



# Georgia Tech 2019 Campus Tree Care Plan



"Big Al" tree - Removed due to structural failure September 2018 - Replaced with 11 oaks of various species

The purposes of campus tree care plan are to:

- Facilitate the achievement of 55% minimum tree canopy on campus as recommended by the 2010 Campus Landscape Master Plan.
- Facilitate the achievement of 22% woodlands coverage on campus as recommended by the 2010 Campus Landscape Master Plan.
- Protect and maintain the campus urban forest by managing the impact of development and constructions on campus trees.
- Provide protection and to make sure that removal of all trees on campus are conducted with proper considerations and adequate replacement program, according to our approved 2010 Campus Landscape Master Plan.

The responsibility of the Campus Tree Care Plan rests with Facilities Department.

# The Campus Tree Advisory Committee is composed of

- Hyacinth Ide, Associate Director , Landscape & Fleet Services , Facilities Management
- Jason Gregory, Sr. Planner, Capital Planning & Space Management
- Quentin Holden, Lead Tree Surgeon, Facilities Management
- Jerry Young, Landscape Project Manager, Facilities – Design and Construction
- Rama Sivakumar (Siva), Senior Research Engineer, Center for Spatial Planning Analytics and Visualization (CSPAV), College of Design
- Alison Onstine, School of Biology
- Teddy Yallah, Sr. Facilities Manager, Parking and Transportation
- Joshua Martinez-Jaffee, Student
- Dr. Monica Halka, Faculty, Associate Director, Honors Program
- Scott Mussack, Finance Analyst, Budget Management & Capitol Budgets
- Ed Lanz, Landscape /Waste Management Ops. Housing Department
- Jeffrey Sheehan , Turf Maintenance Manager, Facilities- Landscape
- Dhaneish Ramdin, Horticulturist II, Facilities – Landscape
- Hugh Crawford, Associate Professor, Literature,Media & Com
- Pat Bras, GaTech Affiliate, Midtown Neighborhood Rep, Landscape Designer
- Student reps: Rebecca Gray, Lawton Fairchild (SGA Rep.), Melissa Estacio, Joseph Staubes, Austin Rahn, Anna Pille & Yi Lei Pei, Ruchi Aggarwal, Joshua Martín-Jaffe, and Kelly Wu

## Roles of Representatives:

The committee members will accept to serve for a period of one calendar year with a renewal option. Members shall appoint officials who will conduct the day to day business of the committee. Committee members are expected to actively participate and contribute in policy/guideline issues as well as research/information gathering that would aid in the campus tree care plan.



# CAMPUS TREE CARE POLICIES- TREE PLANTING

## Plant Selection

Plant species used on Georgia Tech campus will come from the list of the Landscape Standards in the 2010 Landscape Maser Plan, as updated and EBB/South Central Sector Plans. The list contains both native and exotic species that have been screened for adaptability to physical conditions and serviceability, to meeting planting needs based on site orientation, drainage, soil condition, use, etc. Where appropriate, the best plant shall be selected for a given site, which may or may not be a "native". Trees to be used on campus must be preselected at the farm or nursery for good quality and tagged. Only trees of 2"-2 1/2" minimum caliper and maximum of 4"-4 1/2" caliper will be planted. Smaller trees sizes may be used in forest zones. Careful consideration needs to be taken in selection of trees as it relates to the final placement. Per the 2010 Landscape master plan, the growth expectations for each species should be taken into account prior to installing new trees. The final selections shall be reviewed and approved by the Tree Campus and or Arboretum Committee prior to installation.

Due to planting requirements, plant materials associated with donations and or dedications will be installed from October to March. When possible the installations will be coordinated with the annual installment of 50 trees. Recommended species and placement shall be reviewed and approved by the Tree Campus Committee and office of the Executive Vice President for Administration through the office of Capital Planning & Space Management.

## Prohibited Practices

Under no condition shall a tree be planted on Georgia Tech campus for dedication without per-approval from the office of the Executive Vice President for Administration & Finance through the office of Capital Planning & Space Management.



Landscape Master Plan (<http://space.gatech.edu/landscape-master-plan>)

7. Plant Palette

TREES					
Botanical Name	Common Name	Hydric	Mesic	Xeric	
<i>Acer rubrum</i>	Red maple	x	x		
<i>Acer rubrum 'Bowhall'</i>	Red maple	x			
<i>Acer saccharum</i>	Sugar maple	x			
<i>Aesculus pavia</i>	Red buckeye		x		
<i>Amelanchier spp.</i>	Serviceberry	x	x		
<i>Betula nigra 'Durahart'</i>	River birch	x	x		
<i>Carpinus caroliniana</i>	Musclewood	x	x		
<i>Carya spp.</i>	Hickory			x	
<i>Chionanthus virginicus</i>	Fringe tree	x			
<i>Celtis laevigata</i>	Sugarberry	x			
<i>Cercis canadensis</i>	Redbud	x			
<i>Cornus florida</i>	Dogwood	x			
<i>Cortaeus viridis 'Winter King'</i>	Hawthorn			x	
<i>Fagus grandifolia</i>	American beech			x	
<i>Halesia tetrapetala</i>	Carolina silverbell	x			
<i>Hammamelis x intermedia</i>	Witch hazel	x			
<i>Liriodendron tulipifera</i>	Tulip poplar		x		
<i>Magnolia virginiana</i>	Sweetbay magnolia	x			
<i>Nyssa aquatica</i>	Water tupelo	x			
<i>Nyssa sylvatica</i>	Blackgum		x		
<i>Ostrya virginiana</i>	Hop hornbeam			x	
<i>Pinus echinata</i>	Shortleaf pine			x	
<i>Pinus taeda</i>	Loblolly pine			x	
<i>Platanus occidentalis</i>	Sycamore	x	x		
<i>Platanus x acerifolia 'Columbia'</i>	Plane tree		x		
<i>Quercus coccinea</i>	Scarlet oak		x		
<i>Quercus nigra</i>	Water oak	x	x		
<i>Quercus phellos</i>	Willow oak		x		
<i>Quercus spp.</i>	Oak			x	
<i>Taxodium ascendens</i>	Pond Cypress	x			
<i>Ulmus americana 'Princeton'</i>	American elm		x		
<i>Ulmus spp.</i>	Elm			x	

Plant list from EBB/South Central Sector Plan Document ([www.space.gatech.edu/sites/default/files/images/ebb-sc-sectorplan.pdf](http://www.space.gatech.edu/sites/default/files/images/ebb-sc-sectorplan.pdf))

# Landscaping

Landscaping on Georgia Tech campus must adhere to the five plant communities indicated in the 2010 Landscape Master Plan. They are Woodland, Parkland, Meadowland, Ornamental and Lawn. All landscaping, new and old shall use the list of acceptable plants in the Campus Landscape Master Plan as updated. The best plant materials should be chosen based on the site conditions, not based solely on the merit of its being native. The objectives are to increase campus tree canopy to a minimum of 55% and campus coverage by Woodlands to 22%.

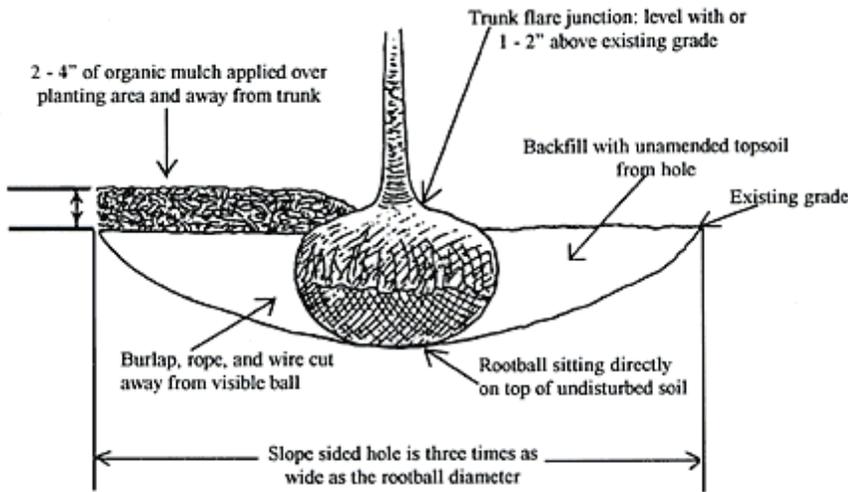


Diagram illustrating proper planting procedure for a tree or shrub.

