

# III

## CAMPUS SUSTAINABILITY



# MASTER PLAN TO ROBUST PRACTICE: THE EVOLUTION OF SUSTAINABLE LANDSCAPE PRACTICES AT GEORGIA INSTITUTE OF TECHNOLOGY

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## INTRODUCTION

Universities across the globe are recognizing the need to implement sustainable landscaping practices in order to support wildlife, improve water quality and positively impact human health and wellbeing. Georgia Institute of Technology learned that such sustainable practices, when properly aligned with overarching campus goals, can also enable continuous, collaborative decision-making and student engagement.

The Georgia Institute of Technology (Georgia Tech) is a leading research university situated on 426 acres of land in midtown Atlanta, Georgia, with a student population of 27,000 (Fall 2017). An urban oasis in the center of town, Georgia Tech's campus offers 312.5 landscaped acres, 3.5 naturalized acres and 110 acres of buildings. The campus is also a level II certified arboretum boasting 12,000+ trees in its urban forest.

Prior to the 1990s, Georgia Tech was commonly referred to as a concrete and brick campus with very little landscape. However, in 1999 all that changed when the Georgia Tech administration decided to invest in sustainable landscaping, including the recruitment of qualified staff with specific skill sets to take on this challenge. The Institute's initial landscape master plan objectives were to reduce impervious surfaces such as surface parking lots, increase woodland coverage and enlarge the tree canopy.

A significant amount of sustainable landscape practices and collaborative methods grew from these initial objectives. Establishing a plan with clear goals, having the support of executive leadership and employing the right team members enabled the Georgia Tech campus to be transformed from a concrete jungle to a forested, urban oasis in less than 20 years.

## KEYWORDS

sustainable landscape practices, Campus Landscape Master Plan, service learning projects, living laboratory, Tree Campus USA

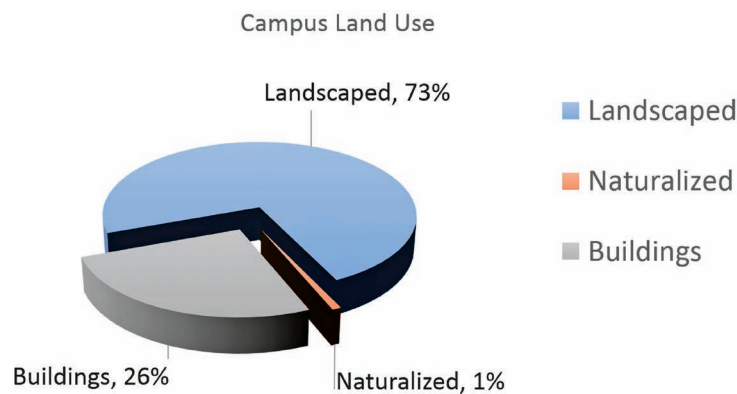
## SUPPORTING A VISION

The vision of Georgia Tech is that it will define the technological research University of the 21st century. Through that philosophy, Georgia Tech's Landscape Services department positions itself as a pillar of environmental stewardship by fostering the intrinsic value of natural

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**FIGURE 1.** Georgia Tech land use



systems, implementing hands-on, sustainable technologies and collaborating across the campus to address technical challenges in the exterior built and planned environment.

Georgia Tech established The Campus Landscape Master Plan in 2004 (updated in 2006 and again in 2010). Plan objectives include but are not limited to: increasing the campus tree canopy to a minimum of 55% by planting more trees and providing an effective maintenance program; increase campus woodland coverage to 22% by converting hardscapes and building footprints into sustainable landscapes; increase biodiversity and use plants that are predominately native or ecologically appropriate to this region; reduce storm water discharge into the City of Atlanta Sewer System by 50% over 2003.

Pursuing such ambitious objectives required significant rethinking of how our landscaping teams were organized and how work was prioritized. Today, the Landscape Services Department employees 69 people, includes a dedicated tree team, and is charged with the maintenance of hardscapes, landscapes, and 12,000 trees, as well as snow and ice removal in the winter months. The mission of the department is to help Georgia Tech achieve its goal of environmental sustainability by maintaining an integrated, ecologically-based landscape and open space system that serves as a beautiful, attractive and safe campus environment where students, faculty, staff and visitors can enjoy, live, work and study.

