So You Want to Build a Rain Garden?

What have we learned so far?

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Stormwater Treatment Section
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On the Agenda

1. What is a rain garden and why build one?
2. Design of Rain Gardens
   1. Siting & Sizing
   2. Location/Drainage Area
   3. Infiltration Rates
   4. Inlets
   5. Types and Alternatives
   6. Media
3. Maintenance of rain gardens
4. Completed Projects

Image: Morton Salt Co.
What is a Rain Garden?

A rain garden is a vegetated, depressed landscape area designed to capture and infiltrate and/or filter stormwater runoff from impervious surfaces.
Rain Garden Guidance

Why Build a Rain Garden?

- Protect Watershed
- Conserve Water
- Clean water
- Reduce peak runoff
- Wildlife Friendly
- Aesthetics
Rain Garden Design Considerations

**Constraints**
- Location
  - Utilities
  - Drainage Area
  - Soils
- Regulatory
  - WQ Req’d or Retrofit?
  - Drawdown Time
  - Geology (Liners)
- Maintenance

**Design Variables**
- Footprint Size
- Inlet Design
- Capture Volume
- Depth
- Type
- Media
- Layout
- Plants

**Goals**
- Treat Pollutants
- Reduce Peak Runoff
- Aesthetic Amenity
Siting

For Water Quality Credit:

Land Use -

- Commercial, Multi-Family, Civic, and Right of Way developments only.
- Single Family water quality credit allowed under certain circumstances.
  1. Rain garden must be located in a dedicated common area or within a drainage easement that is accessible by standard maintenance equipment from the right of way.
  2. A minimum of four (4) single family lots must be treated by the rain garden.
  3. No rain gardens are to be located in backyards or fenced in yards.
  4. The City of Austin will provide functional maintenance per City Code Section 25-8-231. Homeowners may add additional native landscaping and provide more frequent care.
Stormwater Hotspots -

Infiltration rain gardens are not allowed in areas where activities generate highly contaminated runoff due to the potential for ground water contamination.

Hot spots include, but are not limited to:

- commercial nurseries,
- auto salvage facilities,
- hazardous materials generators (where containers are exposed to rainfall),
- vehicle fueling and maintenance areas, and
- vehicle and equipment washing,
- dry or steam cleaning facilities,
- food production/distribution loading dock, and
- trash compactor areas
Location

Drainage Area –
Contributing area not to exceed 2.0 acres.

Setbacks –
Prevent adverse impacts to building foundations, basements, wellheads, and roadways.

Slopes –
Should not be located on slopes exceeding 15 percent.
Soil Conditions

Consider depth to water table, bedrock, and the soil infiltration rate.

- Infiltration rain gardens are not allowed in locations where the depth from the bottom of the rain garden growing medium:
  - to the highest known groundwater table is less than 12 inches.
  - to bedrock is less than 12 inches.

- Infiltration rate of the soil subgrade below the growing medium of the rain garden must be determined using in-situ testing.
Infiltration Rate of Soil
(For infiltration only rain gardens)

- Don’t rely on soil survey maps or desktop evaluation for soil infiltration rates
- Perform onsite infiltration test (percolation test)
- At least one test for every 2000 square feet of rain garden
- Dig test hole deep enough to measure infiltration at the bottom of the rain garden.
- Apply factor of safety (COA recommends using FS = 2)
Infiltration Test

Dig Test Hole to this Depth
Infiltration vs. Ponding Depth

The underlying native soil must have a design infiltration rate that will draw down the full ponded depth in 48 to 72 hours.

<table>
<thead>
<tr>
<th>Infiltration Rate (inches/hour)</th>
<th>Recommended Ponding Depth (inches)</th>
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<td>12</td>
</tr>
<tr>
<td>0.13</td>
<td>6</td>
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<tr>
<td>0.06</td>
<td>3</td>
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</table>
Drawdown Time - How fast should the rain garden empty after it rains?

The City of Austin recommends a drawdown time goal of no more than 2-3 days.

