Rainscape Project Design for Homes & Schools

WaterWise Rainscape Rebate Class
Tom Franke & Michelle Adlong
September 5, 2015
I. What Are Rainscapes?

Landscape features that retain rainwater on the property
I. WHAT ARE RAINECSCAPES?

**Rain Garden**

A vegetated, depressed landscape area designed to capture and infiltrate and/or filter stormwater runoff from impervious surfaces.
I. What Are Rainscapes?

Rain Garden

Photos COA/Grover & Reese
I. WHAT ARE RAINSCAPES?

**Elevated Rain Garden/Planter Boxes**

- Rain gardens are gravity-fed systems
- If drainage area is elevated (rooftops, parking garages)…rain garden can be, too!

Graphics: Melbourne Water
I. WHAT ARE RAINSCAPES?

Berms, Smiles, and Terraces

Low, curved berms that create shallow infiltration basins to capture and slow stormwater runoff facilitating greater infiltration and improving water quality.
I. What are Rainscapes?

**Vegetated Swale**

A broad, shallow channel which reduces the flow velocity and filters stormwater runoff.


Photo: COA/Rosewood Park
I. What Are Rainscapes?

**Porous Concrete**

A system comprising a limited capacity load-bearing, durable surface together with an underlying gravel layer that temporarily stores water prior to infiltration into the underlying permeable subgrade.
POROUS CONCRETE

Photos: COA/Escarpment Village
I. What are Rainscapes?

Pervious Pavers

These systems consist of high strength concrete units that are separated by open or stone-filled joints that allow stormwater to infiltrate.
II. Site Selection & Design
II. SITE SELECTION & DESIGN

Identify drainage area (water source)

Aim to treat:
- Impervious surfaces
- Concentrated flows

Avoid drainage areas > 2 Ac.

Graphics: City of Tucson
II. Site Selection & Design

Where to place Rainscape?

- Consider topography
  - Gravity-driven flow
- Natural landscaped areas
- Lawns
- Leave buffer around:
  - Basements, foundations
  - Trees
- Before you dig, locate underground utilities!
II. SITE SELECTION & DESIGN

Discharge & Bypass

- Predict where it goes
- Avoid:
  - Neighbors – outside of natural flowpath
  - Garages, chemical storage, “hot spots”
- Use flow spreader if possible
- If discharge is concentrated, aim directly toward roadway or drainage infrastructure
II. SITE SELECTION & DESIGN

Lawn Slope

- Limit to 15% max
- Calculate the slope of your lawn

\[
% \text{slope} = \frac{\Delta \text{Height}}{\Delta \text{Length}} \cdot 100
\]

- Example

![Graphic: COA Grow Green]
II. SITE SELECTION & DESIGN

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

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

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

**Goals**
- Reduce
- Peak
- Runoff
- Treat
- Pollutants
- Aesthetic
- Amenity
II. SITE SELECTION & DESIGN

Types of Rain Gardens

Infiltration vs. Filtration

Captured runoff soaks down into ground

Captured runoff exits through pipe

Source: Oregon State University Extension
II. Site Selection & Design

Ponding Depth: Infiltration Rates

- Where water ponds, design for **Drawdown time \( \leq 48 \) hours**
- Faster drawdown allows deeper garden
- Test your soil’s infiltration rate
  1. Dig a 12” deep \( \times \) 6” diameter hole. Insert a ruler & fill with water.
  2. Time how long it takes for the water to disappear

<table>
<thead>
<tr>
<th>Water disappears from 12” deep hole in...</th>
<th>Rain Garden Max Depth*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 hours</td>
<td>Verify with second test hole.</td>
</tr>
<tr>
<td>1 day</td>
<td>12”</td>
</tr>
<tr>
<td>2 days</td>
<td>6”</td>
</tr>
<tr>
<td>4 days</td>
<td>3”</td>
</tr>
<tr>
<td>&gt;4 days</td>
<td>Minimal</td>
</tr>
</tbody>
</table>

*These guidelines include a factor of safety of 2

Photo: COA Grow Green
II. SITE SELECTION & DESIGN

Ponding Depth: Other factors

- What is your soil type?
  - Clayey: Slower drawdown, shallower garden
  - Sandy: Faster drawdown, deeper garden

- Is there a lot of natural groundwater?
  - YES: Shallower garden with bottom higher than groundwater table

