Monitoring the Effectiveness of a New Rain Garden Filtering Medium for Pollutant Removal and Urban Hydromodification Mitigation

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Introduction

- Not a traditional bioretention (rain garden)
  - Traditionally, peat was used to provide nutrients and carbon source for plant health
    - Expensive
    - Large carbon cost
  - Replaced peat with compost and shredded paper
    - Relatively inexpensive
    - Paper captures/stores nutrients from compost and retains moisture

- Monitored throughout the 2011 rain season:
  - For pollutant reduction
  - To measure the effective mitigation of the hydromodification effects of urbanization.
Project Location

- West 21st Avenue and Iris Street in Lakewood, CO
Watershed map
Site Description

- Total watershed area: 83,300 ft$^2$
  - 38,901 ft$^2$ impervious area tributary to rain garden
  - Impervious percentage = 47%
- Impervious areas include:
  - asphalt street,
  - gravel driveways,
  - sidewalks, and
  - rooftops
- Some imperviousness is disconnected.
Before vegetation growth
After initial growth
Data Collection

- **Inlet**
  - ISCO 6712 sampler
    - Stored in job box
    - Collects flow data throughout the runoff event
    - Powered by 12 volt battery charged by solar panels
  - ISCO 720 pressure transducer
    - Measures depth behind composite v-notch weir
  - ISCO 674 tipping rain gauge
    - Measures rainfall to 0.04”
Equipment
Data Collection (cont’d)

- Outlet
  - ISCO 6712 sampler
    - Stored in a vault
    - Collects flow data when rainfall is indicated in conjunction with pressure increase equivalent to 0.01’ hydrostatic head
    - Powered by 12 volt battery charged by solar panels
  - (2011) ISCO 720 pressure transducer
    - Measures pressure behind 0.7” dia orifice
      - Designed to drain WQCV in 12 hrs
  - (2012) ISCO 730 bubbler
    - Measures depth behind v-notch weir
  - ISCO 674 tipping rain gauge
    - Measures rainfall to 0.04”
Equipment (Outlet)
Equipment (Outlet)
Of 38 constituents analyzed, TSS showed the most promising downward trend – some had upward trends, possibly due to “dirty sand” in the filter.
Analysis (Quantity)

Volume Comparison

- Estimated Flow Volume (Q=ciA)
- Measured Inlet Flow Volume
- Measured Outlet Flow Volume

Storm Number

Volume (cf)
Analysis Summary

- Flow measurements proved to be very problematic
  - Inflow weir did not have enough elevation to collect meaningful PT data.
  - Outflow PT signal was very noisy.

- Solution:
  - Inflow – estimate flow based on rainfall and Rational method?
  - Outflow – design a new outlet box with V-notch weir and replace transducer with bubbler.
New outflow set up
Conclusion

The 21st and Iris rain garden has been set up for the 2012 rain season and more results are to follow at www.udfccd.org.