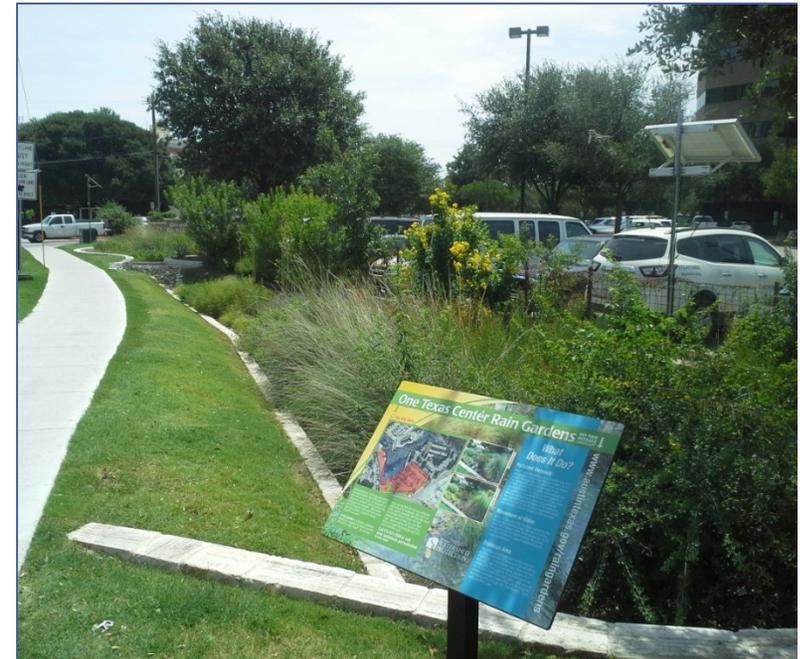


RAINSCAPE PROJECT DESIGN FOR HOMES & SCHOOLS

*WaterWise Rainscape Rebate
Class*

Tom Franke & Michelle Adlong
September 5, 2015



I. WHAT ARE RAINSCAPES?

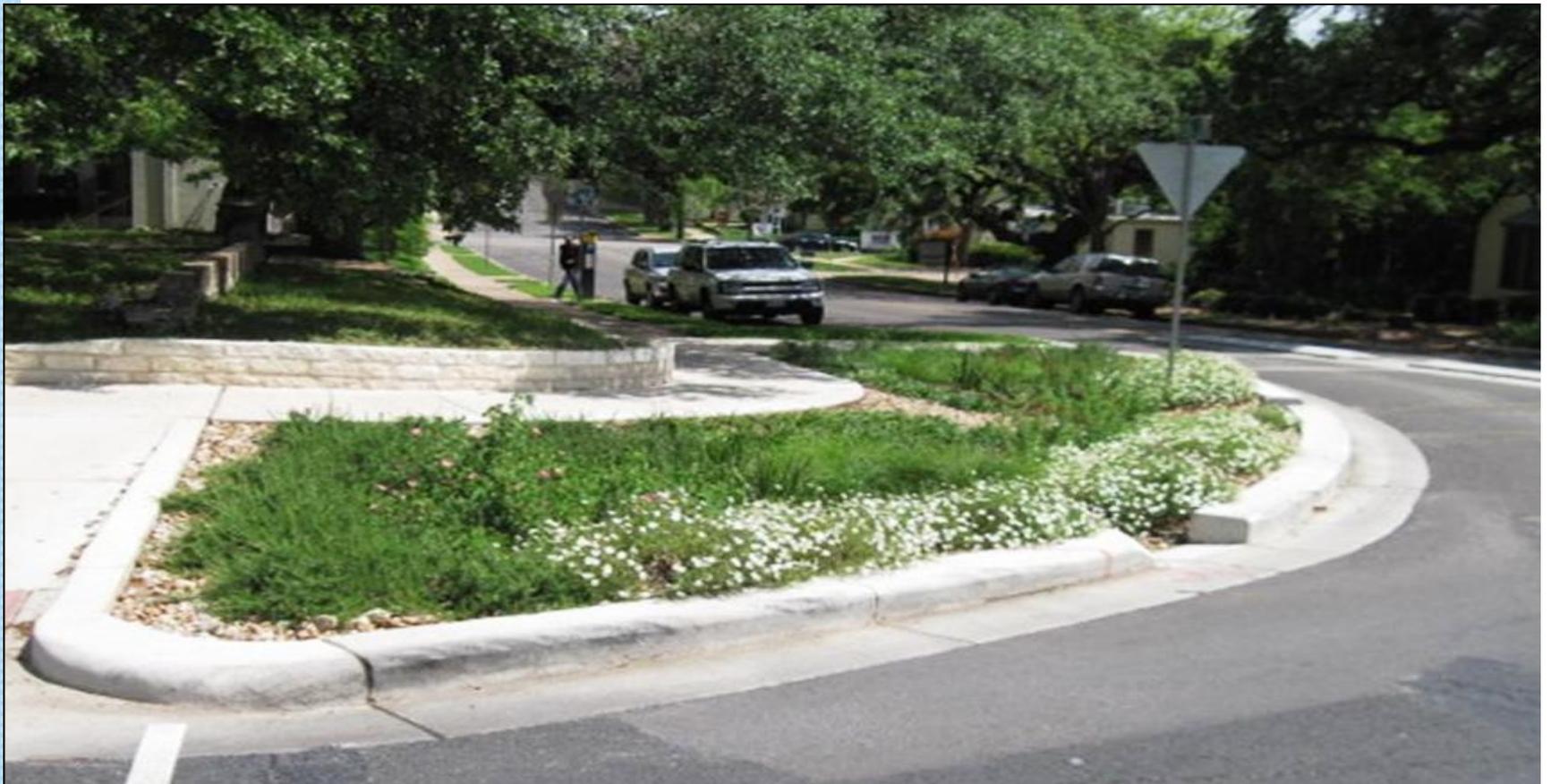
Landscape features that
retain rainwater on the
property



I. WHAT ARE RAINSCAPES?

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



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: Pennsylvania Stormwater Management Manual



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.



