21047.93	355.77	21,875		
57	424	Fraxinus pennsylvanica	66	12.2	8.8	Excellent	64.99	4.24	7.36	560.22	25.21	1,335	NO	NO
57	425	Liquidambar styraciflua	68.6	12.2	13.3	Excellent	112.82	5.19	8.49	581.95	25.45	1,462	NO	NO
57	422	Pinus taeda	66	12.2	7.3	Excellent	49.81	4.04	6.81	590.55	78.9	1,577	NO	NO
57	423	Pinus taeda	68.6	12.2	4.1	Excellent	24.19	1.96	5.89	639.01	30.25	1,639	NO	NO
57	426	Quercus virginiana	63.5	12.2	11.4	Excellent	73.09	15.34	6.41	1641.06	69.94	1,572	NO	NO
57	421	Triadica sebifera	68.6	12.2	11.4	Excellent	96.54	7.21	8.42	1682.38	63.21	1,341	NO	NO
		PLOT TOTAL			56.3		421.45	37.98		5695.22	283.97	8,680		
58	323	Quercus species	75.2	11.3	16.4	Excellent	62.79	6.2	3.82	2041.39	93.82	6,795	NO	NO
58	324	Quercus species	75.2	11.6	13.3	Excellent	51.39	5.07	3.85	2044.55	53.93	6,795	NO	NO
		PLOT TOTAL			29.7		114.18	11.27		4086.05	187.75	13,599		
59	490	Taxodium distichum	124.5	15.8	67.9	Excellent	548.79	85.94	8.08	2817.87	73.49	4,124	NO	NO
59	488	Taxodium distichum	182.9	19.2	55.2	Excellent	454.56	71.25	8.25	5656.9	55.57	5,883	NO	NO
59	489	Taxodium distichum	190.5	21.3	72.4	Excellent	559.31	87.62	7.73	6068.57	60.84	6,049	NO	NO
		PLOT TOTAL			195.5		1563.25	244.81		14543.44	189.9	16,062		
61	241	Fraxinus pennsylvanica	64.5	9.1	22.3	Excellent	87.25	5.69	3.9	411.86	11.43	1,051	NO	NO
61	238	Quercus nigra	121.9	15.5	36.9	Good	189.5	17.92	5.13	6809.76	27.37	3,202	NO	NO
61	239	Quercus nigra	121.9	15.5	36.9	Good	189.5	17.92	5.13	6809.76	27.17	3,202	NO	NO
61	240	Quercus nigra	121.9	16.5	36.9	Excellent	136.24	12.88	3.69	6809.75	19.79	3,371	NO	NO
		PLOT TOTAL			133.2		602.45	54.41		20841.14	85.57	10,835		
62	179	Pinus taeda	50.8	10.7	22.3	Excellent	151.16	12.26	6.76	261.48	15.21	2,851	NO	NO
62	180	Pinus taeda	50.8	10.7	22.3	Excellent	130.48	10.58	5.84	260.81	15.21	2,851	NO	NO
		PLOT TOTAL			44.7		281.64	22.84		522.3	32.41	5,702		
63	430	Fraxinus pennsylvanica	66	12.2	8.8	Excellent	64.99	4.24	7.36	560.22	25.21	1,135	NO	NO
63	427	Liquidambar styraciflua	68.6	12.2	13.3	Excellent	73.55	3.39	5.56	581.56	14.78	1,462	NO	NO
63	428	Pinus taeda	66	12.2	7.3	Excellent	49.81	4.04	6.83	590.55	28.9	1,574	NO	NO
63	429	Pinus taeda	68.6	12.2	4.1	Excellent	24.19	1.96	5.89	639.01	30.25	1,639	NO	NO
		PLOT TOTAL			33.5		212.55	13.64		2371.83	99.14	5,765		
64	491	Acer rubrum	95.5	17.5	33.7	Excellent	221.68	14.93	6.57	3934.3	131.51	2,645	NO	NO
64	494	Liquidambar styraciflua	96.5	14.3	18.7	Excellent	172.1	7.9	9.21	1217.53	40.92	2,610	NO	NO
64	495	Pinus taeda	91.4	13.7	35.3	Excellent	271.83	22.05	7.7	1242.25	44.43	2,709	NO	NO
64	435	Taxodium distichum	83.9	13.7	14.3	Excellent	200.63	31.42	14.03	1236.19	46.8	2,583	NO	NO
64	492	Taxodium distichum	111.8	15.2	29.2	Excellent	213.92	33.5	7.33	2181.73	35.37	3,615	NO	NO
64	493	Taxodium distichum	127	18.3	36.9	Excellent	398.94	62.48	10.8	3007.3	75.55	4,221	NO	NO
		PLOT TOTAL			158.2		1479.1	172.27		12979.3	377.99	18,583		
65	192	Acer rubrum	20.3	4.6	5.9	Good	23.87	1.61	4.04	78.99	13.2	871	NO	NO
65	193	Platanus occidentalis	63.5	12.8	51.2	Excellent	442.43	21.44	8.64	1121.52	59.84	4,203	NO	NO
		PLOT TOTAL			57.2		466.33	23.04		1200.51	73.04	5,074		
66	308	Pinus taeda	144.8	18.3	32.2	Excellent	200.74	16.28	6.24	2933.32	68.11	14,535	NO	NO
66	309	Quercus nigra	147.3	18.3	29.2	Excellent	174.6	16.51	5.98	5712.39	25.38	12,354	NO	NO
		PLOT TOTAL			61.4		375.33	32.79		8645.71	94.49	26,889		
67	191	Pinus taeda	85.4	15.2	26.3	Excellent	197.43	16.01	7.5	933.09	34.75	7,393	NO	NO
67	190	Quercus falcata	94	15.8	45.6	Excellent	194.81	15.13	4.27	3507.27	72.73	8,099	NO	NO
		PLOT TOTAL			71.9		392.24	31.2		4440.36	107.49	15,492		
68	313	Celtis laevigata	94	14.9	45.6	Excellent	414.98	23.21	9.1	3632.75	130.55	2,378	NO	NO
68	312	Celtis laevigata	119.4	18.9	78.5	Excellent	646.58	41.96	8.14	6025.27	105.07	3,789	NO	NO
68	316	Quercus virginiana	142.2	18.3	65.7	Excellent	265.96	55.83	4.05	7110.41	32.04	5,319	NO	NO
68	314	Quercus virginiana	152.4	18.3	72.4	Excellent	260.64	54.72	3.6	7227.72	33.91	5,683	NO	NO
68	315	Salix species	94	17.4	49.3	Excellent	242.68	14.98	4.92	3653.71	631.75	2,125	NO	NO
68	311	Salix x pendulina wendaroi	81.3	15.8	45.6	Excellent	279.1	17.68	6.12	2378.71	107.35	1,719	NO	NO
		PLOT TOTAL			358.1		2109.93	215.39		30138.58	542.85	20,571		
69	220	Carya illinoinensis	134.6	14.3	94.6	Excellent	331.52	23.08	3.51	6000	10	12,235	NO	NO
69	219	Liquidambar styraciflua	114.3	19.8	22.3	Excellent	83.69	3.84	3.75	1737.59	26.55	9,870	NO	NO
69	217	Liquidambar styraciflua	127	18.3	55.2	Excellent	352.41	15.64	6.57	1947.78	50.02	11,185	NO	NO
69	216	Liquidambar styraciflua	132.1	20.4	55.2	Excellent	335.5	15.4	6.08	2297.13	55.58	11,680	NO	NO
69	215	Magnolia grandiflora	115.8	14.3	77.1	Excellent	290.51	33.15	3.76	4784.43	54.89	9,967	NO	NO
69	218	Quercus nigra	53.5	10.7	22.3	Excellent	74.73	7.07	3.34	1295.16	39.87	3,633	NO	NO
		PLOT TOTAL			326.7		1478.15	105.18		17562.09	237	58,573		
71	447	Acer rubrum	95.5	17.5	33.7	Excellent	277.1	19.66	8.22	3934.3	133.51	2,645	NO	NO
71	448	Pinus taeda	101.6	15.8	154.6	Excellent	797.63	64.7	4.65	1692.94	53.55	3,177	NO	NO
71	449	Pinus taeda	101.6	15.8	154.6	Excellent	756.63	61.23	4.59	1691.24	51.55	3,177	NO	NO
71	450	Quercus virginiana	63.5	12.2	11.4	Excellent	73.09	15.34	6.41	1641.06	89.54	1,572	NO	NO
		PLOT TOTAL			374.4		1903.43	160		8959.54	330.54	10,772		
73	325	Lagerstroemia species	25.4	4.6	7.3	Excellent	22.47	1.68	1.06	117.52	15.04	884	NO	NO
73	325	Quercus nigra	119.4	18.3	77.1	Excellent	354.52	33.52	4.6	5434.55	48.08	3,864	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