**FIGURE 2.** Change from concrete to green campus over time.



## **ENGAGING CAMPUS THROUGH TREE CAMPUS USA PROGRAM PARTICIPATION**

In 2008, while the Landscape Master Plan was being established, Georgia Tech was approached by the Arbor Day Foundation to participate in the new, national program “Tree Campus USA.” Serendipitously, by pursuing the Tree Campus USA program goals, the Institute was able to strengthen our commitment and tactical application of the Landscape Master Plan, supporting outcomes that benefited a broad range of stakeholders.

The Tree Campus USA program aims to foster the development of the next generation of tree stewards. The program is designed to award national recognition to college campuses for promoting healthy urban forest management and engaging the campus community in environmental stewardship. To be recognized as a Tree Campus USA, the college campus must meet five core standards in support of a sustainable campus forest. These standards include a campus tree care plan, the establishment of a tree advisory committee, dedicated annual expenditures for a campus tree program, Arbor Day observance and a service-learning project.

The first requirement of Tree Campus USA is to provide a Campus Tree Care Plan flexible enough to fit the campus’ needs and circumstances. The Georgia Tech plan includes goals regarding tree planting, canopy cover, a GIS tree inventory, guidelines for maintenance, removal and more. Georgia Tech’s 2009 Tree Care Plan is used as a sample on the Arbor Day’s website under Tree Campus USA application procedures.

Other program requirements include having a tree advisory committee, dedicated annual expenditures for a campus tree program, Arbor Day observance and at least one tree-related service-learning project. These requirements and their benefits are discussed below.

## **COLLABORATIVE DECISIONMAKING & MUTUAL APPRECIATION**

On the Georgia Tech campus, the establishment of a Campus Tree Advisory Committee is a multi-disciplinary/cross-campus consortium. Members include representatives from Facilities Management, Capital Planning and Space Management, Parking, Housing, Georgia Tech Research Institute, students and faculty, as well as the surrounding Home Park and Vine City communities. The committee holds monthly meetings where they develop and update the Georgia Tech Tree Care Plan every five years and apply for the yearly recognition. This committee has provided a platform for members from various departments to sit at one table and discuss ways of improving sustainable programs that can benefit everyone.

A Landscape Review Committee serves as the reviewing and approving body for all landscape related constructions, developments, standards and maintenance issues. The Executive Vice President of Administration and Finance chairs the committee. It is composed of members from various departments across campus. Having overlapping members between the Landscape Review Committee and the Tree Campus USA Advisory Committee fosters an ongoing communication from one committee to another.

As the operator, the Landscape Services Department hears directly from the planners and project managers on the intent of design. This enables the sharing of ideas and concerns in bridging the gap between ideation, design and daily maintenance. In return, there is a clearer understanding of the impact of grounds management and operations on the environment. Too often, when establishing ambitious environmental goals, an organization will design and build sustainability, but forget the importance of supporting sustainable operational practices for the lifetime of the landscape investments.

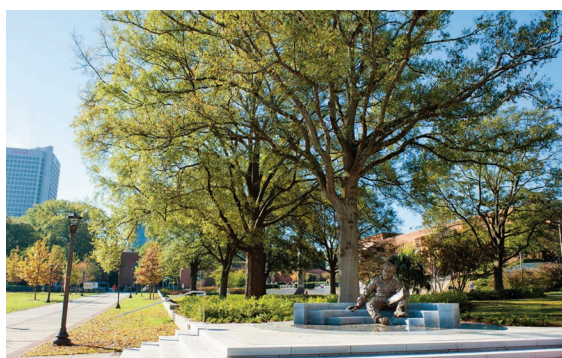
These committees also shed light on funding limitations from the finance team, which helps alleviate angst when a project undergoes a change or reduction. It is not a perfect science, but these committees do provide opportunities for information exchange during committee meetings, which never existed before. Thus, clarifying expectations for all stakeholders.

Overtime the committee has become a powerful force on campus by bringing together stakeholders from the executive leadership, the student body, Capital Planning and Space Management, Facilities Management, Campus Services and Georgia Tech Research to focus on the same goals. The committee cultivates an atmosphere of collaboration and shared purpose among staff, colleagues and community members.

