

Striving for a Resilient Future Through High Performance Landscapes

January 30, 2015 | 14th Annual New Partners for Smart Growth Conference | Baltimore, Maryland



Photo by Denmarsh Photography, Inc.

Striving for a Resilient Future Through High Performance Landscapes

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LEARNING OBJECTIVES

- Learn about completed projects where landscapes were considered and which resulted in healthier urban environments and communities
- Identify tools for supporting and measuring the performance of sustainable land design and development
- Learn how standards and certification systems provide a framework for the design and development of healthier, more resilient communities
- Learn about opportunities to increase beneficial ecosystem services provided by a site



Encouraging and Rewarding Leadership in Site Sustainability

Danielle Pieranunzi
SITES Program Director
Lady Bird Johnson Wildflower Center
University of Texas at Austin

Sustainable SITES Initiative™

An interdisciplinary effort to develop guidelines and a voluntary rating system for sustainable land design, construction, and maintenance across the globe



Conventional Development



Photo © Edward Burtynsky

Growth of Green Building



In U.S. alone, buildings account for 41% of energy use
73% of electricity consumption
38% of all CO₂ emissions.
Globally, buildings use 40% of raw materials,
or 3 billion tons annually.





Rating System

LEED for New Construction

LEED for Core & Shell

LEED for Schools

LEED for Healthcare*

LEED for Retail*

LEED for Commercial Interiors

LEED for Retail Interiors*

LEED for Existing Buildings

LEED for Existing Schools*

Reference Guide

**GREEN BUILDING DESIGN
& CONSTRUCTION**
2009 Edition

**GREEN INTERIOR DESIGN
& CONSTRUCTION**
2009 Edition

**GREEN BUILDING
OPERATIONS & MAINTENANCE**
2009 Edition

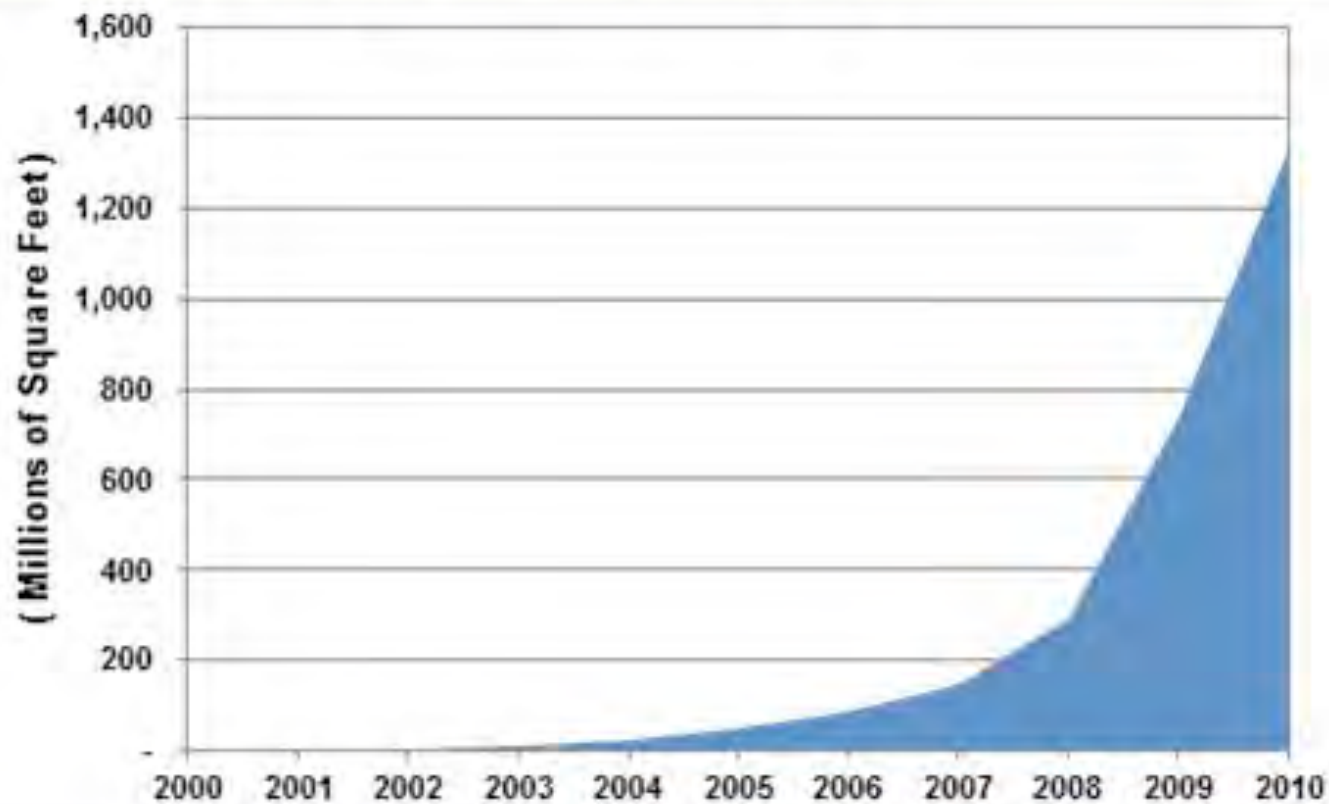
Growth of Green Building



3 billion square feet of LEED certified space = 68,870 acres

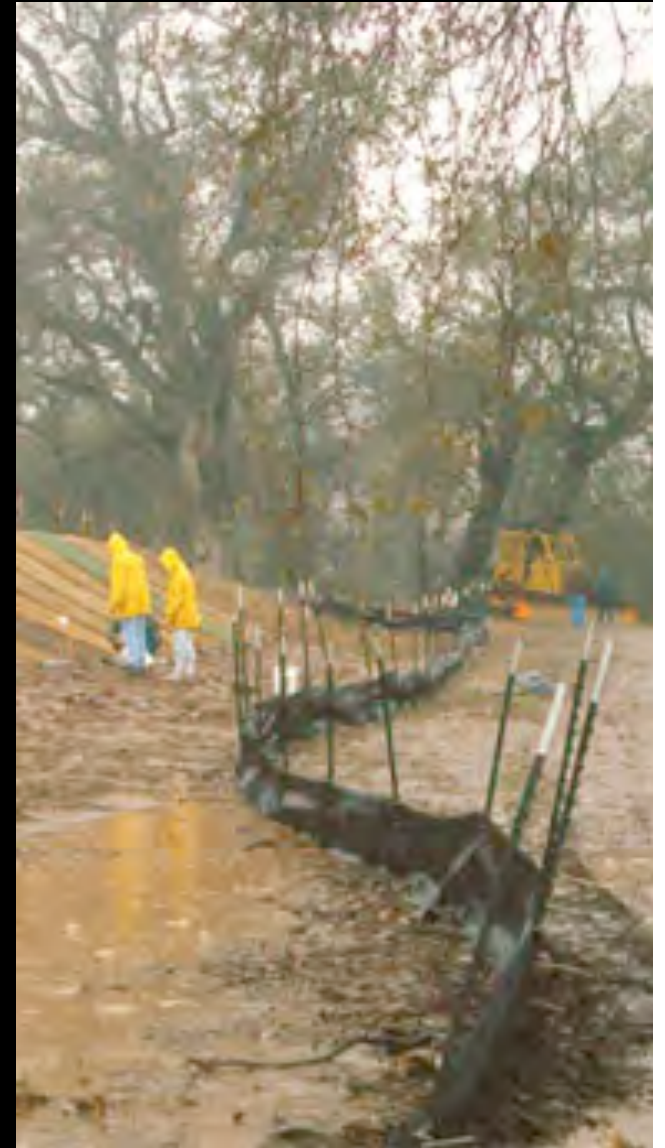
LEED is in more than **140 countries and territories**

Cumulative LEED Certified Space, World Markets: 2000-2010



(Source: Green Building Certification Institute)





Ecosystem services are the benefits people obtain from ecosystems that support our lives, but are often considered free and not a part of conventional accounting methods

**US \$125
trillion per
year!**

What are Ecosystem Services?

Provisioning Services

Products obtained from ecosystems

- Food
- Fresh water
- Fuelwood
- Fiber
- Biochemicals
- Genetic resources

Regulating Services

Benefits obtained from regulation of ecosystem processes

- Climate regulation
- Disease regulation
- Water regulation
- Water purification
- Pollination

Cultural Services

Nonmaterial benefits obtained from ecosystems

- Spiritual and religious
- Recreation and ecotourism
- Aesthetic
- Inspirational
- Educational
- Sense of place
- Cultural heritage

Supporting Services

Services necessary for the production of all other ecosystem services

- Soil formation
- Nutrient cycling
- Primary production

Research on the monetary valuation of ecosystem services

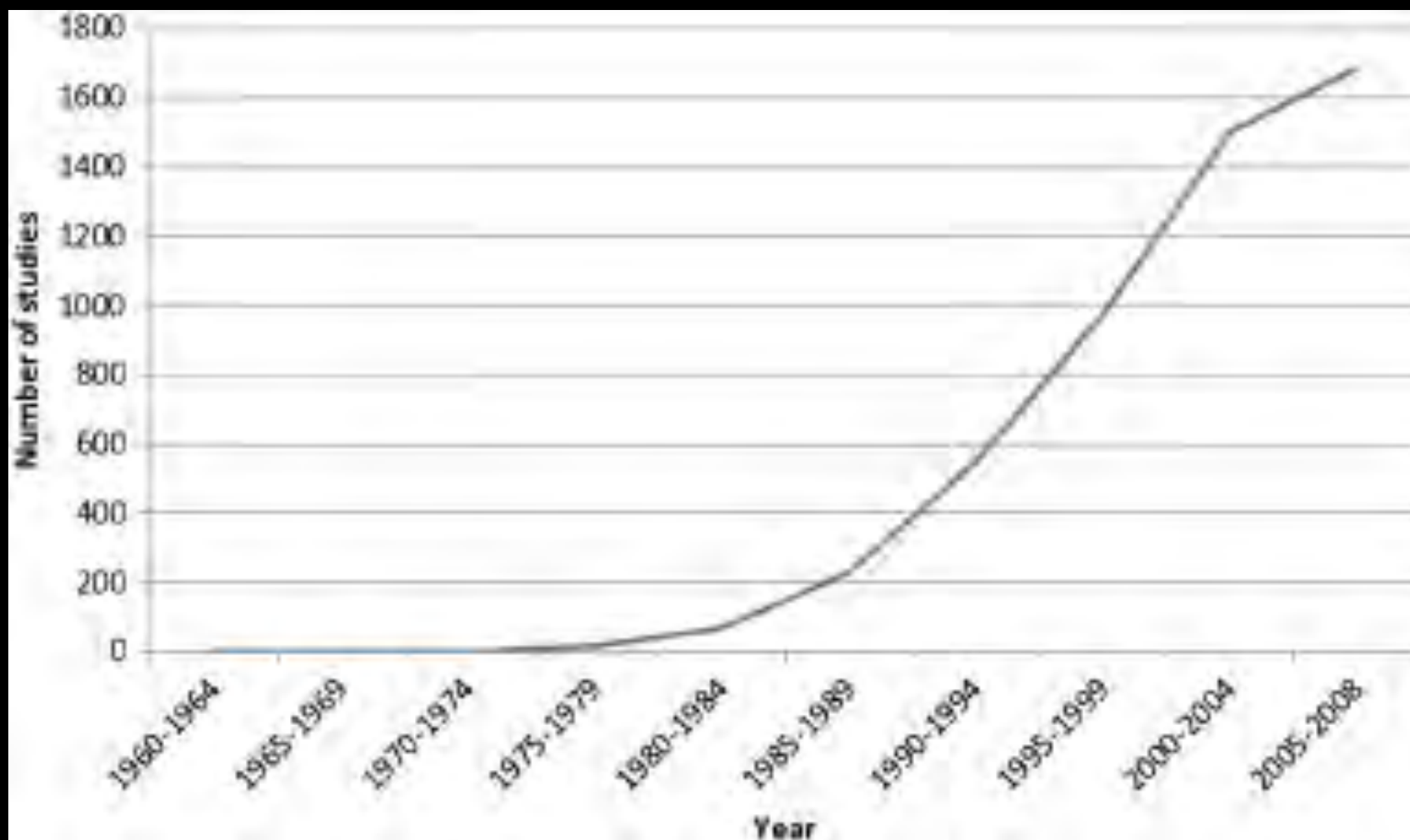



Fig. 1 Cumulative total of ecosystem services valuation studies sourced from EVRI from 1960 to 2008. Source: modified from [Christie et al., 2008](#) .