## Site Preparation

The planting hole should be dug no deeper than the root ball when measured from the bottom of the root ball to the trunk flare. If the hole is deeper than the root ball, it often results in the settling of the plant above the trunk flare and structure roots which can result in the root ball being planted too deep. But the width of the hole should be at least 2 to 3 times the diameter of the root ball with sloping sides.



Tree Planting on Tech Beautification Day

## Setting the Plant and Back Filling the Hole

Plants must be set with trunk flare 1"-2" above the existing grade. Once the plant is properly placed, all visible ropes and burlaps at the top one-third should be cut away. The top 8"-16" of the wire basket should be removed once the root ball is stable in the planting hole; backfill the planting hole with the existing soil. If the existing soil is of a poor quality, addition of soil amendment as recommended by the soil analysis should be used. The backfill soil should be tamped firm enough to remove large air pockets, but not too firm as to remove all fine air spaces needed for a well aerated soil for root development. Complete the backfill by making sure that the trunk flare is completely exposed, spread mulch at 2-4" depth but not touching the trunk, water the root ball and the planting area deeply. Newly planted trees must receive adequate water weekly during the entire first growing season right up until dormancy in the fall, by irrigation or placement of ooze bag or hand watering. Mulch the planting area with 3-4" pine straw mulch. Leaf litter may be used below a layer of pine straw.

# Transplanting

Desirable trees in a development area or other construction sites shall be transplanted by staff if the tree caliper is between 2"-4" where there is an acceptable location and during the planting season (October to March). Trees of larger caliper shall be contracted out using comparable tree transplanting equipments (spades). The tree inventory will be updated to show the new locations after trees are transplanted while maintaining the original tree number.



Tree spade planting in Tech Triangle Lawn

# Fertilizing

Newly planted trees should not receive fertilization during the first growing season except in a situation where a soil test recommends its use. A slow release type of fertilizer should be used around the tree basin. Trees in poor condition should receive deep root fertilization of 5-35-10 plus micro nutrients, with repeat application if necessary. Also, when necessary, we shall use 10-20-10 for evergreen trees and 25-10-10 for general application. Routine tree fertilization is not recommended; however, campus trees receive adequate nutrients from turf, shrubs and ground cover routine application of fertilizers. As part of the maintenance plan, records of fertilizing will be kept as part of the GIS database and used as a tool to track areas needing fertilization.

# Staking

Staking of trees at planting is not required if the root ball is stable. If staking must be done, it will be done in accordance with ANSI most recent edition.

# Critical Root Zone

Careful consideration should be taken when there are impacts to the critical root zone of existing trees. The structural root plate is the zone of rapid root taper that provides the tree stability against wind throw and the general health of the tree. Damage done to the radius of the root zone will encourage pathogens and allow disease to enter the tree. The radius of the root plate is proportional to the stem diameter (DBH) of a tree. The adjacent table provides examples of root plate radii for upright trees without restricted roots.

<u>Critical Root Zone Table</u>	
DBH (inches)	Root plate (feet)
8"	5.5 feet
16"	8 feet
32"	10.5 feet
48"	12 feet

# MAINTENANCE & REMOVAL

## Preventive Maintenance Pruning

The tree team systematically prunes trees annually through a preventive maintenance pruning program. Preventive maintenance pruning is conducted on an as needed basis at this time. All campus trees are periodically surveyed and rated based on their pruning needs to determine scheduling priorities. As part of the maintenance plan, records of pruning are kept as part of the GIS database and used as a tool to track areas needing maintenance.



Sheep used for Kudzu removal

## Service Request

The tree team typically prunes approximately 300 trees annually by service request. Requests are made by customers around campus, which is then followed up by an inspection of the trees by the staff arborist who generates the evaluation and tree rating to determine the type of pruning to be performed by staff. See appendix A, routine inspections by staff provide most of our pruning needs.

## Fallen Limb Removal

When limbs fall from trees on campus, members of the campus community can call in or make a service request (via web base) and by staff inspection to promptly clean up the debris. Every attempt will be made to clean up dropped limbs within the same day, depending on the severity of the storm and the extent of the tree damage (except in the Greek and religious properties). We do not maintain private properties. The remaining tree will be evaluated to assess its suitability for removal.

## Pruning

After planting, only broken or damaged branches should be pruned. Pruning should take place with new and older trees to help train them early on and throughout their lifespan. Tree wrapping is generally not recommended. As part of the maintenance plan, records of pruning will be kept as part of the GIS database and used as a tool to track areas needing pruning.



Street Tree Pruning

## Hazard and Emergency Tree Removal and Re-use

When a tree removal request is made, a certified arborist evaluates the tree in question and makes the determination for removal or not based, on the result. If the tree is considered a hazardous tree, it is then scheduled for removal. All hazardous trees have two things in common, a significant defect and a potential target for falling on a building, car or pedestrian. Most tree removals are done by staff or contractor. Very large trees needing a crane are contracted out. For significant trees 16" caliper or larger, a second opinion from a certified arborist shall be required to ensure that removal is necessary. A "significant" tree is one that is highly visible and/or obviously part of the campus aesthetic. The Tree Campus Committee will review trees subject for removal and determine if the trees are "significant". Those trees deemed "significant" will require a second opinion and level 3 assessment. The Tree Campus Committee is authorized to identify trees appropriate for removal and determining which are significant thus warranting a level 3 assessment. For removal of any trees, the Tree Campus Committee will be notified and the inventory will be updated as needed.

After verifying that it is necessary to remove a tree, it should be evaluated for possible re-use for lumber. Suitability for reuse, ease of access/removal, and if there is a known use for the lumber will be considered as part of the evaluation process. If determined to be suitable, the wood shall be stored and processed to meet the anticipated need at the cost of the proposed end user of the wood.

## Criteria for Re-use

Tree trunks and major limbs are primarily envisioned for processing. The minimum diameter should be 12" and the minimum length should be 8'-0". For 20" or larger trees considerations should be made for alternate uses in active projects on campus to increase the possible uses.

Wood can be cut into a variety of thicknesses. 8"/4" is optimal as it can still be cut down in size but has a reasonable drying time. Note that kiln drying finishes the drying process only, board moisture content needs to be significantly reduced before entering the kiln to limit warping and warping, boards may not be available for use for several years after initial processing. Larger boards will take longer to dry, a year per inch of thickness is advised so drying lumber for structural purposes may take several years. Boards should be clearly labeled to identify tree species, both to track the wood but also as the dust from certain woods can be irritants for those working in fine detail.

As not all wood is suitable for processing into lumber, smaller limbs free of transferable diseases or insects should be chipped. The placement of chipped wood should be coordinated with Georgia Tech Landscaping Services. For additional guidance, refer to the Georgia Tech Green Book and the USDA Recycling Municipal Trees document. (<https://www.srs.fs.usda.gov/pubs/12865>)



Lumber milled from trees during the construction of EBB.



Bar from salvaged trees in Kendeda Building

## Tree Damage Assessment

All damaged trees on Georgia Tech campus shall be assessed by a Certified Arborist using the existing tree evaluation form. Results from the evaluation determines whether the tree should be removed, pruned or receive treatment such as fertilization, and insect/disease control, see pages 20-21 for required forms. Removed trees are updated on the tree inventory list. Whenever it is determined that violation of this procedure has occurred, the Facilities representative or designee shall immediately issue written and oral notice to the person or company or department in violation, identifying the nature and location of the violation and specifying that remedial action is necessary to bring the violation into compliance. The person or company or department in violation shall immediately, conditions permitting, commence remedial action and shall have seven (7) working days after the receipt of the notice, or such longer times as may be specified in the notice, to complete the remedial actions required to bring the activity into compliance with this policy.

## Stump Grinding

After trees are removed, the stumps are then scheduled for grinding, provided there is adequate access to the site. When the stump is ground out, the grindings are raked and left slightly mounded to allow for decay and settling to occur. Utility locates are required when stump grinding is needed.

## Managing for Catastrophic Events

In the event of severe weather conditions such as tornadoes or hurricanes, falling trees will be removed by Landscape Services staff or an outside tree removal company. Roads and streets shall be cleared first, then access to critical buildings, administration, buildings with critical labs, library, student center, etc., in that order. In the advance of severe weather conditions, all necessary equipment shall be checked for readiness and safety by staff.