### FOSTERING SERVICE LEARNING & LIVING LABORATORY

Sustainable landscape practices at Georgia Tech have led to student engagements that enable service-learning and hands-on research. To accurately track our tree inventory and understand the impact that campus forested areas are having on urban heat island, we have a research

**FIGURE 3.** Tree campus USA has been realized on campus since 2008.

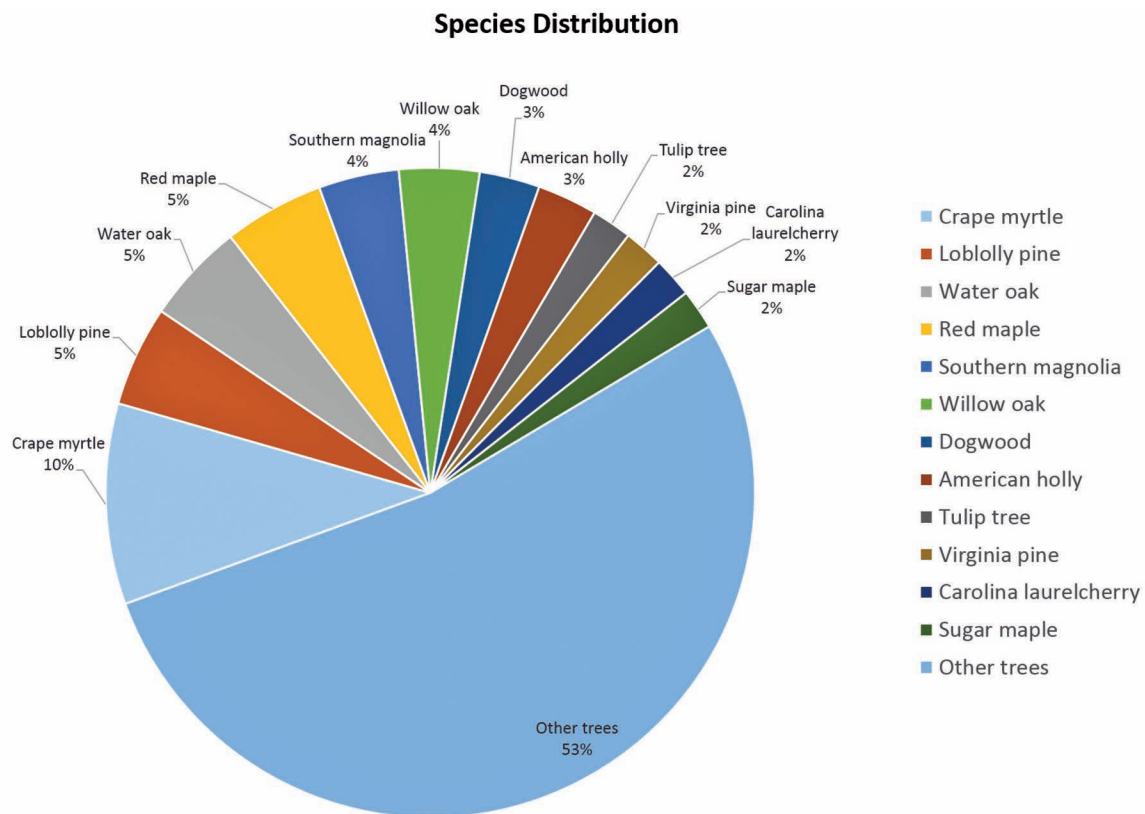


partnership with the College of Design. To assure we are meeting the requirements of Tree Campus USA, we participate in observance of Arbor Day by providing educational outreach and the Landscape Department sponsors and supports a campus-wide, student-led beatification event.

