Research Park Green Infrastructure Stormwater Management Implementation Plan

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Goal

The goal of my research is to create a Green Infrastructure (GI) implementation plan for the U of U Research Park sub-watershed of Red Butte Creek to study the effects of GI implementation on mitigating the hydrologic impacts of urbanization on Red Butte Creek.

Figure 1. *Left:* storm drain network that conveys runoff from Research Park directly to Red Butte Creek. Construction at Research Park is increasing impervious areas without improving mitigation. *Upper right:* Red Butte Creek is deeply entrenched adjacent to Research Park. *Lower Right:* hydrograph generated from a 0.3" rain storm on 9/1/12 (gauge located about1 mile downstream from Research Park at 1600 E. 1050 S).

Research Methodology

1) Synthesize literature from rangeland restoration, plant physiology, and urban stormwater into a design recommendation for a bioinfiltration GI facility that treats urban stormwater runoff on site and survives Utah's extreme climate without irrigation.[1]

Table 2: SWMM model results determine annual performance of varying garden area as a percent of drainage area for Salt Lake City, UT[1]

GA as % DA	6.3%	5 %	4%
Annual average runoff capture (%)	99.8	97.2	94.2

2) Simulate pre-development, current conditions, and post-GI implementation hydrology for Research Park using SWMM models developed by CVEEN 7440 Urban Watershed Management Students
   - Quantify GI runoff reduction for design storms
   - Compare performance of post-GI hydrology to pre-development hydrology with continuous precipitation simulations
3) Coordinate with public utility managers from Salt Lake City, Salt Lake County, and the University of Utah (including the Office of Sustainability, Environmental Health and Safety, and Research Park)
   - Obtain permits for instrumentation
   - SCIF and iUTAH grant applications to purchase monitoring networks to supplement GAMUT network

4) Next steps:

- Students will incorporate GI into SWMM models
- Refine, calibrate, and validate the student models with the help of proposed stormdrain flow monitoring networks and GAMUT
- Recommend implementation strategy specific to Research Park

Results to Date

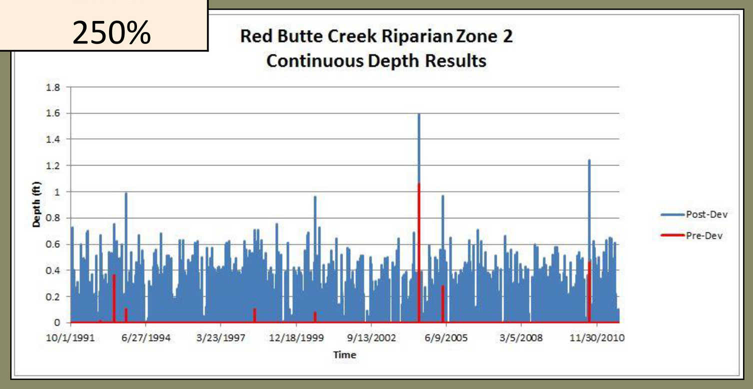
1) Design results:

on-campus bioretention gardens verify and improve recommendations of plant densities and plant species to use in GI along the Wasatch Front

- Native plants transpire small fraction of inflow
- Large contributing impervious areas provide enough water to support dense plantings of native upland species
- Annual water quality study demonstrates Wetland species require irrigation but remove more N and P from stormwater
- ^{15}N tracer study verifies that plants take up N from stormwater in bioretention

2) Hydrologic Model Results:

Design Storm	Precipitation depth	Pre-development flows (cfs)	Post-development flows	Percent increase
2 yr 24 hr	1.3"	13	124	940%
10 yr 24 hr	2.0"	40	171	420%
25 yr 24 hr	2.64"	83	218	260%
50 yr 24 hr	2.94"	84	221	260%
100 yr 24 hr	3.24"	90	223	250%



Figures 3 and 4.
Results of CVEEN 7440 pre-development and post-development Research Park SWMM models. Peak flow generated from design-storm simulations (left) and flow increases in the main channel from development in continuous simulations (right).

1. Houdeshel, C. D., C. A. Pomeroy and K. R. Hultine (2012). "Bioretention Design for Xeric Climates Based on Ecological Principles1. *JAWRA Journal of the American Water Resources Association* 48(6): 1178-1190.

iUTAH EPSCoR Graduate Research Fellowship Program

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