## Protection/Preservation Policies and Procedures

Tree protection zones shall be established and maintained for all trees to be preserved in a construction or utility project site. Construct a simple barrier for each tree or grouping to protect the trunk and root systems. This reduces damage from heavy equipment and trucks. Wood, plastic or chain link 4' fencing would be suitable. Install the barrier fence 1 foot for every inch diameter of that tree's diameter breast height (DBH), provided that in no case shall the protection zone be less than a radius of 2.5 feet. No root raking shall be allowed within any tree protection zone at anytime during clearing, grading or construction of a project. No equipment or vehicle shall be parked or construction material stored, or substances poured or disposed of or placed within any tree protection zone at anytime during clearing or construction of a project. All work sites shall be planned and conducted in a manner that will minimize damage to protected trees from environmental changes such as altered site drainage or any other land disturbance within or immediately adjacent to the critical root zone of the tree.

Georgia Institute of Technology - 2019 Campus Tree Care Plan



Tree removal due to storm damage.



Champion Willow Oak "Big Al" - September 2018



Tree protection during construction.

# New Building or Facilities Construction

Development activities shall be planned to the extent possible in order to preserve and protect trees on Georgia Tech Campus. Any tree on Georgia Tech campus that must be removed to accommodate development, damage during storm events, disease and water/sewer repairs must be shown on the site plan and a method of compensation shall apply as prescribed by the 2010 Campus Landscape Master Plan update.

1. A 1" diameter tree shall be compensated with an equivalent monetary value.
2. A 1" diameter tree shall cost no less than 200.00 (2018 cost)
3. The sum total of the diameter of replacement trees (inches) shall be multiplied by that year's actual cost of the tree market value.

**GUIDELINES & STANDARDS**

**6.2.2 TREE REPLACEMENT**

**Objectives:**

1. To replace the ecological value of existing trees that are removed because of construction or poor condition.
2. To increase the total tree canopy of the campus to a minimum of 55%.

Trees are vitally important to the ecology and sustainability of Georgia Tech's campus. When an existing tree is removed for some reason, it must be replaced with enough new trees to approximate its ecological value within a reasonable period. Since it takes several decades for a small planted tree to equal the size of a large removed tree, the number of replacement trees is based on the basal area of the removed tree. Basal area is the cross-sectional area of its trunk 4.5 feet above ground and reflects a tree's biomass, which includes its roots, trunk and canopy. and reflects its ecological value for campus soils, hydrology, micro-climate and biodiversity.

Eco-mimicry suggests that trees be planted abundantly to replace a lost tree. This is commonly seen in nature when an opening occurs in a forest and is spontaneously replaced with many seedlings - Nature appears unwilling to wait the decades required for a single tree to grow to equal

what was lost. Since Georgia Tech's goal is to grow its tree canopy to cover 55% of the campus, it makes sense to plant abundantly to replace lost trees.

**Requirements:**

1. If trees are to be removed, a tree condition assessment must be completed by a certified arborist.
2. Use the Tree Replacement Chart for Large and Medium Trees (Chart 6-3) to determine how many trees are required to replace a tree that is removed.

Chart: 6-3

**TREE REPLACEMENT CHART FOR LARGE AND MEDIUM TREES**

	Circumference 4.5' Above Ground	Diameter 4.5' Above Ground		3" Caliper Tree*	2" Caliper Tree	1" Caliper Tree
If Tree is:	<b>Less than 37"</b>	or <b>Less than 6"</b>	then plant:	<b>1</b>	or <b>2</b>	or <b>10</b>
If Tree is:	<b>29' - 37"</b>	or <b>6" - 11"</b>	then plant:	<b>2</b>	or <b>4</b>	or <b>20</b>
If Tree is:	<b>38" - 56"</b>	or <b>12" - 17"</b>	then plant:	<b>5</b>	or <b>10</b>	or <b>50</b>
If Tree is:	<b>57" - 74"</b>	or <b>18" - 23"</b>	then plant:	<b>10</b>	or <b>20</b>	or <b>100</b>
If Tree is:	<b>75" - 93"</b>	or <b>24" - 29"</b>	then plant:	<b>18</b>	or <b>36</b>	or <b>180</b>
If Tree is:	<b>94" -112"</b>	or <b>30" - 35"</b>	then plant:	<b>28</b>	or <b>56</b>	or <b>280</b>
If Tree is:	<b>113" -132"</b>	or <b>36" - 41"</b>	then plant:	<b>41</b>	or <b>82</b>	or <b>410</b>
If Tree is:	<b>More than 132"</b>	or <b>More than 42"</b>	then plant:	<b>55</b>	or <b>110</b>	or <b>550</b>

\* The caliper of replacement trees are measured 6" above ground. To substitute other acceptable sizes: 1(3"caliper tree) = 2 (2"caliper trees) or 10 (1"caliper trees)

## Tree Bank

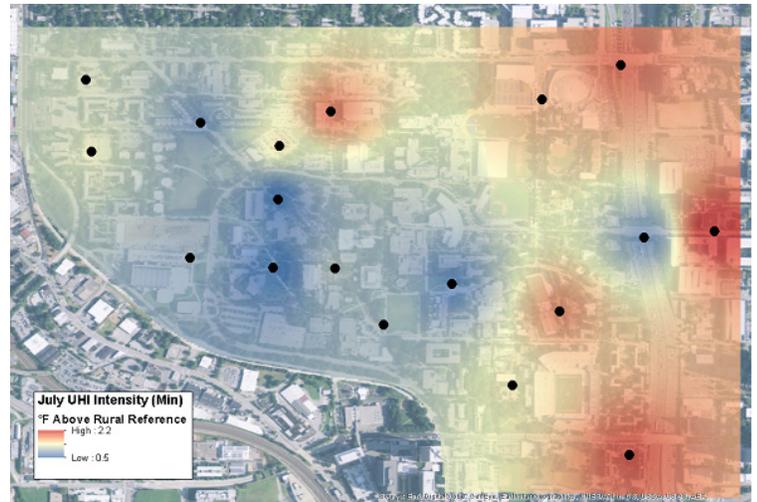
An account is available to receive and manage the tree replacement program. This account allows for flexibility of planting time and/or the issue of having a site with insufficient space for tree planting. If the schedule or space limitations prevent sufficient tree recompense, a payment shall be made to the tree planting and replacement account. The tree replacement or planting account a separate account from the general account allowing funds to be used from year to year for the purpose of tree planting and replacement only.

# Georgia Tech Arboretum

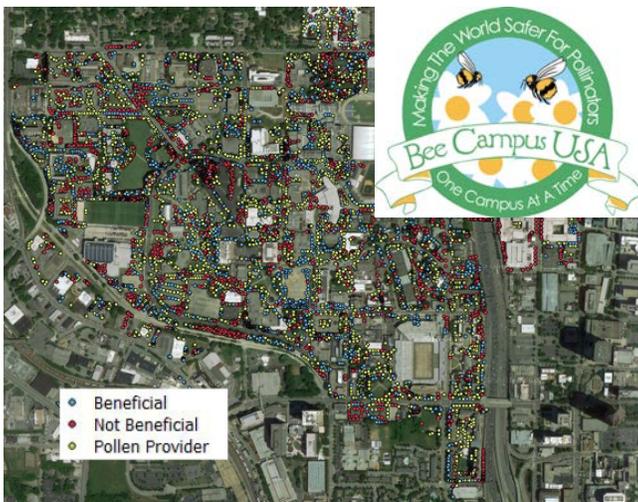
In 2016 Georgia Tech established itself as a Level II Arboretum. The Georgia Tech Arboretum provides a platform for the development of educational tools defining the performance of individual trees and the collective forest in the urban landscape. From the microscopic impacts of trees on soil, to the regional impact of the urban forest on the air we breathe, the Arboretum provides the Georgia Tech community a tool for explaining tree performance values while they are being researched as part of our living learning laboratory.

The arboretum and tree inventory has been or will be used for the research and educational opportunities listed below.

- Heat Island Effect – Canopy coverage
- Stormwater Runoff Calculations
- Leaf Biomass
- Bee Research
- Augmented Reality/Web Development
- Environmentalism & Eco-criticism
- The Urban Forest
- Impacts on Energy use in adjacent buildings
- Phytoremediation
- Biodiversity
- Pollution Reduction
- Carbon Sequestration
- Healthy Trails



Heat Island Research by Urban Climate Lab



Pollinator friendly Tree Research by College of Science Students



Environmentalism and Ecocriticism, "The Fall of a Champion" Remembering Big Al

# Significant Trees on Campus

A recent addition to the Tree Care plan is the designation of significant trees on campus. The goal of this program is to recognize and document trees on the main Georgia Tech campus with exceptional horticultural and/or historical significance. Listed trees will be specially designated members of the Georgia Tech Arboretum and eligible for a more rigorous and specialized program of care and maintenance. These designations will be documented in the tree inventory. Below are criteria to base whether a tree meets 'Significant' status.