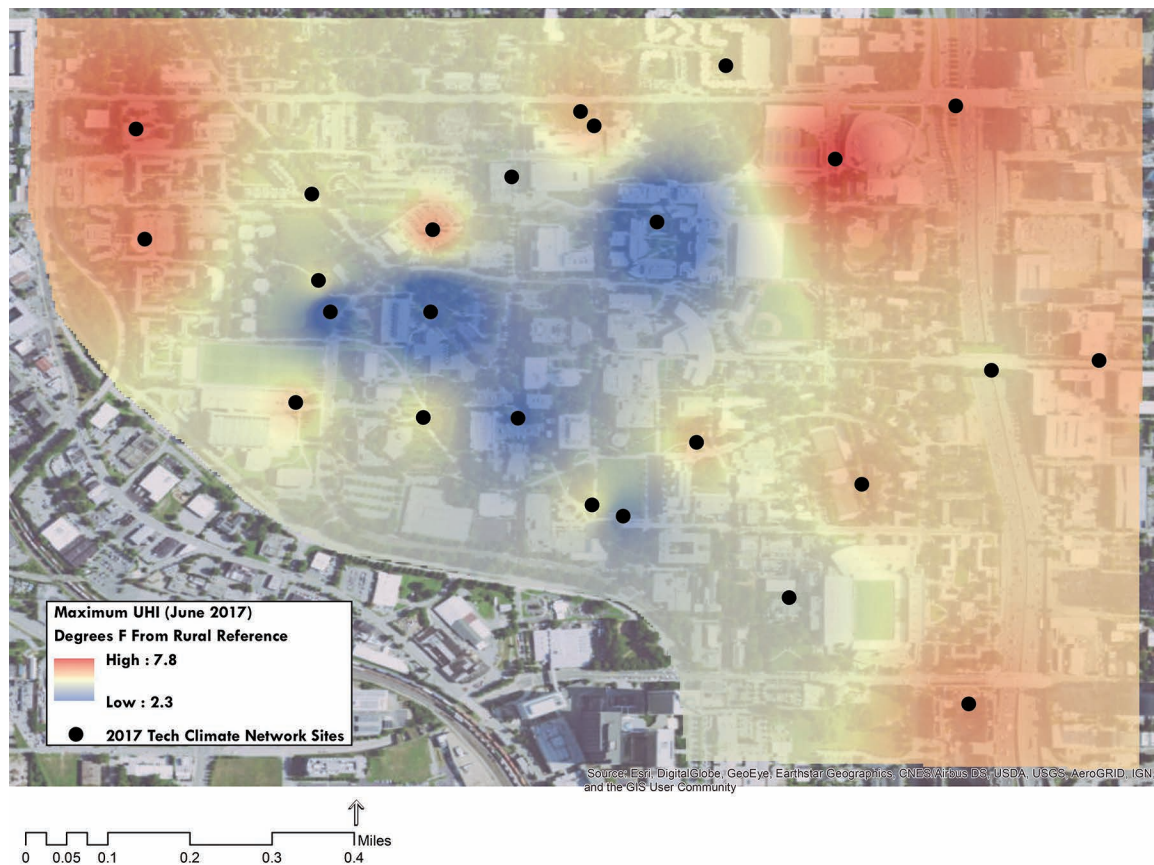
In 2012, Georgia Tech completed a GIS tree inventory showing that the campus had over 11,000 trees with 2" caliper or greater. The inventory also identified tree conditions, types, sizes, and more. Trees noted to be unsafe were further evaluated and removed, pruned or treated. Currently, the campus has over 12,000 trees and the Center for Spatial Planning Analytics and Visualization within the College of Design oversees the tracking and updating of our inventory annually. The comprehensive GIS base maps developed by this extraordinary center are shared with members of the Facilities Management Information Technology Department to enable the addition of other critical data layers that support operations.

Another research initiative within the College of Design is within the Urban Climate Lab, where a team of researchers manages and monitors temperature sensors placed throughout campus. The program, led by Professor of City and Regional Planning, Dr. Brian Stone Jr., has 29 sensors deployed on campus. There are four sensors on rooftops, and 25 at a height of two meters from the ground. Results of the research are shared annually with campus planners and landscape service staff members in order to close the loop on the hard work that has gone toward meeting Landscape Master Plan objectives. By educating groundworkers and horticulturists of the outcomes of their daily activities, particularly how vegetation and trees impact urban

**FIGURE 4.** 2014 Tree species distribution across campus.



The Georgia Tech Urban Climate Lab has placed 29 temperature sensors throughout campus, illustrating the cooling value of trees and vegetation in a dense, urban environment.)



temperatures, we have increased employee engagement and reflected sustainable values already held by many working in the landscape services field.

Service Learning Projects are aimed at engaging students, faculty, staff and the communities surrounding the campus on tree related projects. Arbor Day observance is a day set aside to educate the campus community on the importance and benefits of trees on campus and in the community at large.

Additionally, the Georgia Tech Landscape Services Department sponsors and supports Tech Beautification Day (TBD). Conducting Tech Beautification in March/April as a service learning project exposes student volunteers to most aspects of environmental stewardship by participating in tree plantings, shrub planting, mulch and pine straw spreading, all to beautify the campus. TBD also provides over 1,500 hours of volunteer labor per year to Georgia Tech, equating to about \$27,000 each year.