Photos: COA/Town & Country Optimist Club

POROUS CONCRETE

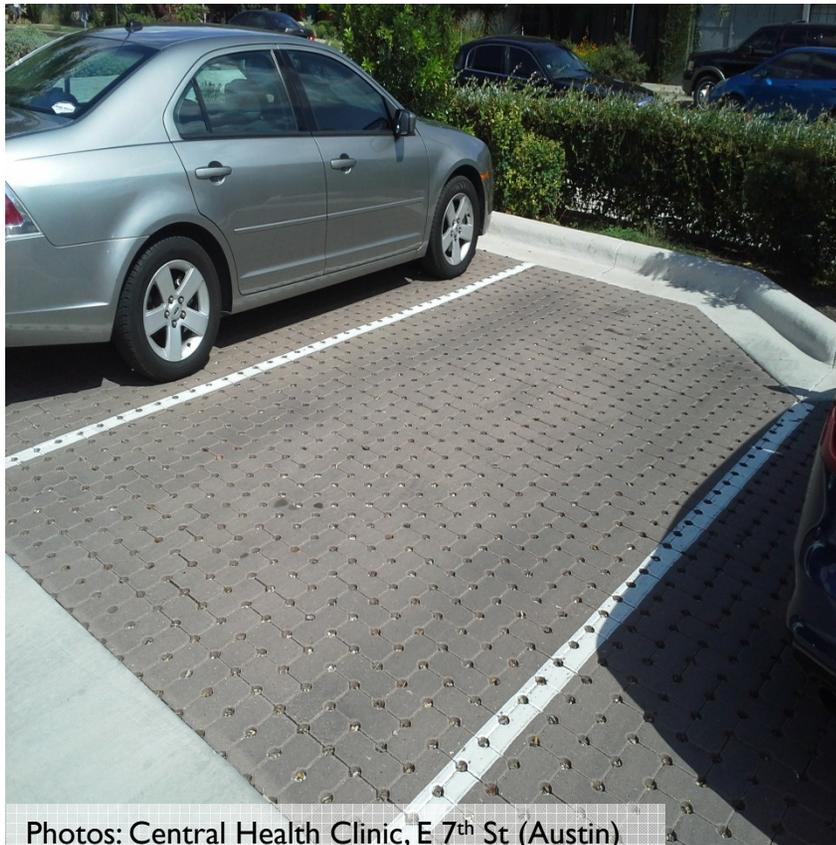


Photos: COA/Escarpment Village

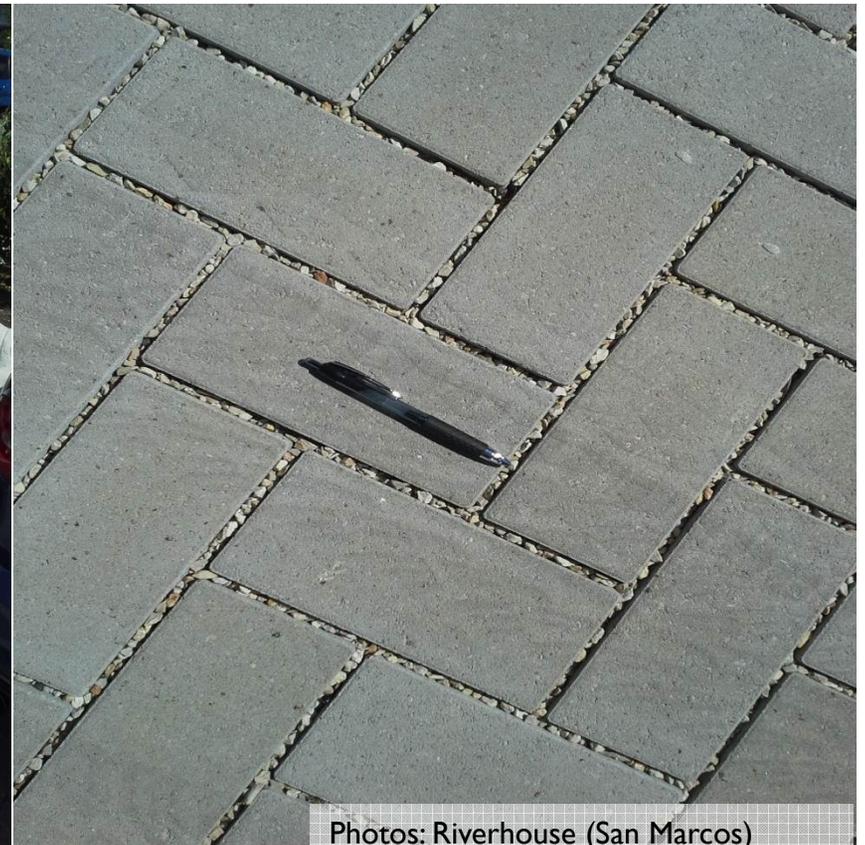
I. WHAT ARE RAINSCAPES?

Pervious Pavers

These systems consist of high strength concrete units that are separated by open or stone-filled joints that allow stormwater to infiltrate.



Photos: Central Health Clinic, E 7th St (Austin)



Photos: Riverhouse (San Marcos)



I. WHAT ARE RAINCAPES?

Infiltration Trench

Device used to infiltrate stormwater runoff into the ground. Runoff is stored in the void space between the porous material and infiltrates through the bottom and into the soil matrix over a few days.



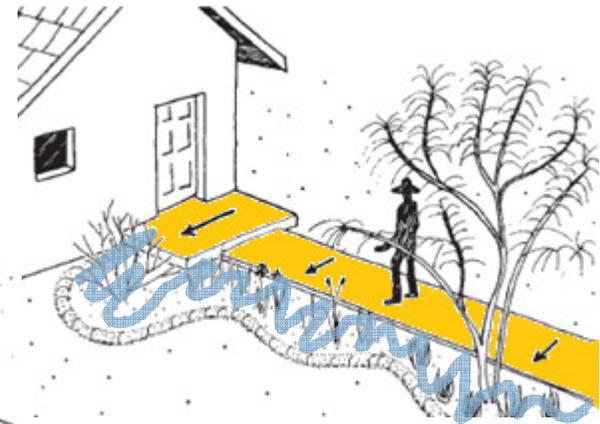
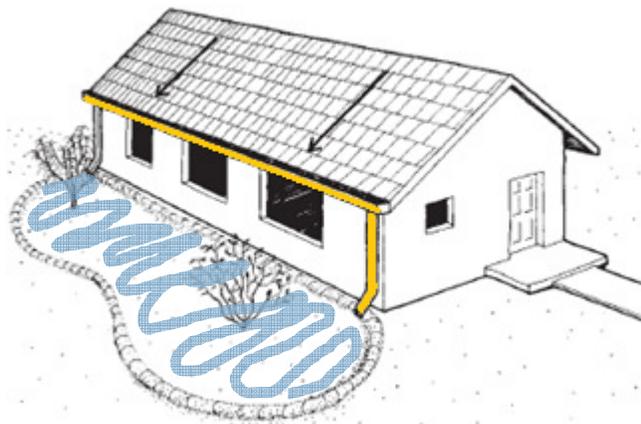
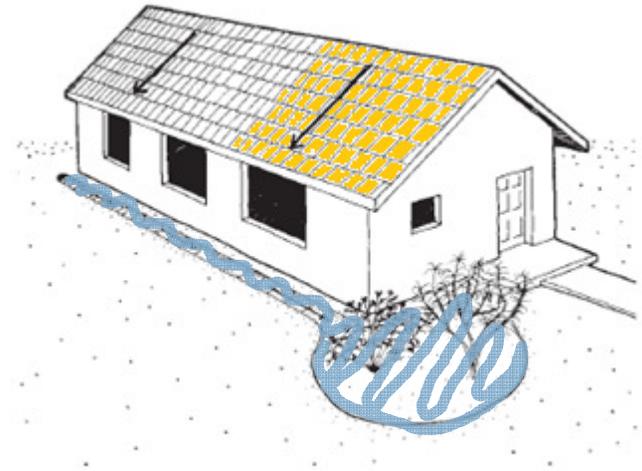
II. SITE SELECTION & DESIGN

Identify drainage area (water source)

Aim to treat:

- Impervious surfaces
- Concentrated flows

Avoid drainage areas > 2 Ac.