1. Age; will vary by species.
2. Diversity; rare species on campus
3. Historic Significance; tree has association with an important event or person.
4. Location and setting; designates a contribution to a significant view or spatial structure of a setting.
5. Appearance Size or Habit; designates an exemplary representation of the characteristics of a genus or species

Significant trees will be designated by the Tree Campus USA committee and take into consideration. Any member of the Georgia Tech community may nominate a campus tree for consideration by contacting the committee chair. Currently there are 24 trees that have been designated as Significant Trees. Below are a few from the designated list for locations of the designated trees refer to the tree inventory at [Arboretum.gatech.edu](http://Arboretum.gatech.edu).



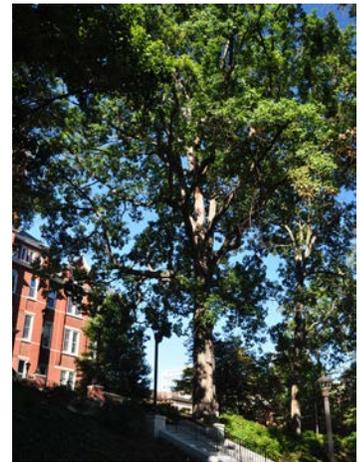
Big Leaf Magnolia (Tree 4569)



Sabal Palmetto (Tree 2121)



Star Magnolia (Tree 742)



White Oak (Tree 1470)

## Significant Tree List

Tree #	Common Name	Scientific Name
8273	American beech	<i>Fagus gradifolia</i>
4569	Big leaf magnolia	<i>Magnolia macrophylla</i>
2121	Cabbage palmetto	<i>Sabal palmetto</i>
4539	Carolina hemlock	<i>Tsuga caroliniana</i>
7715	Chinese evergreen oak	<i>Quercus myrsinifolia</i>
1451	Blue spruce	<i>Picea pungens glauca</i>
1927	Ginko	<i>Ginkgo biloba</i>
504	Japanese maple	<i>Acer palmatum</i>
503	Japanese maple	<i>Acer palmatum</i>
2189	Japanese maple	<i>Acer palmatum</i>
1926	Kwanzoh cherry	<i>Prunus serrulata</i>
5064	Post oak	<i>Quercus stellata</i>
1370	Redbud	<i>Cercis canadensis</i>

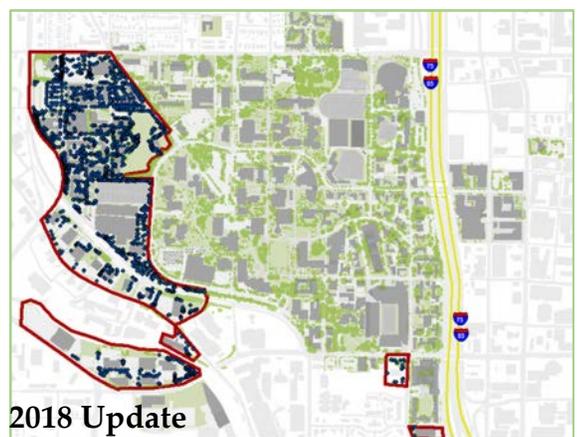
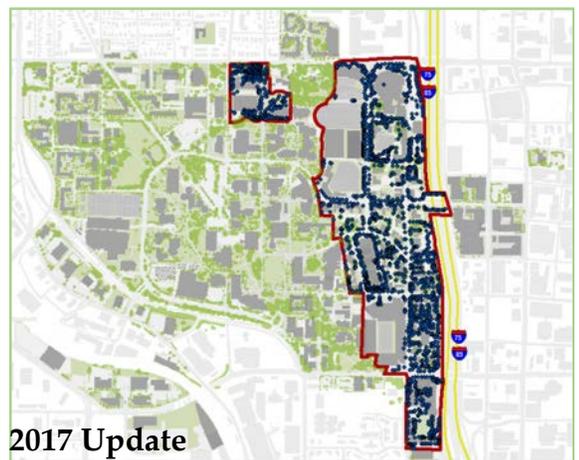
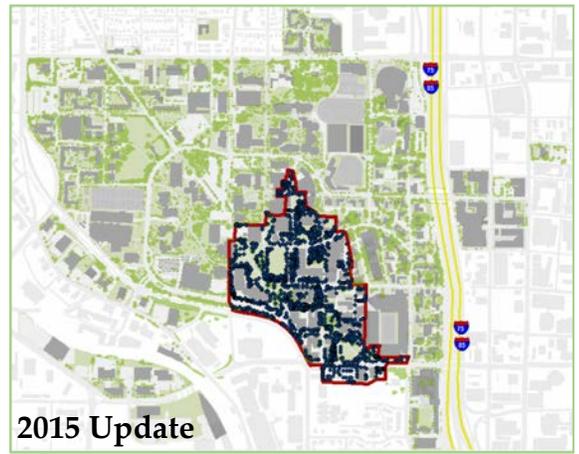
Tree #	Common Name	Scientific Name
4958	Sawtooth oak	<i>Quercus acutissima</i>
7044	Serbian spruce	<i>Picea omorika</i>
7689	Slash pine	<i>Pinus elliottii</i>
8199	Southern magnolia	<i>Magnolia grandiflora</i>
742	Star magnolia	<i>Magnolia stellata</i>
988	Southern red oak	<i>Quercus falcata</i>
1470	White oak	<i>Quercus alba</i>
1781	Willow oak	<i>Quercus phellos</i>
1782	Willow oak	<i>Quercus phellos</i>
1783	Willow oak	<i>Quercus phellos</i>
1784	Willow oak	<i>Quercus phellos</i>

# Tree inventory Upkeep Strategy

Continued maintenance of tree inventory is of utmost importance. Plenty of examples exist where comprehensive inventories are not maintained and become stale and unreliable. Since the completion of a full campus tree inventory in 2012, Georgia Tech has committed to keeping its inventory continually updated. The campus is divided into five zones and a program to comprehensively re-inventory the trees in a five-year revolving cycle has been adopted. With assistance from CSPAV (formerly Center for GIS) since 2015, Georgia Tech has performed updates on 4 of 5 different zones of the campus inventory.

These updates document new and removed trees and the growth of existing trees. Coordination with significant capital projects has been required to capture data efficiently. There may be instances where a large capital construction project may plant a number of new trees, remove existing trees, or transplant existing trees. In situations like these the contractor will be required to provide a complete tree update as per Georgia Tech's inventory specification outlined in the campus green book. A comprehensive process for tree data capture has been incorporated into the "Green Book". The Green Book documents the campus landscape standards for consultant and contractors to reference.

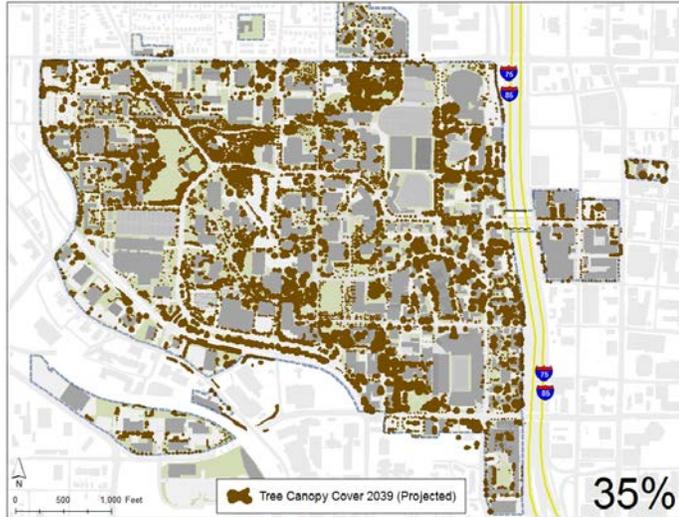
In 2019/20 the 5th zone will be updated. Upon completion, the data will be analyzed to study the growth rates and estimate the projected canopy coverage for twenty years.



