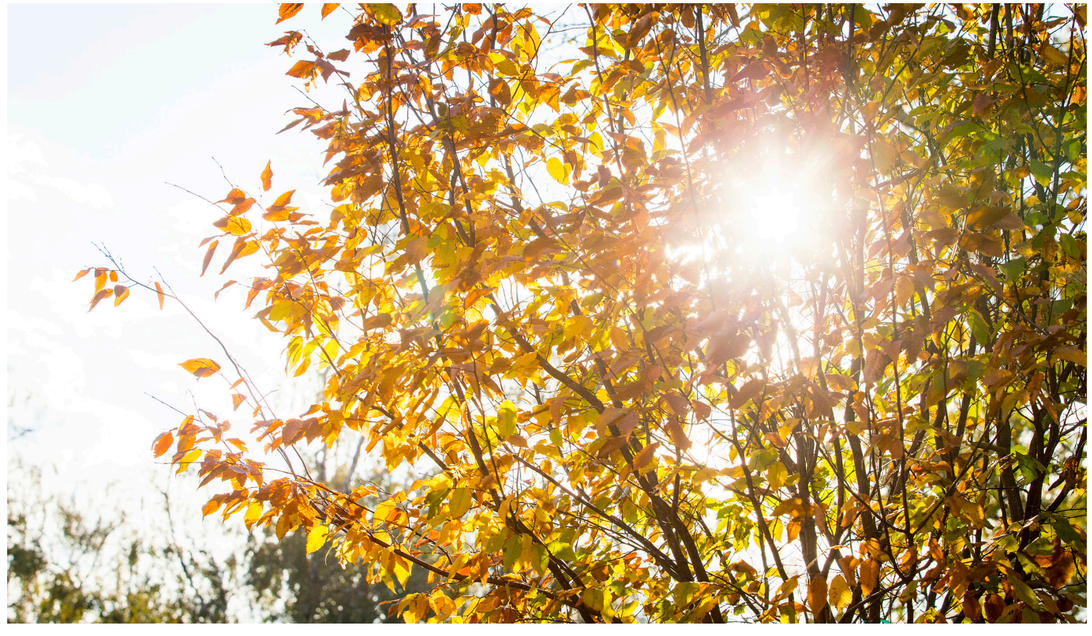
Temple University

Grounds Department Sustainable Practices



To meet Temple University's goal of carbon neutrality by 2050, the university must embrace practices that mitigate carbon and address climate change. One of these critical practices is the sustainable design and management of campus grounds.

Sustainable landscapes sequester carbon, clean air, and water, increase energy efficiency, restore habitats, and create long-lasting value within communities. Temple University seriously considers the impact of its campus grounds on its surrounding community, especially amid a changing climate. The university creates reliable, attractive spaces that cultivate health and wellness, even with expected changes in temperature and precipitation.

Temple University has three campuses, all of which are in a humid, continental climate zone (meaning they experience all four seasons with cold, snowy winters and hot, humid summers). Despite these similarities, though, the campuses are distinct with their own challenges:

- Temple University's Main Campus consists of 115 acres in the densely populated and urban North Philadelphia.
- Just 1.5 miles north of the Main Campus, the Health Sciences Campus represents 20 more acres in a very similar environment in North Philadelphia.
- About 14 miles north of the Main Campus, Ambler Campus boasts 187 acres. Located in suburban Ambler, PA, the campus has environments ranging from woodlands to meadows.

The Temple University Grounds Department strives to create and maintain clean, safe, aesthetically pleasing, and sustainable external environments across all the university's campuses. This document hopes to catalogue the department's significant contributions to sustainable landscape best practices at the time of publication.

Students in the Landscape Architecture and Horticulture program designed the Ground Cover Garden at Ambler Campus. The garden demonstrates how "green mulch" helps keep moisture in and weeds out of gardens.

Integrated Landscape Management

Temple University takes a holistic approach to landscape management, considering environmental, financial, and labor impacts. This comprehensive approach is also referred to as Integrated Landscape Management (ILM).

ILM is characterized by five key features, all of which facilitate participatory development processes: 1) shared or agreed upon management objectives that encompass multiple landscape benefits; 2) field practices that are designed to contribute to multiple objectives; 3) management of ecological, social, and economic interactions for the realization of positive synergies and the mitigation of negative trade-offs; 4) collaborative, community-engaged planning, management, and monitoring processes; and 5) the re-configuration of markets and public policies to achieve diverse landscape objectives.

