• Stormwater pollution is the #1 source of water pollution in the U.S.
• More than 1/3 of water pollution comes from urban runoff
Rain Gardens (Bioretention Cells)

The Rain Garden’s Dilemma

Success with Rain Gardens - Rain Garden Components

1. Depression
2. Amended filter bed
3. Rockery
4. Berm
5. Plants
6. Mulch

Rain Gardens & The Water Cycle

Dr. Helen Kraus - Substrate Materials for Rain Gardens
Pollutants Filtered by a Rain Garden

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Source</th>
<th>Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals</td>
<td>Roof shingles, oil, grease, soil</td>
<td>43-97%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Detergents, fertilizers, pet wastes</td>
<td>65-87%</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Fertilizer, pet waste, organic matter</td>
<td>15-92%</td>
</tr>
</tbody>
</table>

Filter Bed Substrates

- **Sand**: 80% washed sand, 15% clay and silt fines and 5% pine bark (v/v)
- **Slate**: 80% MS-16 expanded slate and 20% pine bark fines (v/v)
- **Soil**: 50% sandy loam soil with a P index of <30 and 50% pine bark

Research: HS + BAE = Power!

- **Plants**
  - Remediation
  - Garden performance
- **Substrates**
  - Characteristics
  - Remediation
  - Compostition

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Nitrogen in Effluent

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Phosphorus in Effluent

Summary: Filter Bed Substrate Removal
- Sand
  - Good - except N
- Soil
  - Good - except P
- Slate
  - Good both N and P

Organic Matter Investigation

Nutrient Uptake
Dr. Helen Kraus - Substrate Materials for Rain Gardens
Coming soon!

– Nutrient concentration of effluent