2019 - Tree count 13,178

# Tree Canopy Planning and Analysis

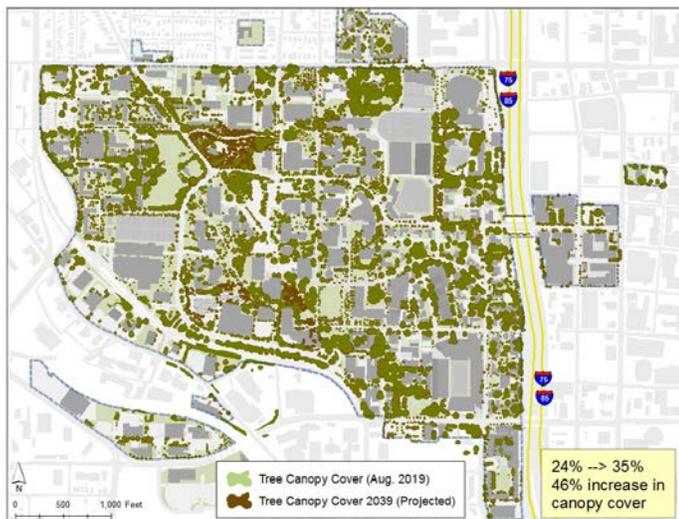
This data provides valuable information regarding the growth rate of trees since the completion of the initial inventory. These growth rates are now being used to estimate the anticipated growth of our tree canopy.



Canopy Coverage Estimates

Estimates for Canopy Growth over 20 years calculated based on the following estimates

- Canopy Trees under 10" caliper assume 50% growth
- Canopy Trees 10-20" caliper assume 25% increase
- Canopy Trees 20-30" caliper assume 15% increase
- Canopy Trees 30"-50" caliper assume 7.5% increase
- Canopy Trees over 50" caliper assume 2.5% increase
- Remaining "Non-Canopy" tree species assume 25% increase.

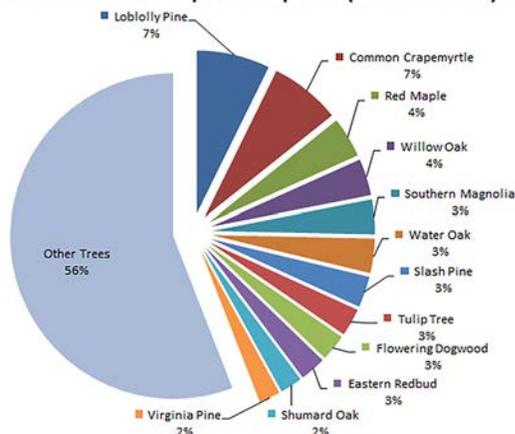


Growth Comparison Study

Growth Comparison overlay

- Canopy Coverage 2019 tree canopy coverage 24% (96 acres)
- Projected 2039 tree canopy 35% (138 acres)
- Campus area for canopy calculation is 397 acres
- Approximate percent canopy increase from 2019 to 2039 results in a 46% in canopy coverage over 20 years.

## Tree Distribution - Top Dozen Species (All Active 2019)



Tree Distribution Chart

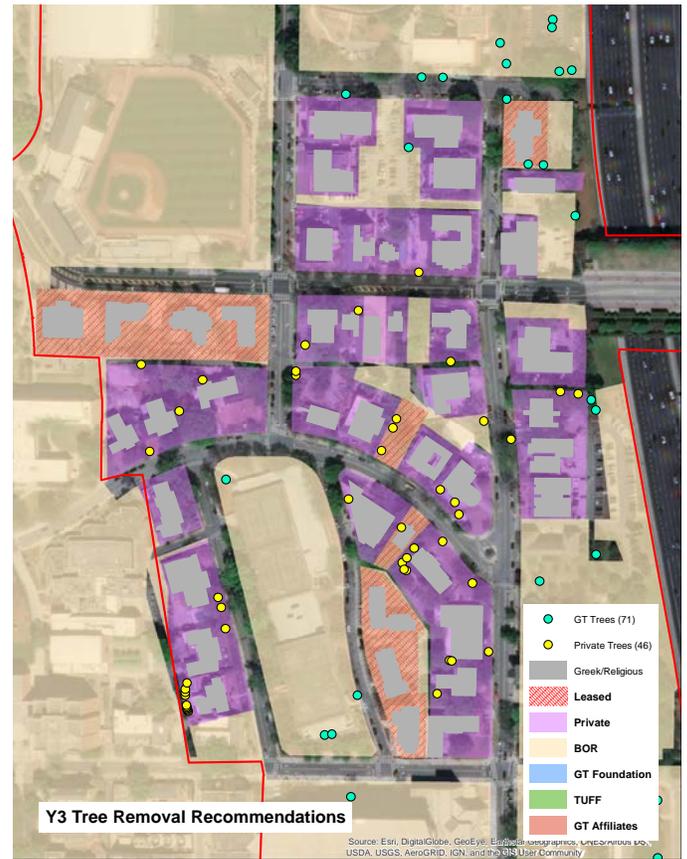
## Species Distribution

These estimates provide a guide for planning purposes to see when and if the campus wide goal of 55% canopy coverage is achievable. While also allowing us to monitor the species distribution across campus.

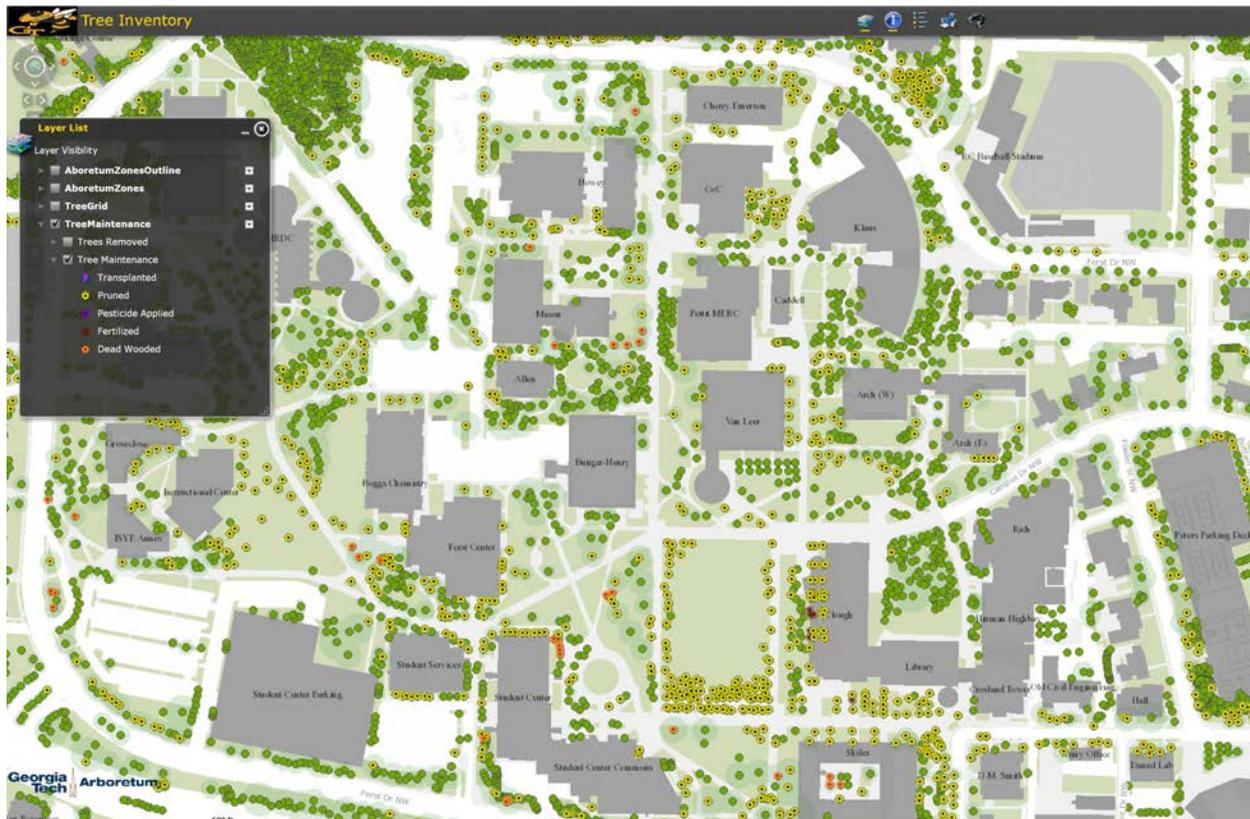
In addition to the inventory updates the Campus stakeholders continue to document and monitor tree maintenance activities including regular on demand maintenance tasks such as pruning, fertilizer applications, new trees plantings, tree removals, and transplanting of trees. Maintenance activities are recorded as an overlay to the existing inventory on a GPS hand-held GIS application.