- Are you in the Edwards Aquifer Recharge Zone?
  - YES: Additional rules. Liner req’d for basins; shallow ponding only
II. SITE SELECTION & DESIGN

Sizing

- The larger the roof, the larger the rain garden
- **Depth** matters more for **small** rain gardens

<table>
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<tr>
<th>Rain Garden Area</th>
<th>Rain Garden Average Depth</th>
<th>Percent Runoff Captured*</th>
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<tr>
<td></td>
<td>Small Roof (200 SF)</td>
<td>Medium Roof (500 SF)</td>
</tr>
<tr>
<td>Small Rain Garden (100 SF)</td>
<td>3”</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>6”</td>
<td>97%</td>
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*Includes rainfall on roof and rainscape. Capture varies based on individual site.
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![Graph showing gallons captured per year vs. rain garden depth](image)
II. SITE SELECTION & DESIGN

Vegetated Berm & Swale

- **Swales** are typically trapezoidal or parabolic in cross section
- Running slope is fairly flat (generally < 4%). May have check dams

Photos: Rosewood Park, Austin, TX
II. SITE SELECTION & DESIGN

Berms, Terracing, Smiles

Cross Section View

Cross Section Detail

- Top width ≥ 1’
- Water Spread
- Overflow
- Side slopes 3H:1V or flatter
- Ponding depth ≤ 12”
- Topsoil over compacted berm
- Existing ground
- Inflow

Existing ground

Ponding depth ≤ 12”

Topsoil over compacted berm

Side slopes 3H:1V or flatter

Water Spread

Overflow

Top width ≥ 1’
II. SITE SELECTION & DESIGN

Berm & Rain Garden

CROSS SECTION VIEW

CROSS SECTION DETAIL

- Topsoil over compacted berm
- Ponding depth \( \leq 12" \)
- Side slopes 3H:1V or flatter
- Excavate
- Inflow
- Overflow
- Water Spread
- Existing ground
III. CONSTRUCTION

Items to Consider

Compaction of Soils during construction

Decompauction of Soils prior to placement of topsoil
Keep Flow Path Clear

Often the addition of topsoil, sod, rock, splash pad, etc. is not considered during design or construction and flows are hindered.
Rock or Gravel Requirement

Gravel or rock rainscape must not extend over 3 feet in width.
IV. MAINTENANCE

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

- Select native vegetation whenever possible to minimize long term watering needs once established.

- Crushed granite & other materials with fines should not be used as they can clog the system, preventing proper drainage.

- If pedestrian traffic is expected, provide stepping stones to direct walking.
Green Stormwater Infrastructure – Maintenance Manual

Completed 2014

Includes:

• Recommended maintenance schedule

• Checklist of items to inspect/maintain for a variety of stormwater control measures

Direct link:
https://www.austintexas.gov/department/stormwater-management
Maintenance

**IDEAL CONDITIONS**

- No erosion or scouring of soil in garden/berm/swale
- No sediment or debris at inlet or within garden/berm/swale
- Uniform coverage with desired vegetation; no weeds
- Uniform mulch coverage
- No visible compaction, water drains within 2 to 3 days
Erosion/Scouring

Erosion or scouring present; Mulch or topsoil is worn away by water flow.

Redistribute/replace mulch to consistent 3 inch depth; Cover extensive scouring with appropriately sized rock (typically 3 inch river rock)
Inlet Blockage

Sediment deposits or debris at the inlet

Remove sediment, leaves, debris, and trash from the inlet
Sediment Buildup

Sediment/debris deposits greater than 3 inches deep in bottom of basin

If sediment deposits in discrete piles or uniformly covers bottom of basin, remove with hand tools.

If vegetation is disturbed, replace with in-kind vegetation.

Refer to Grow Green Native & Adaptive Plant Guide for information on appropriate vegetation.
**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
- Mosquitos (typically take 4 to 5 days to hatch)
- Could affect health of plantings
V. Positive Impacts

Benefits beyond water conservation

Hydrologic
- Recharge groundwater
- Increase stream baseflow
- Decrease peak runoff rate

Water Quality
- Treat pollutants at the source through biofiltration

Decrease erosion
Decrease flooding (a little)
Increase biodiversity
Cleaner water for all
ONE TEXAS CENTER
505 Barton Springs Road