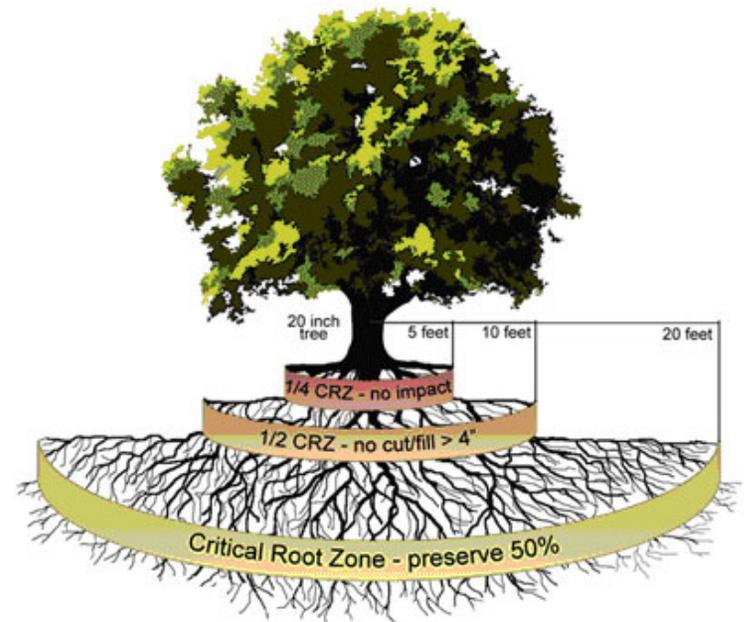


Graphics: City of Tucson

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!



Graphic: City of Austin



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



Photo: OutboardMotorOilBlog.com



Photo: KXAN 2014

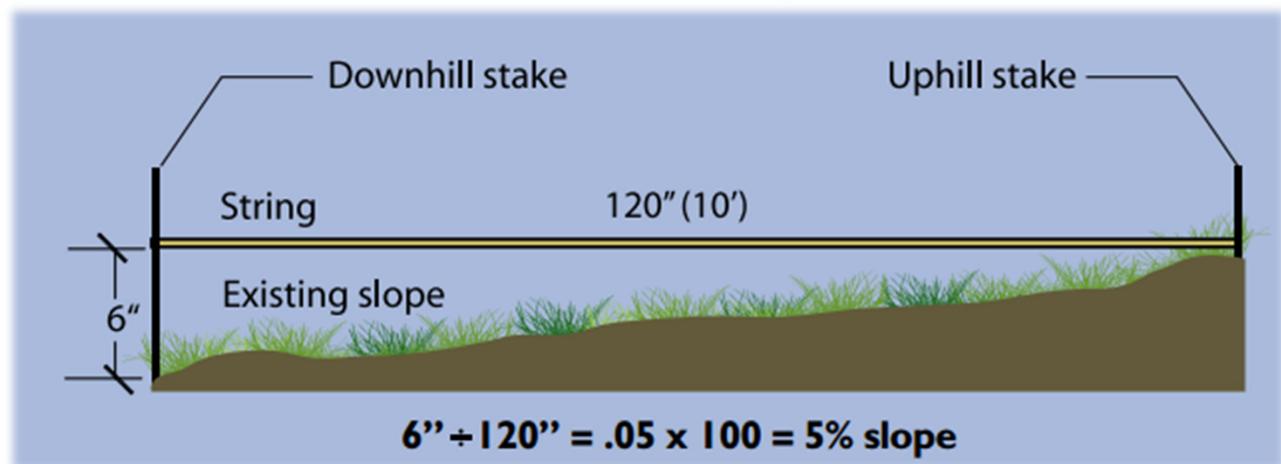
II. SITE SELECTION & DESIGN

Lawn Slope

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

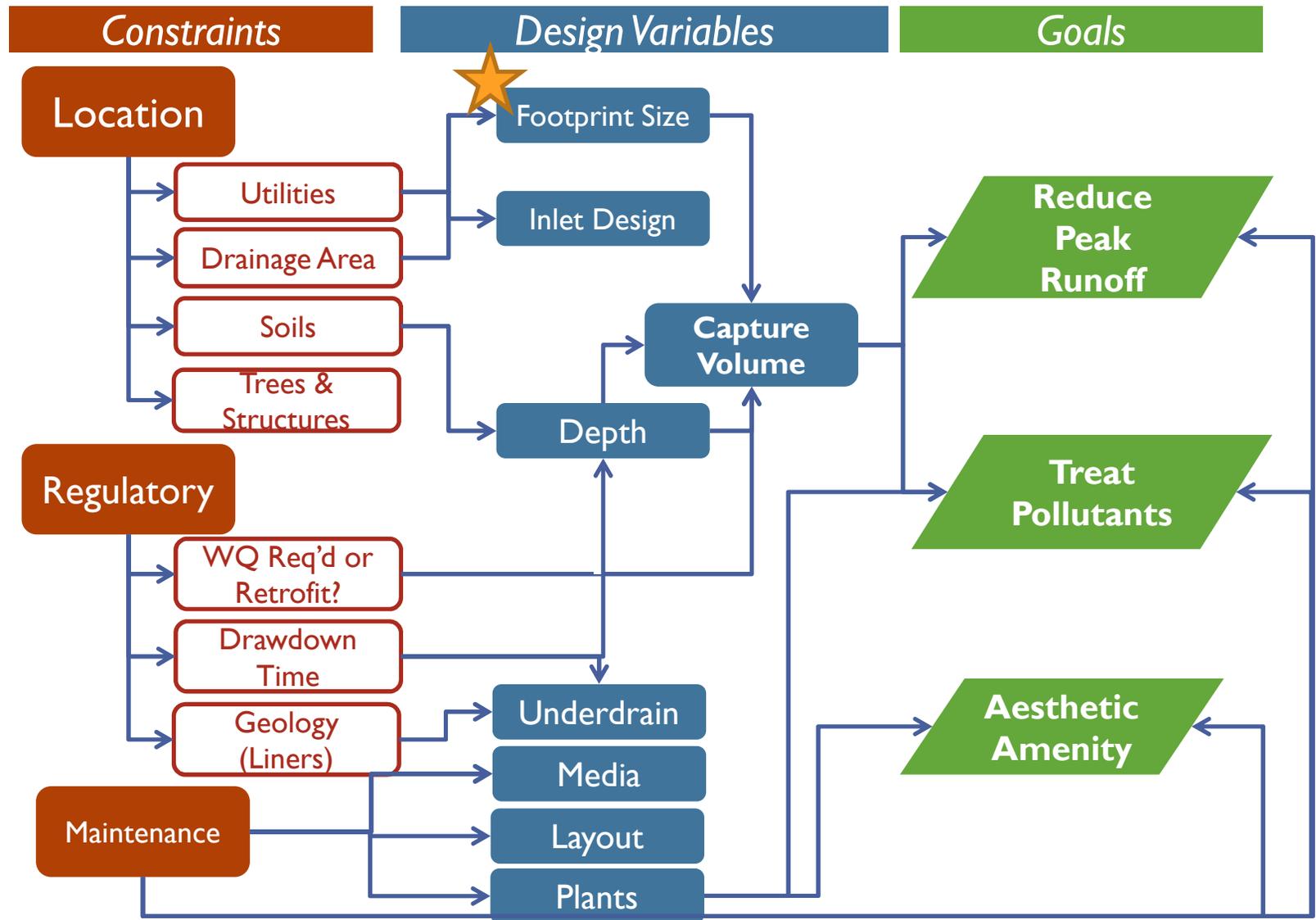
$$\% \text{ slope} = \frac{\Delta \text{Height}}{\Delta \text{Length}} \cdot 100$$