		PLOT TOTAL			84.4		376.99	35.2		5552.57	64.12	10,747		
74	253	Carya illinoinensis	101.6	14.3	77.1	Excellent	291.46	20.27	3.78	5569.47	192.2	2,885	NO	N
74	251	Liquidambar styraciflua	75.2	12.2	102.5	Excellent	327.34	15.03	1.13	699.52	29.3	1,777	NO	N
74	249	Liquidambar styraciflua	86.4	13.4	22.3	Excellent	73.45	3.37	1.29	946.1	19.67	2,187	NO	N
74	250	Quercus nigra	86.4	13.4	22.3	Excellent	61.31	5.8	2.74	3516.5	79.51	2,076	NO	N
74	248	Quercus nigra	139.7	17.4	77.1	Excellent	287.24	27.15	3.73	7015.58	30.86	3,509	NO	N
74	252	Quercus virginiana	76.2	12.2	102.6	Excellent	284.88	59.75	2.77	2593.89	117.69	2,218	NO	N
		PLOT TOTAL			404		1325.49	131.39		20341.45	469.24	15,652		
75	458	Taxodium distichum	127	18.3	55.2	Excellent	481.73	75.44	8.73	3007.3	76.66	4,221	NO	N
75	457	Taxodium distichum	132.1	18.3	58.1	Excellent	517.99	81.12	8.74	3274.11	80.45	4,408	NO	N
75	456	Taxodium distichum	142.2	14	57.2	Excellent	519.15	81.3	9.08	3524.54	84.09	4,751	NO	N
75	455	Taxodium distichum	152.4	15.2	63.5	Excellent	491.02	76.9	7.73	4286.59	92.96	5,096	NO	N
		PLOT TOTAL			235.7		2009.89	314.76		14192.55	334.16	18,476		
76	420	Pinus taeda	114.3	19.8	8.8	Excellent	56.97	4.62	1.45	2281.91	65.11	3,721	NO	N
76	418	Pinus taeda	127	20.1	15.4	Excellent	70.12	5.60	4.27	2572.09	74.43	4,221	NO	N
76	419	Pinus taeda	127	19.8	40.3	Excellent	257.64	20.9	6.39	2962.17	74.08	4,221	NO	N
		PLOT TOTAL			65.5		384.73	31.21		8016.17	213.62	12,162		
77	22	Liquidambar styraciflua	114.3	14	53.1	Excellent	132.84	6.1	2.24	1284.51	38.35	9,870	NO	N
77	19	Palm species	75.2	9.1	15.4	Excellent	220.35	34.03	13.42	25.15	0.52	351	NO	N
77	20	Pinus taeda	127	19.3	35.9	Fair	177.31	14.33	4.8	3216.87	57.85	10,383	NO	N
77	21	Quercus virginiana	111.8	14.3	71.4	Excellent	230.51	48.41	3.19	4392.22	81.06	11,191	NO	N
		PLOT TOTAL			165		761.11	102.92		8518.75	177.78	32,705		
78	409	Acer rubrum	96.5	12.5	33.7	Excellent	241.08	16.24	3.15	3934.3	133.51	2,845	NO	N
78	412	Taxodium distichum	88.9	13.7	14.3	Excellent	179.51	28.11	12.55	1296.19	45.8	2,588	NO	N
78	413	Taxodium distichum	88.9	13.7	14.3	Excellent	200.53	31.42	14.03	1296.19	45.8	2,588	NO	N
78	410	Taxodium distichum	111.8	15.2	29.2	Excellent	202.66	31.74	6.54	2181.73	35.37	3,616	NO	N
78	411	Taxodium distichum	127	18.3	36.9	Excellent	347.08	54.35	9.4	3007.3	76.66	4,221	NO	N
		PLOT TOTAL			128.5		1170.96	151.86		11715.72	339.14	15,857		
80	6	Fraxinus pennsylvanica	147.3	16.8	77.1	Excellent	320.85	20.93	4.16	2255.67	28.72	10,620	NO	N
80	5	Quercus nigra	127	18.9	102.9	Excellent	351.19	33.3	3.43	5552.94	17	10,596	NO	N
80	4	Quercus nigra	177.8	20.4	131.8	Excellent	593.08	56.08	6.5	6000	10	14,457	NO	N
		PLOT TOTAL			311.5		1266.12	110.31		13808.61	55.72	35,674		
81	196	Celtis laevigata	101.6	17.1	64.3	Excellent	595.08	40.46	7.06	4415.52	147.03	2,666	NO	N
81	197	Pinus taeda	139.7	19.8	33.7	Excellent	217.98	17.68	6.45	3502.97	46.67	4,676	NO	N
81	190	Quercus nigra	71.1	10.1	55.2	Excellent	164.82	15.59	2.59	2136.49	58.81	1,487	NO	N
81	194	Quercus nigra	132.4	17.4	89.4	Excellent	345.91	32.71	3.87	7154.71	33.14	4,250	NO	N
81	188	Salix x pendulina wenderot	63.5	11.3	61.4	Excellent	259.55	17.07	4.39	1392.1	41.53	1,121	NO	N
81	165	Triadica sebifera	114.3	18.3	116.7	Excellent	548.47	40.97	4.7	5623.9	115.2	2,996	NO	N
81	133	Triadica sebifera	114.3	18.3	108.2	Excellent	575.28	42.98	5.32	5623.9	115.2	2,996	NO	N
