[#]Sustainable SITES Initiative[®]

The Dell Medical School district is the first SITES v2 Gold certified project in Texas.



WHY SITES?

The Sustainable SITES Initiative

The Sustainable SITES Initiative (SITES) is a rating system that guides, evaluates, and certifies sustainability and resilience in the design, development, and management of landscapes and other outdoor spaces. Owned and administered by Green Business Certification Inc. (GBCI), SITES supports landscape architects, planners, developers and others in implementing nature-based solutions. This means that SITES projects prioritize biodiversity and mitigate climate change while conserving resources, improving public health and providing economic benefits. SITES certification applies globally to a wide variety of project types and sizes and for sites with or without buildings—ranging from parks to corporate campuses, urban development projects to universities, and more. By protecting and restoring ecosystem services, SITES provides essential benefits to the environment, property owners, and local and regional communities and economies.

About Green Business Certification Inc. (GBCI)

GBCI is the world's leading sustainability and health certification and credentialing body. Established in 2008, GBCI exclusively administers project certifications and professional credentials and certificates within the framework of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system, as well as the Sustainable SITES Initiative (SITES), the PEER standard for power systems, the WELL Building Standard, EDGE (Excellence in Design for Greater Efficiencies), TRUE certification for zero waste and Investor Confidence Project (ICP) for energy efficiency retrofits.

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CARBON, ENERGY + CLIMATE

SITES guides projects in reducing carbon emissions and regulating climate, creating positive impacts at multiple scales. Strategies such as protecting and restoring native habitats, restoring soil, and increasing key vegetation cover help to cool cities and communities. Promoting the use of low-impact materials, electric or manual maintenance strategies, and energy-efficient equipment helps to reduce carbon emissions and energy consumption. There are many ways to reduce carbon in our built environment; however, only landscapes have the unique capacity to sequester and store carbon while creating a more livable place.

Energy Conservation in Buildings

In cool temperatures, trees strategically planted around buildings can serve as a windbreak that insulates buildings against heat loss. In warmer months, tree cover and the use of green walls and green roofs cool buildings through shading and evapotranspiration. Evapotranspiration alone can reduce peak summer air temperatures by as much as 2 to 9 °F. Tree canopy with 20% coverage over a house can result in annual cooling savings of 8 to 18% and annual heating savings of 2 to 8%. By moderating temperature extremes, vegetation reduces energy consumption in buildings as well as the carbon emissions and costs associated with indoor climate control.

Reducing Urban Heat Island Effects

Urban areas that experience significantly warmer temperatures than surrounding rural areas are known as urban heat islands. This phenomenon occurs because cities typically contain building, pavement and road materials that absorb and emit heat; structural masses that obstruct natural wind flow; and heat-emitting sources such as vehicles and air-conditioning units. Urban heat islands can experience increased air-conditioning costs, more air pollution, and heat- and pollution-related illness and mortality. However, vegetation protects buildings and pavement from direct solar exposure, reducing urban heat absorption and emittance. Parks can be up to 2 °F cooler than the surrounding urban area in the day. The cooling effect of urban green space has been directly correlated with vegetation cover and tree shade area.

Global Climate Regulation and Increasing Carbon Storage

With concerted global action on land use over the next decade, nature can be a significant part of the climate solution, offering up to 37% of the mitigation needed to prevent global temperatures from rising more than 2 °C through carbon sequestration and other natural climate solutions.

SITES requires projects to protect critical functioning ecosystems, such as floodplains and wetlands, so they can continue to provide essential services, including preserving biodiversity, minimizing flood risks, improving water quality, and sequestering and storing carbon. For example, the estimated total carbon storage of wetlands globally is 225 billion metric tons (MT), or the equivalent of carbon emissions from roughly 189 million cars every year—which is more than the number of registered automobiles in the United States as of 2015. Additionally, grasslands store approximately one-third of the global terrestrial carbon stocks and can also act as an important soil carbon sink.

Additionally, grasslands sequester most of their carbon underground, while forests store it mostly in woody biomass and leaves. When wildfires cause trees to go up in flames, the carbon they formerly stored is burned and released back to the atmosphere. When fire burns grasslands, however, the carbon fixed underground tends to stay in the roots and soil, making them more adaptive to climate change.