Examples of ILM can be found across all three of Temple University's campuses. The most notable examples of ILM strategies used by the university are detailed in the following section.

“Green” Mulch

Green mulch, a living ground cover spreading across garden beds to provide a low-rise layer of plant protection, is also utilized by the Grounds Department. It has all the same benefits as traditional mulch with the added environmental benefits of having a fully planted bed. This technique is also less labor-intensive when compared to traditional mulch and does not require annual replacing.

These closely planted, dense grasses and shrubs prevent new unwanted growth and provide a dense layer of uniform plantings.

“Traditional” Mulch

Traditional mulch is a composite of tree bark, wood chips, grass clippings, and other organic material. It is placed on the top layer of soil to lock in moisture and nutrients and to block growing weeds, resulting in an overall improvement to the soil quality of the area. Aesthetically, it also provides an appealing and cohesive look to the gardens it is used in.

Temple grounds apply mulch to freshly planted flowers to minimize weeds, hold moisture, and ensure plant well-being.

Temple University’s uses ILM plant selection techniques for everything it grows, from the tallest trees to the smallest flowers.

Plant Selection

When making plant selections, the department’s ILM techniques consider the physical conditions of the environment, the physical labor, and the soil additives that the specific species would need to flourish. When balancing all these considerations, the Grounds Department chooses native species when possible but also utilizes nonnative, noninvasive species when they are the best fit.

Mechanical Labor

ILM also considers the effects that mechanical labor has on the environment and attempts to limit gasoline and electrical inputs on the landscape.

Street sweepers are budgeted on campus to smooth gravel, remove debris from pathways, and keep campuses clean.

William Jones, a Temple Grounds employee, efficiently and effectively maintains grounds without mechanical equipment.

Plant Species Selection Across Campuses

Climate is the first factor that influences which plants are most likely to thrive in a particular region. The United State Department of Agriculture publishes a Plant Hardiness Zone Map to assist gardeners and growers in determining which plant species will survive annual minimum winter temperatures. While all the Temple University's campuses are in the same planting hardiness zone, there are more nuanced considerations that influence plant selection at each of Temple University campuses.

Plant selection for Main Campus and the Health Sciences Campus is heavily influenced by a plant's ability to flourish in an urban environment. Ambler Campus, meanwhile, provides different challenges as a rural campus. For example, the size of Ambler Campus makes removing invasive species a more challenging, long-term effort.

While there is variation in specific species selection across Temple University's campuses, the Grounds Department's principles regarding invasive, native, and non-invasive species remain consistent across campuses.

Invasive Plant Species

Invasive species grow very quickly or harm surrounding species, creating a monoculture in an area. On Main Campus and the Health Sciences Campus, the process of eliminating all known invasive species is nearly complete. There is a brief list of invasive species still present, such as burning bush, butterfly bush, miscanthus grass, and Japanese barberry bush. Invasive species are typically eliminated by a new construction project in the area, where all plantings are uprooted, except for significant trees or shrubs that are near their prime.

At Ambler Campus, identifying and removing invasive species is more challenging. The campus consists of three environments: woodlands, meadows, and maintained gardens. The woodlands and meadows are wild, natural environments that have maintained trails.

With the range of species planted across all campuses, many environments are created to attract a range of wildlife including songbirds, butterflies, bees and other pollinators.

Biodiversity and Climate Change

Biodiversity provides functioning ecosystems that supply oxygen, clean air and water, pollination of plants, pest control, stormwater treatment and many eco system services. Climate change has a negative effect on biodiversity; as the climate warms, biodiversity decreases. These new temperatures and precipitations limit the species that can survive in the environment. Temple Grounds monitors the how the changing climate impacts campus ecosystems and adapts accordingly.

Currently, more than 80 types of trees, shrubs, and perennials can be found on Main Campus in a variety of configurations that maximize the benefits of biodiversity[1]. Additionally, Ambler Campus boasts a uniquely diverse campus, in both flora and fauna. More than 600 plant species have been recorded by the Temple Ambler Field Station.

Because of their natural characteristics, invasive species management is difficult in these areas. In the maintained lawns and gardens, however, routine maintenance limits and removes invasive species. All currently known invasive species are closely monitored to reduce the risk of spread.

