Natural Systems Planning

Master Planning Council
February 2013

Julia Monteith, AICP, LEED AP and Jeff Sitler, PG
Office of the Architect for the University
Environmental Health and Safety
NATURAL SYSTEMS PLANNING

• Environment
• Connectivity
• Multi-Disciplinary Learning
• Context
• Preservation

Grounds Plan Principles
NATURAL SYSTEMS PLANNING

Detailed Studies in Coordination with the Grounds Plan

- UVa Health System Area Plan
- UVa Design Guidelines
- UVa Guidelines for Sustainable Buildings and Environmental Design
- UVa Historic Preservation Framework Plan
- UVa Transportation Demand Management Plan, Phase 1 & 2
- UVa Biodiversity Analysis and Conservation Assessment
- UVa Strategic Plan for Water Resources Management
- UVa Current Planning and Projects Report
NATURAL SYSTEMS PLANNING

- Carbon Sequestration (CO2 reduction)
- Tree Canopy Expansion
- Forest Diversity
- Stormwater Quality
- Stormwater Quantity
Recent Regulatory Actions are giving us direction

- TMDL’s for Chesapeake Bay and local streams
- Enhanced Stormwater regulations for development
- New MS4 Permit – Significant new requirements (2013)
- Greenhouse Gas reporting is a reality
NATURAL SYSTEMS PLANNING

Provides a framework to integrate regulatory and sustainability goals allowing UVA to continue to grow

- Establish resource management direction and goals
- Provides a written framework for cooperative interactions with the local community
- Provides a written plan to document compliance
Planning team included multiple entities and disciplines including:

- Office of the Architect
- Facilities Management
- Environmental Health and Safety
- UVa Foundation
- Academics & Research
- TMDL Regional Planning Team
Examples of Current Practices

Carbon Sequestration

Stormwater Quantity Reduction

Stormwater Quality Improvement

Tree Canopy Expansion

Tree Diversity Improvement
UVa is a partner in the program to mitigate the total maximum daily load (TMDL) for the Chesapeake Bay.

UVa has been implementing its Stormwater Master Plan since 2001 across Grounds.

UVa has an active stormwater banking system for its two watersheds - Moore's and Meadow creeks.

UVa has been implementing low impact design (LID) installations across Grounds such as stream daylighting & restoration green roofs to improve stormwater quality and quantity.

Cisterns and are used under buildings to conserve water.

Stream bank stabilization and constructed wetlands implementations have improved the stormwater quality in our two watersheds.
NATURAL SYSTEMS PLANNING

- Water quality monitoring programs are actively used on Grounds to assess beneficial results for LID implementations.
- Construction sites are managed with best management practices to reduce stormwater pollution.
- Use of fertilizers on Grounds have been minimized to reduce stormwater pollution.

Stormwater Quality and Quantity
NATURAL SYSTEMS PLANNING

- Reduce greenhouse gas emissions by 25% from 2009 levels by 2025
- Forested land sequesters metric tons of carbon per year
- Forested lands of Observatory Hill, North Grounds, and Foundation properties support tree diversity and provide habitat
- UVa uses compact development through infill on Grounds to retain green spaces and the systems they support
- Tree canopy on UVa grounds covers over 50% which reduces heat island, and mitigates stormwater quantity and quality
- UVa has an established tree replacement program that has been in effect over 40 years and trees on Grounds are managed and supported by the UVa arborist
• Tree diversity research sites developed for randomized sample on Observatory Hill, Fall 2011

• Forest Sampling course set up research sites with student teams, Spring 2012

• Analyze tree diversity and advise at to how diversity could be improved, 2013
Program Development

Research Institutional Best Practices

Develop Program Options & Synergies

Recommend program for UVa

Program Implementation in Phases
### Natural Systems Planning

Analysis of future program implementation included multiple factors:

- **Time Frame**
- **Priority Ranking**
- **Funding**
- **Ease of Implementation**
- **Urban/Woodland**
- **Current Practice**
- **Policies**
- **Precursors**

---

#### Table of Program Implementation

<table>
<thead>
<tr>
<th>Approach</th>
<th>Time Frame</th>
<th>Priority Ranking</th>
<th>Ease of Implementation</th>
<th>Urban/Woodland</th>
<th>Current Practice</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Volume: Infiltration/Pollution</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>1a. Reduce SW facilities to increase performance</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>1b. Increase use of permeable paving</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>1c. Reduce urbanized erosion by subsurface</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>1d. Promote vegetated roofs</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>1e. Evaluate sub-surface performance on projects</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Table of Program Implementation

<table>
<thead>
<tr>
<th>Approach</th>
<th>Time Frame</th>
<th>Priority Ranking</th>
<th>Ease of Implementation</th>
<th>Urban/Woodland</th>
<th>Current Practice</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Volume: Water Use</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2a. Develop constructed wetlands</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2b. Capture rainwater for reuse</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2c. Capture condensate</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2d. Capture greywater</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2e. Maximize use of cisterns/knowline systems</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2f. Develop capacity/automation of systems</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>2g. Minimize SW use at chilled water plants</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Table of Program Implementation

<table>
<thead>
<tr>
<th>Approach</th>
<th>Time Frame</th>
<th>Priority Ranking</th>
<th>Ease of Implementation</th>
<th>Urban/Woodland</th>
<th>Current Practice</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve Stream Environments</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>3a. Develop stormwater models</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>3b. Capture stormwater</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
<tr>
<td>3c. Minimize use of stormwater</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
</tr>
</tbody>
</table>
NATURAL SYSTEMS PLANNING

