In the face of mounting environmental, social and economic challenges across the globe, landscape architecture that is deeply rooted in research is needed now more than ever. With dwindling resources and ever-urbanizing open space, landscape architects are being called on to provide innovative solutions for increasingly complex problems. OLIN has a systematic and historically-grounded research program committed to exploring and analyzing how landscape architecture can positively impact the people and environment of the 21st century.
a gradual process in which something changes into a different and usually more complex or better form
Bryant Park, 1985-1991

J. Paul Getty Center, 1993-1997

Washington Monument, 2001-2005

Washington Canal Park, 2008-2012
DESIGN and RESEARCH

EDUCATION
- Collaboration
- Investigation
- Testing
- Sharing

CRAFT
- Innovation
- Tools/Process
- Materials/Methods

ECOLOGY / ENVIRONMENTS
- Systems
- Restoration
- Sustainability

DIRECTORS
- Research
- Technology
- Green Infrastructure
SCALES of RESEARCH

Black Locust

Introduction
Black Locust (Robinia pseudoacacia L.), sometimes called Yellow Locust, is one of the most decay-resistant native woods. It has escaped cultivation and become naturalized throughout eastern North America and parts of the West. It has been successfully established throughout much of the humid section of the United States and in many foreign countries. Although black locust is not an important timber tree in the United States, it is used for a wide variety of products. Because of its hardness and resistance to decay [compare to other species], black locust has been used consistently for fence posts, railroad ties, and shipmast posts.1

Description

Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Dried Weight</td>
<td>51 lb/ft³</td>
</tr>
<tr>
<td>Basic Specific Gravity</td>
<td>.65</td>
</tr>
<tr>
<td>Hardness</td>
<td>1,700 lb</td>
</tr>
<tr>
<td>Rupture Strength</td>
<td>19,400 lb/ft²</td>
</tr>
<tr>
<td>Elastic Strength</td>
<td>2,050,000 lb/ft²</td>
</tr>
<tr>
<td>Crushing Strength</td>
<td>10,200 lb/ft²</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>Radial: 4.5%</td>
</tr>
<tr>
<td></td>
<td>Tangential: 7.2%</td>
</tr>
<tr>
<td></td>
<td>Volumetric: 10.2%</td>
</tr>
<tr>
<td></td>
<td>T/R Ratio: 1.6</td>
</tr>
</tbody>
</table>

Although black locust is not an important timber tree in the United States, it is listed...
SCALES of RESEARCH

PROJECT INQUIRY
### SCALES of RESEARCH

#### Word Frequency: Similarities (At Least in Aggregate)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Bryant</th>
<th>Pershing</th>
</tr>
</thead>
<tbody>
<tr>
<td>References to People and Social Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryant</td>
<td>2</td>
<td>1.5</td>
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<tr>
<td>Pershing</td>
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<tr>
<td>References to Centrality and Urbanity</td>
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</tr>
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<td>Bryant</td>
<td>2.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Pershing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References to Events and Formal Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryant</td>
<td>1.5</td>
<td>1.0</td>
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<tr>
<td>Pershing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References to Informal Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryant</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pershing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Population

- Total in intersecting census tracts: 80,791
- Total in intersecting block groups: 16,161
- Total in intersecting census tracts: 44,320
- Total in intersecting block groups: 12,260
SCALES of RESEARCH

FOCUSED TOPIC EXPLORATION
FOCUSED TOPIC EXPLORATION
SCALES of RESEARCH

REBUILD BY DESIGN

rebuilding water + culture

MULTI-DISCIPLINE COLLABORATION
SCALES of RESEARCH

HUNTS POINT, BRONX
SECURING THE POINT WITH LIFELINES

Many plans, investments, and imperatives align in Hunts Point. Community initiatives and government plans have long-term community vision plans and local champions, but few are designed. The Hunts Point Food Market is a major economic hub, creating over 25,000 jobs and $3 billion in annual direct economic activity. The Food Market is a key link in the New York City food chain and even short disruption is catastrophic. Strong community leadership has articulated a desire to achieve physical resilience through local jobs. This design opportunity engages community will to develop site-specific designs for integrated storm protection and green infrastructure that offers high-quality social space, engages industrial property owners and features components that can be manufactured locally and built out cooperatively.