- Example



Graphic: COA Grow Green

II. SITE SELECTION & DESIGN



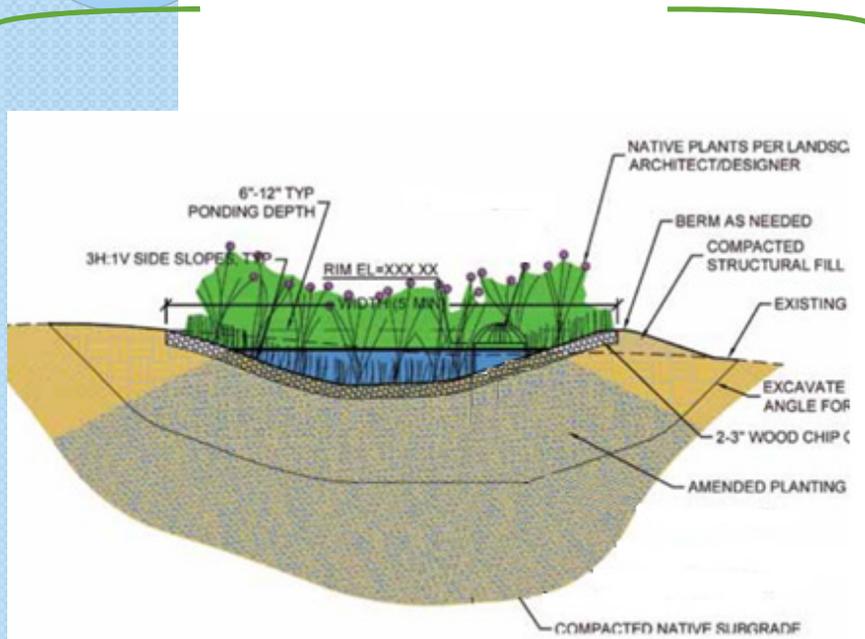
II. SITE SELECTION & DESIGN

Types of Rain Gardens

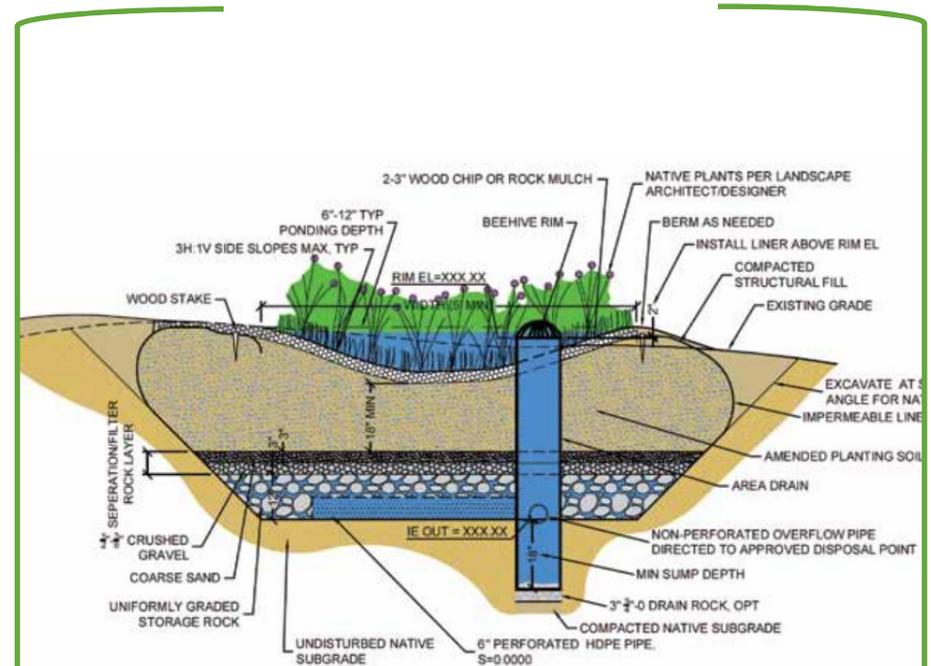
Infiltration

vs.

Filtration



Captured runoff soaks down into ground



Captured runoff exits through pipe

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** x 6" diameter hole. Insert a ruler & fill with water.

2. Time how long it takes for the water to disappear



Photo: COA Grow Green

Water disappears from 12" deep hole in... Rain Garden Max Depth*

<12 hours	Verify with second test hole.
1 day	12"
2 days	6"
4 days	3"
>4 days	Minimal

*These guidelines include a factor of safety of 2

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

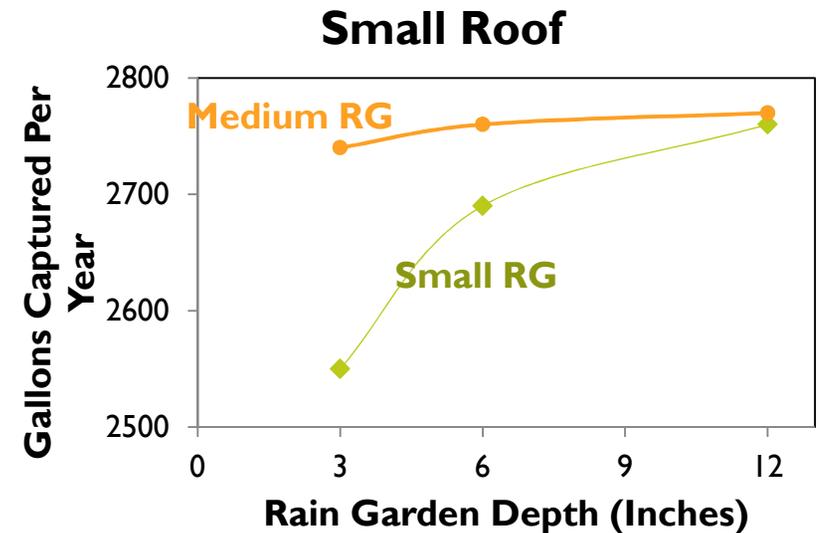
II. SITE SELECTION & DESIGN

Sizing

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

Rain Garden Area	Rain Garden Average Depth	Percent Runoff Captured*	
		Small Roof (200 SF)	Medium Roof (500 SF)
Small Rain Garden (100 SF)	3"	91%	75%
	6"	97%	89%
	12"	99%	95%
Medium Rain Garden (500 SF)	3"	99%	97%
	6"	100%	99%
	12"	100%	100%

*Includes rainfall on roof and rainscape. Capture varies based on individual site.