Rudolf de Groot , Luke Brander , Sander van der Ploeg , Robert Costanza , Florence Bernard , Leon Braat , Mike Ch...







2005	Forming Relationships
2006	Research and Development process begins
2007	<i>Standards & Guidelines Preliminary Report</i>
2008	<i>Guidelines and Performance Benchmarks Draft 2008</i>
2009	<i>Guidelines and Performance Benchmarks 2009</i>
2010 – 2012	Pilot Program
2013	Refinement and Completion of Rating System
2014	<i>SITES v2 Rating System / Reference Guide</i> Education + Outreach
2015	Open Enrollment
2016	Professional Credentialing
2017	

SITES Timeline

SITES v2

Rating System

For Sustainable Land Design and Development



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SITES
Initiative

SITES v2

Reference Guide

For Sustainable Land Design and Development



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Initiative

SITES v2 Rating System

For Sustainable Land Design and Development



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Initiative

Section 1: Site Context

Section 2: Pre-Design Assessment + Planning

Section 3: Site Design – Water

Section 4: Site Design – Soil + Vegetation

Section 5: Site Design – Materials

Section 6: Site Design – Human Health + Well-Being

Section 7: Construction

Section 8: Operations + Maintenance

Section 9: Education + Performance Monitoring

Section 10: Innovation + Exemplary Performance

www.sustainablesites.org/rating-system

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Section 3: Site Design – Water



Prerequisite/ Credit	Title	Points
Water P3.1	Manage precipitation on site	Required
Water P3.2	Reduce water use for landscape irrigation	Required
Water C3.3	Manage precipitation beyond baseline	4-6 points
Water C3.4	Reduce outdoor water use	4-6 points
Water C3.5	Design functional stormwater features as amenities	4-5 points
Water C3.6	Restore aquatic ecosystems	4-6 points







before



after



before



after

Section 4: Site Design – Soil + Vegetation



Prerequisite/Credit	Title	Points
Soil+Veg P4.1	Create and communicate a soil management plan	Required
Soil+Veg P4.2	Control and manage invasive plants	Required
Soil+Veg P4.3	Use appropriate plants	Required
Soil+Veg C4.4	Conserve healthy soils and appropriate vegetations	4-6 points
Soil+Veg C4.5	Conserve special status vegetation	4 points
Soil+Veg C4.6	Conserve and use native plants	3-6 points
Soil+Veg C4.7	Conserve and restore native plant communities	4-6 points
Soil+Veg C4.8	Optimize biomass	1-6 points
Soil+Veg C4.9	Reduce urban heat island effects	4 points
Soil+Veg C4.10	Use vegetation to minimize building energy use	1-4 points
Soil+Veg C4.11	Reduce the risk of catastrophic wildfire	4 points

Section 4: Site Design – Soil + Vegetation



Section 4: Site Design – Soil + Vegetation





Stone Brewing World Bistro & Gardens
Escondido, California

Image credit: John Durant
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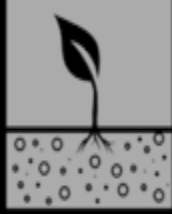


**Stone Brewing World Bistro & Gardens
Escondido, California**

Image credit: John Durant

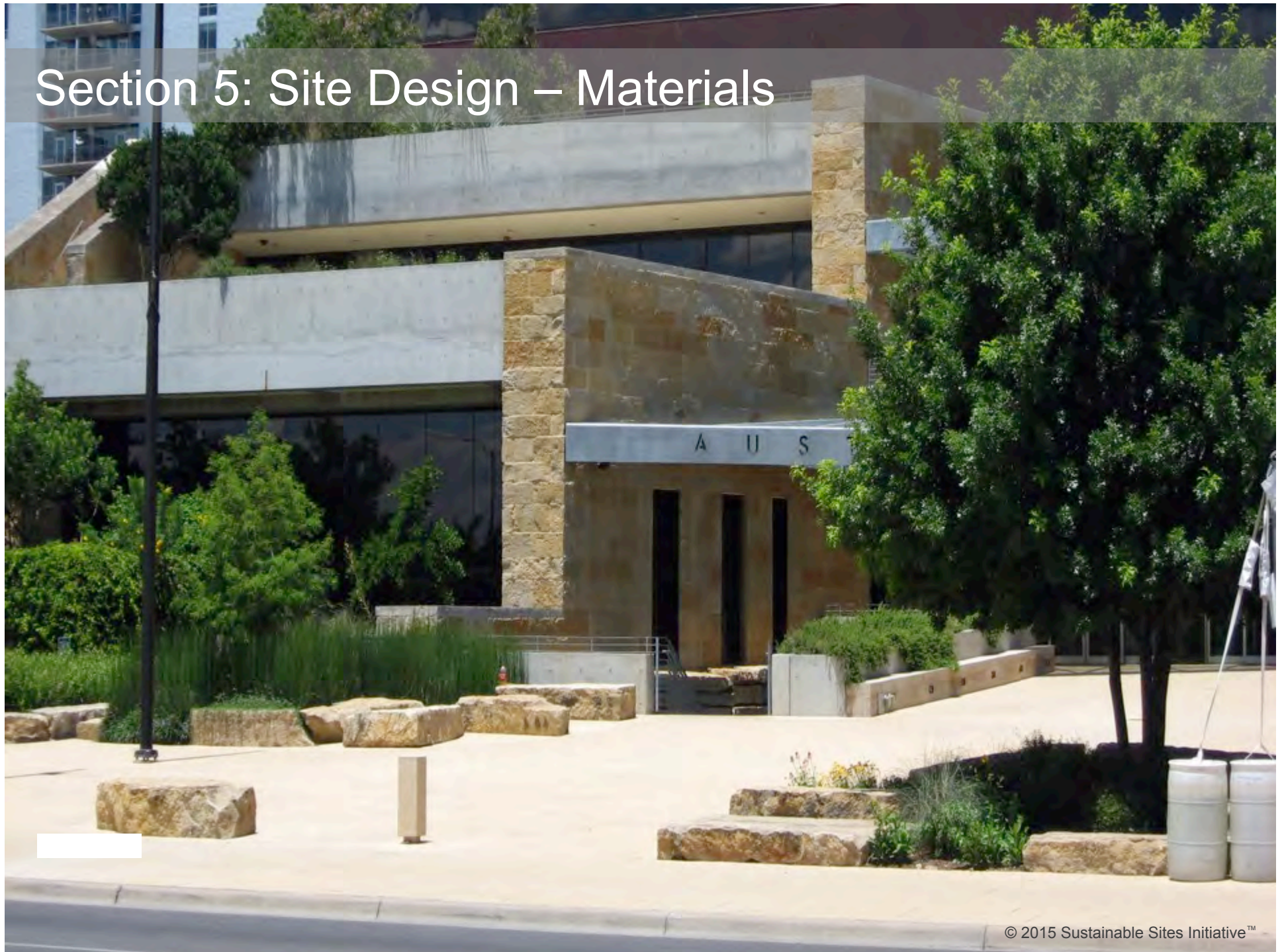
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Section 5: Site Design – Materials