An abandoned marine transfer station in the west could serve as a Resilient Design and Research Center in support of local delivery and water demonstration of the value of investment in other job bases in the significant maritime industrial areas of New York and New Jersey. The aim is to stake out the potential of hybrid port, protection and ecology uses throughout the estuary.

MULTI-DISCIPLINE COLLABORATION
How do we live on a barrier island that wants to move?

Is there a viable form of edge protection?

Do we migrate away from risky places?

Do we build new house types?

TYPICAL OPTIONS
- DUNES
  Pros: surge protection
  Cons: difficult to finance; repeat costs individual property rights issues not a long term solution

ALTERNATE IDEAS
- REINFORCED DUNES; MULTIPLE STRUCTURES

MIGRATION
- PROS: Reduces physical risk
- CONS: Individuals separated from home + community
- Risk of municipal loss of tax base

ADAPTIVE REBUILD
- PROS: Individuals can stay in the community; municipalities keep tax base
- CONS: Not affordable for all individuals to do on their own

LAND SWAP FINANCING; DENSIFICATION

MODULAR OR DYNAMIC BUILDINGS

MULTI-DISCIPLINE COLLABORATION
MULTI-DISCIPLINE COLLABORATION

SCALES of RESEARCH
OLIN KNOWLEDGE BASE
OLIN’s Custom Benches

Introduction

Since the 1970s, OLIN has created over 100 custom seating designs. An excel file (last updated April 2012) with bench materials and descriptions, and CAD file (last updated February 2013) with all of bench profiles added to date, are attached below. Additional individual bench detail files, and a periodically updated CAD compiled bench file can be found on the server: Y:\LIBRARY\Research\Benches
POST-OCCUPANCY MONITORING

CANAL PARK: Washington, DC
9 MONITORING AND INNOVATION

Credit 9.1
Monitor performance of sustainable design practices

10 Points

Intent
Monitor and document sustainable design practices to evaluate their performance over time and improve the body of knowledge on long-term site sustainability.

Requirements
1. Monitor at least three prerequisites and/or credits included in Table 9.1-A on the following pages. Monitoring must be done by a third party or qualified person on the design team for independent peer review. Achievement of this credit is based on the completion and reporting of the evaluation; negative findings will not affect achievement of this or other prerequisites/credits.
2. Complete separate summary reports* for each of the prerequisites and/or credits that include the following components:
   a. Describe site feature and/or program that were implemented for the sustainable site selected credit/prerequisite and define the performance or outcome that is being evaluated.
   b. Describe the methodology used to assess performance (e.g., sampling, measures/instruments, and procedures).
   c. Describe the results from performance monitoring process.
   d. Provide documentation that supports and verifies performance data (e.g., tests, interview transcripts, survey results, site visits, etc.).
   e. Include recommendations for improving performance in future designs.
3. Widely communicate the results to improve the body of knowledge on long-term site sustainability. Submit the summary reports to a discipline-wide professional magazine (e.g., Planning, Landscape Architecture), peer-reviewed scientific journal, professional national/international conference, or national/international public database.