		PLOT TOTAL			543.9		2717.2	207.46		29849.49	557.59	20,131		
82	98	Liquidambar styraciflua	55.9	11	21.1	Fair	99	4.54	4.69	296.87	16.26	2,499	NO	N
82	102	Magnolia grandiflora	38.1	7.6	14.3	Poor	44.45	6	3.11	321.79	21.65	1,023	NO	N
82	101	Other species	111.8	11.6	29.2	Good	25.6	1.91	0.68	4229.84	95.8	8,299	NO	N
82	103	Pinus taeda	119.4	15.8	49.3	Good	233.06	18.9	4.73	1844.45	51.45	11,189	NO	N
82	104	Pinus taeda	134.6	15.2	50.3	Good	239.3	19.41	4.04	2354.21	59.21	12,822	NO	N
82	97	Quercus falcata	61	10.1	21.1	Fair	81.03	6.32	3.84	1166.39	67.11	3,109	NO	N
82	99	Quercus nigra	68.6	10.7	21.1	Fair	85.53	8.09	4.06	1567.33	60.08	3,423	NO	N
82	100	Quercus nigra	73.7	10.4	59.1	Fair	237.83	22.49	4.01	1867.59	88.9	3,902	NO	N
		PLOT TOTAL			274.5		1045.82	87.67		13648.38	490.46	46,257		
84	237	Celtis laevigata	96.5	13.4	102.6	Excellent	540.31	36.74	5.27	3082.78	168.4	7,426	NO	N
		PLOT TOTAL			102.5		540.31	36.74		3082.78	168.4	7,426		
86	226	Fraxinus pennsylvanica	63.5	10.7	36.9	Excellent	204.29	13.32	5.53	375.05	17.94	3,152	NO	N
86	227	Quercus species	50.8	7.6	35.9	Excellent	128.6	12.69	3.48	730.65	50.68	2,616	NO	N
		PLOT TOTAL			73.9		332.89	26.02		1105.7	68.63	5,798		
87	352	Acer rubrum	96.5	12.5	33.7	Excellent	235.54	15.86	6.59	3934.3	133.51	2,845	NO	N
87	355	Taxodium distichum	88.9	13.7	14.3	Excellent	168.95	26.46	11.61	1296.19	45.8	2,588	NO	N
87	356	Taxodium distichum	88.9	13.7	14.3	Excellent	190.07	29.77	11.29	1296.19	45.8	2,588	NO	N
87	353	Taxodium distichum	111.8	15.2	29.2	Excellent	161.41	28.97	6.56	2181.73	35.37	3,616	NO	N
87	354	Taxodium distichum	127	18.3	36.9	Excellent	319.15	49.98	8.64	3007.3	76.66	4,221	NO	N
		PLOT TOTAL			123.5		1175.11	152.04		11715.72	339.14	15,857		
88	142	Liquidambar styraciflua	91.4	12.2	13.9	Good	170.01	7.8	8.56	962.15	35.14	2,281	NO	N
88	143	Liquidambar styraciflua	114.3	11.6	7.3	Excellent	14.91	0.68	2.04	1358.75	24.1	3,730	NO	N
88	144	Quercus virginiana	215.9	19.8	7.3	Excellent	21.54	4.95	3.24	7502.48	37.5	7,233	NO	N
88	145	Taxodium distichum	114.3	12.2	33.7	Excellent	234.03	36.65	7.63	2187.22	62.59	3,721	NO	N
88	146	Triadica sebifera	106.7	11.6	35.3	Excellent	236.51	17.63	6.7	4841.54	132.05	2,740	NO	N
		PLOT TOTAL			100.4		679.21	67.73		15852.2	265.38	19,256		
89	25	Magnolia grandiflora	43.2	7.9	16.4	Excellent	22.01	9.73	4.39	436.29	34.19	1,682	NO	N
89	24	Pinus taeda	104.1	15.9	33.7	Excellent	256.89	16.78	6.13	1377.72	43.44	8,223	NO	N
89	23	Pinus taeda	124.5	18.3	45.6	Excellent	250.35	20.31	5.49	2125.87	56.42	10,311	NO	N
89	27	Quercus falcata	101.6	14.3	59.3	Excellent	230.95	18.01	3.9	4224.51	61.25	7,377	NO	N
89	26	Quercus nigra	114.3	14.3	59.3	Excellent	321.74	30.42	5.43	5110.44	83.58	7,794	NO	N
89	28	Taxodium distichum	61	9.1	38.6	Excellent	286.12	44.81	7.41	420.82	32.34	3,237	NO	N
		PLOT TOTAL			252.9		1368.06	140.05		13595.55	311.22	38,663		
92	297	Pinus taeda	165.1	20.7	77.1	Excellent	340.99	27.65	4.42	3954.85	65.98	16,355	NO	N
		PLOT TOTAL			77.1		340.99	27.65		3954.85	65.98	16,355		
93	332	Acer rubrum	96.5	12.5	33.7	Excellent	235.54	15.86	6.98	3934.3	133.51	2,845	NO	N
93	335	Liquidambar styraciflua	96.5	14.3	19.2	Excellent	181.55	8.34	4.73	1217.53	40.92	2,610	NO	N
93	331	Magnolia grandiflora	96.5	12.5	33.7	Excellent	246.76	33.32	7.32	3857.7	135.19	2,711	NO	N
93	336	Taxodium distichum	88.9	13.7	14.3	Excellent	200.53	31.42	14.03	1296.19	45.8	2,588	NO	N

