HILL COUNTRY
WATER
GARDENS
& NURSERY

Rain Gardens

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What is a rain garden?

Also known as bioremediation area

A shallow, usually vegetated depression that absorbs and filters runoff

Should be planted with native plants

A beautiful addition to any yard while conserving water and protecting its quality

Why build a rain garden

Counters the impervious surfaces created by urbanization that prevent water from slowly soaking into the ground

Prevent pollutants from being carried into waterways

Decreases chance of flood and erosion

Helps slow absorption of runoff areas and provides natural infiltration into the soil

Goals of Rain Gardens

Keep water on one's land

Helps recharge groundwater and in turn higher creeks and rivers

Filter pollutants like fertilizers, pesticides, heavy metals, oils, and other chemicals that would have gone through drainage ditches or storm drains

Lower risk of erosion and flooding by keeping water on your property

Planning a Rain Garden

Pick a suitable location

Test the soil (Know texture and drainage)

Determine the size of your rain garden

Design your rain garden

Location

Consider drainage patterns, sun exposure (full sun to part sun), and existing vegetation

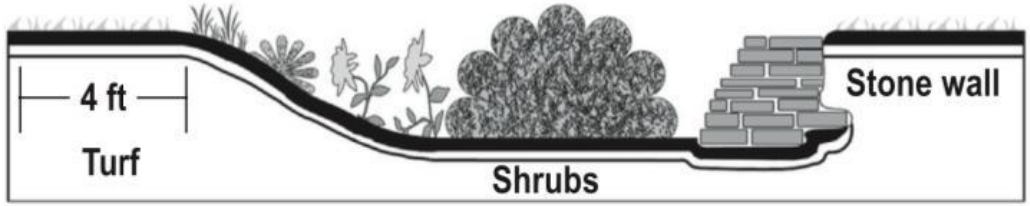
At least 4 feet of grass before rain garden to help trap sediments

Choose or create a low spot where water naturally collects.

Avoid placing near septic systems or foundation, at least 10 feet away

Slope should be less than 10%

Asymmetrical raingarden with masonry wall



Symmetrical raingarden

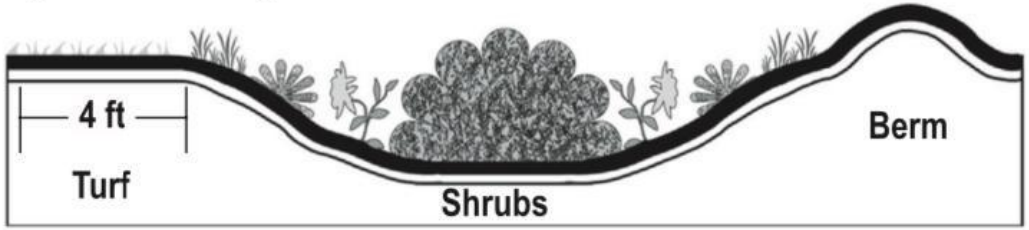
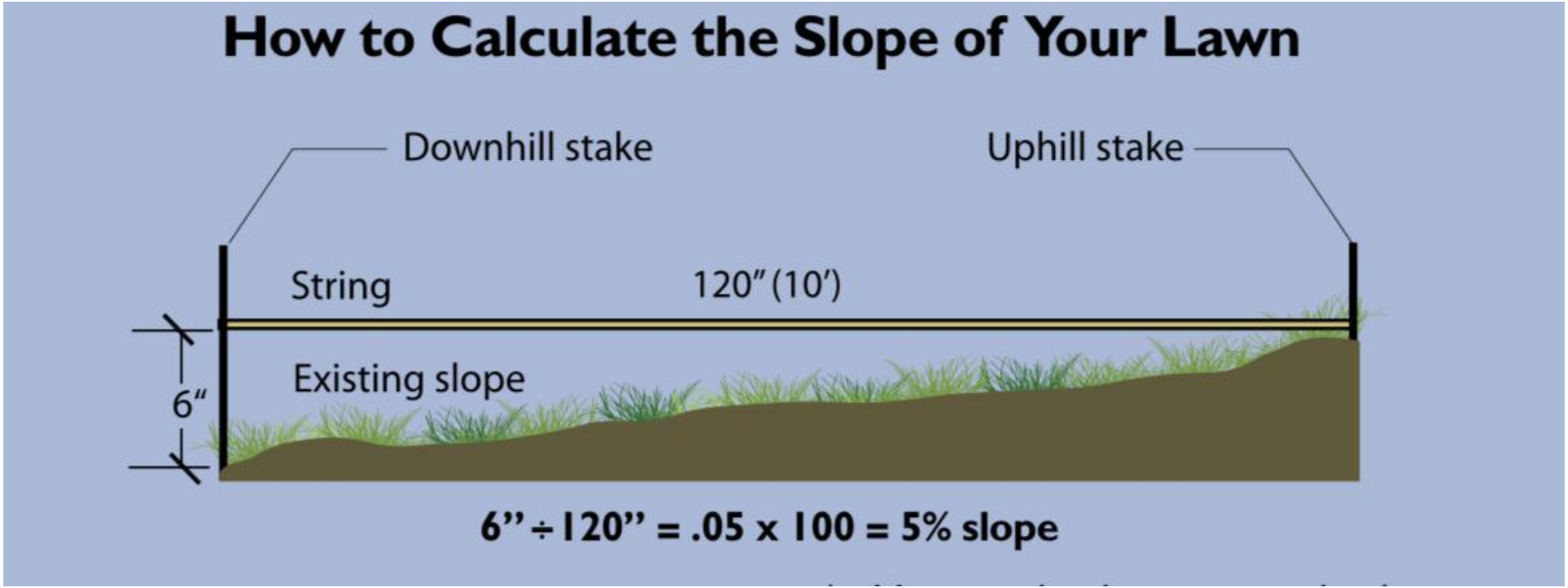