As part of this inventory update process, trees considered in poor health are identified and evaluated to determine the appropriate action. Part of this process is confirming ownership and notifying the responsible party of the tree and its need for further evaluation.

Prior to monthly Tree Campus USA meeting modifications will be synchronized to the database. Updates to the campus tree inventory will be presented to the entire Tree Campus USA committee during the monthly meetings with maps and reports of monthly activities. These updates will also serve as a tool for Tree Campus USA renewal process each year. Efforts will be made to visually inspect and record tree condition alongside regular maintenance activities.



Tree Ownership Verification



Tree Inventory Database

# Design Requirements

Design of a new developments or reconstruction shall include a green space plan in the proposal. Such plans shall include a tree protection, tree establishment and landscape plan. The plan shall conform to the landscape standards as described in the Campus Master Plan, Landscape Master Plan, and Green Book.

## Vegetation Communities

Guidelines for establishing and maintaining the three vegetation communities, Woodland, Parkland, and Meadowland, are provided in the landscape master plan. These guidelines ensure the programmatic and sustainability requirements for the vegetation communities are met.

The Woodlands are multi-layered plant communities with an overstory canopy, an understory of young or small trees and shrubs, an herbaceous ground layer, and a heavy leaf litter layer. It is the most important ecological and sustainable component of the campus landscape. Its defining aspect is its vertical layering of leaf masses with 100%, redundant coverage of the ground plane. Woodland vegetation areas are characterized as zones requiring minimum maintenance and maximum tree canopy. The maintenance requirements for these areas are unique from the parkland zones as they allow a dense canopy of non-invasive trees to grow and mature with minimal under story maintenance. Annual selective pruning is required to maintain safety and visibility through the trees and eliminate invasive species. The woodlands should be managed with the mindset that the trees are one organism, whose form will change over time, as its biomass increases to reach stasis with site resources. Individual trees may be squeezed out by competition but the community is more important than an individuals within it.

The Parklands are more manicured and consist of a discontinuous overstory canopy, a limited and intermittent understory, and an open herbaceous or ground layer. It is primarily lawn and large trees. It is best used where there is a need for free movement at the ground plane, open visibility at eye level, and park uses of lawn.

The Meadowlands/Grass is predominantly a landscape of grasses and forbs with shrubs masses have a few trees. In natural settings it is associated with old fields and the edge of woodlands, ponds, and streams. It is best used on campus where there is a need to preserve open views.



Woodland Pruning - Before



Woodland Pruning - After



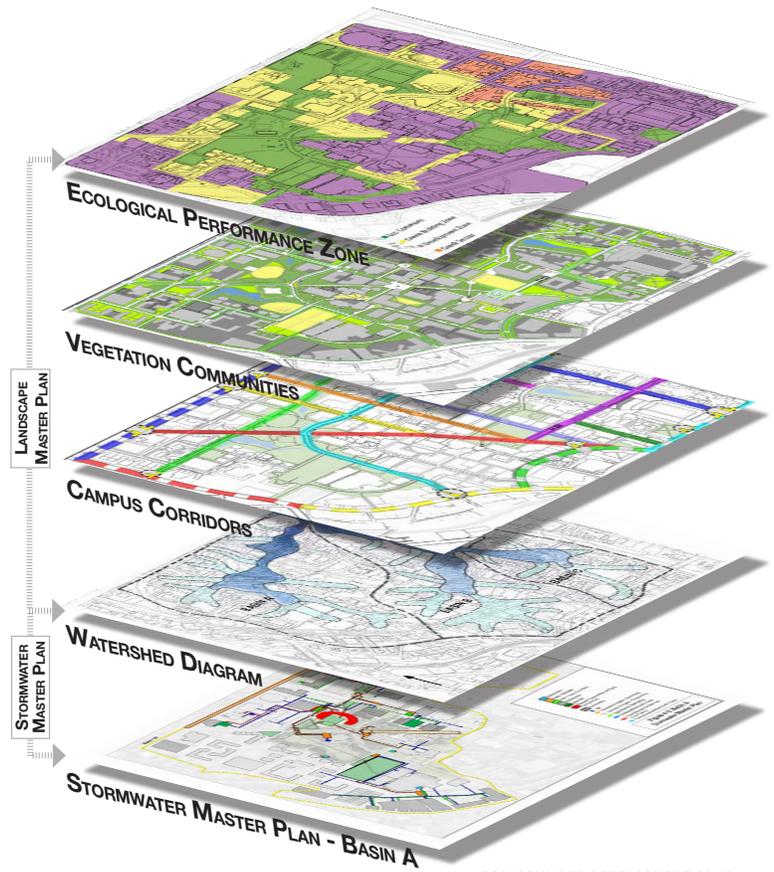
IC Lawn Parkland with Grass areas

## Landscape Master Plan and Stormwater Master Plan

The Landscape Master Plan grew out of the 2004 Campus Master Plan Update (CPMU), which highlighted the role of open space in achieving goals of sustainability and livability. It recommended the landscape could perform valuable ecological work for the Institute, and established the Eco-Commons as a permanent open space in the heart of campus for stormwater management and outdoor recreation.

The Landscape Master Plan is based on the concept that the campus represents two landscapes that are one — an ecological landscape, governed by biophysical processes, and a human landscape, governed by the social activities and experience of people. The purpose of the Master Plan is to engender the performance and value of both through a holistic approach, based on Ecology.

To further separate the layers and comprehensively study the civil engineering, Georgia Tech developed the Stormwater Master Plan for Basin A. The plan outlines the infrastructure needed to achieve the goal of 50% reduction in stormwater runoff from campus.



Masterplan Summary Graphics

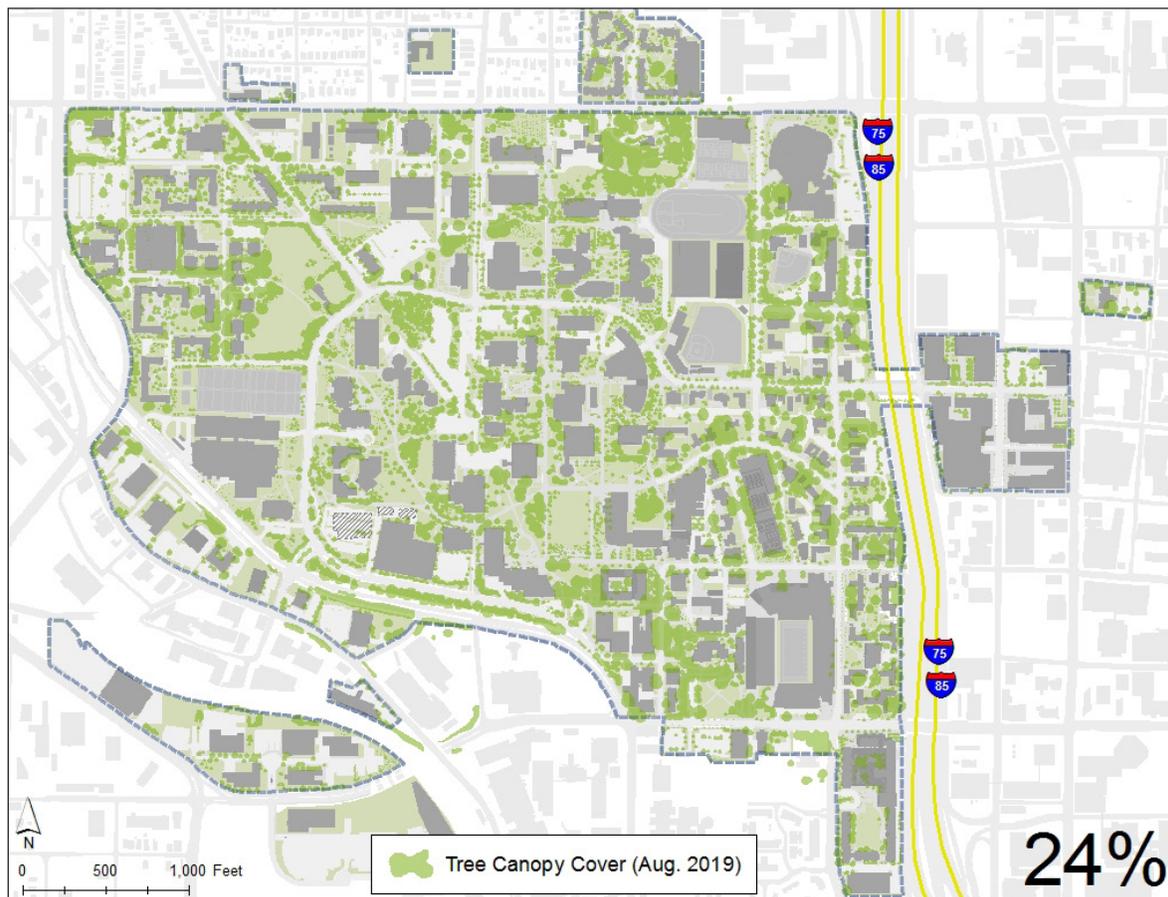
## The Right Tree in the Right Place

A healthy community forest begins with careful planning. Trees will be properly placed to avoid collisions with power lines and buildings.