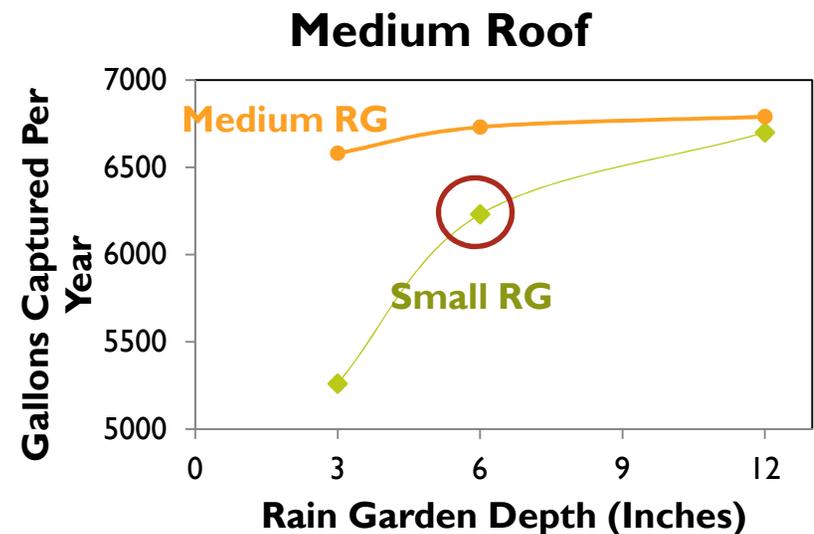
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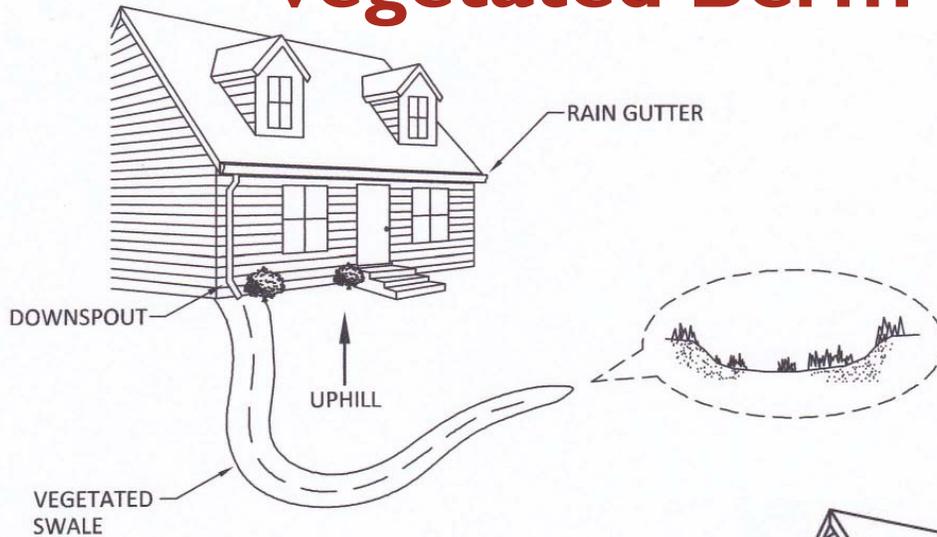