Figure 1. Typical asymmetrical and symmetrical raingardens (adapted from Barr Engineering Company, 2001).

Downspout Diagram

Work with existing runoff areas

Finding Slope



Finding Slope Formula

Put two stakes at uphill and downhill end about 10’ or 120” apart

Use a carpenter’s level to run a string from both stakes at the same height

Measure distance in between two stakes (120”)

Measure height on downhill stake between string and ground (6”)

Divide height by the length of the two stakes and multiply by 100 for percent slope

Soil Test

The ground should be able to absorb water quickly

Test by digging a hole 1 foot deep, fill with water, let drain, and fill again. If 24 hours pass with no standing water you are good.

If you have standing water you will have to amend

Soil Triangle

Sand has the biggest size, followed by silt, and finally Clay

Clay has the slowest draining potential

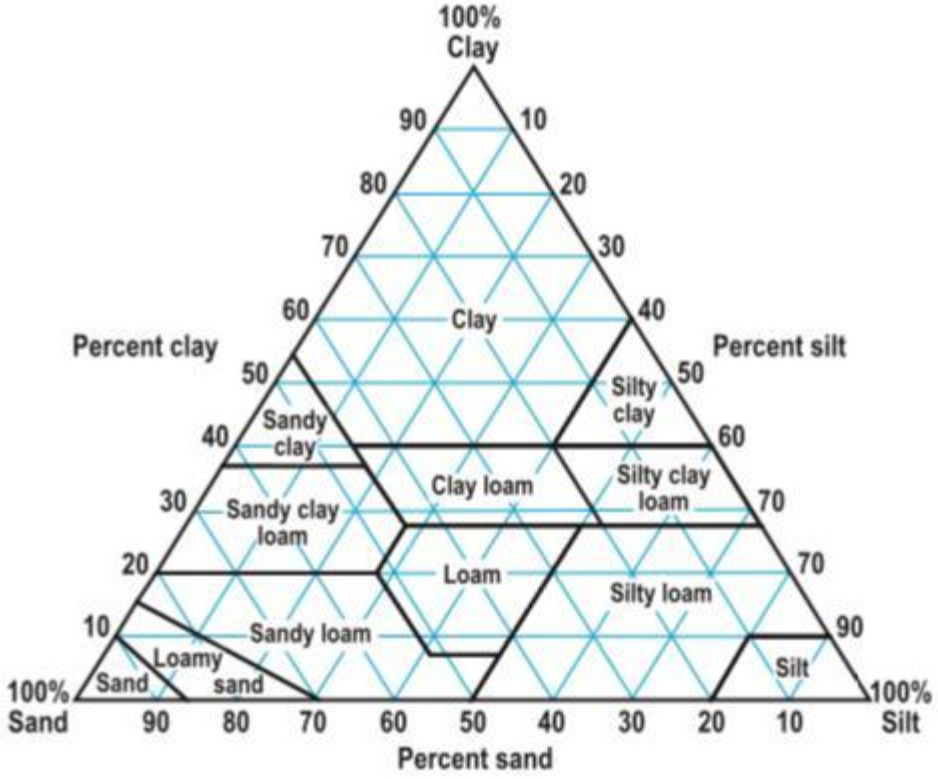


Figure 3. Soil texture triangle (USDA, 1993).