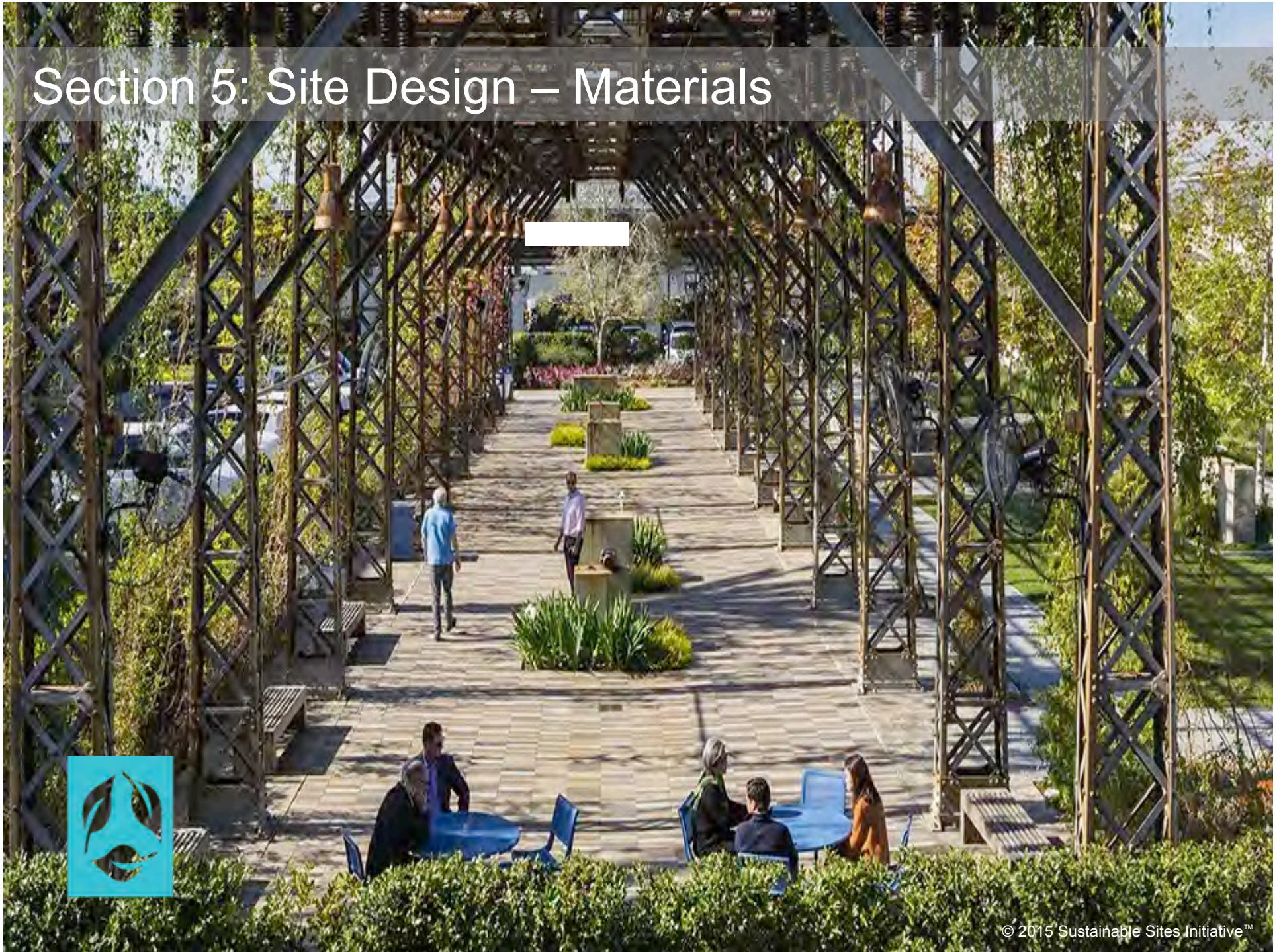


Prerequisite/Credit	Title	Points
Materials P5.1	Eliminate the use of wood from threatened tree species	Required
Materials C5.2	Maintain on-site structures and paving	2-4 points
Materials C5.3	Design for adaptability and disassembly	3-4 points
Materials C5.4	Reuse salvaged materials and plants	3-4 points
Materials C5.5	Use recycled content materials	3-4 points
Materials C5.6	Use regional materials	3-5 points
Materials C5.7	Support responsible extraction of raw materials	1-5 points
Materials C5.8	Support transparency and safer chemistry	1-5 points
Materials C5.9	Support sustainability in materials manufacturing	1-5 points
Materials C5.10	Support sustainability in plant production	1-5 points

Section 5: Site Design – Materials



Section 5: Site Design – Materials



Section 6: Site Design – Human Health + Well-Being



Prerequisite/ Credit	Title	Points
HHWB C6.1	Protect and maintain cultural and historic places	2-3 points
HHWB C6.2	Provide optimum site accessibility, safety, and wayfinding	2 points
HHWB C6.3	Promote equitable site use	2 points
HHWB C6.4	Support mental restoration	2 points
HHWB C6.5	Support physical activity	2 points
HHWB C6.6	Support social connection	2 points
HHWB C6.7	Provide on-site food production	3-4 points
HHWB C6.8	Reduce light pollution	4 points
HHWB C6.9	Encourage fuel efficient and multi-modal transportation	4 points
HHWB C6.10	Minimize exposure to environmental tobacco smoke	1-2 points
HHWB C6.11	Support local economy	3 points

Section 6: Site Design – Human Health + Well-Being



Section 6: Site Design – Human Health + Well-Being



SITES v2 Rating System

For Sustainable Land Design and Development



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Initiative

Section 1: Site Context

Section 2: Pre-Design Assessment + Planning

Section 3: Site Design – Water

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www.sustainablesites.org/rating-system

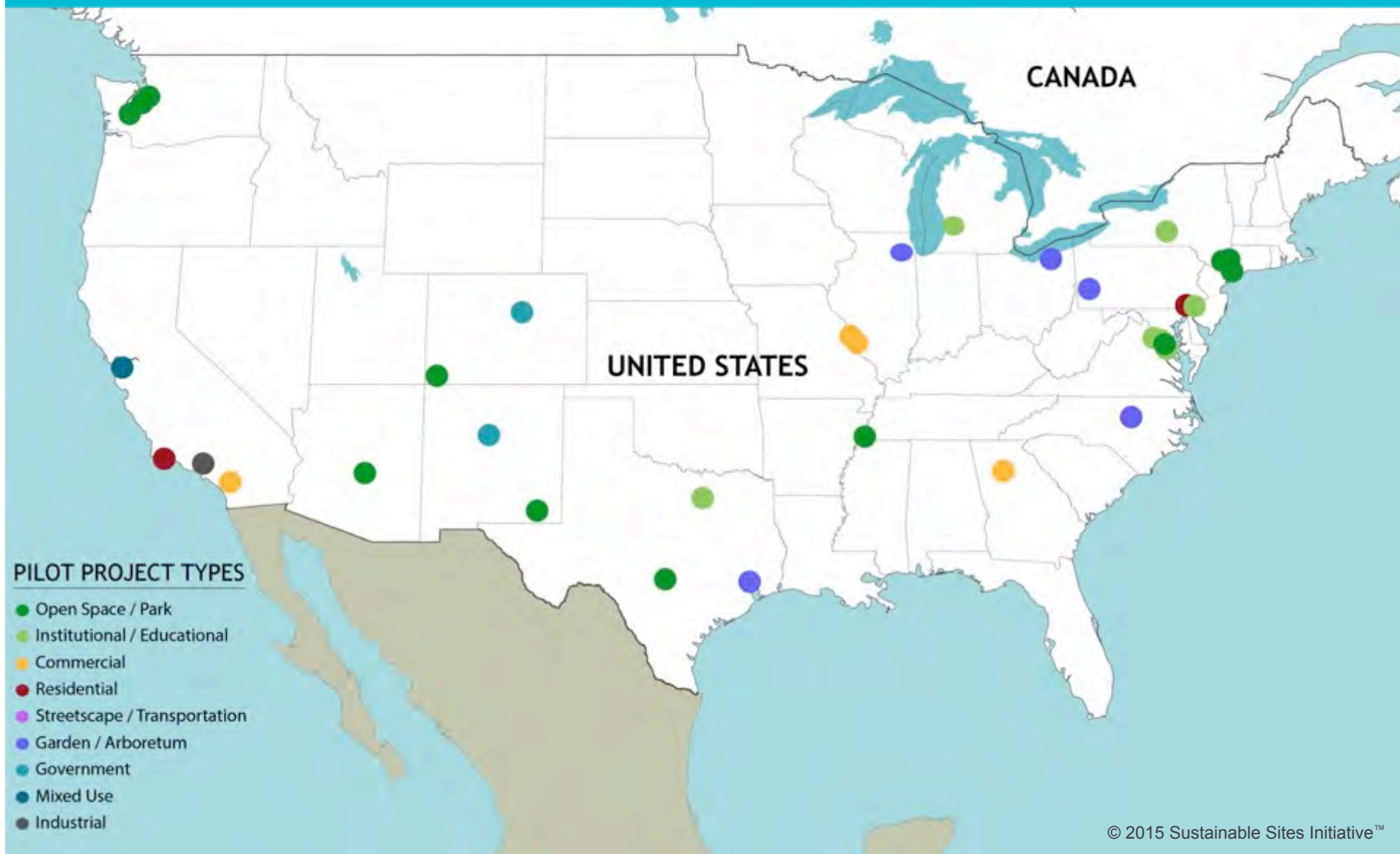
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Section 9: Education + Performance Monitoring



Prerequisite/Credit	Title	Points
Education C9.1	Promote sustainability awareness and education	3-4 points
Education C9.2	Develop and communicate a case study	3 points
Education C9.3	Plan to monitor and report site performance	4 points

SITES Certified Pilot Projects



SITES Certified Pilot Projects



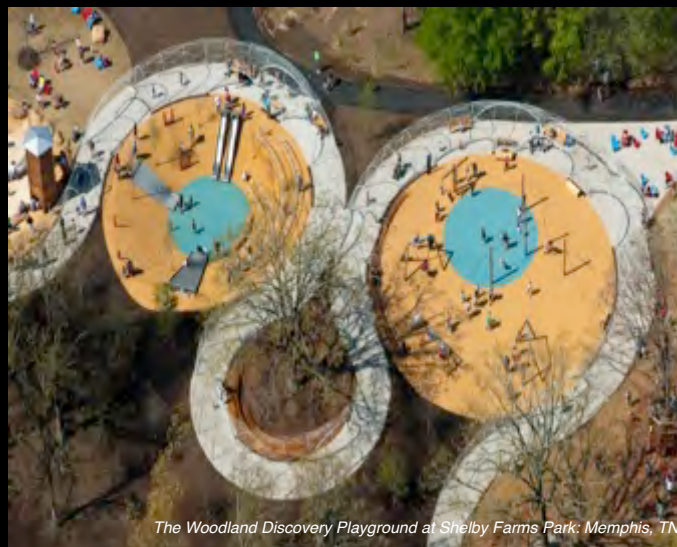
Victoria Garden Mews: Santa Barbara, CA



The Green at College Park at The University of Texas at Arlington



The Charlotte Brody Discovery Garden: Durham, NC



The Woodland Discovery Playground at Shelby Farms Park: Memphis, TN

34 Certified To-Date

15 Open Space/ Park

8 Educational

5 Garden/ Arboretum

5 Commercial

3 Government

2 Residential

1 Industrial

1 Mixed Use

....and 12 more under review



before



Scenic Hudson's Long Dock Park

Beacon, New York | Park | 14 acres

© 2015 Sustainable Sites Initiative™



Scenic Hudson's Long Dock Park

Beacon, New York | Park | 14 acres

Image credit: Robert Rodriguez, Jr.

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Scenic Hudson's Long Dock Park

Beacon, New York | Park | 14 acres

Image credit: Reed Hilderbrand LLC

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Hunts Point Landing
Bronx, New York | Park | 1.5 acres