Native Plant Species

Native species are any species that originated in the area that they currently occupy. Temple University made it a goal to promote the growth of native plants whenever possible. On Main Campus and the Health Sciences Campus, the Grounds Department uses knowledge of plants' tolerance of urban conditions to inform their planting plans. For example, through practice, the department has determined that it can rely on River Birch and Sycamore to grow across campus. While native species are a significant focus, their use is not always possible due to their decreased resilience in the city's complex urban environment. On the less harsh, suburban environment of Ambler Campus, a broader range of native species can flourish. Ambler Campus also houses a Formal Native Plant Garden, with highly curated designs of native plant species.

Golden ragwort (Packera aurea) native to Pennsylvania, can be found in Ambler Campus' Formal Native Plant Garden.

Non-Native, Non-Invasive Plant Species

Although the university strives to use native species, it does also use non-native, non-invasive species when it sees fit. When making these decisions in plant selection, the Grounds Department considers the ability of the species to grow with little to no attention after the first two years. For example, many native shrubs require significant watering to remain in good health, while some plants like the Star Magnolia rely on insecticide to survive. Both requirements are labor intensive and cost-intensive, so they are not planted on any campus. On the other hand, many native trees and plants can withstand urban environments with little attention. The Grounds Department also pays attention to how specific cultivars of species perform and will select those best fit for their campuses.

The department also considers factors outside of growth requirements, like campus safety. For example, plants that could hide people or objects within them, like shrubs above four feet and dense evergreen trees, are

Through trial and error, the Grounds Department discovers the native river birch (Betula nigra) is a tree species that grows well on their urban campuses.

Mazur Terrace provides an open lawn space with plentiful planting beds that are used for seasonal interest flowers that allow pollinators to thrive year-round.

avoided. Another key factor is the plants' effect on area wildlife, particularly pollinators. At Ambler Campus, there is a strong push for flowering trees and shrubs to attract pollinators, which would allow both plant and pollinator to flourish and reproduce.

Irrigation Management

Temple University strives to limit supplemental irrigation whenever possible, except for select locations. A few recreational lawns receive watering to encourage dense grass growth for student use. The university uses a low-waste irrigation system to ensure water efficiency and plant growth.

The university also practices spot watering for select planting beds with annual flowers. The Grounds Department also uses water to establish new plantings, like trees, to ensure strong rooting and support a long lifespan. Overall, though, Temple University does not rely on regular watering and irrigation for long-term growth and maintenance. It achieves this through thoughtful plant selection, such as using drought-tolerant plants in landscape beds.

These practices on Temple University's Main Campus and Health Sciences Campus reduce wastewater in Philadelphia's combined sewer system, minimizing potentially harmful effects on the urban environment. On Ambler Campus, these techniques provide many similar environmental benefits, even though it is not part of the combined sewer system network.

Maintaining Stormwater Management Interventions

Temple University takes action to mitigate the amount of rainfall that is sent to the City of Philadelphia's wastewater treatment plants during rain events through key runoff-reducing techniques, like impermeable surfaces and paved walkways.

Runoff poses more threats than simply overflowing the combined sewer system; it also poses a danger to growing plants in an already variable, urban environment. With particles of oil, pesticides, bacteria, and more, runoff can increase salinity, vary pH levels, and decrease soil nutrients. As such, Temple University takes great care to proactively manage rainfall.

By managing rainfall on-site, the university mitigates the environmental impact of runoff both onsite and downstream. When runoff is left unchecked, it takes critical nutrients from the soil on-campus and carries them downstream, where they infiltrate and harm surrounding greenspaces and nature areas, like the Delaware and Schuylkill Rivers. The Grounds Department is responsible for managing this potentially harmful runoff using three stormwater management strategies: permeable walkways, green roofs, and rain gardens.

The grounds crew utilizing spot watering to help new plantings establish themselves.

Drought-tolerant plants can be found throughout campus. Juniper and yucca, two native drought-tolerant plants, are pictured on the right.

Informative signage indicates the functionality of SMPs and a few of their locations on campus.

Permeable Walkways

A key stormwater mitigation technique Temple University employs is Subsurface Detention Stormwater Management Practices (SMPs). SMPS are structures below the surface that retain stormwater and either slowly release it into the combined sewer system or percolate into the ground. This prevents the building's and the impermeable surface's water from overflowing the sewer system, which would wreak negative effects on the city.