## LEADERSHIP COMMITMENT & ESTABLISHED FUNDING SOURCES

The last Tree Campus USA requirement is that dedicated expenditures are provided to support trees on campus. Tree Campus USA suggests that campuses work toward an annual expenditure equal to or greater than \$3.00 per full time student for tree related programs. Georgia Tech's

fulltime student population is  $27,000 \times \$3.00 = \$81,000.00$  expenditure to satisfy this condition. Our administration exceeds this expenditure commitment every year.

The Georgia Tech administration has committed to supporting a 'tree bank' which provides funds for continuous tree planting to replace trees removed because of disease and acts of nature, as well as secure funds to replace trees removed to make room for new capital and infrastructure projects. The goal of this policy is to recognize trees as a valuable resource and part of campus ecosystem services. By assigning specific monetary value to trees that are removed and sequestering funds to be used only for the continuous replanting of trees, we assure an increase in the campus' urban forest.

Tree Bank Policy Statement: Any tree on the Georgia Tech Campus that must be removed to accommodate development or because of damage from storm events, disease and infrastructure repairs must be shown on the site plan and replacement shall apply as prescribed by the 2010 Campus Landscape Master Plan. A tree bank project number will be set up in the appropriate funding sources to transfer budget so the funds can be used at a later date.

### **VALIDATING: THIRD PARTY CERTIFICATION**

In order to validate years of investment on sustainable landscape development, installations and maintenance practices, in 2014 Georgia Tech requested the Professional Grounds Management Society (PGMS) to conduct an accreditation evaluation on the strength and completeness of our sustainable practices.

The PGMS has existed in its current form since 1911 as mainly an individual membership society of grounds professionals advancing the grounds management profession through education and professional development. Members are composed of colleges and universities, municipalities, parks and recreation facilities, theme parks, hotel/motels, cemeteries, office parks, apartment complexes, students, independent contractors and more. The PGMS Landscape Management and Operations Accreditation, which began in March 2014, is a third-party means of providing an assessment of Landscape Management and Sustainable Operations best practices.

Through peer expertise, the program evaluates "strategic grounds management principles and practices that have produced and guided the delivery of properties to an attractive, healthy, sustainable and high-quality state. The PGMS Landscape Management and Operations Accreditation verifies and recognizes an environmental Management Systems approach to the grounds management template," (PGMS website: accreditation, 2018). The applying organization must submit a formal application after completing the site survey questionnaire with the proper fee and contract signature. The evaluators schedule a site visit that can last for two days or more.

At Georgia Tech, the PGMS organization reviewed 38 best practices based on 3 categories: Environmental Stewardship, Economic Performance and Social Responsibility. Each best practice is rated from 1–5. One indicates no activity and five indicates there is a best practice in place. There are four levels of the accreditation ranging from one (1) star (114–127 points) all the way up to (4) stars (166+ points).

Georgia Tech was awarded a 3-star accreditation in 2015 with a score between 142–165 points for the period of December 2015 to January 2018. We applied for re-accreditation in December 2017 and were awarded a 4-star rating, the highest level for the period January 2018

to December 2020 which re-affirms the strength of our sustainable program. This 3rd-party accreditation illustrates the Institute's Landscape Master Plan in action, especially in the areas of reforestation, sustainable landscape and stormwater management.

## BENEFITS TO CAMPUS REPUTATION

By wholeheartedly dedicating to sustainable practices, Georgia Tech's Landscape Services Department has become a driving force for environmental stewardship on campus. This dedication has led to a variety of awards and other forms of recognition that support our campus reputation. In turn, the recognition has created pride and ownership among staff for achieving such high honors.

Georgia Tech was the first campus to be recognized in the state of Georgia and 10th in the nation as a Tree Campus USA, (2008). Being an early adopter always helps establish a leadership position in an industry and this program positioning was no exception. In 2015 the Georgia Urban Forest Council awarded Georgia Tech their 2015 GUFC President's Award for its Comprehensive Urban Campus Tree Inventory and Management Practice.

Next, Georgia Tech was recognized as a Level II Campus Arboretum in 2016 with 5 Arboretum zones, (see ArbNet Arboretum Accreditation Program and the Morton Arboretum for more details). In the same year, Georgia Tech was also recognized as a Bee Campus USA, making the Institute only the second organization in the nation to earn this honor at the time.

## CASCADE EFFECTS

Committing to sustainable landscape practices enables the Landscape Services Department to be deeply engrained in both immediate and on-going opportunities to assure continuous improvement in a greener outdoor campus environment. As relationships are strengthened and symbiosis between planning and operations becomes clearer, a cascade of additional positive effects have ensued.