Why 3 days?
- Odors
- Mosquitoes (typically take 4 to 5 days to hatch)
- Could affect health of plantings
Drainage Area

Desktop analysis
• GIS and Google map

Field Verify Drainage Areas
• Preferably in the rain
Drainage Area

Design inlet for certainty of capture
- Grading features or trench drains
Inlet Design

- Rain Garden Inlet
- Stormsewer Inlet
- Runoff Enters through Curb Cut
- Runoff in excess of WQV flows into storm drain inlet
- Rain Garden
- Runoff Enters Inlet
- Stormsewer Inlet
Inlet Design

Overflow Grate

Runoff Enters
Inlet Design: Items to Consider

Flow Control

- Flows into the rain garden should not exceed 2 feet per second. Higher velocities can cause scouring and erosion of the media, topsoil and plantings.
Inlet Design

Watch the Elevations during Construction

- Top of the area inlet, location of the curb cut, overflow weir sets the ponding depth.
Inlet Design

Don’t block flow path into RG

- Often the addition of topsoil, sod, rock splash pad, etc. is not considered during design or construction and ponding volume is reduced or flows are hindered.
Splash Pad Design

Watch the length and width.

**Length**
- less than 6 inches from inside edge of inlet.
Splash Pad Design

Width

• extend 6 to 12 inches beyond the width of the inlet opening.
Splash Pad Issues

Longer splash pads cause sediment and debris to drop out at the inlet entrance. Over time the inlet becomes blocked and prevents stormwater from entering the rain garden.
Splash Pad Issues

- Drop from edge of inlet opening onto splash pad should be at least 4 inches.
Drop onto Splash Pad

4 inches
Types of Rain Gardens

**Infiltration** vs. **Filtration**

**Infiltration**
- Captured runoff soaks down into ground

**Filtration**
- Captured runoff exits through pipe

Source: Oregon State University Extension
Rainscape Alternative: Berms

Prevent erosion and improve water quality at the source

- **Slow** it down
- **Spread** it out
- **Soak** it in

1. **PLAN VIEW**
   - Top of stream bank
   - Flat top of gently curved berm or “smile”
   - Concentrated runoff in yard
   - Runoff spreads and soaks in Native bunch grasses planted around berm
   - Non-mowed Grow Zone buffers creek

2. **CROSS SECTION VIEW**
   - Give the house space
   - Don’t bury or cut large tree roots

3. **CROSS SECTION DETAIL**
   - Flat, level top of berm 1 ft. wide
   - Berm Height ≤ 6 in.
   - Side slopes 3H:1V or flatter
   - Topsoil and native plants over compacted berm
   - Inflow
   - Existing ground
Media

Biofiltration medium

- Blend: 70% concrete sand and 30% chocolate loam
- Organic Matter
  - Aged mulch (partially decomposed) may be added (up to 5% by weight)
    - Increase Water Holding Capacity (% silt plus clay should be less than 27% of total volume)
    - No added nutrients
    - No manure & no biosolids based compost

Plants

- Filter stormwater, uptake nutrients (pollution), stabilize the soil, increase porosity
- Plant health for variable conditions - use diverse, drought-tolerant, native or adapted plants
Underdrain design

- Allows plant roots to access underlying soil
- Washed river gravel works best

Saturated zone

- Promotes pollution removal
- May help with plant viability
Infiltration Only Rain Gardens

During Construction:
Foot and equipment traffic on the bottom of the rain garden area will compact the soils and will affect the infiltration rate.
Scarification/Decompaction

Prior to installation of media/topsoil and plantings:
Scarify/decompact top four to six inches at the bottom of rain garden

- restores infiltration rate.
- promotes root penetration.
- minimizes nuisance ponding issues.
Scarification/Decompaction

DETAIL: 6" TOPSOIL PLANTING

TYPICAL RAIN GARDEN WITH 6" CURB
N.T.S.

NOTE:
* TOPSOIL DEPTH SHALL BE 3" UNDER TURF AND 6" WHERE CONTAINER PLANTS ARE INSTALLED.
Scarification/Decompaction

Sources: USFS, USDA, City of Austin, State of Minnesota
Maintenance

“Another flaw in the human character is that everybody wants to build and nobody wants to do maintenance.”
— Kurt Vonnegut, *Hocus Pocus*

Source: sbgardendesign.wordpress.com
Maintenance Manual

Completed 2014

Includes:

- Recommended maintenance schedule
- Checklist of items to inspect/maintain for a variety of stormwater control measures

http://www.austintexas.gov/department/stormwater-management
Grover & Reese
One Texas Center

Increased plant growth with the infiltration only design
Zilker Disc Golf Course

- Installed soil berms, rock check dams, log terraces, and shallow depressions to slow & soak in stormwater runoff
- Revegetated and aerated the soil
- Established roughs as “grow zones”
Zilker Disc Golf Course

Tee #14 Rock Check Dam

Before

After

Tee #1 “Smile” shaped berm

Before

After
JJ Seabrook – Denver at Pershing
JJ Seabrook - Greenwood at Pershing
EM Franklin Rain Garden
Questions ???

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Thank you for attending