INTEGRATED LID AND GREEN INFRASTRUCTURE PLANNING AT RUTGERS UNIVERSITY TO ACHIEVE BETTER ECOLOGICAL OUTCOMES AT LOWER COST

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Biohabitats, Inc

Low Impact Development Symposium
September 2011
Philadelphia, PA
Outline

Introduction
Green Infrastructure Approach
Stormwater and Landscape Ecology
Hydrologic Modeling
Precinct Study
Lessons Learned
Project Team and Acknowledgments

• Rutgers Facilities Staff
  – Larry Porter
  – Seth Richter
  – Frank Wong

• Biohabitats
  – Jenn Dowdell

• Wells Appel
  – Stu Appel
  – Tim Magee

• HydroQual
  – Sri Rangarajan
  – Nitin Katiyar

Project Coordination

Landscape Ecology, Stormwater Management

Landscape Architecture

H/H Modeling
Envision a world where the earth’s complex living systems are intricately linked and delicately balanced with their surroundings. Where your actions conserve critical habitat; where your project restores ecological processes; or where your footprint regenerates natural systems.
Livingston and Busch Campus
Stormwater and Landscape Management Master Plan

Master Plan Introduction

Raritan River
BUSCH CAMPUS
LIVINGSTON CAMPUS
Rutgers Ecological Preserve
Raritan River
Green Infrastructure Approach

Campuses as Multifunctional Landscapes

New Stormwater Wetland and Raingardens at Livingston Student Center
Designed by Wells Appel

- Campus amenity
- Research opportunity
- Native habitat enhancement
- Integrated vs. piecemeal
Green Infrastructure Approach

Photos courtesy of Wells Appel
Stacked Benefits

- **Filter** air
- **Shade** reducing urban heat island effects
- **Infiltration and filtering** of rainwater
- Provide **habitat**
- Provide **human amenity** both for recreation and therapeutic landscape experience
- Provides for the **therapeutic benefits** of natural areas.
- Provide **cooling vegetation** for neighboring structures, green walls, etc
- Provide noise and aesthetic **buffers**
- Provide spaces for **research and learning**
- Reducing emissions and fuel costs through **limited maintenance**
Hydrologic flows

Ecological networks, habitat corridors, potential connections

Understanding systems and processes

Landscape change
Multiple stakeholder groups with diverse needs
Regional Hydrologic Data and Flow Movement
Historic Hydrologic Flows
Stormwater and Landscape Ecology

Rutgers Ecological Preserve

Biohabitats
Ecological Characterization
Campus Vegetative Condition
Existing BMPs
Opportunities by Landscape Position

- Rooftop
- Turf
- Courtyards and Quads
- Parking Lots
- Riparian Areas
- Streets/ Roads
Opportunities by Landscape Position

- Rooftop
- Turf
- Courtyards and Quads
- Parking Lots
- Riparian Areas
- Streets/ Roads
Green Infrastructure Provides Enhanced Connections
2-D Hydrologic Modeling

Before
After – with inclusion of 2-acre foot storage facility
Regenerative Stormwater Conveyance

Bioretention and Permeable Pavement

Stormwater wetlands

Edible landscapes
<table>
<thead>
<tr>
<th>Priority Level</th>
<th>Retrofit ID</th>
<th>Recommended Project Description</th>
<th>Time Frame/ Phasing</th>
<th>Planning Level Capital Cost Estimate</th>
<th>Annual Routine Maintenance Cost (as % of construction costs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RL-2</td>
<td>Large parking lot north of RAC bioretention integrated into parking lot design, linear and internal</td>
<td>•</td>
<td>$1,860,000</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>RL-10</td>
<td>Quad 2: bioretention, riparian restoration</td>
<td>•</td>
<td>$261,000</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>RL-7</td>
<td>Levin Building and natural area: reforestation, native meadow conversion</td>
<td>•</td>
<td>$4,000</td>
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<tr>
<td>1</td>
<td>RL-17</td>
<td>Woodland area along Preserve: bioretention and native meadow conversion</td>
<td>• •</td>
<td>$298,000</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>EL-2</td>
<td>Naturalized meadows along preserve edge and in some core areas</td>
<td>•</td>
<td>$131,612</td>
<td>0.5%</td>
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<tr>
<td>1</td>
<td>EL-4</td>
<td>Riparian woodland regeneration southwest of Quad 2</td>
<td>• • •</td>
<td>$216,632</td>
<td>0.5%</td>
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<tr>
<td>1</td>
<td>EL-5</td>
<td>Riparian buffer enhancement in Preserve streams (headwaters protection)</td>
<td>• • •</td>
<td>$319,525</td>
<td>0.5%</td>
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<tr>
<td>1</td>
<td>EL-6</td>
<td>Streetscape tree canopy enhancements</td>
<td>•</td>
<td>$129,800</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>CL-1</td>
<td>Gateway feature at hinge point Ave E and Metlars lane</td>
<td>•</td>
<td>$250,000</td>
<td>5%</td>
</tr>
<tr>
<td>1</td>
<td>CL-2</td>
<td>Major axes enhancement, east-west within campus RAC to central, north-south to Preserve, and entry at Preserve SE location</td>
<td>•</td>
<td>$755,000</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>CL-5</td>
<td>Green spine design in large surface parking lot (Yellow Lot)</td>
<td>•</td>
<td>$401,000</td>
<td>5%</td>
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<tr>
<td>1</td>
<td>CL-6</td>
<td>Bike trail expansion on campus</td>
<td>• •</td>
<td>$111,000</td>
<td>5%</td>
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<tr>
<td>1</td>
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<td>Preserve Management Plan</td>
<td>•</td>
<td>$50,000</td>
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<td>1</td>
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<td>Provide a consistent way finding &amp; signage program directing pedestrians, bicyclists, and vehicles</td>
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<td>$450,000</td>
<td>$50,000</td>
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<td>Invasives Management Plan- deer and vegetative control</td>
<td>•</td>
<td>$50,000</td>
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<td>Project review process</td>
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<td>$1000, integrated into new project costs</td>
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<tr>
<td>1</td>
<td></td>
<td>Maintenance - handbooks/plans for each new project</td>
<td>• •</td>
<td>$1000, integrated into new project costs</td>
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</table>
Lessons Learned: Many challenges to the success of such a master plan

- Individual projects limit the holistic nature of implementation, discrete practices versus integrated practices across camps

- **Funding structure** - first cost (sometimes higher) versus life-cycle cost (typically lower). Public sector funding often segregates capital costs from O&M.

- Varying **maintenance** resources and staffing

- Varying **budgets** to cover practices in different campus precincts, depending on **programming** or use

- Various **priorities** across the campus

- **Consensus** - design guidelines/planning principles were a success!
New Livingston Master Plan

Next steps
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For more information also visit Rutgers University Facilities and Capital Planning Department Website:

http://facilities.rutgers.edu/