Co-Design for second-order effects and institutional Change: A case study in sustainability
Barba, Evan and Stewart, Audrey

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Co-Design for Second-Order Effects and Institutional Change

Evan Barba
Communication, Culture and Technology Program
Georgetown University
“Every action has consequences and those consequences have consequences which are called Second-Order Effects.”

http://www.dubberly.com/articles/what-is-interaction.html
http://personalmba.com/second-order-effects/: Josh Kaufman quote
• Weak Emergence
  “effects you did not anticipate”
  Indirect effects

• Strong Emergence
  “connections between effects at different scales”

Emergent effects
Goals at two scales

• Create a new course
  – Systems theory and design practice
  – Use campus as “living laboratory”
  – Authentic design experience
  – Support sustainability initiatives

• Emergent Goal
  Connect Institutions
Georgetown University
Rainwater Capture at Lauinger Library

**Site Overview**

1. **Healy Lawn**
   - Rainfall from 1.2" storm: 3,400 gallons
   - Contributing Drainage Area: 4,600 sq. ft.
   - Site dynamics: highly compacted soil on central lawn causes rainwater runoff to pond in underutilized southeast corner. Existing plant life does little to retain rainfall, flooding the high-traffic library steps and causing significant erosion.
   - Rainwater Intervention: BIORETENTION

2. **Library Roof**
   - Rainfall from 1.2" storm: 650 gallons
   - Contributing Drainage Area: 860 sq. ft.
   - Site dynamics: ballasted flat roof overhang with central interior downspout located above the main entrance to Lauinger Library. Visible from 5th floor administrative offices and student study lounges.
   - Rainwater Intervention: GREEN ROOF

3. **Lot Nine**
   - Rainfall from 1.2" storm: 18,000 gallons
   - Contributing Drainage Area: 24,500 sq. ft.
   - Site dynamics: impermeable asphalt parking lot used by university commuters and delivery vehicles. Two inlet drains divert rainwater runoff directly into the sewer. Current surface is degraded/deteriorating.
   - Rainwater Intervention: PERMEABLE PAVEMENT (w/ BIORETENTION)

**Three-in-One Demonstration Site**

In 2014, the Potomac Conservancy identified Washington, DC’s aging sewer infrastructure as one of the top three threats to the Potomac River, due to frequent combined sewer overflow events that release raw sewage pollution directly into the river during even moderate rain storms. The local water authority, DC Water, has put forth an ambitious plan to mitigate this pollution in part through large-scale deployment of green infrastructure, which would provide triple-bottom-line sustainability benefits in priority combined sewer overflow (CSO) drainage areas.

Georgetown University’s campus comprises significant acreage within priority combined drainage areas, thus offering the potential to play a key role in reducing runoff and mitigating overflow events. Our design plan leverages GU’s location within the combined sewer area and capitalizes on the heavily visited nature of our campus to offer a 3-in-1 demonstration site for green infrastructure in the nation’s capital.
1 Million Visitors
Georgetown campus architects estimate that the central portion of historic main campus—including Healy Lawn, Lauinger Library, and Healy Hall—receive one million visitors each year. Tourists, faculty, staff, professors, and other scholars—from around the world—will have a chance to see what Georgetown University is doing to change the planet. In this prominent location, in the heart of our nation’s capital, our demonstration sites will not only change the quality of the Potomac’s waters, but also change the minds of all who see them.

HEALY LAWN
By removing decaying plant life and concrete drainage basins, we will open up the historic heart of campus. To capture rainwater runoff from Healy Lawn, we will add 230 sq. ft. of bioretention at the site. Using the existing slope to create a terraced outdoor classroom and extending the recently planned permeable pavement “library walk” pathway, we will create a unique, accessible learning space for future generations of students.

Bioretention surrounds terraced outdoor classroom

Educational placards by new benches describe the intervention

New bicycle rack for commuters

New seating areas and solar charging station.

Bioretention Palette (Native Species)
Big Bluestem  Wild Hydrangea  Arbor Vitae

Swamp Milkweed  New England Aster  Eco-Friendly Mulch

All plants are native to the Mid-Atlantic; recommended by Fairfax County Dept. of Public Works and Environmental Services

Bioretention strips replace existing concrete barriers

Green Roof manages 650 gal. of water
Lush overhanging plants give a concrete cube new life and increase visibility from below

Vinyl stickers promote Georgetown’s sustainable infrastructure and educate passersby about green roof

Student study lounge, library special collections, and library administration benefit from a new perspective

3 LOT NINE
This commuter lot is the last stop between campus runoff and the Potomac. By simply replacing the perimeter parking spaces with permeable asphalt pavement, we anticipate being able to collect 18,000 gallons of runoff during a 1.2” rainstorm. We will also add two bioretention strips where current concrete barricades stand.

1. LIBRARY ROOF
This highly visible space is often criticized by students as “harsh” or “soulless.” This flat-roofed building has a ballast surface which allows rainwater to flow directly to the downspout and into the sewer. By removing the ballast and replacing it with a multi-layered green roof structure including overhanging plants, we wish to brighten up the academic hub of campus and create a study space that serves to educate at the same time. Students, library administrators, and those on the lawn below will instantly recognize this key part of our initiative.
Results

• Honorable Mention (3rd Place) in the Rainworks Challenge
• 9-month survey of CDAs and drainage system
• Green Roof to be installed 2017
• Modified Consent Decree for Long-Term Control Plan
• Ongoing talks re: MOU
Takeaways

• Institutional time scales are longer
• Students have no sense of how change happens
• Student have no sense of what they are actually learning
• Sacrifice managing complexity at one scale for managing complexity at another
Questions