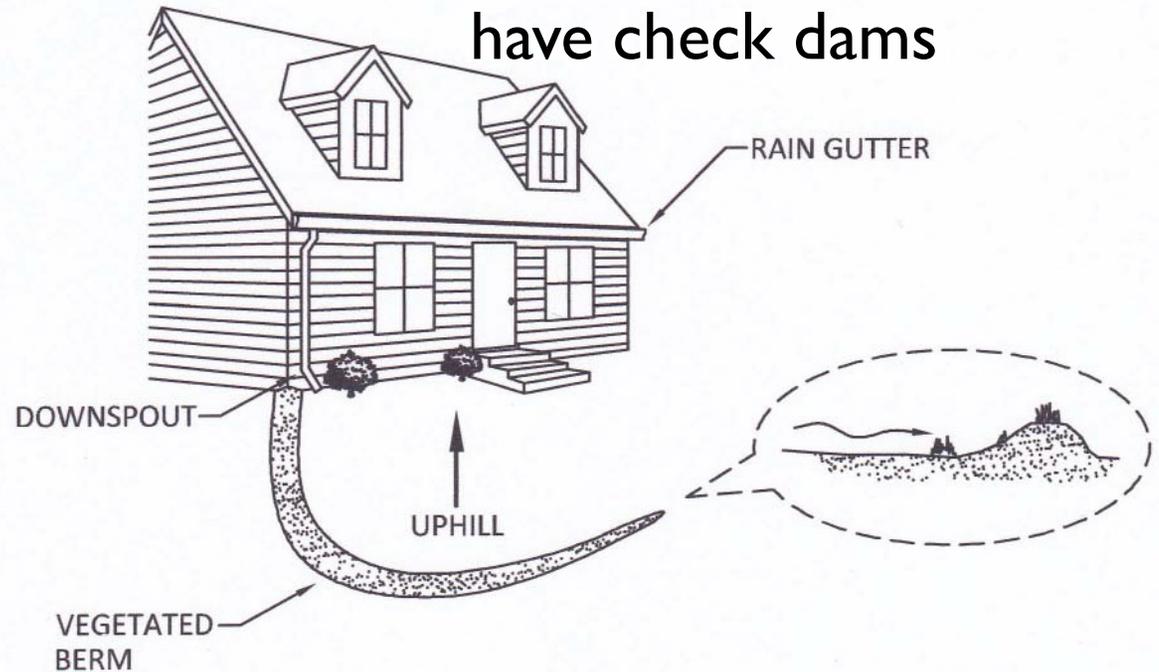
II. SITE SELECTION & DESIGN

Vegetated Berm & Swale

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

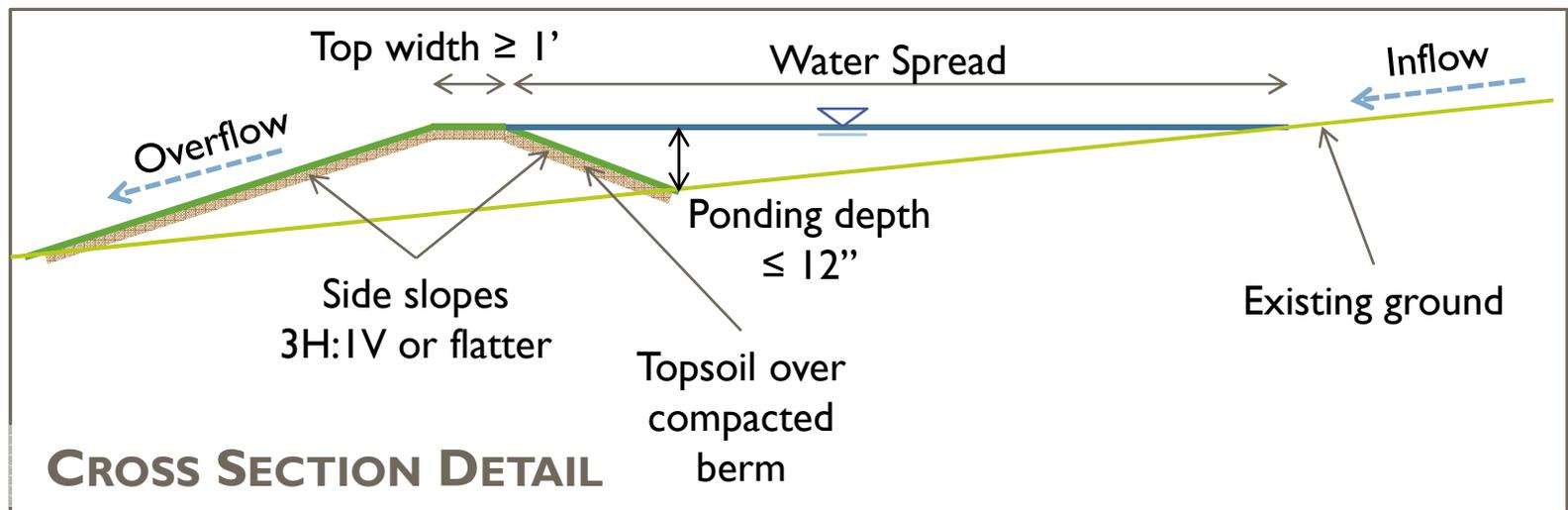