To further reduce impacts on carbon, SITES promotes the use of peat-free amendments. Peatlands are the largest natural terrestrial carbon store and <u>store more carbon</u> than all other vegetation types in the world combined. SITES also promotes the use of low-emitting or electrical equipment, native and appropriate vegetation, and local and low-embodied-carbon materials, and SITES encourages projects to promote walking, biking and public transit in order to reduce carbon emissions. Additionally, SITES also rewards projects that quantify their carbon impact and make improvements accordingly.

WATER

Natural systems are of critical value for their ability to store, clean and distribute water and to serve as a habitat for a variety of species. SITES encourages designs that conserve water, maximize the use of precipitation, protect water quality, and protect and restore aquatic resources. The goal is to incorporate strategies and technologies that restore or mimic natural systems and ultimately value water as a critical resource rather than a waste product.

Conserving Water

According to a 2014 Government Accountability report, 40 out of 50 U.S. state water managers expected water shortages under average conditions in some portion of their states over the next decade. Outdoor water use accounts for more than 30% of total household water use, on average, but can be as much as 60% of total household water use in arid regions.

SITES values water as a precious resource and considers various strategies to conserve water on a project. First, healthy soils and vegetation work hand in hand to elevate a landscape's water retention capabilities. Healthy vegetation maintains soil structure, contributes to soil organic matter and prevents erosion, creating healthier soils better equipped to store water and nourish plants. SITES also encourages the use of native drought-tolerant plant species that require little to no irrigation in order to conserve water. Water retained on site provides habitat for animal life and ecosystem functions. It can also be used for irrigation, thus conserving potable water resources and reducing associated energy use and costs. Retained water may slowly infiltrate down through the soil, eventually recharging and purifying groundwater resources, where about 33% of public municipal water and 90% of rural drinking water is sourced.



Promoting Green Infrastructure

What it means to "manage" stormwater has evolved over time. For many years, managing stormwater meant collecting rainwater that fell on impervious surfaces such as roofs, roads and parking lots and transporting it to a stream, river or treatment facility. However, SITES emphasizes the use of green infrastructure (GI) or low-impact development (LID) as stormwater controls for improving water quality, reducing stormwater volume, and controlling erosion and sedimentation. The list of benefits that GI or LID can provide also includes: improved air quality, reduced heat island effect, improved amenity values and increased property values.

Reducing Stormwater Runoff

When stormwater falls onto impervious surfaces such as roads and parking lots, it is unable to soak into the soil. Instead, it travels over these surfaces, collecting pollutants such as heavy metals, petroleum products, bacteria and pesticides. Stormwater runoff can flow directly into bodies of water, or it can be funneled through stormwater drains into traditional stormwater management systems. In large storm events, these systems can overflow and discharge wastewater into nearby bodies of water. Combined sewer overflows may contain untreated waste, toxic materials and other debris that cause human illness, water pollution, and the degradation of aquatic ecosystem health and function. By capturing, treating and reusing water, SITES-certified landscapes naturally minimize the adverse effects of water runoff. Additionally, public and private utilities save on the costs and energy expenditures associated with stormwater collection and treatment. SITES helps projects maximize their water-holding retention capacities on site by protecting and restoring soils and landscapes, as well as by promoting the implementation of GI, such as rain gardens, pervious pavement, green roofs and bioswales.

Improving Water Quality

Aquatic ecosystems are negatively impacted by pollution from sources such as stormwater runoff, as well as changes to the landscape and hydrological systems. SITES encourages the restoration of aquatic ecosystems such as riparian buffers, streams and wetlands. Excess nutrients, such as phosphorus and nitrogen, cause eutrophication in bodies of water. During eutrophication, an overgrowth of algae can lead to low levels of dissolved oxygen in the water, aquatic plant and animal deaths, and contamination of drinking water. When these ecosystems are healthy, they naturally filter pollutants by intercepting surface runoff and removing, retaining, and processing inorganic nutrients and organic wastes.

SITES also promotes the protection and restoration of floodplains, which reduce water pollution by providing areas for the deposition of excess sediment carried in floodwaters. Instead of clogging waterways and smothering habitats, deposited sediment replenishes soils and nourishes vegetation. Healthy soils, in turn, further filter water resources through physical, chemical and biological processes.



RESILIENCE

SITES-certified projects mitigate floods, droughts, heat waves, wildfires and other hazards that pose risks to property owners and the health and safety of humans and habitats. These risks are exacerbated by climate change and high-impact development. SITES mitigates these hazards by protecting and restoring landscapes, enhancing biodiversity and promoting the implementation of GI and ongoing sustainable management strategies.