Determine the size of your rain garden

Size will depend on the amount of runoff

A good rule of thumb is to size the rain garden to hold 1 inch of runoff from a 100 square foot area

Table 1. Volume of rainwater captured in a 100-square-foot area (assuming 100 percent collection).

Rainfall amount (inches)	Volume (ft^3)	Volume (gallons)
0.5	4.2	31
1.0	8.3	62
1.5	12.5	94
2.0	16.7	125
2.5	20.8	156
3.0	25.0	187

Calculating Size of Rain Garden

Locate impervious surfaces that will provide runoff

Use a tape measure and estimate area

Divide area by 6; this area should be able to hold 1” of runoff in a rain garden 6” deep

1. So a quarter of the rooftop is 30’ by 15’ meaning 450 feet squared
2. Divide 450 square feet by 6” to get 75 sq. ft needed for a rain garden

Chart for Different Areas

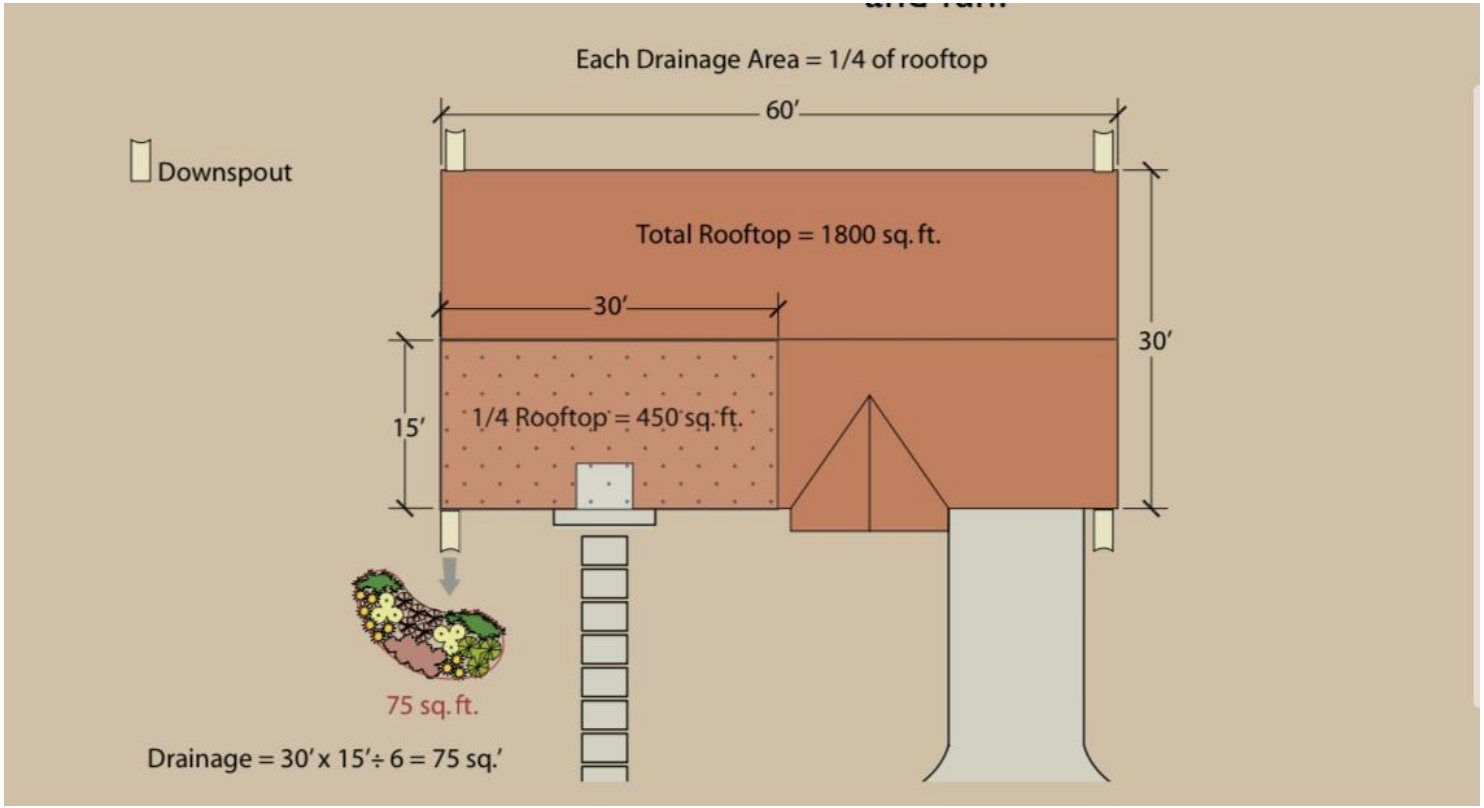
Impervious Surface Area (sq. ft.)	Rain Garden (sq. ft.)	Size Options (ft. x ft.)
200	33	3x11; 4x9
400	67	5x14; 7x10
600	100	5x20; 8x12
800	133	6x22; 10x13
1000	167	6x28; 10x17