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

93	380	Taxodium distichum	109.2	20.4	66.8	Excellent	495.73	77.63	5.71	2235.46	35.55	3,509	NO	NO
93	383	Taxodium distichum	111.8	15.2	39.2	Excellent	202.66	31.74	6.94	3181.73	35.37	3,615	NO	NO
93	378	Taxodium distichum	114.3	12.2	30.7	Excellent	234.03	36.65	7.63	2187.27	52.53	3,721	NO	NO
93	384	Taxodium distichum	127	18.3	35.9	Excellent	378.99	59.35	10.26	3007.3	76.65	4,221	NO	NO
93	387	Taxodium distichum	132.1	18.3	33.7	Excellent	318.73	47.97	9.45	3774.11	80.45	4,408	NO	NO
93	379	Triadica sebifera	105.2	11.6	35.3	Excellent	254.14	18.98	7.2	4341.54	137.05	2,740	NO	NO
		PLOT TOTAL			353.1		2748.83	363.22		26213.15	780.09	33,958		
95	461	Acer rubrum	71.1	10.7	45.6	Excellent	123.39	8.31	2.71	1528.52	70.64	3,092	NO	NO
95	460	Acer rubrum	71.1	10.7	45.6	Excellent	237.31	15.98	5.2	1528.52	70.14	3,092	NO	NO
95	459	Pinus taeda	91.4	19.8	45.6	Good	178.69	14.49	3.92	1143.37	39.8	7,721	NO	NO
95	462	Pinus taeda	91.4	19.8	45.6	Good	178.69	14.49	3.92	1143.37	39.8	7,721	NO	NO
		PLOT TOTAL			182.4		718.07	33.28		5343.97	220.88	23,625		
97	280	Carya illinoinensis	114.3	17.7	77.1	Excellent	240.46	15.72	3.12	5000	10	10,173	NO	NO
97	279	Magnolia grandiflora	139.4	17.7	77.1	Excellent	353.91	47.79	4.59	4520.46	81.64	10,821	NO	NO
97	281	Pinus taeda	144.8	20.1	55.2	Excellent	252.08	20.45	4.57	3042.93	70	14,535	NO	NO
97	282	Pinus taeda	144.8	20.1	55.2	Excellent	252.08	20.45	4.57	3042.93	70	14,535	NO	NO
		PLOT TOTAL			264.5		1098.52	105.41		16906.32	231.64	50,030		
98	243	Carya illinoinensis	63.5	12.2	55.2	Excellent	118.53	8.24	7.15	1356.92	31.05	3,904	NO	NO
98	244	Fraxinus pennsylvanica	68.9	13.4	55.2	Excellent	226.24	14.76	4.1	800.15	15.64	5,656	NO	NO
98	246	Pinus taeda	127	18.9	65.7	Excellent	302.3	24.52	4.6	2749.07	37.71	12,667	NO	NO
98	245	Pinus taeda	152.4	19.8	65.7	Excellent	279.37	22.66	4.25	3375.52	41.61	15,258	NO	NO
98	242	Pinus taeda	162.6	19.8	77.1	Excellent	344.4	27.93	4.47	3789.35	36.31	16,145	NO	NO
98	247	Taxodium distichum	68.9	13.4	102.6	Excellent	535.63	83.88	5.22	3031.85	20.85	7,753	NO	NO
		PLOT TOTAL			421.4		1806.47	182		13102.59	160.17	61,368		
99	454	Liquidambar styraciflua	68.6	12.2	13.3	Excellent	117.82	5.13	8.48	581.96	26.45	1,462	NO	NO
99	451	Pinus taeda	139.7	19.2	35.9	Excellent	200.95	16.3	5.44	3450.22	82.55	4,676	NO	NO
99	452	Pinus taeda	139.7	19.2	35.9	Excellent	200.95	16.3	5.44	3450.22	82.55	4,675	NO	NO
99	453	Quercus virginiana	63.5	12.2	11.4	Excellent	73.09	15.34	6.41	1641.06	89.94	1,572	NO	NO
		PLOT TOTAL			98.6		587.81	53.12		9143.46	281.52	12,385		
101	347	Lagerstroemia species	35.6	6.1	16.4	Excellent	71.58	5.35	4.36	267.58	25.83	1,363	NO	NO
101	346	Taxodium distichum	85.4	18.3	65.7	Excellent	650.13	101.81	9.9	1045.7	38.34	7,393	NO	NO
		PLOT TOTAL			82.1		721.71	107.16		1313.38	64.17	8,756		
102	7	Quercus virginiana	198.1	15.8	164.6	Excellent	674.98	141.7	4.1	6656.58	10	20,777	NO	NO
		PLOT TOTAL			164.6		674.98	141.7		6656.58	10	20,777		
103	459	Fraxinus pennsylvanica	66	9.1	17.5	Excellent	73.31	4.78	4.18	351.93	9.49	2,840	NO	NO
103	458	Lagerstroemia species	30.5	4.6	1.8	Excellent	7.65	0.57	4.19	182.47	11.45	919	NO	NO
		PLOT TOTAL			19.4		80.96	5.35		534.4	20.93	3,760		
104	329	Liquidambar styraciflua	111.8	17.4	29.2	Excellent	235.16	10.84	8.09	1489.53	42.67	9,593	NO	NO
104	328	Taxodium distichum	20.3	3	1.8	Excellent	14.63	2.29	8.02	32.8	5.22	740	NO	NO