The following should be taken into consideration

1. Height - Will the tree impact anything when it is fully grown?
2. Canopy spread - How wide will the tree grow?
3. Leaf type - Is the tree deciduous or evergreen and where the leaves will drop?
4. Typical tree form - Form or shape typical of the species and the desired result impact placement.
5. Growth rate - Species growth rate and anticipated life expectancy.
6. Site conditions - Soil, sun, and moisture requirements.
7. Fruit - Fruit trees are encouraged, however adjacencies to sidewalks and parking lots should be avoided.
8. Hardiness zone - The hardiness zone typically associated with a specific species and the micro climate of the proposed location.





Canopy Coverage 2019

## Goals and Targets

Develop an integrated, ecologically based landscape and open space system that will help Georgia Tech achieve its goal of environmental sustainability by 1) increasing campus tree canopy to a minimum of 55%, 2) increase campus coverage by Woodlands to 22% and 3) the completion and maintenance of the campus tree inventory. The campus tree inventory as indicated in the 2006 Campus Landscape Master Plan 2005 was 5000 trees and the tree canopy coverage was 15-18%. In 2008 and 2009, it was estimated that Georgia Tech Campus had about 6,700 and 7,023 trees respectively providing approximately 33.8% of tree canopy in 2008. In 2012, Georgia Tech completed GIS Tree Inventory of its 2" caliper or greater trees for the 397 acre campus. The inventory total in 2012 was 11,046 with approximately 178 species. Due to an increase in area and accuracy of data collection, the 2012 campus canopy coverage was 25%. The inventory was completed using a GIS base system and further leveraged to derive environmental benefits resulting from campus trees using the USFS iTree software model. The model has been rerun to update inventories periodically assessing the performance of trees across campus. A critical component of this goal is the ongoing maintenance of the tree inventory database. Georgia Tech's 5 Year Tree Management Plan/Inventory Update provides current data for research and maintenance tracking allow for a variety of planning uses.

For example, since 2012, there has been significant construction across campus and several large champion trees were lost due to a variety of issues. This has had impacts on the canopy coverage. However, even with these impacts, Georgia Tech has maintained the canopy coverage of 24% while increasing the number of trees by more than 2,000. As of October 2019, Georgia Tech has 13,178 trees. Without the inventory we would not be able to track this data.



# Awards and Recognition

In addition to being an annual Tree Campus USA recipient since 2008, Georgia Tech has received several awards since the last submission of the tree care plan in 2014. Below are the awards and recognitions Georgia Tech has received for several programs related to trees and the campus landscape.

## 2015 PGMS Green Star Award

The Professional Grounds Management Society (PGMS) recognized Georgia Institute of Technology in Atlanta, Georgia with an Honor Award in the Society’s 2015 Green Star Awards competition. The award was given in the University and College Grounds category for exceptional grounds maintenance.



2015 PGMS Award

## 2015 GUFC President’s Award

The Georgia Urban Forest Council recognized Georgia Tech for its Comprehensive Urban Campus Tree Inventory and Management Practice.



2015 GUFC President’s Award

## 2016 ArbNet Level II Accredited Arboretum

Georgia Tech meets the requirements for and is recognized as a Level II Arboretum



2016 Arboretum Accreditation

## 2017 Georgia Water Conservancy Chattahoochee Riverkeeper - Green 13 Award

Georgia Tech received the Green 13 Award for the planning and implementation of a variety of green solutions to reduce stormwater runoff. These include re-establishing and managing forests as a significant component of this infrastructure.



2017 Green 13 Award

## Dedicated Annual Expenditures for Campus Tree Program

Georgia Tech has dedicated two full time employees (a certified arborist & equipment operator) and 1/3 of Forepersons time totaling \$138,518.39 for the tree program. On average, Georgia Tech Landscape Services spends \$19,000.00 to purchase new trees per year. The following equipment is used in the maintenance and care of our campus trees.

• Hand-held GPS Unit	\$ 9,500.00
• Chipper truck with 25' bucket	\$ 52,756.20
• Vermeer 1250 Chipper	\$ 20,000.00
• Vermeer Stump Grinder	\$ 11,542.90
• New Holland Ford Backhoe	\$ 55,542.90
• Bobcat 863 Loader	\$ 19,960.84
• Chainsaw (6)	\$ 3,809.70
• Pole saw	\$ 749.00
• Climbing Gears	\$ 1,122.75
• Bobcat Grapple Bucket Subtotal (Equipment Invested)	<u>\$ 2,999.000</u>
	\$177,983.29
Equipment Maintenance/yr	\$ 1,722.69
Grand total on equipment	<u>\$179,946.19</u>
Annual Contract Labor Cost	\$ 66,566.50

# The Georgia Tech Beautification Day (TBD) and Earth Day

The Georgia Tech Beautification Day and Earth Day held annually in March or April, account for over 500 students, faculty & staff volunteers. Participants at 3 hours per volunteers x \$18 equals \$27,000.00 of volunteer labor per year. They participate in planting trees, shrubs, ground cover, flowers, laying sod, spreading pine straw and wood chips, pulling weeds, picking up trash, etc. on the Georgia Tech campus. Some Hands-On-Atlanta members also participate with the students, faculty and staff.

Other associated costs of the campus tree management are:

- Tree Inventory database maintenance by Georgia Tech Center at \$20,000/yr
- Updated Georgia Tech Campus Landscape Master Plan 2010
- Three staff members are ISA Certified Arborist with assorted fees of \$3,000.00 (currently these are funded by the individual arborists)
- Conducting 5 year Tree Management Plan/Inventory update at \$103,932.00

Summary of the dollar value dedicated to the tree program by Georgia Tech are:

• Labor staff/yr	\$178,038.39
• Labor contract/yr	\$ 66,566.50
• Labor volunteer/yr	\$ 27,000.00
• Tree purchase/yr	\$ 19,000.00
• Materials/yr	\$ 7,500.00
• Equipment investment	\$177,983.29
• Equipment maintenance/yr	\$ 1,722.69
• 5 year tree management plan/inventory update	\$ 103,932.00
• Database tree maintenance/yearly	\$ 20,000.00
• Staff associations & training cost	<u>\$ 3,000.00</u>
TOTAL	\$604,742.87

Georgia Tech's full time student population is 22,384 x \$3 annual expenditure requirement is \$67,152.00. Therefore, Georgia Tech is well over the required amount of expenditures needed for Tree Campus USA participation.