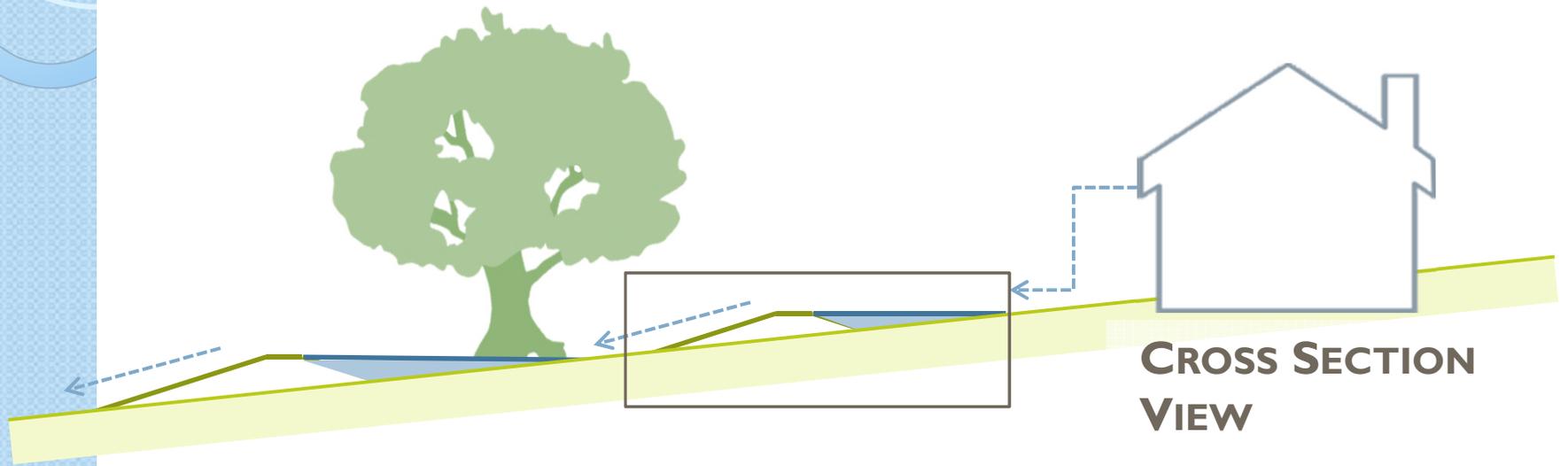


Photos: Rosewood Park, Austin, TX



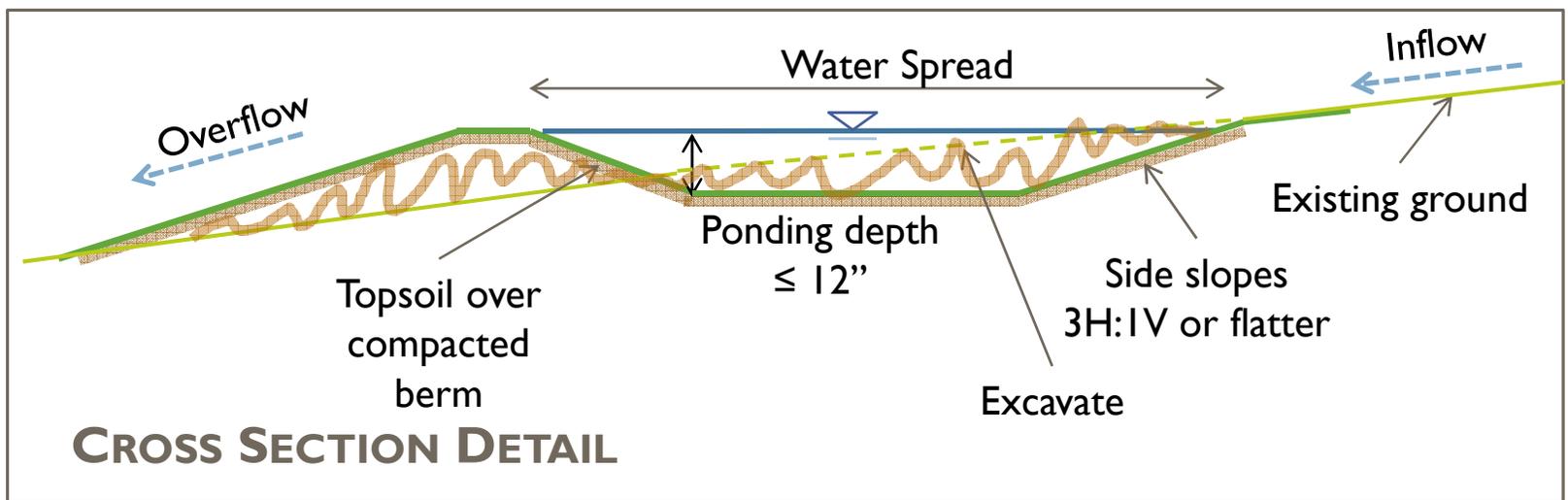
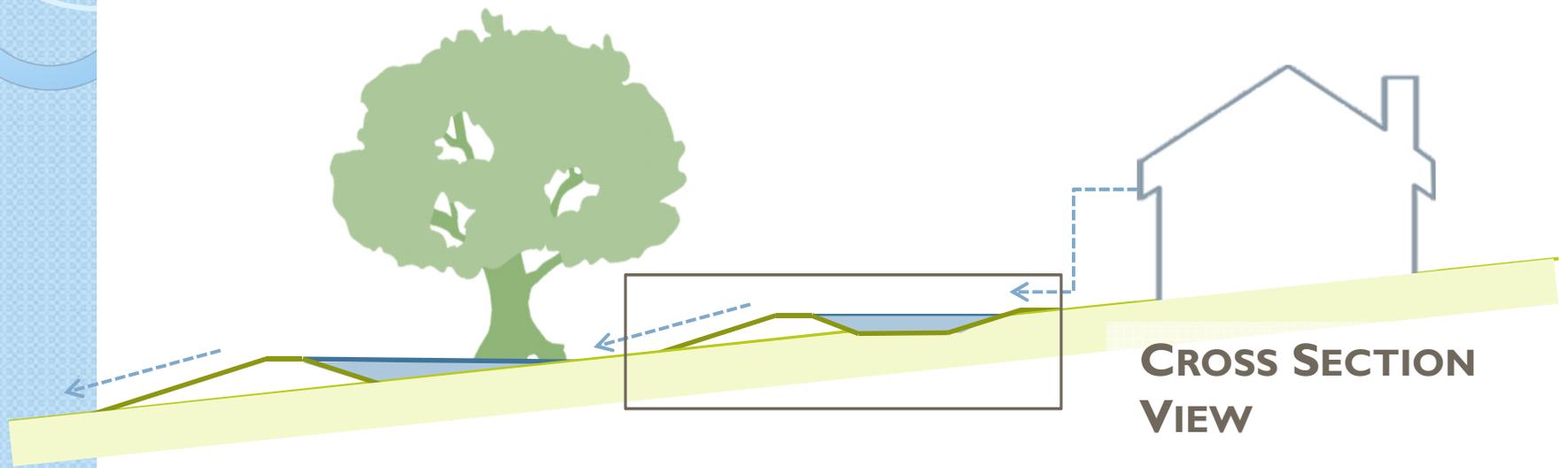
II. SITE SELECTION & DESIGN