Design your rain garden

Can be any shape (usually round or kidney)

Should be shallow, about 6 inches and sloped away from foundation

With heavy clay soils, berm on the downslope side to prevent erosion


Each Drainage Area = 1/4 of rooftop
Downspout
60′
Total Rooftop = 1800 sq. ft.
30′
30′
15′
1/4 Rooftop = 450 sq. ft.
75 sq. ft.
Drainage = 30′ x 15′ ÷ 6 = 75 sq.′

Building a Rain Garden Step-by-Step

Preparation

Excavation

Compost and Gravel

Preparation

Mark the chosen area and remove existing vegetation

Typically twice as long as they are wide

Call utility companies before digging

Excavation

Dig area out to 6” (use string level to maintain 6” throughout)

If on a slope, dig uphill side and throw spoils down slope to make a berm

Gently slope sides of rain garden

Level top area of basin to keep flow in evenly distributed

Loosen soil down 3” in rain garden and cover with compost

Splash pad needed on areas of high flow into rain garden (rocks extended 2” to 3” from entry point)

Tips and Tricks

Adding a rain garden to capture overflow from a pond or water feature

NEVER add liner to guide water

Rain Gardens can be for huge parking lots or even smaller areas like raised beds or a water collection system

DO NOT compact soil in rain garden as it will slow infiltration

Expanded shale and compost are perfect for adding drainage

PLANT SELECTION

Consider your soil type and ecoregion: clay or limestone?

Bottom of bowl, or side of bowl?

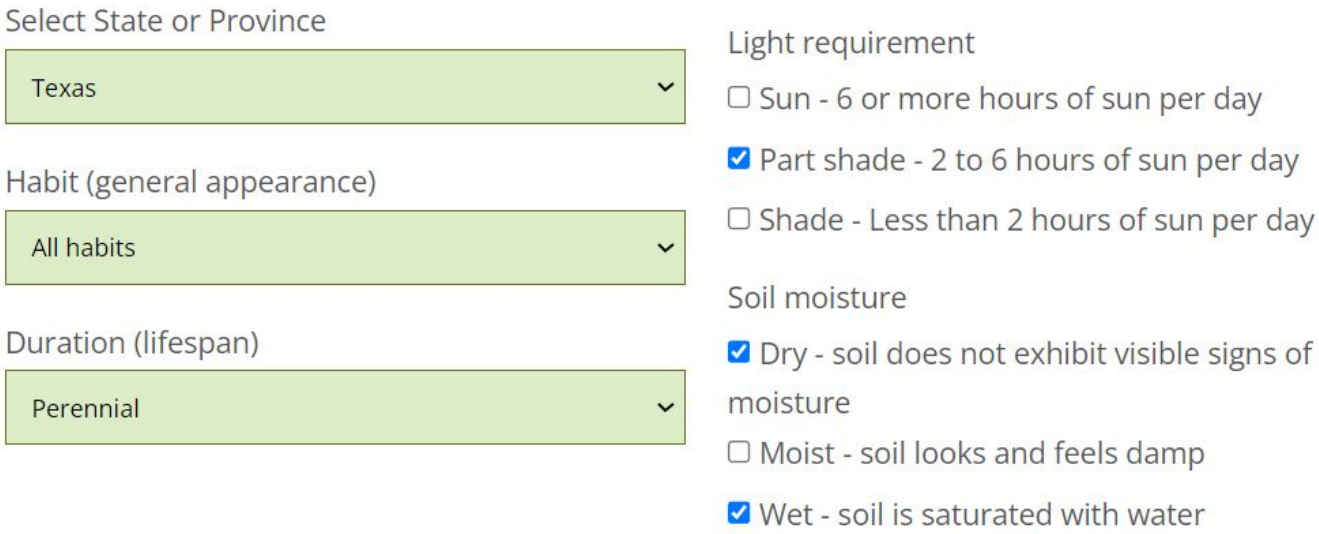
- Moist, mesic, dry

Directing water or absorbing water?