104	327	Taxodium distichum	50.8	9.1	8.8	Excellent	90.04	14.1	10.2	282.94	17.72	2,851	NO	NO
		PLOT TOTAL			39.8		340.83	27.23		1805.25	65.61	13,184		
106	30	Liquidambar styraciflua	106.7	14.3	59.3	Excellent	371.50	17.06	6.27	1160.7	35.19	9,074	NO	NO
106	32	Magnolia grandiflora	75.2	12.2	23.6	Excellent	79.4	12.72	3.36	3739.04	77.25	3,529	NO	NO
106	29	Pinus taeda	114.3	20.1	27.7	Excellent	160.37	13.01	5.78	1440.37	57.39	11,163	NO	NO
106	31	Quercus nigra	132.1	19.8	73.1	Good	292.32	27.64	4.17	5623.82	25.09	10,508	NO	NO
106	33	Triadica sebifera	50.8	10.1	29.2	Excellent	55.94	4.19	1.92	647.17	43.31	7,392	NO	NO
		PLOT TOTAL			210		959.61	72.61		11010.57	234.2	38,657		
110	403	Liquidambar styraciflua	114.3	11.6	7.3	Excellent	14.91	0.68	2.04	1358.76	24.1	1,230	NO	NO
110	402	Liquidambar styraciflua	137.2	18.3	13.9	Good	120.79	5.54	6.08	2765.24	67.57	3,649	NO	NO
110	399	Taxodium distichum	127	18.3	56.2	Excellent	535.25	83.82	9.7	3007.3	75.65	4,221	NO	NO
110	400	Taxodium distichum	133.7	18.6	45.6	Excellent	461.32	77.13	10.8	3712.79	85.52	4,675	NO	NO
110	401	Taxodium distichum	139.7	18.9	14.3	Excellent	139.01	21.77	9.72	3727.54	85.81	4,676	NO	NO
		PLOT TOTAL			142.2		1302.48	188.95		14592.03	341.15	20,711		
111	152	Liquidambar styraciflua	96.5	14.3	18.7	Excellent	121.66	8.34	9.73	1217.53	40.92	2,630	NO	NO
111	157	Magnolia grandiflora	177.8	18.3	74.7	Good	368.36	49.74	4.53	7334.55	10.44	5,031	NO	NO
111	156	Salix x pendulina wenderoi	78.2	15.2	32.2	Excellent	142.32	9.92	4.42	2165.33	54.42	1,555	NO	NO
111	155	Salix x pendulina wenderoi	78.2	15.7	32.2	Excellent	173.04	7.79	3.82	2195.33	54.47	1,556	NO	NO
111	153	Taxodium distichum	88.9	13.7	14.3	Excellent	175.28	27.45	12.26	1296.19	45.8	2,568	NO	NO
111	154	Taxodium distichum	132.1	18.3	33.7	Excellent	301.03	47.14	8.93	3274.11	80.45	4,408	NO	NO
		PLOT TOTAL			205.8		1281.69	148.49		17513.17	295.46	17,749		
113	225	Pinus taeda	127	18.3	35.9	Excellent	209.1	16.96	5.66	2772.37	72.32	4,221	NO	NO
113	224	Pinus taeda	139.7	19.8	35.9	Excellent	215.31	17.55	5.86	3502.85	83.33	4,676	NO	NO
113	221	Quercus nigra	139.7	19.5	35.9	Excellent	159.58	15.09	4.32	7105.58	32.54	3,909	NO	NO
113	222	Quercus virginiana	170.7	16.8	77.1	Excellent	220.08	46.2	2.46	7092.69	21.59	5,223	NO	NO
113	223	Ulmus species	71.1	10.7	11.4	Excellent	64.57	4.4	5.66	1537.91	40.27	1,334	NO	NO
		PLOT TOTAL			179.3		863.63	100.19		21931.6	250.05	19,363		
114	463	Lagerstroemia species	30.5	4.6	1.8	Excellent	7.65	0.57	4.19	182.47	11.45	1,103	NO	NO
		PLOT TOTAL			1.8		7.65	0.57		182.47	11.45	1,103		
115	454	Quercus nigra	71.1	10.7	16.4	Excellent	83.4	7.89	5.08	1714.92	47.37	4,451	NO	NO
		PLOT TOTAL			16.4		83.4	7.89		1714.92	47.37	4,451		
116	332	Pinus taeda	111.8	17.1	45.6	Good	228.38	18.51	5.03	1646.55	44.41	10,304	NO	NO
116	331	Pinus taeda	129.4	18.8	55.2	Good	328.9	26.68	5.96	1885.42	52.25	11,159	NO	NO
116	330	Taxodium distichum	66.4	15.2	77.1	Excellent	718.38	112.5	9.32	997.79	36.87	7,393	NO	NO
		PLOT TOTAL			177.9		1275.66	157.78		4529.85	137.55	28,687		
117	306	Celtis laevigata	50.8	9.1	55.2	Excellent	462.06	31.42	8.37	804.89	53.95	820	NO	NO
117	303	Magnolia grandiflora	127	17.4	77.1	Excellent	431.59	58.28	5.6	6457.33	76.55	3,875	NO	NO
117	304	Quercus nigra	50.8	9.1	35.9	Excellent	151.29	14.31	4.1	922.84	63.84	820	NO	NO
117	305	Quercus nigra	50.8	9.1	35.9	Excellent	151.29	14.31	4.1	922.84	63.84	820	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