Berms, Terracing, Smiles



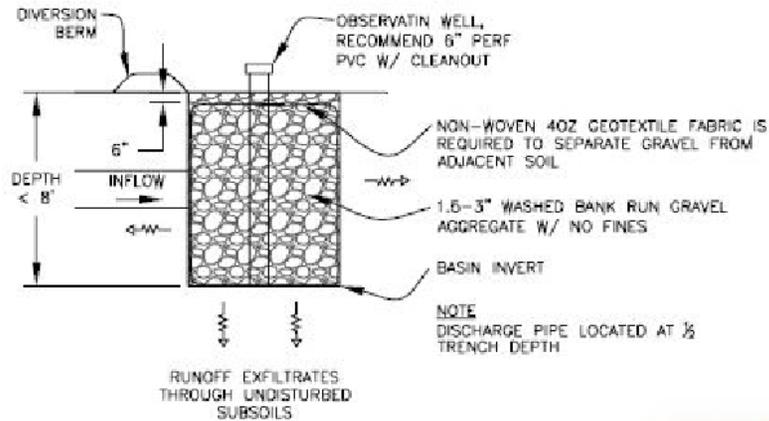
II. SITE SELECTION & DESIGN

Berm & Rain Garden

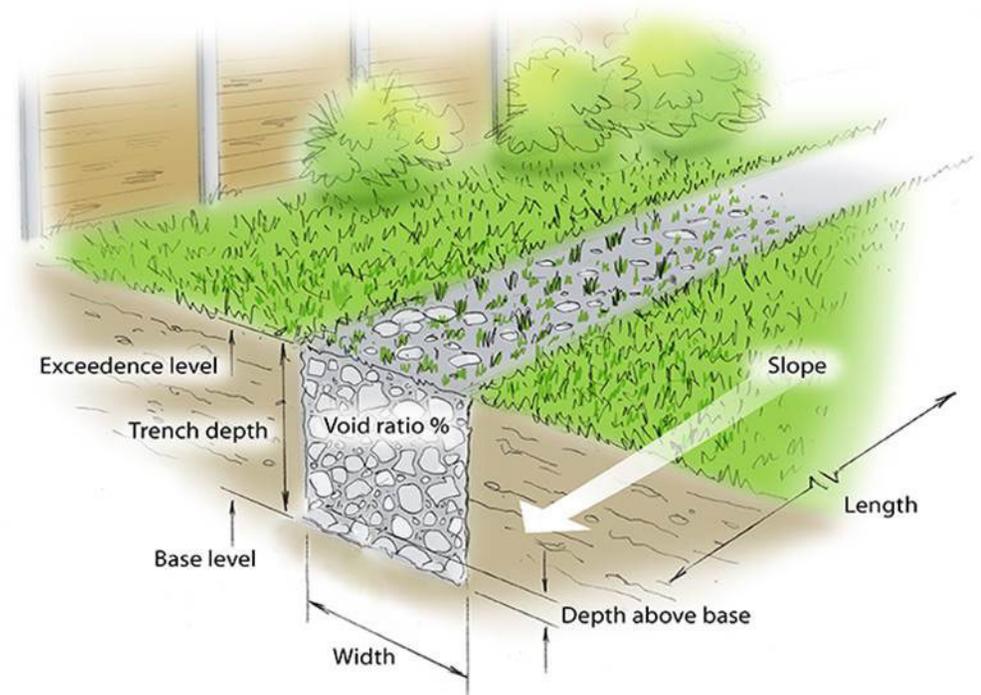


II. SITE SELECTION & DESIGN

Infiltration Trench



Graphic: LCRA



III. CONSTRUCTION

Items to Consider

Compaction of Soils during construction



Decompaction 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

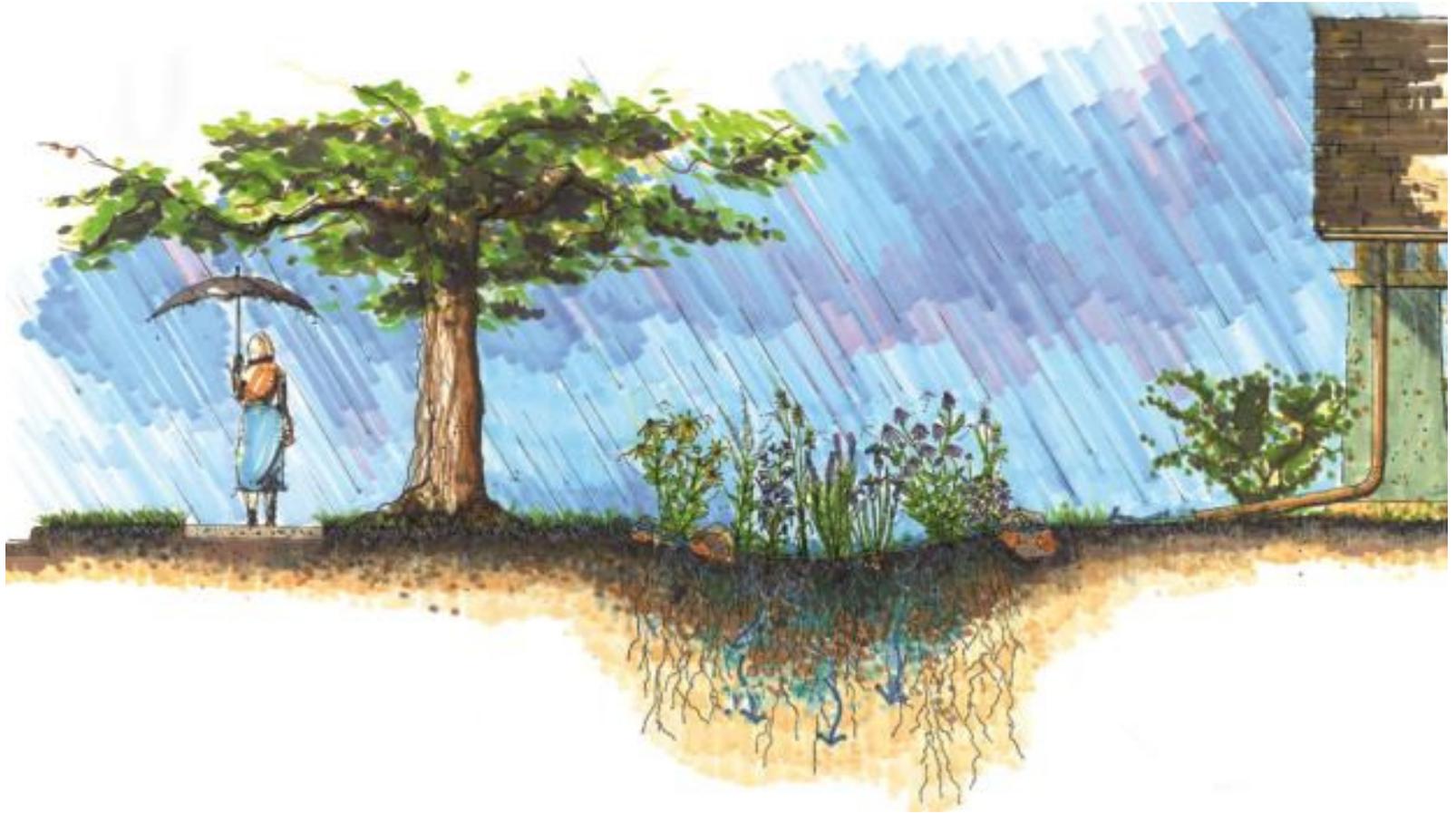
Gravel or rock rainscape must not extend over 3 feet in width.



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

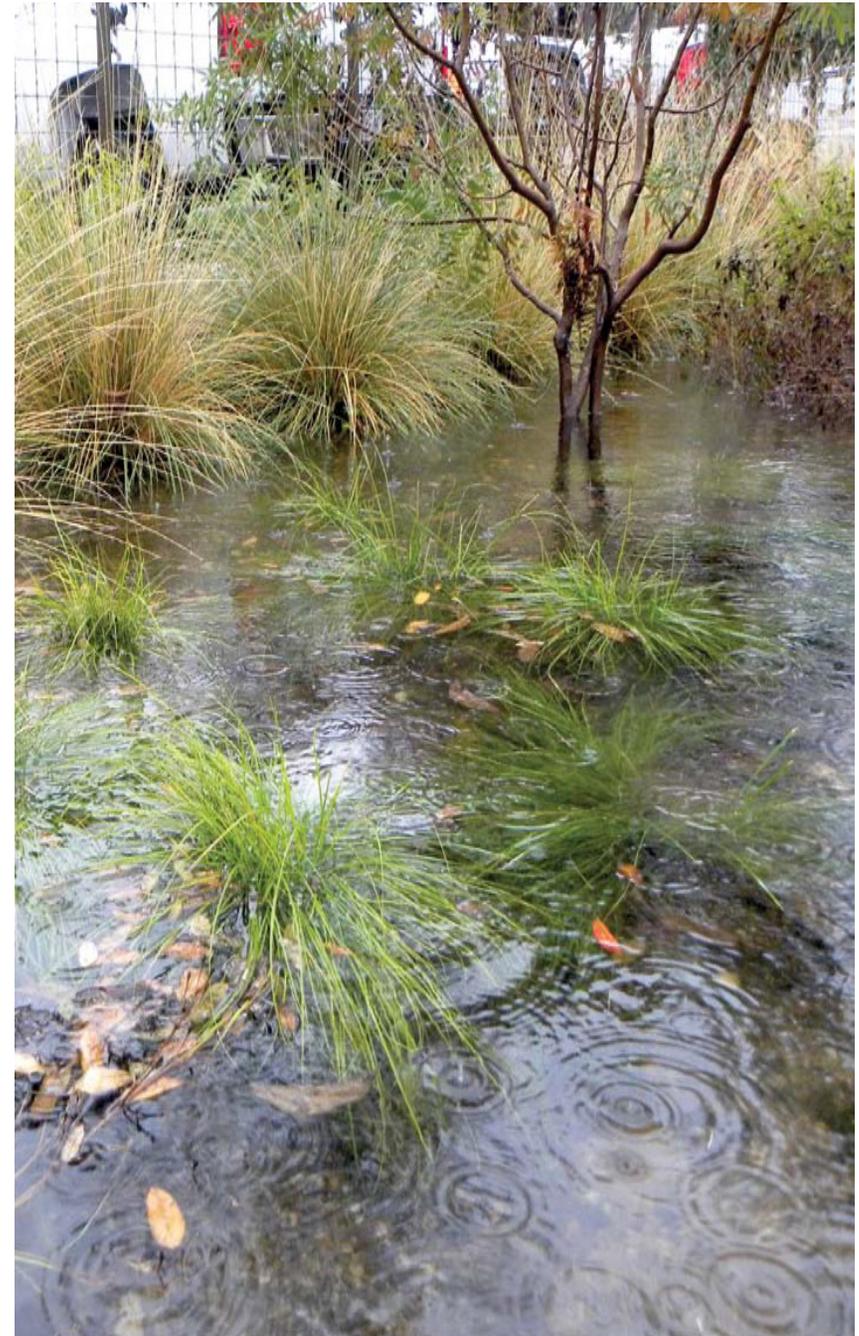
Direct link:

<https://www.austintexas.gov/departments/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

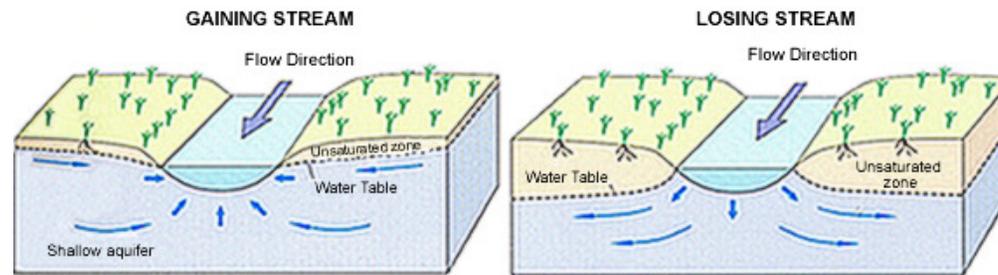
Benefits beyond water conservation

Hydrologic

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

Water Quality

- Treat pollutants at the source through biofiltration



Courtesy of U.S. Geological Survey



Decrease
erosion



Decrease
flooding
(a little)



Increase
biodiversity



Cleaner
water for all

ONE TEXAS CENTER