The Landscape Department recycles 100% of all grass clippings from the 65-acre lawns and 80% of all wood products from pruning, tree and shrub removals. Over 750 cubic yards of

**FIGURE 5.** Stages of treecycling on campus, resulting in stair treads made from felled trees from the construction site.



**FIGURE 6.** Rendering for the Kendeda Building for Innovative and Sustainable Design, positioned to be the first certified Living Building of its size in the Southeastern United States. Opens summer 2019.



woodchips are reused in the campus landscape annually. Leaves collected on campus during the fall months are collected and turned into composting to support a closed loop of bio-material. A total of approximately 9,000 cubic yards are collected annually.

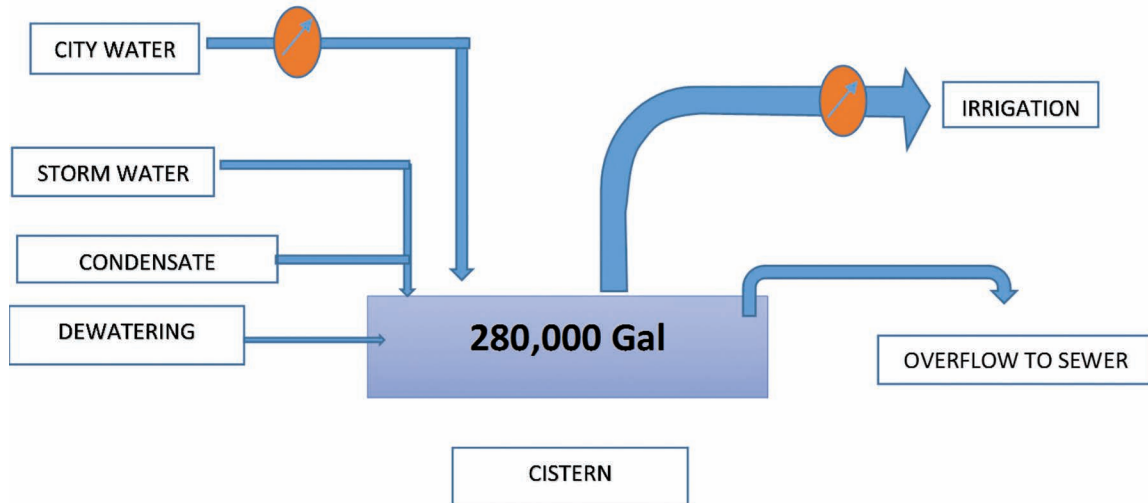
Additionally, desirable wood logs from felled trees are stored and processed for building materials as part of a treecycling program. Currently, we have installed campus-felled wood in