117	337 Quercus virginiana	50.8	9.1	35.2	Excellent	239.3	50.24	4.34	942.96	83.84	1,043	NO	NO
	PLOT TOTAL			263.3		1435.54	158.33		10088.06	322.05	7,390		
118	329 Castanea dentata	38.1	9.1	18.7	Excellent	49.96	2.24	2.61	322.63	12.59	1,508	NO	NO
118	327 Liquidambar styraciflua	104.5	15.2	26.3	Excellent	104.75	4.81	3.58	1124.56	20.02	8,436	NO	NO
118	330 Pinus taeda	139.4	18.3	33.7	Excellent	137.63	11.15	4.06	3942.04	55.6	11,778	NO	NO
118	328 Quercus falcata	139.4	18.3	97.2	Excellent	357.73	27.9	3.18	5434.55	44.08	11,231	NO	NO
118	326 Quercus virginiana	127	18.3	72.6	Excellent	270.47	56.77	3.74	5558.53	23.46	14,137	NO	NO
	PLOT TOTAL			248.6		919.49	102.87		14382.99	157.75	47,091		
119	404 Taxodium distichum	139.7	18.5	45.6	Excellent	443.27	69.47	4.22	3712.79	85.52	4,675	NO	NO
119	405 Taxodium distichum	139.7	18.9	14.3	Excellent	131.29	20.56	9.18	3727.94	85.81	4,676	NO	NO
	PLOT TOTAL			59.9		574.56	89.93		7440.73	173.32	9,351		
120	499 Liquidambar styraciflua	55	12.2	29.2	Excellent	83.9	3.85	2.87	544.81	25.52	1,365	NO	NO
120	497 Pinus taeda	63.5	13.7	13.4	Excellent	62.02	5.03	5.44	568.38	29.54	1,402	NO	NO
120	498 Pinus taeda	104.5	18.3	11.4	Fair	54.27	4.4	4.75	3720.75	55	2,605	NO	NO
120	501 Quercus virginiana	127	17.1	55.2	Good	139.82	29.35	2.53	5891.55	28.45	4,477	NO	NO
120	500 Triadica sebifera	75.2	11.3	32.2	Excellent	215.65	16.11	6.7	2150.26	55.11	1,676	NO	NO
	PLOT TOTAL			139.3		555.66	58.75		11865.75	233.82	11,494		
121	503 Pinus taeda	71.1	9.1	18.7	Excellent	79.34	6.44	4.25	505.24	23.56	5,264	NO	NO
121	502 Pinus taeda	71.1	10.7	16.4	Excellent	165.56	13.43	10.08	537.66	24.43	5,264	NO	NO
	PLOT TOTAL			35.1		244.89	19.86		1037.9	47.99	10,528		
122	93 Acer rubrum	76.2	9.1	42	Fair	164.18	11.05	3.91	1779.54	77.55	4,753	NO	NO
122	91 Fraxinus pennsylvanica	63.5	9.1	22.3	Fair	80.51	5.25	3.5	323.40	16.38	2,609	NO	NO
122	94 Fraxinus pennsylvanica	85.4	12.2	49.3	Good	255.69	16.64	5.18	701.47	25.76	5,125	NO	NO
122	95 Pinus taeda	88.9	11.3	57.2	Good	211.51	17.16	3.7	875.21	32.66	7,375	NO	NO
122	92 Quercus phellos	116.8	13.7	57.2	Good	293.82	26.06	5.14	1940.84	54.02	10,424	NO	NO
122	96 Quercus virginiana	75.2	9.1	58.3	Good	218.12	45.79	3.68	2036.66	91.03	6,322	NO	NO
	PLOT TOTAL			287.4		1223.83	122		7665.72	309.19	36,606		
123	504 Magnolia grandiflora	65	9.1	19.9	Excellent	86.02	11.62	4.33	1216.66	62.49	4,242	NO	NO
123	505 Quercus nigra	93.8	11	23.6	Excellent	90.26	8.53	3.82	2521.55	107.93	5,916	NO	NO
	PLOT TOTAL			43.5		176.28	20.15		3738.22	170.42	10,158		
124	159 Liquidambar styraciflua	83.8	11.3	35.2	Excellent	343.52	15.72	6.23	617.6	24.57	6,231	NO	NO
124	161 Liquidambar styraciflua	83.8	11.3	35.2	Excellent	359.69	16.51	6.57	617.6	24.57	6,231	NO	NO
124	158 Pinus taeda	91.4	13.7	35.3	Excellent	240.35	19.5	6.81	912.78	35.55	8,127	NO	NO
124	160 Quercus virginiana	127	11.3	45.3	Excellent	264.62	55.55	5.35	5331.16	19.4	14,137	NO	NO
	PLOT TOTAL			155		1208.17	107.33		7587.15	104.09	34,726		
125	3 Celtis laevigata	59.1	21.6	77.1	Excellent	517.78	33.2	6.72	3296.17	63.1	7,715	NO	NO
125	1 Quercus falcata	139.7	20.1	102.6	Excellent	441.22	34.41	4.3	5704.98	26.41	13,370	NO	NO
125	2 Quercus nigra	134.5	20.4	68.4	Excellent	390.02	38.88	4.35	5666.14	25.83	11,289	NO	NO
	PLOT TOTAL			268.1		1349.01	106.49		14667.29	115.35	32,373		
126	159 Acer rubrum	95.5	12.5	33.7	Excellent	235.54	15.60	6.98	3534.3	133.51	2,645	NO	NO
126	172 Liquidambar styraciflua	95.5	14.6	18.7	Excellent	181.66	8.34	9.73	3217.53	40.57	2,610	NO	NO
126	170 Taxodium distichum	111.8	15.2	29.2	Excellent	129.15	29.62	6.48	2121.73	35.37	3,616	NO	NO
126	171 Taxodium distichum	127	18.3	36.9	Excellent	312.13	51.23	8.46	3067.3	76.66	4,221	NO	NO
	PLOT TOTAL			118.5		911.49	105.05		10940.86	285.45	13,092		
127	84 Liquidambar styraciflua	50.8	7.6	26.3	Excellent	121.38	5.57	4.61	192.74	12.74	2,147	NO	NO
127	81 Pinus taeda	127	17.4	36.9	Excellent	176.15	14.29	4.77	2174.51	37	16,551	NO	NO
127	79 Pinus taeda	127	18.3	22.3	Excellent	121.56	9.86	5.44	2215.06	57.85	16,551	NO	NO
127	80 Pinus taeda	132.1	12.2	22.3	Excellent	85.24	6.91	3.88	2100.6	54.87	13,020	NO	NO
127	82 Quercus virginiana	104.5	15.2	65.7	Excellent	257.1	53.97	3.92	4262.99	145.71	8,853	NO	NO
127	83 Quercus virginiana	104.5	15.2	65.7	Excellent	262.35	55.08	4	4263.43	145.71	8,853	NO	NO
	PLOT TOTAL			239.3		1023.79	145.68		15159.33	472.89	51,971		
128	231 Celtis laevigata	68.9	14.3	108.2	Excellent	779.68	53.01	7.21	2535.3	95.69	6,534	NO	NO
128	234 Celtis laevigata	139.7	20.1	122.7	Excellent	794.57	54.02	6.48	5370.47	34.45	11,728	NO	NO
128	233 Quercus nigra	139.7	20.1	122.7	Excellent	432.73	40.92	3.53	5704.98	25.41	11,728	NO	NO
128	232 Quercus nigra	144.8	20.1	122.7	Excellent	437.58	41.41	3.57	5755	27.19	12,150	NO	NO
128	235 Ulmus alata	139.7	20.1	122.7	Excellent	618.19	44.66	5.04	6000	10	17,877	NO	NO
128	236 Ulmus alata	139.7	20.1	122.7	Excellent	618.19	44.66	5.04	6000	10	17,877	NO	NO
	PLOT TOTAL			721.4		3681.23	278.68		31366.74	204.63	67,895		
129	506 Quercus virginiana	142.2	15.8	94.6	Excellent	406.63	85.36	4.3	5646.79	24.66	15,957	NO	NO
	PLOT TOTAL			94.6		406.63	85.36		5646.79	24.66	15,957		
130	149 Acer rubrum	93.5	12.5	33.7	Excellent	226.45	15.12	6.65	3334.3	133.51	2,645	NO	NO
130	148 Magnolia grandiflora	93.5	12.5	33.7	Excellent	252.93	34.16	7.5	3858.12	135.19	2,711	NO	NO
130	147 Taxodium distichum	109.2	20.4	86.8	Excellent	475.73	77.63	5.76	2735.46	36.55	3,509	NO	NO
130	150 Taxodium distichum	111.8	15.2	29.2	Excellent	180.15	28.21	6.17	2181.73	35.37	3,616	NO	NO
130	151 Taxodium distichum	127	18.3	46.9	Excellent	315.11	52.48	9.02	3067.3	75.66	4,221	NO	NO
	PLOT TOTAL			230.4		1448.37	207.6		15216.91	417.73	16,901		
131	466 Pinus taeda	71.1	9.1	16.7	Excellent	71.49	5.8	3.83	504.98	13.16	5,264	NO	NO
131	467 Pinus taeda	71.1	9.1	18.7	Excellent	79.34	6.44	4.25	505.24	23.56	5,264	NO	NO
131	465 Quercus nigra	71.1	13.7	18.4	Excellent	127.97	12.1	7.8	1714.92	84.5	4,461	NO	NO
	PLOT TOTAL			53.8		279.81	24.34		2725.14	121.22	14,989		
133	507 Taxodium distichum	71.1	9.1	16.4	Excellent	147.57	23.11	8.99	589.13	25.69	4,386	NO	NO
	PLOT TOTAL			16.4		147.57	23.11		589.13	25.69	4,386		
134	206 Celtis laevigata	88.9	12.2	77.1	Excellent	508.16	34.21	6.58	2316.34	95.14	5,445	NO	NO
134	207 Magnolia grandiflora	88.9	12.2	77.1	Excellent	364.4	49.21	4.73	2530.03	95.14	5,557	NO	NO
134	209 Quercus falcata	129.5	15.2	38.9	Excellent	205.33	16.01	5.55	5427.25	22.02	10,285	NO	NO
134	208 Quercus falcata	154.9	17.7	55.2	Excellent	225.63	17.59	4.09	5791.67	22.01	12,300	NO	NO
134	205 Quercus nigra	165.1	14.6	22.3	Excellent	151.12	14.29	6.75	5715.65	25.38	11,340	NO	NO
134	204 Quercus virginiana	147.3	19.3	84.3	Excellent	310.8	65.25	3.68	5738.49	26.38	13,763	NO	NO