Hunts Point Landing
Bronx, New York | Park | 1.5 acres



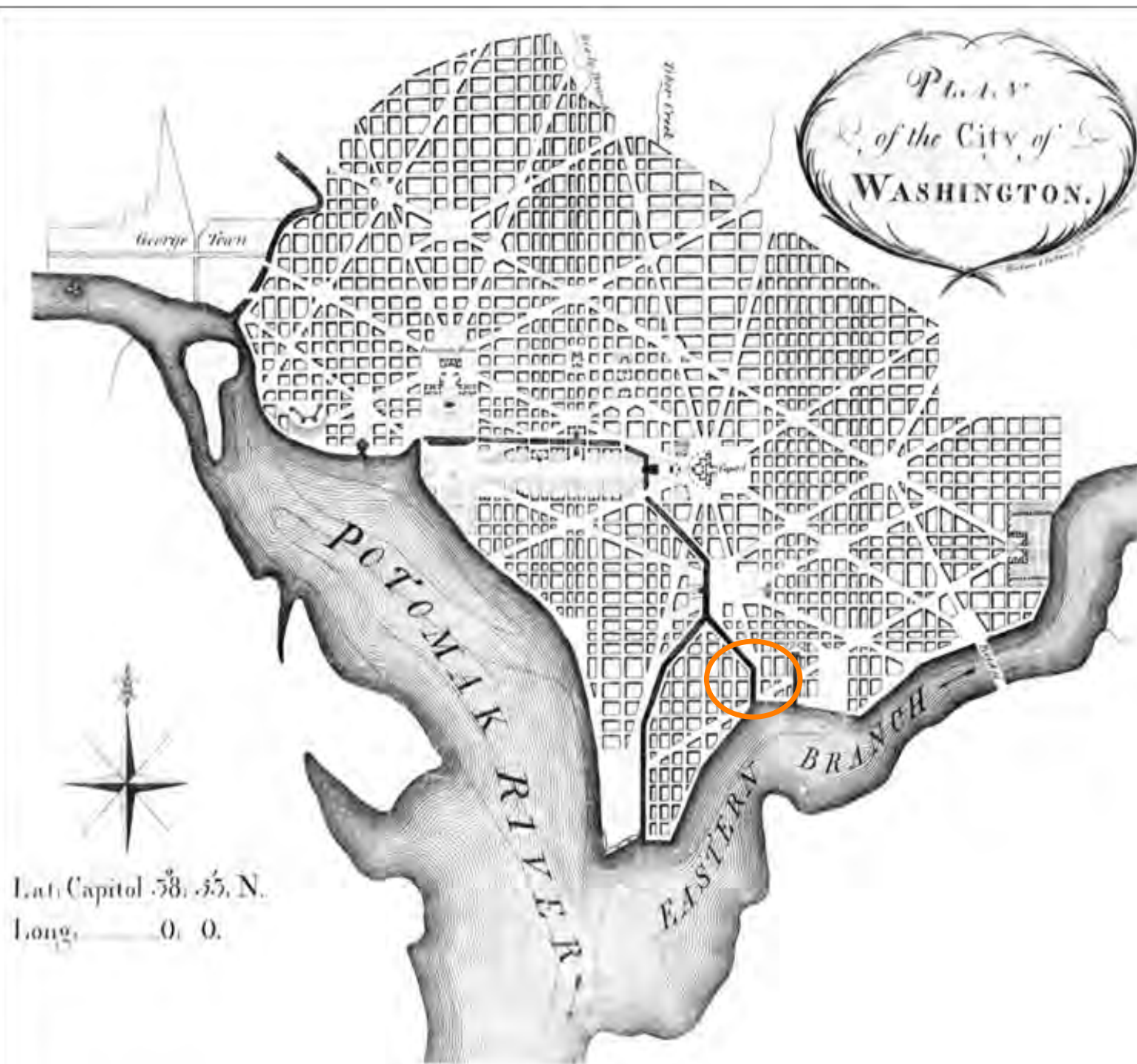
Hunts Point Landing

Bronx, New York | Park | 1.5 acres

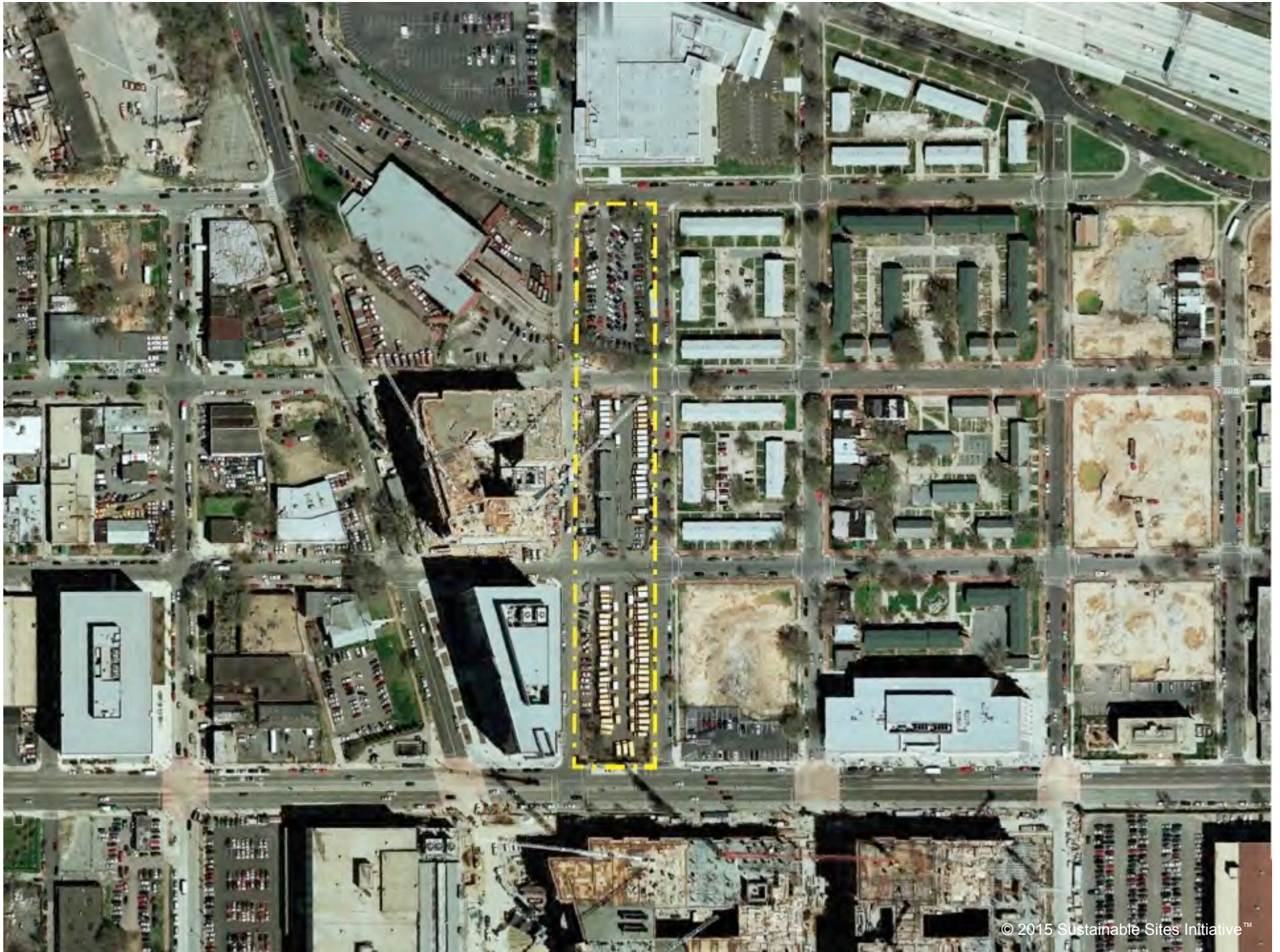
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Hunts Point Landing
Bronx, New York | Park | 1.5 acres