Flood Mitigation

Warmer atmospheric temperatures cause more evaporation and larger, more frequent heavy precipitation events, leading to an increased risk of flooding. Between 1998 and 2014, the United States spent an estimated \$48.6 billion to repair and replace flood-damaged infrastructure. SITES-certified landscapes with restored ecosystems, such as wetlands and floodplains, as well as GI strategies such as bioretention ponds, mitigate flooding by storing and slowly releasing excess water from thunderstorms, hurricanes and other precipitation events. SITES-certified landscapes that include sand dunes and mangrove forests mitigate coastal flooding by providing a physical buffer against waves and storm surges. A study found that during Hurricane Irma in 2017, mangroves in Florida prevented over \$1.5 billion in direct flood damages and protected the lives of over half a million people.



Drought and Heat Mitigation

The risk of droughts and heat waves increases alongside atmospheric temperature rise. Droughts and heat waves can lead to reduced water flow, water scarcity, soil erosion, biodiversity loss and increased wildfire risk. This can damage infrastructure, degrade ecosystems, and cause human illness and death. Of all weather-related events, heat waves cause the most deaths worldwide. Healthy vegetation promoted by SITES provides shading and evapotranspiration to reduce heat absorption and air temperature.

Healthy soils are also better at storing water and delivering it to plants. GI strategies such as bioretention ponds and rain gardens retain precipitation and recharge groundwater resources. In times of droughts and heat waves, healthy ecosystems that retain and conserve water are important, especially in urban heat islands that experience significantly hotter temperatures than surrounding areas.

Wildfire Mitigation

The frequency of wildfires, length of wildfire seasons and burned area from wildfires are increasing as the climate gets warmer and drier. Wildfires are also more likely to occur due to land use changes, large-scale insect infestation, poor management practices and fuel loads that exceed historical conditions. Wildfires cause significant ecological damage and pose grave threats to human life and property. However, wildfire risk can be greatly reduced by designing, building and maintaining sites to better manage fuels. SITES encourages project teams to create defensible space around structures by planting native fire-resistant plant species and practicing prescribed burns similar to natural fire regimes. These strategies manage vegetative biomass and reduce the accumulation of dead, flammable plant material.

Increased biodiversity also helps to decrease fuel loads. For example, burrowing animals stir up leaf litter, which helps the ground retain moisture and breaks down dead leaves.

Ensuring Future Food Supply

Farmland is ripe for development because it tends to be flat, well drained, open and inexpensive. Once converted to industrial and urban uses, farmland and its value are lost and cannot be regained. Even so, agricultural land is still being converted to urban and highly developed land nationwide. Between 2001 and 2016, 4 million acres were lost to the expansion of urban areas. SITES conserves the most productive farmland for future generations by discouraging projects from building in these areas.

By using native plants, SITES supports habitat for insects, birds, bats and other important pollinator species that support plant reproduction and crop cultivation. Up to 80% of the world's crop plant species depend on pollination by animals, with natural pollination services soon to be worth over \$3 trillion globally. The physical availability of food is important in global efforts to reduce the number of people suffering from hunger and malnutrition.

Sedimentation and Erosion Control

Erosion occurs when the health of plant and soil communities is degraded by activities such as deforestation, overgrazing, chemical pesticide and fertilizer use, and poor construction practices. Eroded soils may lose fertility as well as their ability to support vegetation, combat pests and retain water. Erosion also causes sedimentation, which can lead to water pollution, decreased water quality and reduced stream flow capacity. Both erosion and sedimentation can worsen the impact of floods and degrade the overall health of ecosystems.

SITES prevents erosion by preserving and restoring the health of plant and soil communities, which can take decades or even centuries to grow. During construction, SITES projects control erosion, sedimentation and pollutants. Strategies include mulching, creating sediment traps and covering topsoil for reuse. Native plants are also encouraged because their roots hold the soil in place, absorb the energy of coastal waves, and break up the flow of stream and river currents that may cause erosion.



BIODIVERSITY

Biodiversity is lost due to habitat exploitation, climate change, pollution and invasive species. According to the United Nations, ecosystem loss and degradation are the main threats to 85% of all threatened species. Biodiversity is necessary for the conservation of biological and genetic diversity, as well as the evolutionary processes that support the long-term health and survival of the Earth's many inhabitants. SITES enriches biodiversity through strategies that protect and restore ecosystems. Additionally, SITES prohibits the use of invasive plants and requires projects to have an invasive species management plan and to use an integrated pest management approach.