**FIGURE 7.** Clough roof garden.

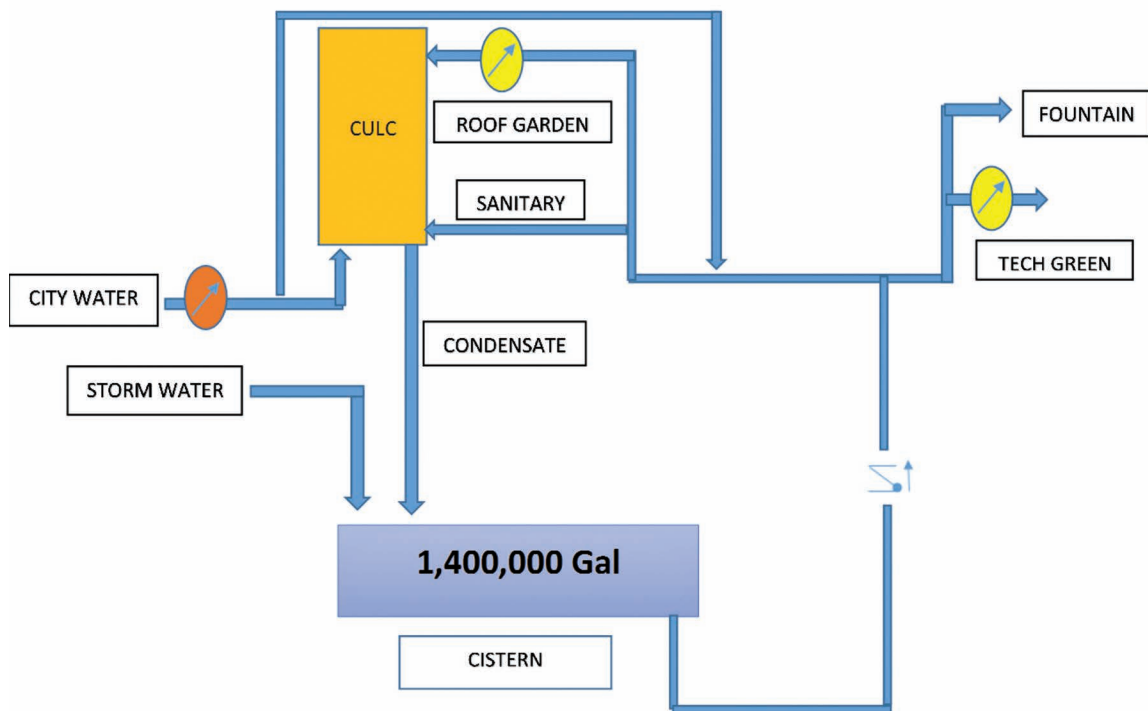


**FIGURE 8.** Clough and Klaus cisterns.

**BUILDING NAME:** KLAUS



**BUILDING NAME:** CULC



**FIGURE 9.** Klaus rain garden.



the stair treads of the Engineered Biosystems Building on campus and have over 1,200 board feet set aside to be included in our upcoming Living Building, the Kendeda Building for Innovative and Sustainable Design.

Other sustainable landscape initiatives at Georgia Tech include the installation of nine significant rain gardens or bioretention sectors, 26 cisterns providing over 2.2 million gallons of collected water storage capacity for irrigation and toilet flushing, as well as a highly celebrated roof garden on the top of the Clough Undergraduate Learning Commons.

Today, Georgia Tech's Landscape Services department conducts staff education and pilot programs to better understand outcomes of deep-green practices. Next, we codify these practices through a "Landscape University" training initiative. A recent pilot program tested zero-petrochemical use and battery equipment, both to support the maintenance of the Kendeda Building for Sustainable Design, (being constructed to meet Living Building Challenge certification).

## CONCLUSION

Sustainable landscape practices have enabled the Georgia Tech Landscape Services to provide exemplary staff training and promote policy decisions that influence outcomes on critical global challenges. By making a serious dedication to sustainable landscape practices and programs, we continue to evolve, sharing vital operational feedback with our planning and research colleagues. Establishing a plan with clear goals, having the support of executive leadership and employing the right team members enabled the Georgia Tech campus to be transformed from a concrete jungle to a forested, urban oasis in less than 20 years, and here are some additional accomplishments:

- Since 2005 to date, Georgia Tech has installed five rain gardens on campus to slow and filter urban stormwater runoff before it enters underground piping.
- In 2007, Georgia Tech constructed the first cistern on campus to collect condensate water and rainwater to be used for non-potable uses including irrigation. There are 26 cisterns on campus with a total capacity of 2,250,000 gallons of water. Also, the 3.5-acre Couch Park Field is fully irrigated with well water. The combined cisterns and well water now provide 33% of Georgia Tech's total landscape irrigation water needs.
- In 2012, the Clough Commons Roof Garden was completed. The garden was built with engineered, lightweight porous soil that could support small size tree growth such as Trident Maples, Crape Myrtles, as well as other plants like Sedum, Jasmine and Ornamental grasses.
- In 2006 a reforestation project at the site now known as the Forest included the planting of over 2,000 trees and saplings. This effort converted a traditional turf area to a Forest.

## USEFUL LINKS

1. About PGMS Accreditation: [Pgms.org/accreditation/](http://Pgms.org/accreditation/)
2. About Green Star Awards: [Pgms.org/Green-star-awards/](http://Pgms.org/Green-star-awards/)
3. About Tree Campus USA: [www.arborday.org/PROGRAMS/treecampususa/](http://www.arborday.org/PROGRAMS/treecampususa/)
4. About accredited arboretums: [Arbnet.org/arboretum-accreditation-program](http://Arbnet.org/arboretum-accreditation-program)
5. About Bee Campus: <https://www.beecityusa.org/what-is-a-bee-campus.html>
6. Georgia Tech's Urban Climate Lab homepage: <http://www.urbanclimate.gatech.edu/>
7. Georgia Tech's Center for Spatial Planning Analytics and Visualization: <http://cspav.gatech.edu/>