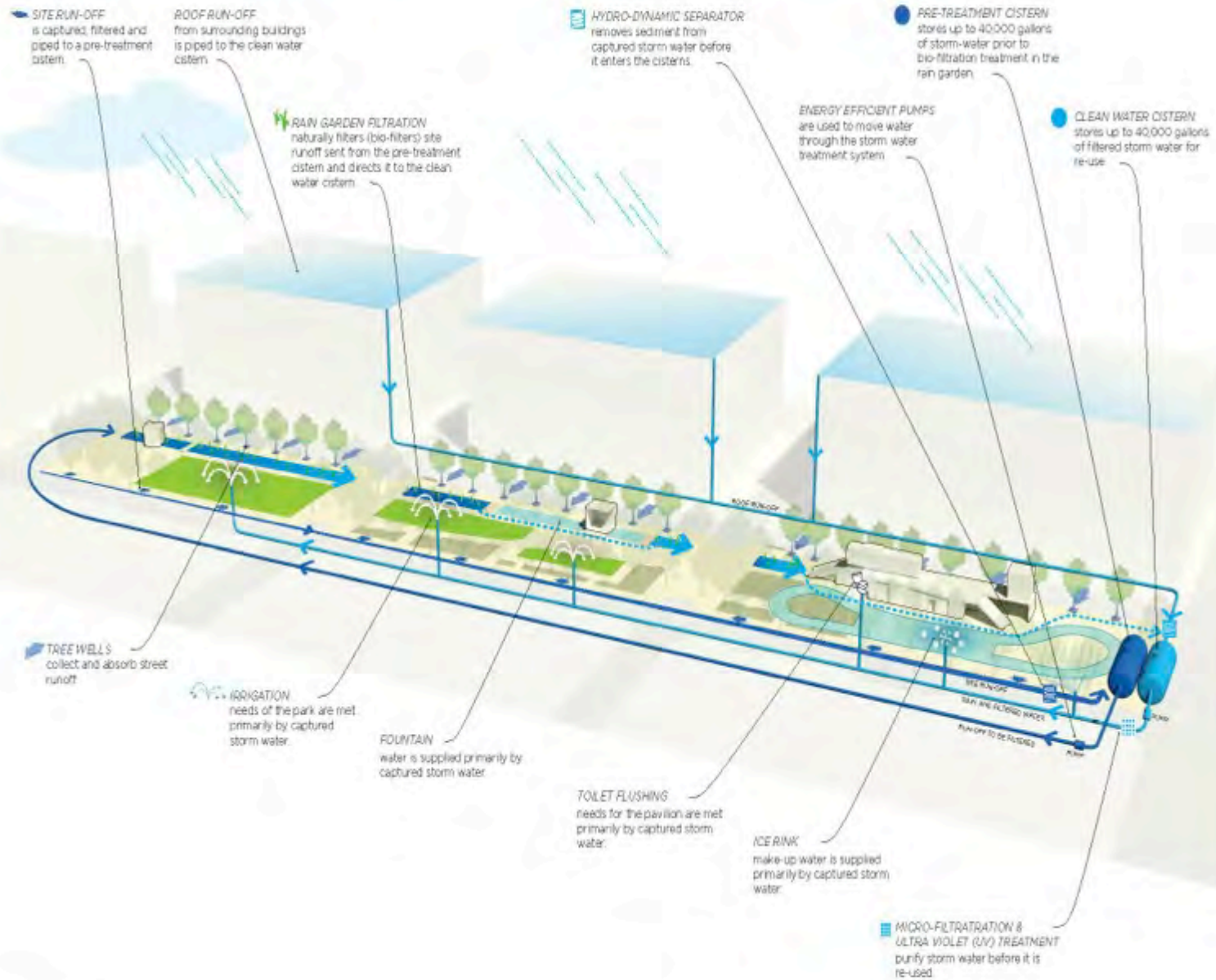
Washington Canal Park

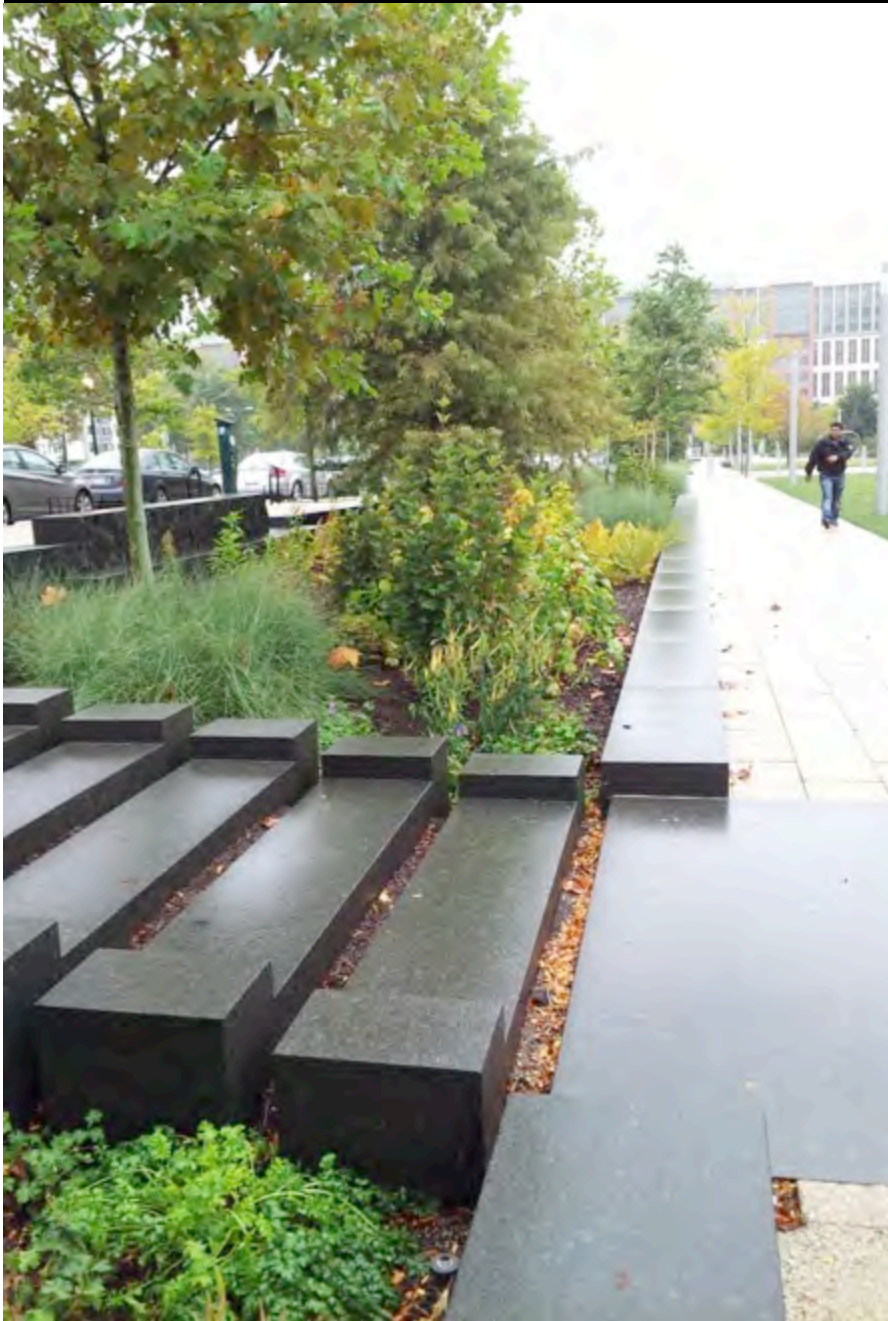
Washington, D.C. | 3 acres | Open Space - Park

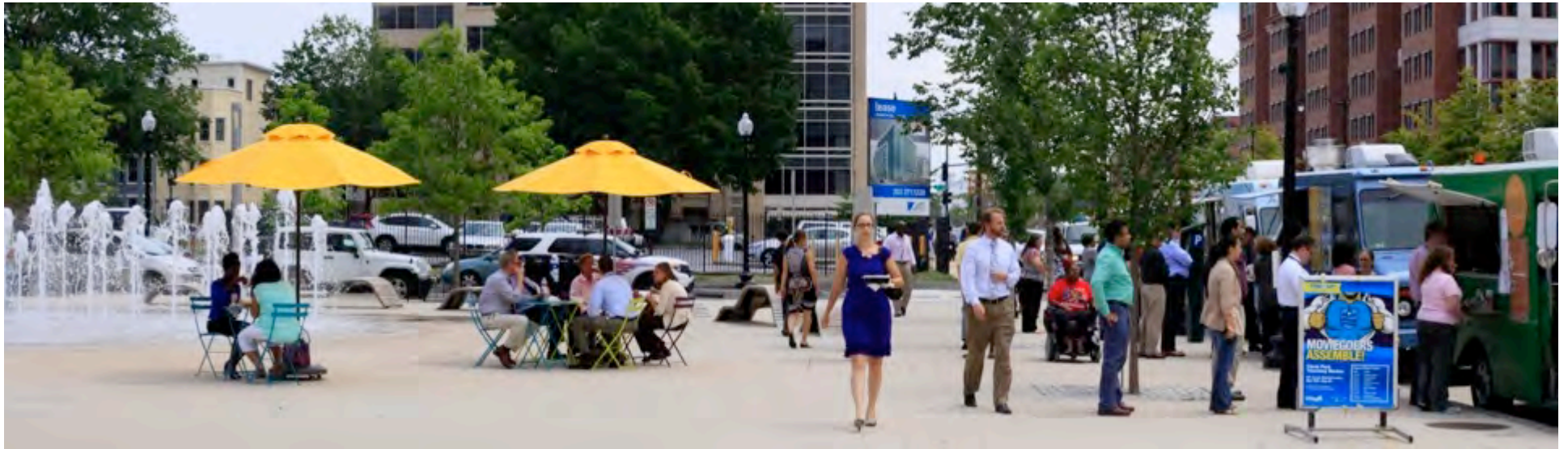
Image credit: OLIN / Karl Blumenthal

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STORMWATER STRATEGY









SITES v2

Rating System

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Reference Guide

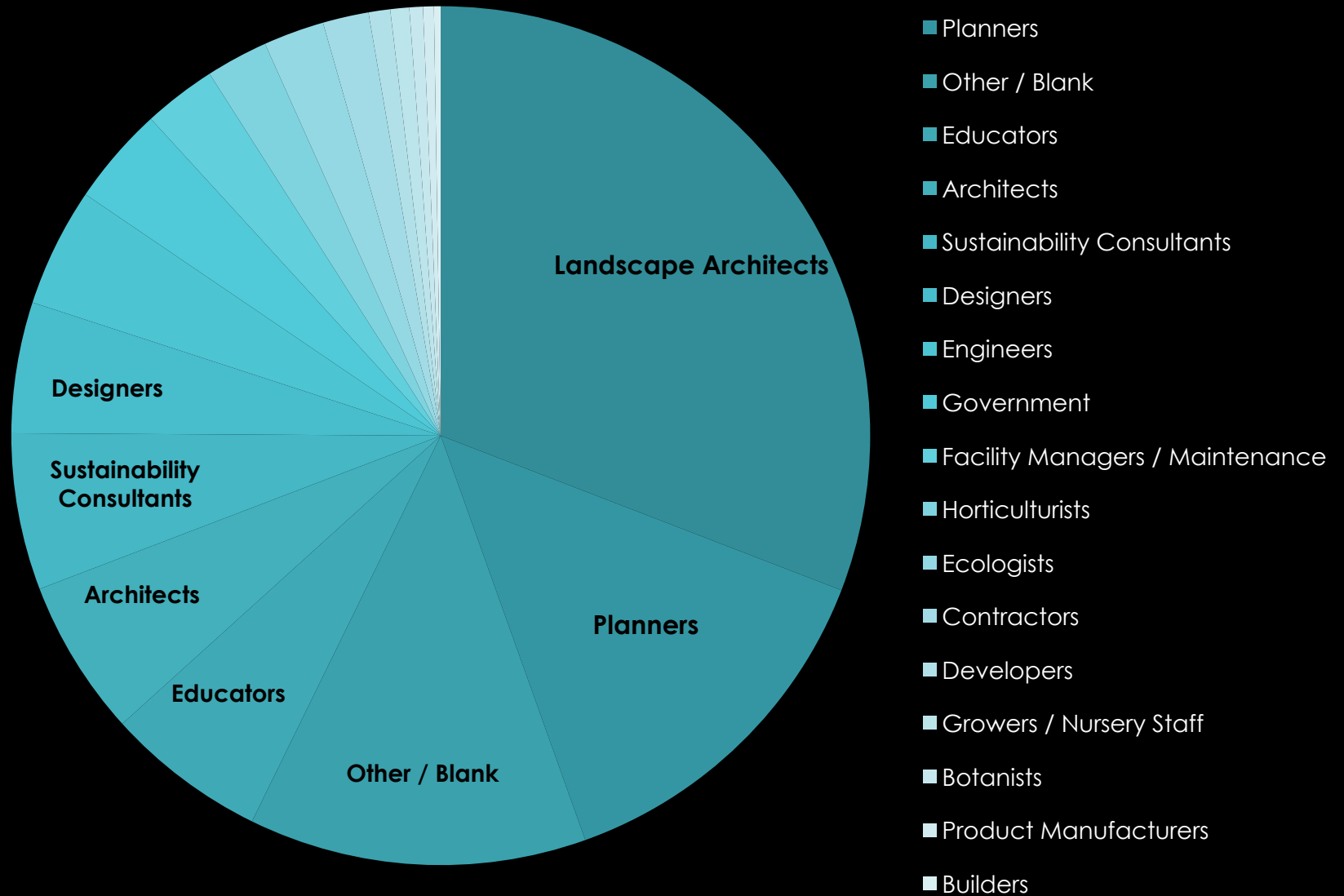
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SITES v2 Rating System + Reference Guide

PROFESSIONS



Eligible Projects

- New construction or major renovations
- No maximum size
- Minimum of 2,000 square feet
- All project types on sites with or without buildings
- Applicable outside U.S.



200 Points Total

70 points

SITES CERTIFIED

85 points

SITES SILVER

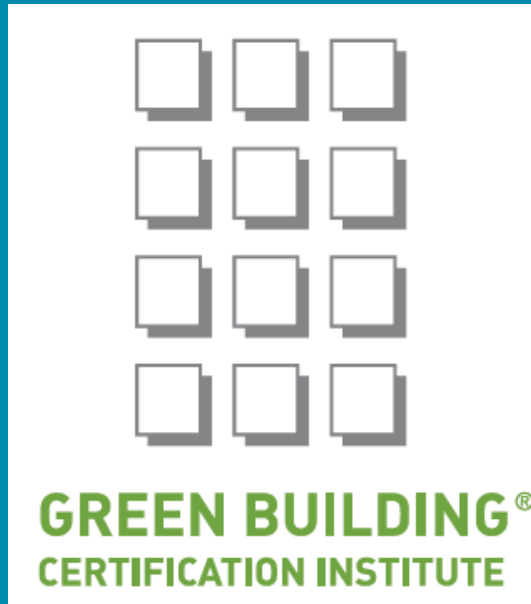
100 points

SITES GOLD

135 points

SITES PLATINUM

SITES v2 Certification Levels



SITES v2 Certification

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INITIATIVES

[Climate Change
Resilience](#)[Federal Sustainability](#)

Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes

“Knowledge gained in developing the Sustainable Sites Initiative served as background for many of the recommendations provided by the working group.”

[America's Great Outdoors
National Ocean Policy](#)[Great Lakes Offshore
Wind](#)[Steps to Modernize and
Reinvigorate NEPA](#)[Retrospective Regulatory
Review Plan](#)[Review of MMS NEPA
Procedures](#)

This guidance is to be used by Federal agencies for landscape practices when constructing new, or rehabilitating existing, owned or leased facilities, or when landscaping improvements are otherwise planned.