Ecosystem Conservation and Restoration

Stable ecosystems are critical for protecting and encouraging biodiversity. Likewise, biodiversity is critical in supporting healthy, stable ecosystems. Stable ecosystems with high levels of biodiversity provide life-sustaining resources and services, such as fresh air and water, climate regulation, pollination, soil fertility, food and medicine. They also protect against extreme weather events and help control carriers of human disease. SITES discourages projects from building in areas that are undeveloped or that contain vital habitat and resources for threatened and endangered species. Instead, SITES-certified projects are encouraged to build in mutually beneficial areas such as urban sites that have already been developed. Ecosystems are further protected and restored through SITES strategies such as restoring healthy soils, establishing native vegetation systems and limiting the use of toxic pesticides. A significant amount of biodiversity can be harbored in SITES-certified projects, including urban parks, gardens, and restored industrial parks and residential areas. SITES protects and restores ecosystem complexity and function, enriches biodiversity, and supports the recovery of individual species populations. For every dollar invested in ecosystem restoration, it is estimated that economic benefits worth up to \$30 USD are created.

Management of Invasive Species

Invasive species adapt easily to new areas, reproduce quickly, outcompete native plant and animal species, and ultimately cause harm to ecosystems, property and the economy. The United Nations has declared invasive species a key driver of population decline of threatened and endangered species, habitat loss and degradation, and illegal trade. Approximately 42% of threatened or endangered species are at risk due to invasive species. Preventing, monitoring and controlling the spread of invasives is also costly. Annually, invasives cost the United States \$137 billion in damages to crops, fisheries, forests and other resources.

SITES forbids the use of invasive plants on projects and requires projects to have a multiyear invasive species control and management plan. This ultimately supports a healthy and stable ecosystem, as well as enhances the biodiversity of a landscape.

Pest Management

Pest species such as insects and bacteria pose threats to ecosystems and farmland. They spread disease, consume plant material and cause declines in native species populations.

Pests are combated with chemical pesticides at a global cost of \$20 billion annually. However, chemical pesticides lead to water and air pollution, soil contamination, and the unintended death of additional organisms, all of which can disrupt the function, integrity and resilience of ecosystems. Chemical pesticides can affect the human nervous, hormone and endocrine systems. SITES promotes natural methods of pest management rooted in the protection and restoration of healthy, biodiverse ecosystems. Compared to chemical pesticides, naturally occurring parasites and predators are estimated to provide 5 to 10 times the amount of pest control for far cheaper. Some estimates value the overall services provided by healthy ecosystems, including the service of natural pest management, at as much as \$125 to \$145 trillion per year.

MATERIALS + WASTE

SITES reduces the amount of waste sent to landfills and incinerators through strategies such as efficient use, reuse, recycling and composting of materials. These methods are encouraged during construction, renovation and demolition of a project site as well as throughout the entirety of a site's life cycle. Project teams further reduce the production of waste from SITEScertified landscapes by purchasing sustainable materials from responsible manufacturers.

Waste Diversion and Resource Recovery

Waste produced throughout a project site's life cycle can lead to water and land pollution, loss of animal life, and human diseases. When stored in landfills, waste contributes to the production of carbon dioxide and methane gases, which contribute to climate change. In 2019, industrial and municipal solid-waste landfills accounted for approximately 17% of human-related methane emissions, equivalent to the emissions of over 21.6 million passenger vehicles driven for one year. Without strong environmental parameters, waste incinerators release pollutants such as particulate matter, acid gases, nitrogen oxides and cancer-causing dioxins.

SITES encourages project teams to design and construct sites to be altered or retrofitted in the future. Alterations and retrofits are more economical and less wasteful than the complete demolition and redevelopment of a site. SITES-certified landscapes are also encouraged to efficiently use, reuse, recycle and compost materials through their entire life. This saves on the costs of transporting wastes to landfills and incinerators, as well as on the costs of purchasing new materials such as structures and paving. Additionally, composting vegetation trimmings and food waste supports nutrient cycling and improves soil health.

Sustainable Purchasing

SITES encourages project teams to look for sustainable production strategies when purchasing materials. Strategies include increased energy efficiency, reduced resource consumption and waste, lowered amounts of embodied carbon, and minimized effects on human health and the environment. SITES also discourages the purchase of products made from threatened tree species and encourages the purchase of products made with recycled content. Products made with recycled content may cost less to manufacture and purchase. By purchasing local, sustainable products from responsible suppliers, SITES-certified landscape teams reduce the amount of energy and resource waste associated with production processes.



