Rain Garden as a BMP:  
Student Recreational Sports Center “West”

Background: This is a proposal for the installation of a rain garden as a best management practice on the west side of the SRSC on Indiana University’s Bloomington campus. The purpose of this rain garden is to control stormwater and erosion, reduce runoff and pollutant volume and load, educate the public about the implications of urban areas on water systems, and how best management practices (BMPs) can mitigate these adverse effects. The substantial erosion and downcutting in this area indicates that it is in need of a BMP. The large runoff volume indicates that this area is a contributing factor to large pollutant loads to nearby water bodies, which conflicts with the MS4 requirements. The implementation of this BMP would be cost-effective and serve as an example for future BMPs around Bloomington’s campus. An image of the area of the garden and the types of plants that will be included is provided below.

Sizing Criteria

- Location: 39°10'24.7"N 86°30'48.7"W; 39.173518, -86.513525
- Area consists of a groomed high-input lawn adjacent to an ephemeral stream; between tennis court and sidewalk; and west of SRSC building
- Total disturbed area: 137,928 ft² (3.17 acres)
- Proposed best management practice (BMP): Rain garden
- Total disturbed area controlled by rain garden: 5,123 ft² (0.1176 acres)
- Surface side slopes near channel: 2:1
- Slopes within site area have a grade value less than 15%
- Planting soil depth: 18 inches

Planting and Volume Storage Soils

- Current soil: loam
- Planting soil should be amended by adding 20-30% composted organic matter and combine it with 70-80% topsoil
- Volume storage soils will have a pH between 5.5 and 6.5
- Volume storage soils will contain less than 10% of clay and free of toxic substances and unwanted plant material
- Volume storage soils will have 5-10% organic matter content

Selected Plants (images below)

- Bloom May and through August after the rain garden implementation in late April
- Native to this watershed
- Can withstand sunny to partly sunny exposure
- Average heights range from 1-4 feet
- Grasses:
  - Reddish Bulrush (*Scirpus pendulus*)
    - Amount needed: 258 individuals
  - Tussock Sedge (*Carex stricta*)
    - Amount needed: 443 individuals
- Flowers
  - Blue Vervain (*Verbena hastata*)
    - Amount needed: 93 individuals
  - Swamp Rose Mallow (*Hibiscus moscheutos*)
● Amount needed: 73 individuals

Considerations

● The disturbed area controlled by the rain garden contains slopes but it can be flattened before the installation of the proposed rain garden
● No curb cuts, trench drains, etc. are needed to direct stormwater into this garden because of the surrounding slope
● Current infiltration rate is 2.25 cm/hour so overflow not an issue now and will not be with amended soils

Advantages

● Low budget and low maintenance
● Provides education and outreach to students, visitors, and staff
● Aesthetically pleasing
● Improved stormwater retention because of large quantity of runoff that will be reduced
● Improved water quality within watershed due to reduced runoff and pollutant load
● This area does not have heavy foot traffic
● This RG will be visible from all sides


● Current runoff volume calculated from Pennsylvania Best Management Practices Manual: 0.01 acre-feet
● Runoff reduction volume after rain garden: 0.0066 acre-feet
● Calculated runoff volume: 0.0034 acre-feet
● Total Suspended Solids Reduction: 1.4 lbs  (required reduction: 0.73)
  • Total Phosphorus Reduction: 0.0017 lbs (required reduction: 0.01)
  • Nitrate Reduction: 0.007 lbs (required reduction: 0.02)

*Assuming a 2-year rainfall of 2 inches

Runoff Volume after BMP Generated in PCSWMM:

● Small rain event (2 inches in 24 hours): 0.004 acre-feet
● Large rain event (10 inches in 24 hours): 0.036 acre-feet
Images

- Proposed rain garden design:

The blue outline on this image represents the area of the berms that will be created. Some of the area will have to be excavated and this soil will be used to create the berms. The sturdy and wet tolerant plants will be placed within the channel; the tussock sedge planted within the current and the Reddish Bulrush planted adjacent to the tussock sedge. The prairie drier plants will be placed further out; the swamp rose mallow planted near the edges and the Blue Vervain planted along the entire berm. Rip-rap will be placed downstream from the drain.

- Grasses:

  Tussock sedge  Reddish bulrush

- Flowers:
Swamp rose mallow  Blue vervain

**Maintenance**

The last proposed rain garden near the School of Public Health had two organizations agree to help maintain the rain garden during the first couple years to prevent the area from becoming “weedy.” These organizations, the Environmental Management and Sustainable Development Association (EMSDA) and Restorative Adaptations to Infrastructure (RAIN), would both be interested in helping build, plant and maintain this new proposed rain garden.

**Timeline**

The goal would be, if given approval, to start construction and planting of the rain garden this spring semester 2016, preferably late April.

**Budget**

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<th>Amount</th>
<th>Cost per</th>
<th>Total</th>
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<tbody>
<tr>
<td><strong>Forbs</strong></td>
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<tr>
<td>Blue Vervain</td>
<td>93</td>
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<tr>
<td>Swamp Rose Mallow</td>
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<td><strong>Grasses/Sedges/Rushes</strong></td>
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<td>Reddish Bulrush</td>
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<td>Tussock sedge</td>
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<td><strong>Total Plants</strong></td>
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<td>Rip rap</td>
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**The Bottom-line**

The SRSC rain garden will be a great addition to area, reducing stormwater erosion that is occurring. The costs are relatively low relative to the stormwater management and aesthetic contributions of the installation. Finally, the plants were selected with an eye towards aesthetics and maintenance, with the idea that lower diversity (4 species) will make maintenance easy and manageable.