The Federal Government controls or owns more than 41 million acres of land and 429,000 building assets, comprising 3.34 billion square feet of space in the United States. Consequently, landscaping practices by Federal agencies can have significant impacts on the environment. Decisions regarding the development and maintenance of Federal landscaped property provide an opportunity to promote the sustainable use of water and land, conserve soils and vegetation, support natural ecosystem functions, conserve materials, promote human health and well-being, and ensure accessibility for all users, including those with disabilities.

[Click here to read the Guidance.](#)

www.whitehouse.gov/administration/eop/ceq/sustainability/landscaping-guidance

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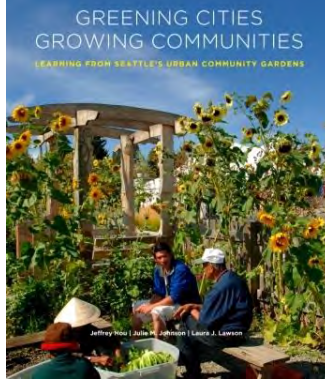
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danielle@sustainablesites.org

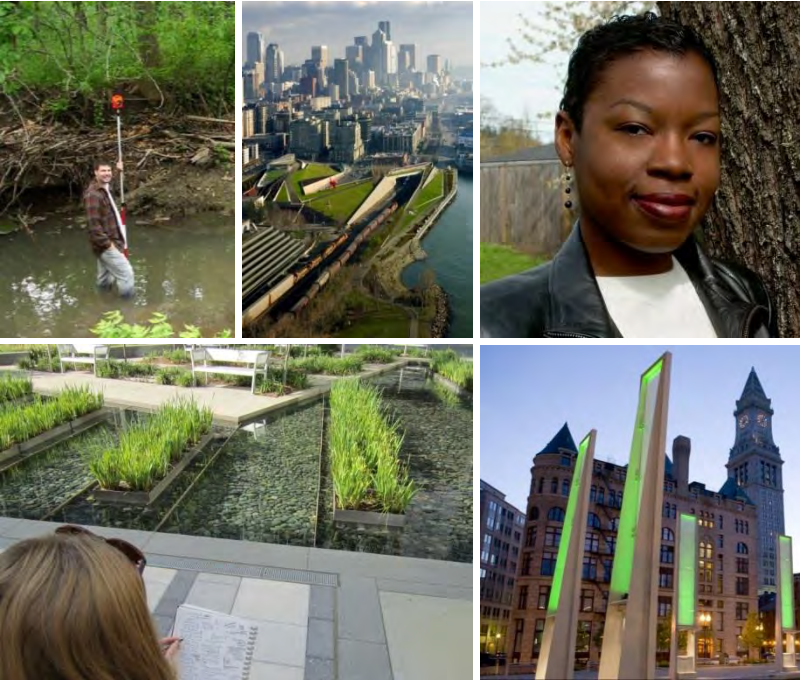


LANDSCAPE ARCHITECTURE FOUNDATION

LANDSCAPE PERFORMANCE SERIES



LANDSCAPE ARCHITECTURE FOUNDATION



- 501(c)(3) nonprofit based in Washington, DC
- Founded in 1966 to preserve, improve and enhance the environment
- Increase our collective capacity to achieve sustainability:
 - Invested **\$2.2 million** in research since 1986
 - Awarded nearly **\$1.1 million** in scholarships to over **500** students



LANDSCAPE PERFORMANCE

MEASURING SUSTAINABILITY

Triple Bottom Line



Living Building Challenge



One Planet Principles

- 1 Zero carbon
- 2 Zero waste
- 3 Sustainable transport
- 4 Sustainable materials
- 5 Local and sustainable food
- 6 Sustainable water
- 7 Land use and wildlife
- 8 Culture and heritage
- 9 Equity and local economy
- 10 Health and happiness

Can't achieve **SUSTAINABILITY**
without considering **LANDSCAPE**



A CASE STUDY COMPARISON

- Reduces water use by 30% compared to a building with standard code-compliant fixtures
- Uses 51,300 kBtu/ft² of energy annually, a 39% reduction from base case
- Reduces carbon emissions by 19 lbs CO₂/ft², or 50% by purchasing renewable energy.
- Provides daylight for 75% of regularly occupied spaces and views for 90% of occupied work areas



A CASE STUDY COMPARISON

- Stormwater planters
- 20 new street trees
- Native and adapted plants
- 5 new outdoor dining areas
- Energy-efficient light blades
- Benches made from local stone



A CASE STUDY COMPARISON

- Captures and cleans stormwater runoff
- Reduces the urban heat island effect
- Sequesters carbon
- Reduces potable water use
- Reduced energy use
- Increases social value of space



FROM FEATURES TO CLAIMS TO BENEFITS

- Captures and infiltrates **50%** of all rain falling on sidewalks.
- Sequesters **3,000** lbs of carbon annually in tree biomass.
- Reduced energy consumption for outdoor lighting by **55,000** kilowatts, saving **\$3,200** annually. □
- Increased restaurant patronage by **30%** on weekdays and **50%** on weekends.

L
A
F

LANDSCAPE PERFORMANCE SERIES

THE ONLINE RESOURCE

Meet The Next-Generation

LANDSCAPE PERFORMANCE SERIES

presented by the
Landscape Architecture Foundation

www.LandscapePerformance.org



Case Study Briefs

Database of over 100 exemplary projects with quantified landscape benefits



Fast Fact Library

Nearly 200 facts on the benefits of landscape derived from published research



Benefits Toolkit

Dozens of online calculators and tools to estimate landscape performance



Collections

Themed LPS highlights curated by LAF and leading thinkers

- Find precedents, show value, and make the case for sustainable landscape solutions
- Explore metrics and methods to quantify environmental, social, and economic benefits
- Earn professional development hours (PDHs) by attending a presentation or webinar
- Browse and share teaching materials to integrate landscape performance into design curricula
- Stay current on landscape performance news and trends

Not just for **LANDSCAPE ARCHITECTS**

LPS TARGET AUDIENCES

- Landscape architects
- Allied design/development professionals
 - Planners
 - Architects
 - Engineers
 - Developers
- Non-profit organizations advocating for sustainable development
- Federal and municipal agencies
- Corporations with sustainability agendas

LPS AND SITES

SITES

- Modeled after LEED
- For sites that will be protected, developed, or redeveloped
- Encourages setting numerical goals
- Requires collection of baseline data
- Provides tools to estimate performance
- Encourages “Human Health and Well Being”

LPS

- Not a rating system
- Focuses on measurable performance of built landscapes
- Easier to evaluate with numerical goals
- Requires collection of baseline data
- Provides tools to estimate performance
- Measures social and economic impact

COMPLEMENTARY approaches
which **STRENGTHEN** one another

Meet The Next-Generation

LANDSCAPE PERFORMANCE SERIES

presented by the
Landscape Architecture Foundation

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Case Study Briefs

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Collections

Themed LPS highlights curated by LAF and leading thinkers



FAST FACT LIBRARY

Empirical evidence indicates “livable” street treatments are safer than conventional roadway designs. In analyzing crash data, livable sections had fewer accidents and pedestrian crashes.

Dumbaugh, Eric. (2005). Safe Streets, Livable Streets. *Journal of the American Planning Association* 71(3), 283-300.

FAST FACT LIBRARY



The first protected bike lanes in the US, on 8th and 9th Avenues in Manhattan, led to a 35% decrease in injuries to all users on 8th Avenue and a 58% decrease in injuries to all users on 9th Avenue.

New York City Department of Transportation. (2012) "Measuring the Street: New Metrics for 21st Century Streets."



FAST FACT LIBRARY

A Modesto, California study found that asphalt on streets shaded by large canopy trees lasts longer than asphalt on unshaded streets, reducing maintenance costs by 60% over 30 years.

McPherson, E. Gregory, Muchnick, Jules, (2005). Effects of Street Tree Shade on Asphalt Concrete Pavement Performance. *Journal of Arboriculture*, 31, 303-310.



FAST FACT LIBRARY

Children with Attention Deficit Hyperactivity Disorder (ADHD) concentrate better after a walk in a city park than after walks in other urban settings.

Faber Taylor, Andrea, Kuo, Frances E., (2009). Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders*, 12, 402-409.

FAST FACT LIBRARY



Recovering surgery patients with window views of trees had 10% shorter hospital stays, took fewer potent pain killers, and had fewer negative notes recorded by their attending nurses than patients with views of a brick wall.

Ulrich, Roger S., (1984) View through a window may influence recovery from surgery. *Science*, 224(4647) 420-421.



FAST FACT LIBRARY

Consumers are willing to spend 9-12% more for goods and services in central business districts with high quality tree canopy.

Wolf, Kathleen L., (2005). Business district streetscapes, trees, and consumer response. *Journal of Forestry* 103(8): 396-400 □



FAST FACT LIBRARY

Atlanta's promotion of public transportation during the 1996 Summer Olympic Games led to a 22% decline in traffic counts, 28% decline in ozone concentrations, and a 41% decrease in asthma acute-care events.

Friedman, Michael S., Graham, LeRoy M., Hutwagner, Lori, Powell, Kenneth E., Teague, W. Gerald, (2001). Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. *Journal of the American Medical Association*, 285, 897-905.

BENEFITS TOOLKIT



GBRL Green Roof Energy Calculator (v 2.0)

Green Roofs for Healthy Cities, Portland State University, University of Toronto

This calculator compares the annual energy performance of a building with a green roof to the same building with either a conventional dark roof or a highly-reflective white roof. Inputs include nearest major city, total roof area, percent green roof cover, growing media depth, and leaf area index of plants. Results are the electrical, gas, and energy cost savings, heat exchange between the roof and the urban environment, and an estimate of the annual roof water balance, including net runoff.

http://greenbuilding.pdx.edu/GR_CALC_v2/grcalc_v2.php#retain

Renaissance Park



BEFORE AFTER

Landscape Performance Benefits

ENVIRONMENTAL

- ▶ Removed 34,000 cu yd of contaminated soil from the 100-year floodplain and sealed it safely within the park's iconic landforms. This includes 12,000 cu yd of soil commingled with enamel frit, which was leaching contaminants into groundwater.
- ▶ Increased floodplain storage by 9.32 acre feet (15,047 cu yd) through excavation of contaminated soil and creation of a constructed wetland.

CASE STUDY BRIEFS

Landscape Performance Benefits

ENVIRONMENTAL

- ▶ Removed 34,000 cu yd of contaminated soil from the 100-year floodplain and sealed it safely within the park's iconic landforms. This includes 12,000 cu yd of soil commingled with enamel frit, which was leaching contaminants into groundwater.
- ▶ Increased floodplain storage by 9.32 acre feet (15,047 cu yd) through excavation of contaminated soil and creation of a constructed wetland.

SOCIAL

- ▶ Promotes a healthy lifestyle, according to 85% of 85 park users surveyed. 81% agree that the park increases their outdoor activity.
- ▶ Attracts an estimated 145,220 visitors annually, many of whom also patronize local businesses. 89% of 85 surveyed park users shop or dine within 1/2 mile of the park before or after visiting the park.