Near-term Implementation

- Improve Stream Environments
- Increase Infiltration & Reuse
- Urban Tree Management
- Woodland Management

Prerequisites:
- Integrate SW training for staff/AE/utilities
- Establish SW utility fee for the distributed budget model
- Establish awareness of Natural Systems at UVA
- Implement EHS, EU in value engineering
- Implement database tracking tree care
- Implement Pollution Reduction Practices
- Account for lifecycle costs in project planning

Strategies - Ranked from most to least effective:
- Preserve wooded headwaters
- Amend soil for permeability
- Increase stream buffers
- Increase vegetative buffer zones
- Evaluate soil performance on project sites
- Formalize tree replacement program
- Incorporate LID BMP in FM design guidelines
- Increase use of permeable paving
- Maximize use of cisterns/overflow systems
- Survey tree location/functionalities
- Maximize use of permeable paving
- Annual training for UVA construction/utility staff
- Define/Restrict mountain bike usage
- Develop capacity/automation of cisterns
- Assess stream for improvements
- Capture condensate
- Identify opportunities for tree infill/banking
- Establish root protection project standards
- Rooftop disconnects
NATURAL SYSTEMS PLANNING

Medium-term Implementation

Prerequisites
- Update SW master plans per new regulations
- Improve/expand monitoring program
- Raise awareness of tree/woodland value
- Green (open) space
- Plan for tree demise

Strategies - Ranked from most to least effective
- Promote forest preservation and protection
- Define/Expand invasive removal program
- Remove underutilized impervious surfaces
- Maximize shade: heat island/building energy
- Add funding for tree contractors/arborists/support
- Academic credit for design/build SW improvements
- Maximize SW use at chilled water plants
- Establish Q-Hill users group
- Retrofit SW facilities to increase performance
- Utilize rooftops for storage
- Promote vegetated roofs
- Develop constructed wetlands

Relative Priority

- Improve Stream Environments
- Increase Infiltration & Reuse
- Urban Tree Management
- Woodland Management
1 acre of woodland sequesters 3.3 metric tons of carbon per year. UVA and neighboring UVAF lands include 1,100 acres of forest - equating to 3,630 metric tons of carbon reduction per year. This benefit comes at no cost to the University and the carbon offset equates to an investment of $25 million in solar panels.

These same 1,100 acres of forest also help to store, filter and cleanse stormwater. Forest landscapes are estimated to retain 45% more stormwater on-site and infiltrate 15 to 20% stormwater into the ground. UVa and neighboring UVaF forests retain up to 220 tons of sediment per year from impairing areas streams and rivers.

Bioretention areas improve water quality by removing pollutants - 20% nitrogen, 45% phosphorous, 60% sediment per year at UVa. The Dell, Emmet-Ivy Garage and JPJ Arena bioretention basins treat 65 acres of impervious cover and remove pollutants from Meadow Creek and its tributaries.

Green roofs intercept 70-90% of stormwater in the growing season and 25-40% in the dormant season. The University currently has 75,000 square feet of green roofs which intercept 1,375,000 gallons of stormwater per year.

Tree canopy provides valuable shade that saves on cooling costs and lessens the heat island effect that is inherent to development. Tree canopy at UVa moderates temperatures by 5-9°F in the summer.

Regardless of their size at maturity, trees provide a net positive benefit for carbon sequestration, stormwater storage, stormwater and air pollution removal, and energy reduction savings. For UVa, the benefit to cost ratio (BCR) of 2.4 means that for every $1 spent on tree care, $2.4 in benefits are created.
Proposed State Route 29 Western Bypass Status Report: Feb 2013
• FHWA environmental evaluation – In process
• Completion of project design – Mid-2013
• Approval of required permits – Oct 2013
• Estimated construction start – Nov 2013
• Completion of property acquisition – Feb 2014
• Project completion & Widening 29 North – 2017
UVa’s formal comments sent to VDOT in Oct 2012:

- **Transportation**: traffic forecasts, impacts to UVa roads and nearby uses
- **Noise**: impacts to UVa nearby uses
- **Air Quality**: analysis of impacts
- **Stormwater and Water Quality**: stream and forest impacts, loss of ecological and stormwater benefits – local, regional, and TMDL mitigations
McCormick Bridge Replacement

Current Bridge Conditions
McCormick Bridge from Emmet Street
Pursuit: Sustainable Planning and Design

Office of the Architect for the University

VDOT Proposal

Existing

Proposed

Proposed Railing
• Project begins May 2013 – following graduation
• Project completed August 2013 – prior to start of classes

No access on bridge during construction
## UVa Bicycle Share RFP Schedule, 2012-2013

<table>
<thead>
<tr>
<th>Event</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDOT Coordination on project/funding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP issues revised goldenrod to VDOT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop RFP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDOT Coordination on project/funding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP issues revised goldenrod to VDOT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop RFP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visit DC bikeshare program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research other bikeshare programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDOT RFP Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committee selection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFP revise and review</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue Requisition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue RFP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-proposal conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-proposal questions due</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responses to RFP due</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal review complete/short list</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provider selection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vendor Selection Schedule
Selection:
Rebecca White, Director, Parking & Transportation
Jonathan Monceaux, TDM, Parking & Transportation
Julia Monteith, Land Use Planner, Office of the Architect
Andrew Greene, Sustainability Planner, Office of the Architect

Advisory:
Angela Tabler (UPD)
Len Schoppa (Faculty)
Rich Hopkins (Facilities Management, Landscape)
Nina Morris (FM Sustainability)
Amanda Poncy (City of Charlottesville)
Will Andrewes (Student Council)
Brantley Tyndall (VCU)