Cont. Appendix III Inventory of trees Samples by Plot in the City of Mandeville

		PLOT TOTAL			222		1041.56	57.23		13404.6	138.1	31,150		
150	291	Liquidambar styraciflua	157.5	19.8	49.5	Excellent	255.06	12.21	5.23	3042.18	65.78	11,554	NO	NO
150	293	Quercus nigra	167.6	18.9	102.6	Excellent	406.33	36.42	3.56	5942.08	29.9	11,523	NO	NO
150	292	Ulmus species	142.2	18.1	19.3	Excellent	189.13	12.83	6.49	6000	10	8,535	NO	NO
		PLOT TOTAL			171.3		851.52	61.52		14984.26	105.13	31,513		
		INVENTORY TOTAL			23300		126200.24	11435.02		1438571	79045.3	3,625,070		

City	Cover	trees	(tons)	(tons/yr)	(tons/yr)	($US)
Calgary, Canada	7.2	11,889,000	445,000	21,422	326	1,611,000
Atlanta, GA	36.8	9,415,000	1,345,000	46,433	1,662	2,534,000
Toronto, Canada	20.5	7,542,000	992,000	40,345	1,212	6,105,000
New York, NY	21.0	5,212,000	1,351,000	42,283	1,677	8,071,000
Baltimore, MD	21.0	2,627,000	596,000	16,127	430	2,129,000
Philadelphia, PA	15.7	2,113,000	530,000	16,115	576	2,826,000
Washington, DC	28.6	1,928,000	523,000	16,148	418	1,956,000
Boston, MA	22.3	1,183,000	319,000	10,509	284	1,426,000
Woodbridge, NJ	29.5	986,000	160,000	5561.00	210	1,037,000
Minneapolis, MN	26.5	979,000	250,000	8,895	305	1,527,000
Syracuse, NY	23.1	876,000	173,000	5,425	109	268,000
Morgantown, WV	35.9	661,000	94,000	2,940	66	311,000
Moorestown, NJ	28.0	583,000	117,000	3,758	118	576,000
Jersey City, NJ	11.5	136,000	21,000	890	41	196,000
Freehold, NJ	34.4	48,000	20,000	545	21	133,000

II. Per acre values of tree effects

City	*No. of trees*	*Carbon storage (tons)*	*Carbon sequestration (lbs/yr)*	*Pollution removal (lbs/yr)*	*Pollution Value ($US)*
Calgary, Canada	66.7	2.5	0.120	3.6	9.0
Atlanta, GA	111.6	15.9	0.550	39.4	30.0
Toronto, Canada	48.3	6.4	0.258	15.6	39.1
New York, NY	26.4	6.8	0.214	17.0	40.9
Baltimore, MD	50.8	11.5	0.312	16.6	41.2
Philadelphia, PA	25.0	6.3	0.190	13.6	33.5
Washington, DC	49.0	13.3	0.410	21.2	49.7
Boston, MA	33.5	9.0	0.297	16.0	40.4
Woodbridge, NJ	66.5	10.8	0.375	28.4	70.0
Minneapolis, MN	26.2	6.7	0.238	16.4	40.9
Syracuse, NY	54.5	10.8	0.338	13.6	16.7
Morgantown, WV	119.7	17.0	0.532	23.8	56.3
Moorestown, NJ	62.0	12.5	0.400	25.2	61.3
Jersey City, NJ	14.3	2.2	0.094	8.6	20.7
Freehold, NJ	38.5	16.0	0.437	33.6	106.6

Appendix IV. Comparison of Urban Forests

A common question asked is, "How does this city compare to other cities?" Although comparison among cities should be made with caution as there are many attributes of a city that affect urban forest structure and functions, summary data are provided from other cities analyzed using the itree model.

I. City totals for trees

	% Tree	Number of	Carbon storage	Carbon Sequestration	Pollution removal	Pollution Value

References

Abdollahi, K.K.; Ning, Z.H.; Appeaning, A., eds.2000. **Global climate change and the urban forest.** Baton Rouge, LA: GCRCC and Franklin Press. 77 p.

Based on 2010 electricity costs (17.1 cents/kWh) from Los Angeles (including taxes) (http://www.
ladwp.com/ladwp/cms/ladwp008935.jsp) and 2007 estimated state average MBTU costs ($11.62 per MBTU).

Baldocchi, D. 1988. **A multi-layer model for estimating sulfur dioxide deposition to a deciduous oak forest canopy.** Atmospheric Environment. 22: 869-884.

Baldocchi, D.D.; Hicks, B.B.; Camara, P. 1987. **A canopy stomatal resistance model for gaseous deposition to vegetated surfaces.** Atmospheric Environment. 21: 91-101.

Based on photo-interpretation of Google Earth imagery (image dates circa 2007) of 1,000 random points. Standard error of estimate is 1.4%. Tree cover was estimated using fi eld plot estimates of tree and shrub cover, along with tree/shrub overlap. Plot cover estimates were pro-rated to equal photointerpretation estimates of combined tree and shrubcover

Bidwell, R.G.S.; Fraser, D.E. 1972. **Carbon monoxide uptake and metabolism by leaves.** Canadian Journal of Botany. 50: 1435-1439.

Carbon values are estimated at $22.8 USD per tonne based on Fankhauser, S. 1994. **The social costs of greenhouse gas emissions: an expected value approach.** The Energy Journal 15(2): 157-184.

Lovett, G.M. 1994. **Atmospheric deposition of nutrients and pollutants in North America: an ecological perspective.** Ecological Applications. 4: 629-650.

McPherson, E.G.; Simpson, J.R. 1999. **Carbon dioxide reduction through urban forestry: guidelines for professional and volunteer tree planters.** Gen. Tech. Rep. PSW-171. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacifi c Southwest Research Station. 237 p. Can be accessed through http://www.fs.fed.us/psw/ **n**publications/gtrs.shtml

Murray, F.J.; Marsh L.; Bradford, P.A. 1994. **New York state energy plan, vol. II: issue reports.** Albany, NY: New York State Energy Office. These values were updated to 2007 dollars based on the producer price index from U.S Department of
Labor, Bureau of Labor Statistics n.d. www.bls.gov/Ppi

Nowak, D.J.; Crane, D.E. 2000. **Th e Urban Forest Effects (UFORE) Model: quantifying urbanforest structure and functions.** In: Hansen, M.; Burk, T., eds. Integrated tools for natural resourcesinventories in the 21st century. Proceedings of IUFRO conference. Gen. Tech. Rep. NC-212. St. Paul, MN: U.S. Department of Agriculture, Forest
Service, North Central Research Station: 714-720

Nowak, D.J.; Hoehn, R.E.; Crane, D.E.; Stevens, J.C.; Walton, J.T.; Bond, J. 2008. **A ground based method of assessing urban forest structure and ecosystem services.** Arboriculture & Urban Forestry. 34(6): 347-358
i-Tree. 2009. **i-Tree Eco Manual.** 96 p. http://www.
itreetools.org/resource_learning_center/manuals_ workbooks.shtm

Nowak, D.J. 1994. **Atmospheric carbon dioxide reduction by Chicago's urban forest.** In: McPherson, E.G.; Nowak, D.J.; Rowntree, R.A.,eds. Chicago's urban forest ecosystem: results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 83-94.