*Note: A separate summary report is not necessary if monitoring results are submitted to the National Stormwater BMP Database.
CANAL PARK: Washington, DC
POST-OCCUPANCY MONITORING

CANAL PARK: Washington, DC
POST-OCCUPANCY MONITORING

CANAL PARK: Washington, DC
• Rainwater harvesting meets 95% of annual non-potable water needs (at full buildout)
• Potable water use for landscape irrigation reduced by 79%
• 1.5 Million gallons stormwater removed from combined sewers annually
• Site water storage capacity improved by 60%
• 88% average annual runoff treated
• 28 geothermal wells reduce overall energy use by 37%
Vegetative Biomass: Density Restored from 0.54 to 1.84
Shade Trees and Green Roof: 38% Surface Area Shaded
Urban Heat Island Effects: 73% Reduction
Materials: 32% Recycled Content
Certified Wood: 100% FSC Certified
Regional Materials: 53%
Jobs Creation: 160 FTE
Composting: 100%
Outdoor Energy Consumption: 67% Reduction

CANAL PARK: Washington, DC
Credit Distribution – 250 Point Maximum

- SITE SELECTION (21)
  - Earned: 21

- PRE-DESIGN ASSESSMENT AND PLANNING (4)
  - Earned: 4

- SITE DESIGN - WATER (44)
  - Earned: 23

- SITE DESIGN - SOIL AND VEGETATION (51)
  - Earned: 24

- SITE DESIGN - MATERIALS SELECTION (36)
  - Earned: 9

- SITE DESIGN - HUMAN HEALTH (32)
  - Earned: 27

- CONSTRUCTION (21)
  - Earned: 11

- OPERATIONS AND MAINTENANCE (23)
  - Earned: 14

- MONITORING AND INNOVATION (22)
  - Earned: 22

Canal Park = 164 Total Points

<table>
<thead>
<tr>
<th>Credit Distribution</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Star (min. of 40% of total points)</td>
<td>100</td>
</tr>
<tr>
<td>Two Stars (min. of 50% of total points)</td>
<td>125</td>
</tr>
<tr>
<td>Three Stars (min. of 60% of total points)</td>
<td>150</td>
</tr>
<tr>
<td>Four Stars (min. of 80% of total points)</td>
<td>200</td>
</tr>
</tbody>
</table>
POST-OCCUPANCY MONITORING

SITES CREDIT 9.1: Monitor Performance of Sustainable Design Practices

1. DIRECT OBSERVATION

2. QUESTIONNAIRE / SURVEYS

3. KEY INFORMANT INTERVIEWS

4. ENVIRONMENTAL TESTING
POST-OCCUPANCY MONITORING

CANAL PARK: Washington, DC
POST-OCCUPANCY MONITORING

CANAL PARK: Washington, DC
FUTURE APPLICATIONS

LIVING CITY – SUSTAINABILITY DASHBOARD

ENERGY

RETROFIT

GUTTED

NEW CONSTRUCTION

Retro-fitted buildings will become more efficient through improved weatherization of building envelopes, new fixtures, and efficient appliances and heating/cooling systems.

SOLAR CAPACITY & DEMAND AT BLOCK SCALE

SOLAR ENERGY CAPACITY (based on roof area) = 8,530 MMBTU/year (9.8 million MJ/year)

ENERGY DEMAND

ENERGY DEFICIT

+8,530 MMBTU annually (+9.8 million MJ/year)

-20,090 MMBTU/year (21.1 million MJ/year)

-18,288 MMBTU/year (-19.3 million MJ/year)

1,802 MMBTU/year (1.9 million MJ/year)

1,802 MMBTU/year (1.9 million MJ/year)

1,802 MMBTU/year (1.9 million MJ/year)

20,090 MMBTU/year (21.1 million MJ/year)

12,280 MMBTU/year (12.9 million MJ/year)

10,478 MMBTU/year (-11 million MJ/year)

6,142 MMBTU/year (6.5 million MJ/year)

4,340 MMBTU/year (-4.6 million MJ/year)

SOLAR ROOFS AND ENERGY CORRIDOR

RIDGE AVENUE ENERGY CORRIDOR

+0 years

— Renewable Energy Commission Establishes PV Demonstration Program
— Photovoltaics Program Guidelines Study Commissioned
— Passive Building Program Guidelines Commissioned

+5 years

— PV Program Begins 20% Efficiency Requirement
— Smart Meter Eco-District System Established