ECONOMIC

- ▶ Stimulates economic development and neighborhood reinvestment. Since 2005, \$55 million has been invested in two redevelopment projects adjacent to Renaissance Park. Five additional properties within 1/4 mile of the park were redeveloped between 2005 and 2013.

View/Download a PDF showing how the landscape performance benefits were derived.

DOWNLOAD METHODS 

CASE STUDY BRIEFS

- Increases floodplain storage by 9.33 acre feet (15,047 cu yd.) due to excavation of contaminated soil below 100 year floodplain elevation and creation of a constructed wetland.***

Methodology:

This performance indicator is based on the thorough review of information provided and cut/fill calculations performed by the project's consulting team as well as calculations performed by the research team.



Figure 4. 100 Year Floodplain

The portion of the site where contaminated soils were excavated from capped waste cells of enamel frit was excavated as much as 10' below finished grade. This +/- one acre area is creatively redesigned as a one-acre constructed wetland that receives, retains, and treats runoff from the site while increasing the storage capacity of the 100 year flood by 9.33 acre feet

CASE STUDY BRIEFS

At a Glance

DESIGNER

Hargreaves Associates

LOCATION

100 Manufacturers Road
Chattanooga, Tennessee
37405
[Map it](#)

SIZE

22 acres

PROJECT TYPE

Park/Open space
Waterfront redevelopment

BUDGET

\$8 million

FORMER LAND USE

Brownfield Park/Open space

CLIMATE ZONE

Humid subtropical

COMPLETION DATE

2006

OVERVIEW



SUSTAINABLE FEATURES



CHALLENGE/ SOLUTION



COST COMPARISON



LESSONS LEARNED



PRODUCTS



PROJECT TEAM



Renaissance Park is a 22-acre urban brownfield redevelopment project within Chattanooga's nationally-recognized Tennessee River Park and the final phase of the 21st Century Waterfront Master Plan. Completed in 2006, this riverfront project transformed a blighted post-industrial site known to be leaching contaminants into surface and groundwater resources into a celebrated public park that has been a catalyst for reinvestment in Chattanooga's growing Northshore neighborhood. Renaissance Park provides a canvas for social engagement, healthy lifestyles, and environmental education, leveraging ecosystem services of preserved floodplain forest, meadow plantings and a constructed wetland that treats site stormwater and increases floodplain storage capacity. Preservation areas and native meadows reduce construction and maintenance costs, while iconic landforms safely and artistically enclose contaminated soils. The park hosts public events, exhibitions of public art, and commemorates the site's role in significant historic

CASE STUDY BRIEFS

At a Glance

DESIGNER

Hargreaves Associates

LOCATION

100 Manufacturers Road
Chattanooga, Tennessee

SIZE

22 acres

PROJECT TYPE

Park/Open space
Waterfront redevelopment

37405

[Map it](#)

BUDGET

\$8 million

FORMER LAND USE

Brownfield Park/Open space

CLIMATE ZONE

Humid subtropical

COMPLETION DATE

2006

OVERVIEW



SUSTAINABLE
FEATURES



CHALLENGE/
SOLUTION



COST
COMPARISON



LESSONS
LEARNED



PRODUCTS



PROJECT
TEAM



- ▶ Test wells indicated a bloom of contaminated groundwater down-gradient from the known location of previously capped industrial waste settling ponds within the 100-year flood plain. 34,000 cu yd of contaminated soils were excavated and placed in upland containment cells, safely sealed within the park's iconic landforms. A drainage system beneath the cells diverts any lingering leachate to the sanitary sewer.
- ▶ The portion of the site from which contaminated soils were excavated was creatively redesigned as a one-acre constructed wetland. This feature receives, holds and treats runoff from the site while increasing floodplain storage capacity by 9.32 acre feet. The wetland is lined with a bentonite geosynthetic clay liner to prevent further groundwater contamination. Two feet of freeboard is provided between the wetland's normal pool level and outfall orifices which discharge into the stream. Gabions, buffered with wetland plantings, artfully establish the water's meandering path through the wetland.

CASE STUDY BRIEFS

At a Glance

DESIGNER

Hargreaves Associates

LOCATION

100 Manufacturers Road
Chattanooga, Tennessee
37405
[Map it](#)

SIZE

22 acres

PROJECT TYPE

Park/Open space
Waterfront redevelopment

BUDGET

\$8 million

FORMER LAND USE

Brownfield Park/Open space

CLIMATE ZONE

Humid subtropical

COMPLETION DATE

2006

OVERVIEW



SUSTAINABLE
FEATURES



CHALLENGE/
SOLUTION



COST
COMPARISON



LESSONS
LEARNED



PRODUCTS



PROJECT
TEAM



Challenge

Monitoring wells installed as part of environmental assessment efforts indicated that capped waste cells located within the site's 100-year flood plain were leaching semi-volatile organic compounds (SVOCs) and heavy metal contaminants into the groundwater. These cells contained postindustrial waste from the site's previous use as an appliance manufacturing and enameling facility. Until environmental regulation outlawed such practices, post-process wastes – including enamel frit – were disposed of on-site in receiving cells that were capped once full.

Solution

Following extensive analysis of historic site topographic maps to determine the probable

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PRODUCTS



PROJECT
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- ▶ The client explored alternative “hard engineering solutions” to manage contaminated soils and prevent further groundwater contamination, such as subterranean groundwater diversion walls and an asphalt cap. The implemented “soft” approach was 25% less expensive than these alternatives.
- ▶ Remediating 12,000 cubic yards of leaching soil containing commingled frit on site cost \$180,000, 75% less than the \$720,000 estimated cost to haul the same volume of soil to a proper landfill.

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CHALLENGE/ SOLUTION



COST COMPARISON



LESSONS LEARNED



PRODUCTS



PROJECT TEAM



- Accurately calculating the volume of contaminated soil that would be excavated and remediated was critical to managing project budgets. The cost of excavation and remediation activities would limit budget available for other site development agendas and features, and the volume of soil to be treated would dictate the amount of area to be committed to the encapsulation of contaminated soil. The design team was not comfortable basing estimates on conventional methods of extrapolating data from a grid of soil borings alone. Therefore, they conducted a “forensic” topographic analysis using historical maps of the site’s undeveloped and post-industrial conditions, in addition to analysis of 60 soil borings and groundwater monitoring data to generate three-dimensional models of the likely extent of contaminated soil. This in-depth analysis gave the design team the information necessary to allocate budget for remediation activities and design the site accounting for proper soil storage capacity.

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PRODUCTS



PROJECT
TEAM



Wetland Liner: CETCO Bentomat geosynthetic clay liner

Wetland Inlets & Outlets: Agri Drain

Light Poles: Hess

Prefabricated Bridges: Moosman Bridge

Site Furniture: Maglin

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LEARNED



PRODUCTS



PROJECT
TEAM



Project Team

Landscape Architect & Lead Designer: Hargreaves Associates

Structural & Electrical Engineer: Moffatt & Nichol Engineers

Environmental Engineer: S&ME

Lighting Designer: LAM Partners, Inc.

Pavilion Architects: Eskew+Dumez+Ripple, Hefferlin+Kronenberg Architects

Pavilion Engineer: March Adams & Associates, Inc.

Pavilion Lighting Designer: Fisher Marantz Stone

General Contractor: Stein Construction Corporation

Landscape Contractor: Earthscapes

Client: River City Company for Chattanooga Downtown Redevelopment Corporation

Architectural Consultant: The Chattanooga Regional Planning Commission, U.S.

CASE STUDY BRIEFS

Additional Images



References and Resources

[Hargreaves Associates: Renaissance Park](#)

[Hefferlin+Kronenberg Architects: Renaissance Park Outdoor Pavilion](#)

[East Tennessee River Valley Geotourism MapGuide](#)

[Bloomberg Businessweek, "Chattanooga Reinvents Its Downtown," 2009](#)

[The Chattanooga "Renaissance Park Wins Governor's Award," 2007](#)

[Tennessee Valley Authority, "Wetland thrives in downtown Chattanooga," 2006](#)

[George Hargreaves, J. Czerniak, A. Berrizbeitia, L. Campbell Kelly, "Landscape Alchemy: The Work of Hargreaves Associates," ORO Editions, 2009.](#)

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[laf:casestudy=738](#)



PROJECTS AND BENEFITS



UPTOWN NORMAL CIRCLE NORMAL, IL | HOERR SCHAUDT

BEFORE



AFTER



Expected to reduce traffic accidents by **35%**.

Captures and reuses **1.4 million** gallons of runoff.

Increased nearby property values by **\$1,500,000**.



DUTCH KILLS GREEN NEW YORK, NY | WRT

Increased bicycle traffic by 12% to 3,500 cyclists per day.

Helped reduce pedestrian and cyclist fatalities from a high of 18 to <1 per year.

Increased estimated market value of surrounding properties by 37%.



MILLIKEN STATE PARK

DETROIT, MI | SMITHGROUPJJR

BEFORE



AFTER



Filters **4.5 million** gallons of runoff from **12.5** acres.

Provides habitat for **62** confirmed species birds.

Expected to catalyze **\$152.3 million** in development.



BLUE HOLE REGIONAL PARK WIMBERLEY, TX | DESIGN WORKSHOP

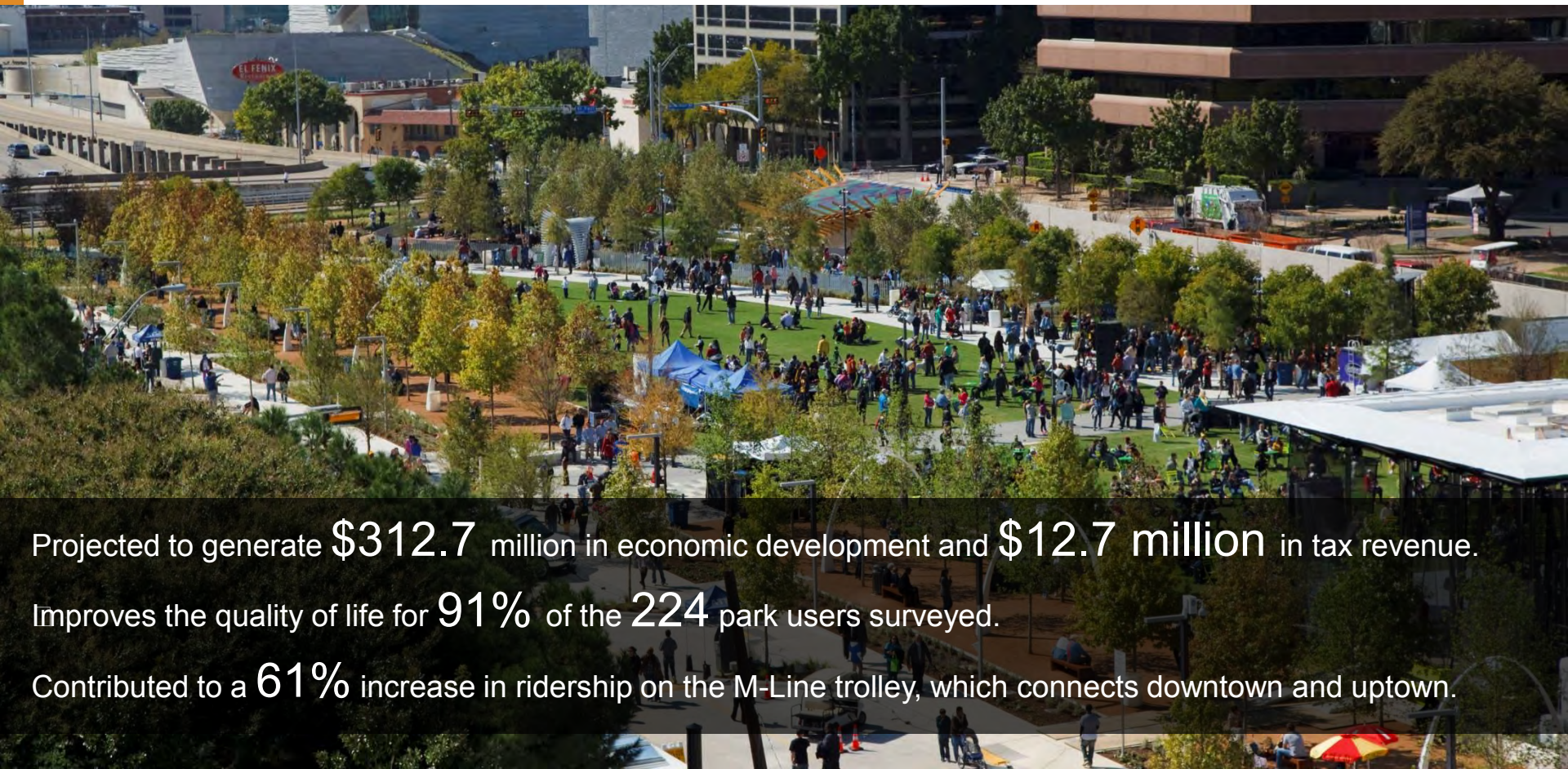
Protects **93** acres or **96%** of the undisturbed area of the site.