Nowak, D.J.; Crane, D.E.; Dwyer, J.F. 2002. **Compensatory value of urban trees in the United States**. Journal of Arboriculture. 28(4): 194-199.

Nowak, D.J.; Crane, D.E.; Stevens, J.C.; Ibarra, M. 2002. **Brooklyn's urban forest.** Gen. Tech. Rep. NE-290. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 107 p.

Nowak D.J.; Dwyer, J.F. 2000. **Understanding the benefits and costs of urban forest ecosystems.**In: Kuser, John E., ed. Handbook of urban and community forestry in the northeast. New York: Kluwer Academics/Plenum: 11-22.

Nowak, D.J.; Stevens, J.C.; Sisinni, S.M.; Luley, C.J. 2002. **Eff ects of urban tree management and species selection on atmospheric carbon dioxide.** Journal of Arboriculture. 28(3): 113-122.

Northeastern Area State and Private Forestry. 2005. **Gypsy moth digests.** Newtown Square, PA:U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. http:// www.na.fs.fed.us/fhp/gm/

USDA Animal and Plant Health Inspection Service. 2010. **Plant Health – Asian Longhorned Beetle.**http://www.aphis.usda.gov/plant_health/plant_ pest_info/asian_lhb/index.shtml

Natural Resources Canada. 2010. **Sustainability Indicators – Asian Longhorned Beetle.** http://canadaforests.nrcan.gc.ca/indicator/ asianlonghornedbeetle

USDA Forest Service et al. 2010. **Emerald ash borer.** http://www.emeraldashborer.info/

Stack, R.W.; McBride, D.K.; Lamey, H.A. 1996. **Dutch elm disease.** (revised). Fargo, ND: North Dakota State University, Cooperative ExtensionService: 324. http://www.ext.nodak.edu/extpubs/ plantsci/trees/pp324w.htm

Zinke, P.J. 1967. **Forest interception studies in the United States.** In: Sopper, W.E.; Lull, H.W., eds. Forest hydrology. Oxford, UK: Pergamon Press: 137-161.

Explanation of Calculations of Appendix III and IV

Total city carbon emissions were based on 2003U.S. per capita carbon emissions, calculated as total U.S. carbon emissions (Energy Information Administration, 2003, Emissions of Greenhouse Gases in the United States 2003. http://www.eia.doe.gov/oiaf/1605/1605aold.html) divided by 2003 total U.S. population (www.census.gov). Per capita emissions were multiplied by study population to estimate total city carbon emissions

Average passenger automobile emissions per mile were based on dividing total 2002 pollutant emissions from light-duty gas vehicles (National Emission Trends http://www.epa.gov/ttn/chief/trends/index.html) by total miles driven in 2002 by passenger cars (National Transportation Statistics http://www.bts.gov/publications/national_transportation_statistics/2004/).

Average annual passenger automobile emissions per vehicle were based on dividing total 2002 pollutant emissions from light-duty gas vehicles by total number of passenger cars in 2002 (National Transportation Statistics http://www. bts.gov/publications/national_transportation_statistics/2004/).

Carbon dioxide emissions from automobiles assumed 6 pounds of carbon per gallon of gasoline with energy costs of refinement and transportation included (Graham, R.L.; Wright, L.L.; Turhollow, A.F. 1992.The potential for short-rotation woody crops to reduce U.S. CO_2 emissions. Climatic Change. 22: 223-238.)

Average household emissions based on average electricity kWh usage, natural gas Btu usage, fuel oil Btu usage, kerosene Btu usage, LPG Btu usage, and wood Btu usage per household from: Energy Information Administration. Total Energy Consumption in U.S. Households by Type of Housing Unit, 2001 www.eia.doe.gov/emeu/recs/ recs 2001/detailcetbls.html.

CO_2, SO_2, and NOx power plant emission per KWh from: U.S. Environmental Protection Agency. U.S. power plant emissions total by year www.epa.gov/Clean energy/egrid/samples.htm.

CO emission per kWh assumes one-third of 1 percent of C emissions is CO based on: Energy Information Administration. 1994.

Energy use and carbon emissions: non-OECD countries. DOE/EIA-0579(94). Washington, DC: Department of Energy, Energy Information Administration. http://tonto.eia.doe.gov/bookshelf

PM_{10} emission per kWh from: Layton, M. 2004. 2005 Electricity environmental performance report: electricity generation and air emissions. Sacramento, CA: California Energy Commission. http://www.energy.ca.gov/2005_energypolicy/ documents/2004-11-15_workshop/2004-11- 15_03-A_LAYTON.PDF

CO_2, NOx, SO_2, PM_{10}, and CO emission per Btu for natural gas, propane and butane (average used to represent LPG), Fuel #4 and #6 (average used to represent fuel oil and kerosene) from: Abraxas energy consulting. http://www.abraxasenergy.com/emissions

CO_2 and fi ne particle emissions per Btu of wood from: Houck, J.E.; Tiegs, P.E.; McCrillis, R.C.; Keithley, C.; Crouch, J. 1998. Air emissions from residential heating: the wood heating option put into environmental perspective. In: Proceedings of U.S.

EPA and Air and Waste Management Association conference: living in a global environment, V.1: 373-384.

CO, NOx and SOx emission per Btu of wood based on total emissions from wood burning (tonnes) from: Residential Wood Burning Emissions in British Columbia. 2005. http://www.env.gov.bc.ca/air/ air quality/pdfs/wood_emissions.pdf.

Emissions per dry tonne of wood converted to emissions per Btu based on average dry weight per cord of wood and average Btu per cord from: Kuhns, M.; Schmidt, T. 1988. Heating with wood: species characteristics and volumes I. NebGuide G-88-881-A. Lincoln, NE: University of Nebraska, Institute of Agriculture and Natural Resources, Cooperative Extension.

National Land Cover Data are available at: www. epa.gov/mrlc/nlcd-2001.html

Standardized value for population density was calculated as PD = (n – m)/r, where PD is the value (0-1), n is the value for the census block (population / km^2), m is the minimum value for all census blocks, and r is the range of values among all census blocks (maximum value – minimum value). Standardized value for tree stocking was calculated as TS = 1 – [t/(t+g)], where TS is the value (0-1), t is percent tree cover, and g is percent grass cover. Standardized value for tree cover per capita was calculated as TPC = 1 – [(n – m)/r], where TPC is the value (0-1), n is the value for the census block (m^2/capita), m is the minimum value for all census blocks, and r is the range of values among all censusblocks (maximum value – minimum value).