HUMAN HEALTH + WELL-BEING

SITES landscapes promote human health and well-being by regulating the climate, mitigating natural disasters, and preventing disease and illness. SITES further supports both physical and mental health by promoting outdoor opportunities for physical activity, restorative and aesthetic experiences, mental restoration, and social interaction.

Physical Well-Being

Trees and other vegetation act as a filter to improve air quality by sequestering carbon dioxide from the atmosphere, as well as by absorbing other particulates and low-level ozone and emitting breathable oxygen. Estimated total annual air pollution removal (of ozone, particulate matter, NO2, SO2 and carbon monoxide) by urban trees across 55 U.S. cities is 711,000 metric tons, representing \$3.8 billion in public value. In fact, a single acre of tree cover can remove about 80 to 200 pounds of air pollution per year.

Car-dependent communities without adequate outdoor recreational opportunities discourage active transportation and physical activity. Physical inactivity is a risk factor for obesity, diabetes, heart disease and other health threats. SITES promotes physical activity by encouraging playgrounds, walking paths, multimodal transportation routes and proximity to public transportation. The physical health and well-being of all citizens can be improved by SITES-certified landscapes that promote activities such as walking, biking and more.

Mental Well-Being

Exposure to nature contributes positively to mental health and well-being by reducing stress and improving cognitive function. One study found that green spaces near schools promoted cognitive development in children and that adults living in public housing units with more green space displayed better focus than those with less green space. Physical activity and exercise also support mental well-being by reducing stress and feelings of depression and anxiety.



Orange Mall Green Infrastructure Project at Arizona State University | Photo: Arizona State University

COMMUNITY BENEFITS

SITES encourages projects to address social equity and improve economic opportunities in their design and development choices. In doing so, SITES landscapes can contribute to building a more stable and engaged community that reflects the regional and cultural identity.

Community Development

By hosting publicly available events, facilities, amenities and programming, SITES-certified landscapes bring communities together to inform design and to help create projects that communities actually need and want. Project sites may host educational workshops, after-school programs, sporting games or nature tours, or they may simply provide outdoor spaces where people can gather, eat, work and play together. SITES ensures equitable site use for people of all ages and those with disabilities by encouraging landscapes to provide optimum site accessibility, safety and wayfinding. SITES-certified landscapes are also encouraged to involve site users and stakeholders to address the landscapes' effects on local residents and promote long-term engagement with the community. SITES inspires a stronger sense of identity and meaning for project sites by involving the community and protecting significant historic buildings and other cultural aspects of the landscape.

Food Insecurity Mitigation

By encouraging on-site food production, SITES landscapes combat food insecurity and provide community engagement and education about food production and nutrition. SITES landscapes are encouraged to grow essential foods by including on-site vegetable gardens, community gardens, and native, edible nut and fruit-bearing plants. They are also encouraged to ensure equitable access by selling or distributing this food to local community development while stimulating social connection, encouraging self-reliance, beautifying neighborhoods and reducing family food budgets. Methods of on-site food production used by SITES-certified landscapes can also amend degraded soils, use captured rainwater, contribute to composting efforts and reduce pollution caused by chemical pesticides and fertilizers

Local Economic Stimulation

As SITES-certified landscapes are built, used and enjoyed by visitors, economic benefits are stimulated for local communities. During construction, SITES encourages projects to hire local workforces and purchase local materials and services. SITES-certified landscapes continue to provide economic benefits — such as employment, entrepreneurship and improved value in adjacent properties — throughout their life cycles. Local income and job growth lead to increased local spending and economic activity, which supports public, social and community services. SITES further supports local communities by promoting ecotourism, or sustainable travel to natural areas. Ecotourism allows travelers to visit SITES-certified landscapes and learn about local environments without causing them harm, all while stimulating local economies. By capturing economic opportunities that result from site development and providing these opportunities to residents, SITES-certified landscapes promote the long-term economic sustainability of local families and businesses, ultimately supporting resilient, invigorated communities.

CONCLUSION

By protecting, restoring and generating ecosystem services, the Sustainable SITES Initiative promotes climate regulation, protects air and water quality, controls flooding, improves resilience, mitigates risks from potential hazards, enhances biodiversity, conserves resources, and reduces waste. SITES provides additional benefits for human health and well-being, community development, and local economic stimulation. A wide range of projects can use SITES to elevate the value of their landscapes, ultimately benefiting the environment, property owners and communities.