## Definitions:

- Caliper. The diameter or thickness of the main stem of a young tree or sapling as measured at six (6") inches above ground level. This measurement is used for nursery-grown trees having a diameter of four inches or less.
- Canopy trees. A tree that will grow to a mature height of at least 40 feet with a spread of at least 30 feet.
- Clearing. The removal of trees or other vegetation of two inches DBH or greater.
- Critical Root Zone. The minimum area surrounding a tree that is considered essential to support the viability of the tree and is equal to a radius of one foot per inch of trunk diameter (DBH).
- Development. The act, process or state of erecting buildings or structures, or making improvements to a parcel or tract of land.
- Diameter, breast height (DBH). The diameter or width of the main stem of a tree as measured 4.5 feet above the natural grade at its base. Whenever a branch, limb, defect or abnormal swelling of the trunk occurs at this height, the DBH shall be measured at the nearest point above or below 4.5 feet at which a normal diameter occurs.
- Green space. Any area retained as permeable unpaved ground and dedicated on the site plan to supporting vegetation.
- Green space plan. A map and/or supporting documentation which describes for particular site where vegetation is to be retained or planted in compliance with these regulations. The green space plan shall include a tree establishment plan, or a tree protection plan, and a landscape plan.
- Impervious surface. A solid base underlying a container that is nonporous, unable to absorb hazardous material, free of cracks or gaps and is sufficient to contain leaks, spills and accumulated precipitation until collected material is detected and removed.
- Landscape plan. A map and supporting documentation which describes for a particular site where vegetation, is to be retained or provided in compliance with the requirements of this policy. The landscape plan shall include any required buffer elements.
- Native tree. Any tree species which occurs naturally and is indigenous within the region.
- Tree establishment plan. A map and supporting documentation which describes, for a particular site where existing trees are to be planted in compliance with the requirements of these regulations, the types of trees and their corresponding trees for reforestations.
- Tree protection plan. A map and supporting documentation which describes for a particular site where existing trees are to be retained in compliance with the requirements of the regulations, the types of trees and their corresponding tree for reforestations.
- Tree protection zone. The area surrounding a preserved or planted tree that is essential to the tree's health and survival, and is protected within the guidelines of these regulations.



# Basic Tree Risk Assessment Form

Client \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 Address/Tree location \_\_\_\_\_ Tree no. \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
 Tree species \_\_\_\_\_ dbh \_\_\_\_\_ Height \_\_\_\_\_ Crown spread dia. \_\_\_\_\_  
 Assessor(s) \_\_\_\_\_ Tools used \_\_\_\_\_ Time frame \_\_\_\_\_

### Target Assessment

Target number	Target description	Target protection	Target zone			Occupancy rate 1 – rare 2 – occasional 3 – frequent 4 – constant	Practical to move target?	Restriction practical?
			Target within drip line	Target within 1 x Ht.	Target within 1.5 x Ht.			
1								
2								
3								
4								

### Site Factors

**History of failures** \_\_\_\_\_ **Topography** Flat  Slope  \_\_\_\_\_ % **Aspect** \_\_\_\_\_  
**Site changes** None  Grade change  Site clearing  Changed soil hydrology  Root cuts  Describe \_\_\_\_\_  
**Soil conditions** Limited volume  Saturated  Shallow  Compacted  Pavement over roots  \_\_\_\_\_ % Describe \_\_\_\_\_  
**Prevailing wind direction** \_\_\_\_\_ **Common weather** Strong winds  Ice  Snow  Heavy rain  Describe \_\_\_\_\_

### Tree Health and Species Profile

**Vigor** Low  Normal  High  **Foliage** None (seasonal)  None (dead)  Normal \_\_\_\_\_ % Chlorotic \_\_\_\_\_ % Necrotic \_\_\_\_\_ %  
**Pests/Biotic** \_\_\_\_\_ **Abiotic** \_\_\_\_\_  
**Species failure profile** Branches  Trunk  Roots  Describe \_\_\_\_\_

### Load Factors

**Wind exposure** Protected  Partial  Full  Wind funneling  \_\_\_\_\_ **Relative crown size** Small  Medium  Large   
**Crown density** Sparse  Normal  Dense  **Interior branches** Few  Normal  Dense  **Vines/Mistletoe/Moss**  \_\_\_\_\_  
**Recent or expected change in load factors** \_\_\_\_\_

### Tree Defects and Conditions Affecting the Likelihood of Failure

#### — Crown and Branches —

Unbalanced crown <input type="checkbox"/>	LCR _____ %	Cracks <input type="checkbox"/>	Lightning damage <input type="checkbox"/>
Dead twigs/branches <input type="checkbox"/>	_____ % overall	Codominant <input type="checkbox"/>	Included bark <input type="checkbox"/>
Broken/Hangers	Number _____	Max. dia. _____	Weak attachments <input type="checkbox"/>
Over-extended branches <input type="checkbox"/>		Max. dia. _____	Cavity/Nest hole _____ % circ.
<b>Pruning history</b>			Previous branch failures <input type="checkbox"/>
Crown cleaned <input type="checkbox"/>	Thinned <input type="checkbox"/>	Raised <input type="checkbox"/>	Similar branches present <input type="checkbox"/>
Reduced <input type="checkbox"/>	Topped <input type="checkbox"/>	Lion-tailed <input type="checkbox"/>	Dead/Missing bark <input type="checkbox"/>
Flush cuts <input type="checkbox"/>	Other _____		Cankers/Galls/Burls <input type="checkbox"/>
			Sapwood damage/decay <input type="checkbox"/>
			Conks <input type="checkbox"/>
			Heartwood decay <input type="checkbox"/>
			Response growth _____
_____ Condition (s) of concern _____			
Part Size _____	Fall Distance _____	Part Size _____	Fall Distance _____
<b>Load on defect</b> N/A <input type="checkbox"/>	Minor <input type="checkbox"/>	Moderate <input type="checkbox"/>	Significant <input type="checkbox"/>
<b>Likelihood of failure</b> Improbable <input type="checkbox"/>	Possible <input type="checkbox"/>	Probable <input type="checkbox"/>	Imminent <input type="checkbox"/>

#### — Trunk —

Dead/Missing bark  Abnormal bark texture/color   
 Codominant stems  Included bark  Cracks   
 Sapwood damage/decay  Cankers/Galls/Burls  Sap ooze   
 Lightning damage  Heartwood decay  Conks/Mushrooms   
 Cavity/Nest hole \_\_\_\_\_ % circ. Depth \_\_\_\_\_ Poor taper   
 Lean \_\_\_\_\_° Corrected? \_\_\_\_\_  
 Response growth \_\_\_\_\_  
 Condition (s) of concern \_\_\_\_\_  
 Part Size \_\_\_\_\_ Fall Distance \_\_\_\_\_  
**Load on defect** N/A  Minor  Moderate  Significant   
**Likelihood of failure** Improbable  Possible  Probable  Imminent

#### — Roots and Root Collar —

Collar buried/Not visible  Depth \_\_\_\_\_ Stem girdling   
 Dead  Decay  Conks/Mushrooms   
 Ooze  Cavity  \_\_\_\_\_ % circ.  
 Cracks  Cut/Damaged roots  Distance from trunk \_\_\_\_\_  
 Root plate lifting  Soil weakness   
 Response growth \_\_\_\_\_  
 Condition (s) of concern \_\_\_\_\_  
 Part Size \_\_\_\_\_ Fall Distance \_\_\_\_\_  
**Load on defect** N/A  Minor  Moderate  Significant   
**Likelihood of failure** Improbable  Possible  Probable  Imminent

**Risk Categorization**

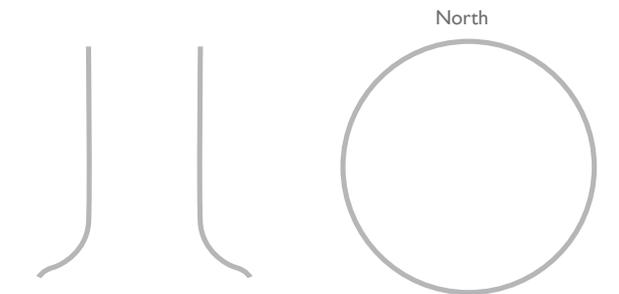
Target (Target number or description)	Tree part	Condition(s) of concern	Likelihood											Consequences				Risk rating (from Matrix 2)		
			Failure				Impact				Failure & Impact <i>(from Matrix 1)</i>									
			Improbable	Possible	Probable	Imminent	Very low	Low	Medium	High	Unlikely	Somewhat	Likely	Very likely	Negligible	Minor	Significant		Severe	

Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impact			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely


Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low



**Notes, explanations, descriptions**

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**Mitigation options**

- \_\_\_\_\_ Residual risk \_\_\_\_\_

**Overall tree risk rating**      Low    Moderate    High    Extreme

**Overall residual risk**      None    Low    Moderate    High    Extreme       **Recommended inspection interval** \_\_\_\_\_

**Data**  Final  Preliminary      **Advanced assessment needed**  No  Yes-Type/Reason \_\_\_\_\_

**Inspection limitations**  None  Visibility  Access  Vines  Root collar buried Describe \_\_\_\_\_