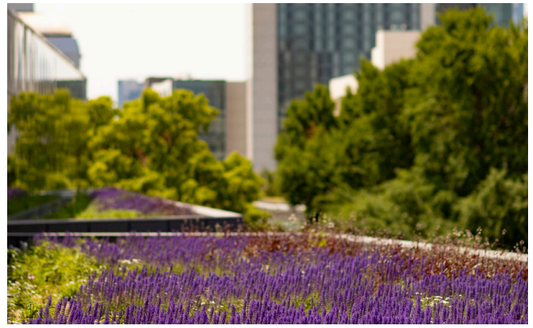
In addition to SMPs, Temple University utilizes permeable paving on major walkways, allowing water to seep through while also allowing for significant durability. The Grounds Department is responsible for maintaining these surfaces, including keeping them free of litter to ensure a large and effective surface area.

Green Roofs

To control its ecological footprint, Temple University utilizes green roofs across campus. This process, known as weatherization, protects the building and its interior from the elements more effectively than a normal roof. Green roofs also increase the lifespan of the roof and reduce heating and cooling costs. Additionally, these unique roofs cool the surrounding environment as the plants transpire. By reducing the amount of hardscaping in the urban environment, light and heat is absorbed rather than reflecting, mitigating the Urban Heat Island Effect.

Rain Gardens

Rain gardens effectively allow rainwater and runoff to slowly percolate into the ground, rather than into sewer systems of waterways. These gardens are composed of dense, lush plantings at a low point or on the slope of a plot of land that water will naturally travel to. The dense planting slows the water, giving it time to seep into the ground. Temple University utilizes rain gardens in areas with high moisture content to eliminate standing water and enhance its water management. At Ambler Campus, students designed and implemented a stormwater management garden that slows runoff and collects it in large basins, where it slowly drains into the soil, recharging the groundwater.



This green roof is located on top of the Architecture Building on Temple's Main Campus and boasts a range of wildflowers and grasses.

Age of Plantings

Although it is not included in the definition of biodiversity, the ages of tree plantings are crucial to the resiliency of the campus ecosystems. On Main Campus, the oldest trees are sprinkled throughout the campus, peaking at around 60 years old. As these trees decline, the Grounds Department actively replaces them with new growth to offset their inevitable loss. The university takes these preemptive measures to allow for its cross-campus canopy to develop and grow, even with natural losses.

When an EF2 tornado struck Ambler Campus in September 2021, a substantial portion of old growth and champion trees were destroyed, some having lived 150 years and growing 1.3 meters wide. Ambler Campus's Field Station is taking advantage of this unique opportunity to study the natural development of its woodlands after a major disturbance. Additionally, they are also planting a significant number of new trees in ranging species to eventually replace the lost canopy.

Organic Waste and Climate Change

Landfills, large garbage dumps that collect waste from various locations, notoriously are ineffective waste decomposers and at the same time major producers of greenhouse gases. Anaerobic decomposition, which occurs in landfills, releases substantial methane and other detrimental gases. Limiting the amount of waste discarded can minimize landfills' carbon footprints by reducing their land use. Landfills also degrade the surrounding soil's biodiversity, limiting the area's ecological value. Given all this, landfills are categorized as unproductive land use that decreases property value and hurts local economies.

Landscape WasteMinimization Strategies

The Grounds Department is committed to composting, the process of turning organic waste into nutrient-rich soil. Compostable goods include plant products from tree trimmings to fruit peals to paper products. In total, 28% of all waste is compostable. By encouraging composting, more productive soil can be produced and used for agricultural or recreational purposes. The nutrient-dence composted soil requires less fertilization and irrigation, which results in less toxic runoff and promotes healthy waterways.

In the fall, the Grounds Department collects and removes leaf litter from campus to be composted offsite by a commercial enterprise. A green compactor is also used to collect green waste, like tree trimmings and fallen branches. These practices keep campuses clear and safe for all visitors while also reducing the amount of waste sent to landfills. Main Campus and the Health Sciences Campus also utilize commercial vacuums that migrate around campus to clean litter.

Conclusion

Temple University's dynamic approach to landscape design and management showcases the goals and guiding principles of sustainable landscape techniques. Water conservation, soil health, carbon sequestration, habitat creation, labor and maintenance, and organic waste management ensures that the university continues to be a leader in sustainable land management.

The university's campuses not only provide important ecosystem services, but they also provide students and community members with educational opportunities. Through signage and instruction, individuals can see firsthand the thoughtful approaches the Grounds Department uses to adapt to environmental challenges.

By instilling modern best practices and experimenting with new techniques, Temple University campuses will continue to provide students, faculty, staff, visitors, and community members with vibrant and climate-resilient environments for years to come.

Appendix

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