+15 years

— PV Program 20% Efficiency Requirement
— Enter into an Energy Performance contract with an ESCO to pay for Home of Power investment
— 100% Renewable Energy Required at Eco-District Scale

+25 years

— PV Program 30% Efficiency Requirement for all new Buildings
— Hydrogen Fuel Producing Algae Farm Quees
FUTURE APPLICATIONS

LIVING CITY – SUSTAINABILITY DASHBOARD

SITE STRATEGY 1 SOCIAL FABRIC
SITE STRATEGY 2 PRODUCTIVE LANDSCAPES
SITE STRATEGY 3 GREEN INFRASTRUCTURE
BUILDING TYPE 1 RETROFIT
BUILDING TYPE 2 GUT AND REHAB
BUILDING TYPE 3 NEW CONSTRUCTION
FUTURE APPLICATIONS

LIVING CITY – SUSTAINABILITY DASHBOARD

- BIPHILIA
- HUMANE SPACES
- ORCHARDS
- CAR FREE LIVING
- NET ZERO ENERGY
- HEALTHY AIR
- HUMAN SCALE
- FILTRATION + INFILTRATION

OLIN LABS
### Sustainable Housing Capacity

(Capacity limit is defined by the scarcest resources ability to support a given population)

<table>
<thead>
<tr>
<th></th>
<th>Current Condition</th>
<th>Current Sustainable Capacity</th>
<th>25 Year Condition</th>
<th>25 Year Sustainable Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>5173 Households</td>
<td>775 Households</td>
<td>6179 Households</td>
<td>17,430 Households</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>5173 Households</td>
<td>67 Households</td>
<td>6179 Households</td>
<td>10,634 Households</td>
</tr>
<tr>
<td><strong>Health/Equity</strong></td>
<td>5173 Households</td>
<td>2586 Households</td>
<td>6179 Households</td>
<td>10,346 Households</td>
</tr>
</tbody>
</table>
FUTURE APPLICATIONS

Kroon Hall, Yale School of Forestry and Environmental Studies

Landscape Performance Benefits
- Transformed the site of a decommissioned power plant, parking lot, and patchwork of service roads into a highly-visible center for the study of environmental science on Yale's Science Road campus. Graduation, happy hour, alumni events, and other school activities are commonly scheduled for the courtyard.
- Saved $34,000 per year on potable water by utilizing the roof for irrigation and in on-site water-conserving plumbing fixtures, reducing the building's potable water use by 33%.
- Treats and retains the first 1% of rainfall
- Treats to remove 80% of total suspended solids (TSS) for all water discharges to the municipal stormwater system.

Simon and Helen Director Park

Landscape Performance Benefits
- Prevents over 290,000 gallons of stormwater from entering the site's combined sewer system, saving $230 in annual storage and pumping costs. This also helps avoid a projected $1.3 million in future capital costs to upgrade stormwater infrastructure, such as constructing a larger combined sewer overflow (CSO) sewer.
- Eliminates the need to use potable water for irrigation through rainwater harvesting and drought-tolerant planting panels, saving $65,500 or $320 annually.
- Serves 208 lbs of carbon and captures 25 lbs of carbon per year in 24 rain trees.
- Boosts local economy: Between 2009 (when the park was completed) and 2012—a period when the real estate market shrank by 3%—the estimated market value of Director Park has increased by 1%. Over the same period, the market value of nearby parts of the city has declined by 10%. In spite of the economic slowdown, the assessed value of the surrounding properties within a half-block radius of the Park increased by 10%.
- Provides unique venues for events per year. Between 2010 and 2012, the park hosted 226 events and attracted over 73,000 event-specific visitors. In summer 2013, the park hosted 114 free events open to the public, including ice cream giveaways, dance classes, music performances, and yoga classes.
- Generates an average annual gross revenue of over $24,000 between 2010 and 2013, the park generated $145,000 in revenue from event rentals with annual gross income increasing over 2010 and 2011.

LAF CASE STUDIES