Improved user satisfaction with park amenities by **165%** and perceptions of safety by **101%**.

Tripled annual visitation, generating **\$217,000** in entry fee revenue.



KLYDE WARREN PARK DALLAS, TX | OFFICE OF JAMES BURNETT



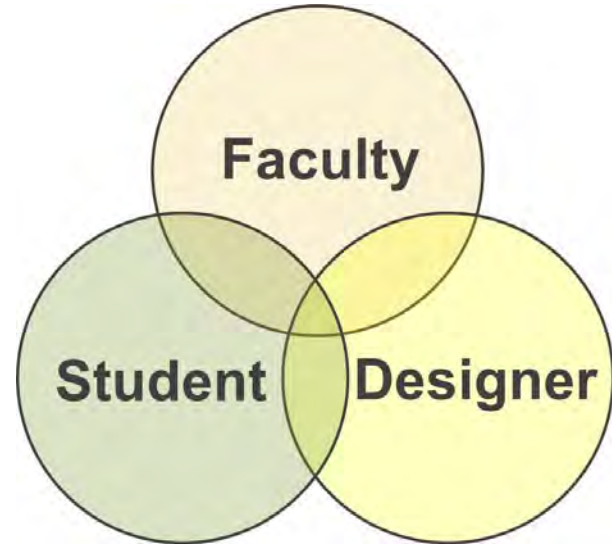
Projected to generate **\$312.7** million in economic development and **\$12.7 million** in tax revenue.

Improves the quality of life for **91%** of the **224** park users surveyed.

Contributed to a **61%** increase in ridership on the M-Line trolley, which connects downtown and uptown.

CASE STUDY INVESTIGATION (CSI)

- Unique research collaboration
 - Faculty Research Fellow
 - Student Research Assistant
 - Practitioner
- Document high-performing landscapes
 - New LPS Case Study Briefs



Guided by **PRACTICE**

Enhanced by **RESEARCH**

A woman wearing a light blue button-down shirt, a white baseball cap, and dark pants stands on a large, dark, rectangular solar panel array. She is holding a small black device, possibly a camera or a remote, in her right hand and looking towards the left. The solar panel array is situated in a grassy field. In the background, there is a wooden fence, a line of green trees, and a range of mountains with patches of snow under a clear blue sky. To the right of the woman, there is a large, dense green bush.

NEW APPROACHES TO RESEARCH



Nature Sacred
Helping communities heal from the outside.



Longer-term Partnerships

- **TKF Foundation**

- Joplin, Missouri “Landscapes of Resilience” Butterfly Gardens and Overlook project, a 2014 TKF “Open Spaces, Sacred Places” award recipient

- Research Team: Stephanie Rolley and graduate student assistant of the Kansas State University Landscape Architecture Program

- **General Services Administration (GSA)**

- United States Coast Guard Headquarters in Washington, DC neighborhood of St. Elizabeths/Congress Heights

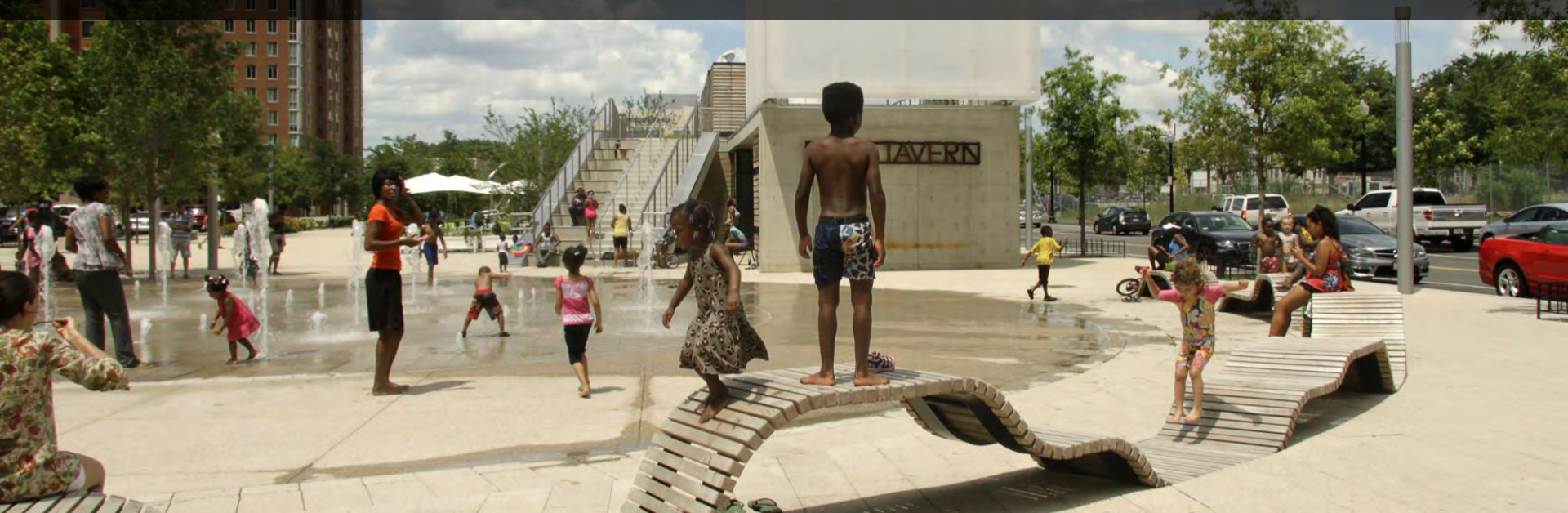
- Research Team: Dr. Chris Ellis and Dylan Reilly of the University of Maryland Landscape Architecture Program

CANAL PARK WASHINGTON, DC | OLIN

Serves local residents and workers, with **78%** of visitors come from within 1/2 mile of the park.

Encourages social interaction, with **25%** of survey respondents having made new acquaintances in the park.

Improves neighborhood safety for **81%** of those surveyed, compared to **45%** in 2008.

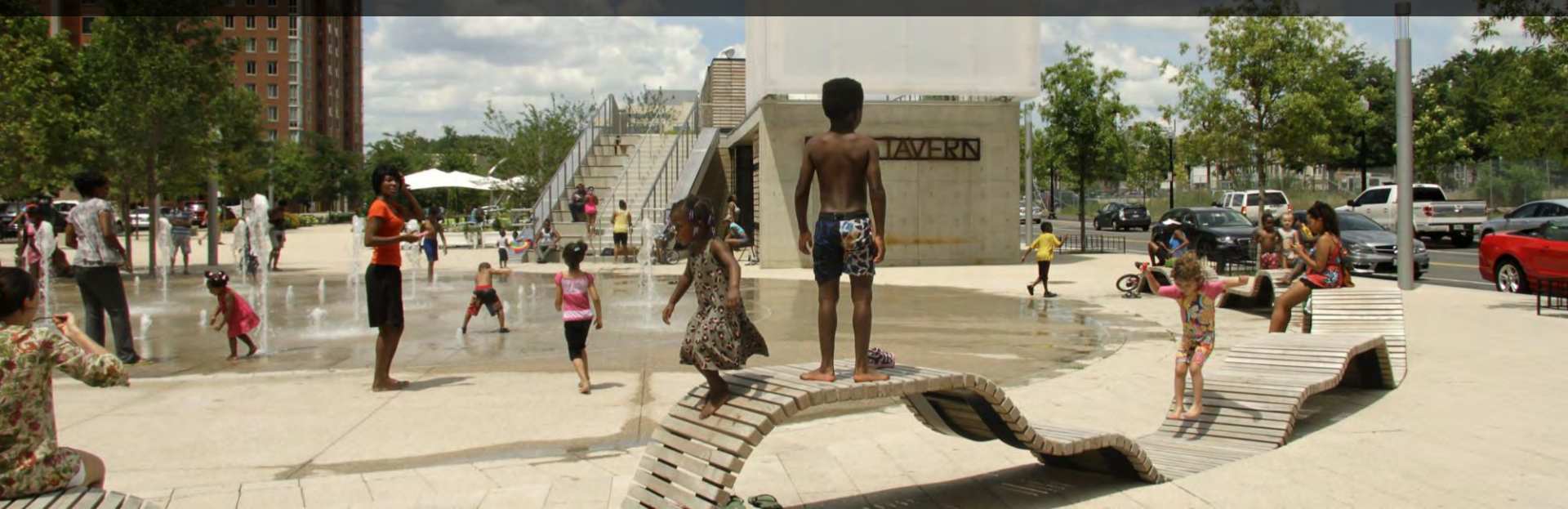


CANAL PARK WASHINGTON, DC | OLIN

Most people surveyed only walk 1-2 blocks to get to the park, not the standard $\frac{1}{4}$ mile assumption.

Despite research indicating people like the high vantage point, the roof viewing platform is **not** utilized.

Roof-mounted cameras were used to take photos every 3 seconds; surveys taken every season.





Founding Partner



AILA/Yamagami/Hope Fellowship



AMERICAN SOCIETY OF
LANDSCAPE ARCHITECTS

Promotional Partner

LPS RESULTS

- Transforming design practice, education, and industry
- Making advocates more effective
- Building the body of knowledge
- Operationalizing and energizing aspirations for change

LandscapePerformance.org



LANDSCAPE ARCHITECTURE FOUNDATION

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