Plant Performance in Green Stormwater Infrastructure

Case Study

GREENING LEA ELEMENTARY SCHOOL
4700 LOCUST STREET, PHILADELPHIA PA
TODAY’S TAKE-AWAY:

1. DEVELOPING A GSI-FRIENDLY SITE PROGRAM
2. IDENTIFYING THE BEST PLANTS
3. PLANT INSTALLATION & COMMUNITY INVOLVEMENT
4. CALCULATING STORMWATER PERFORMANCE
5. IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE
6. KEY DESIGN DECISIONS FOR GSI FUNCTION
7. KEY DESIGN DECISIONS FOR LEA
   (and important lessons learned!)
The CHALLENGE:
Designing GSI for a high foot-traffic, recreation-intensive space

+/- 37,000 SF Impervious Surface
ANTICIPATING FUTURE USE
SELECTING PLANTS FOR URBAN SURVIVAL

ECO PRIORITIES FOR LEA
• Native, Habitat Value (food and cover), Key Pollinator
• Flood & Drought Tolerant, Pollution-Resistant
• Dense Stem/Large Biomass for Erosion Control
• Combo of cool and warm season grasses

SOCIAL/VISUAL PRIORITIES FOR LEA
• Bold Form, 1 or 2 Signature Colors
• Withstand Moderate Foot-Traffic ***
• Create School Identity through Species & Design
• Ease of Maintenance
OUR CHOICES
<table>
<thead>
<tr>
<th><strong>PERENNIALS</strong></th>
<th></th>
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<tbody>
<tr>
<td>Acorus gramineus 'Oborozuki'</td>
<td>Sweet Flag</td>
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<tr>
<td>Deschampsia cespitosa Goldtau</td>
<td>Tufted Hair Grass</td>
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<tr>
<td>Eupatorium maculatum Gateway</td>
<td>Joe Pye Weed</td>
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<tr>
<td>Iris Versicolor</td>
<td>Blue Flag</td>
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<tr>
<td>Liatris spicata</td>
<td>Blazing Star</td>
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<tr>
<td>Lobelia cardinalis 'New Moon Maroon'</td>
<td>Cardinal Flower</td>
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<tr>
<td>Matteucia struthiopteris</td>
<td>Ostrich Fern</td>
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<tr>
<td>Panicum virgatum 'Rotstrahlbusch'</td>
<td>Switchgrass</td>
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</table>
HEALTHY, WELL-ROOTED CONTAINER PERENNIALS
**WORK HORSE**
- *Acorus gramineus* 'Oborozuki'
- *Panicum virgatum* 'Rostrahlbusch'
- *Aronia arbutifolia*

**SPARK**
- *Lobelia cardinalis* ‘New Moon Maroon’
- *Eupatorium maculatum* ‘Gateway’

**FILLER**
- *Deschampsia cespitosa* ‘Goldtau’
- *Matteuccia struthiopteris*
- *Iris versicolor*
- *Vaccinium Corymbosum* two cultivars
GSI TOUR of LEA SCHOOLYARD
BOSQUE TREES

- Acer rubrum ‘October Glory’
- Acer rubrum ‘Autumn Flame’
- Acer freemanii ‘Morgan’
WORK HORSE

- Acorus gramineus 'Oborozuki'
- Panicum virgatum 'Rostrahlbusch'
- Aronia arbutifolia

SPARK

- Lobelia cardinalis 'New Moon Maroon'
- Eupatorium maculatum 'Gateway'
- Liatris spicata

FILLER

- Iris versicolor
- Matteuccia struthiopteris 'Goldtau'
- Deschampsia cespitosa
- Vaccinium Corymbosum two cultivars
WOULD WE PICK THESE SAME PLANTS AGAIN?

“Change will lead to insight far more often than insight will lead to change.”
LOCATION + PROGRAM = PROBABILITY FOR SUCCESS
COMMUNITY ACTION = PROBABILITY FOR SUCCESS
NO POST-CONSTRUCTION EDUCATION OR ACTION

THE REALITY

SPRING 2016

FALL 2015

SPRING 2016
LINWOOD PARK – heavy use in the GSI by kids and adults
LINWOOD PARK – key is post-construction community involvement and education
CALCULATING STORMWATER PERFORMANCE
RAIN GARDEN
PLANT PERFORMANCE TIED TO SOIL QUALITY AND HEALTH
LEA’S GSI MANAGES OVER 58,000 GALLONS OF STORMWATER RUNOFF FOR EVERY INCH OF RAIN THAT FALLS
"The humble little plant can function in ways that the stormwater conveyance system cannot."

Heidi Natura, Living Habits
LOCATION + PROGRAM = PROBABILITY FOR SUCCESS

PERFORMANCE METRICS:
• Physical/Visual Health of Plants
• Productivity (bloom)
• Erosion Control
• Health of Soil (microbial presence)
<table>
<thead>
<tr>
<th>Drainage Area #</th>
<th>Description</th>
<th>Pervious Drainage Area (SF)</th>
<th>Impervious Drainage Area (SF)</th>
<th>Total Drainage Area (SF)</th>
<th>Drainage Area (AC)</th>
<th>Inches Managed</th>
<th>Greened Acres</th>
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<td>1</td>
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Total Area Managed: 10,647
Total Volume Managed: 50,909

Total Drainage Area (AC): 61,556

IS IT STILL WORKING?
GSI MAINTENANCE = HEAVY LIFT WITHOUT SUPPORT

GREENING LEA
West Philly Coalition for Neighborhood Schools
GSI MAINTENANCE REQUIRES: PARTNERSHIPS

between Community ↔ Lea School ↔ School District ↔ PWD ↔ UCGreen

CULTURE SHIFT

within the Community, the Lea School and the Philadelphia School District
IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE

1. Keep the plant palette simple.
   Diversity is great until volunteers can’t identify all the diverse plants, and even to professionals they may look like weeds!
2. Partner with a neighborhood Community Organization for long-term site stewardship. Without West Philly Coalition for Neighborhood Schools, Lea Greening would not have happened!
3. Protect perennials through first 12 months and until well established. Permanent fencing may not be desired or needed, but the plants need temporary fencing for protection from foot traffic.
IDENTIFYING BEST PRACTICES FOR GSI MAINTENANCE

4. Integrate classroom education about the project into school curriculum. Post-construction education and community involvement is essential, otherwise the project remains an orphan.
5. Include Maintenance Budget & Strategy in up-front project costs – to cover long-term management as well as maintenance tasks, such as watering, replanting, weeding and external education.
THE COST OF GOING GREEN (without Maintenance)

Planting + Infrastructure

$76 per SF

$479,000
KEY DECISIONS FOR GSI FUNCTION

1. Increased Loading Ratio for Rain Gardens to keep surface footprint smaller.

2. Maximized porous paving for hard surface to accommodate recreation program & line-up.

3. Changed from monolithic porous paving to porous unit paver to create fundraising opportunities.
KEY DECISIONS FOR LEA SCHOOLYARD DESIGN
INTEGRATING NEIGHBORHOOD CULTURE AND ART TO TELL A STORY
THE VISION
THE OUTCOME
THE FUTURE LANDSCAPE AMBASSADORS