Erosion control for berms and buffer zones

How to find a plant that tolerates wet feet and drought

Wildflower plant finder tool: an example search



Search for plant in Grow Green Guide or bonap.net to determine ecoregion for more clues

How to find a plant that tolerates wet feet, continued

Wetland Indicator Status and riparian species

OBL = Obligate - occurs almost always under natural conditions in wetlands
FACW = Facultative Wetland - usually occurs in wetlands , but occasionally found in nonwetlands
FAC = Facultative - equally likely to occur in wetlands or non-wetlands
FACU = Facultative Upland - usually occurs in non-wetlands , but occasionally found in wetlands
UPL = Upland - occurs almost always under natural conditions in non-wetlands

How to find a plant that tolerates wet feet, continued

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National Wetland Indicator Status

Region:	AGCP	AK	AW	CB	EMP	GP	HI	MW	NCNE	WMVE
Status:	FAC				FAC	FACW		FACW	FAC	

Let's try it! Part 1

Cephalanthus occidentalis

Page, Lee

Cephalanthus occidentalis L.

Common Buttonbush, Buttonbush, Button Willow, Honey Bells, Honeybells, Honey Balls, Honeyballs, Button-bush

Rubiaceae (Madder Family)

Synonym(s): *Cephalanthus occidentalis* var. *californicus*, *Cephalanthus occidentalis* var. *pubescens*

USDA Symbol: CEOC2

USDA Native Status: L48 (N), CAN (N)

Common buttonbush is a multi-stemmed shrub which grows 6-12 ft. or occasionally taller. Leaves in pairs or in threes, petiolate; blade up to 8 inches long, ovate to narrower, sometimes 1/3 or less as wide as long, with a pointed tip and rounded to tapered base, smooth margins and glossy upper surface, lower surface duller. Glossy, dark-green leaves lack significant fall color. Flowers small, borne in distinctive, dense, spherical clusters (heads) with a fringe of pistils protruded beyond the white corollas. Long-lasting, unusual blossoms are white or pale-pink, one-inch globes. Subsequent rounded masses of nutlets persist through the winter. Trunks are often twisted. Spreading, much-branched shrub or sometimes small tree with many branches (often crooked and leaning), irregular crown, balls of white flowers resembling pincushions, and buttonlike balls of fruit.

Buttonbush is a handsome ornamental suited to wet soils and is also a honey plant. Ducks and other water birds and shorebirds consume the seeds.

Distribution

USA: AL , AR , AZ , CA , CT , DC , DE , FL , GA , IA , IL , IN , KS , KY , LA , MA , MD , ME , MI , MN , MO , MS , NC , NE , NH , NJ , NY , OH , OK , PA , RI , SC , TN , TX , VA , VT , WI , WV
Canada: NB , NS , ON , PE , QC
Native Distribution: N.B. & Que. to upper Mississippi R. Valley, e. NE & e. KS, s. to FL & TX
Native Habitat: In swamps, around ponds and margins of streams throughout the state. Sand, loam, clay, limestone; moist, poor drainage or standing water okay. Prairie swales; lake, marsh, creek & swamp margins; dry, limestone bluffs

Growing Conditions

Water Use: High
Light Requirement: Part Shade , Shade
Soil Moisture: Moist , Wet
Soil pH: Circumneutral (pH 6.8-7.2)
CaCO3 Tolerance: Medium
Cold Tolerant: yes
Soil Description: Limestone-based, Sandy, Sandy Loam, Medium Loam, Clay Loam, Clay
Conditions Comments: Common buttonbush is a spreading, multi-branched shrub or sometimes small tree with many branches (often crooked and leaning), irregular crown, balls of white flowers resembling pincushions, and buttonlike balls of fruit. Buttonbush is a handsome ornamental suited to wet soils and is also a honey plant. Ducks and other water birds and shorebirds consume the seeds.

Try it, Part III

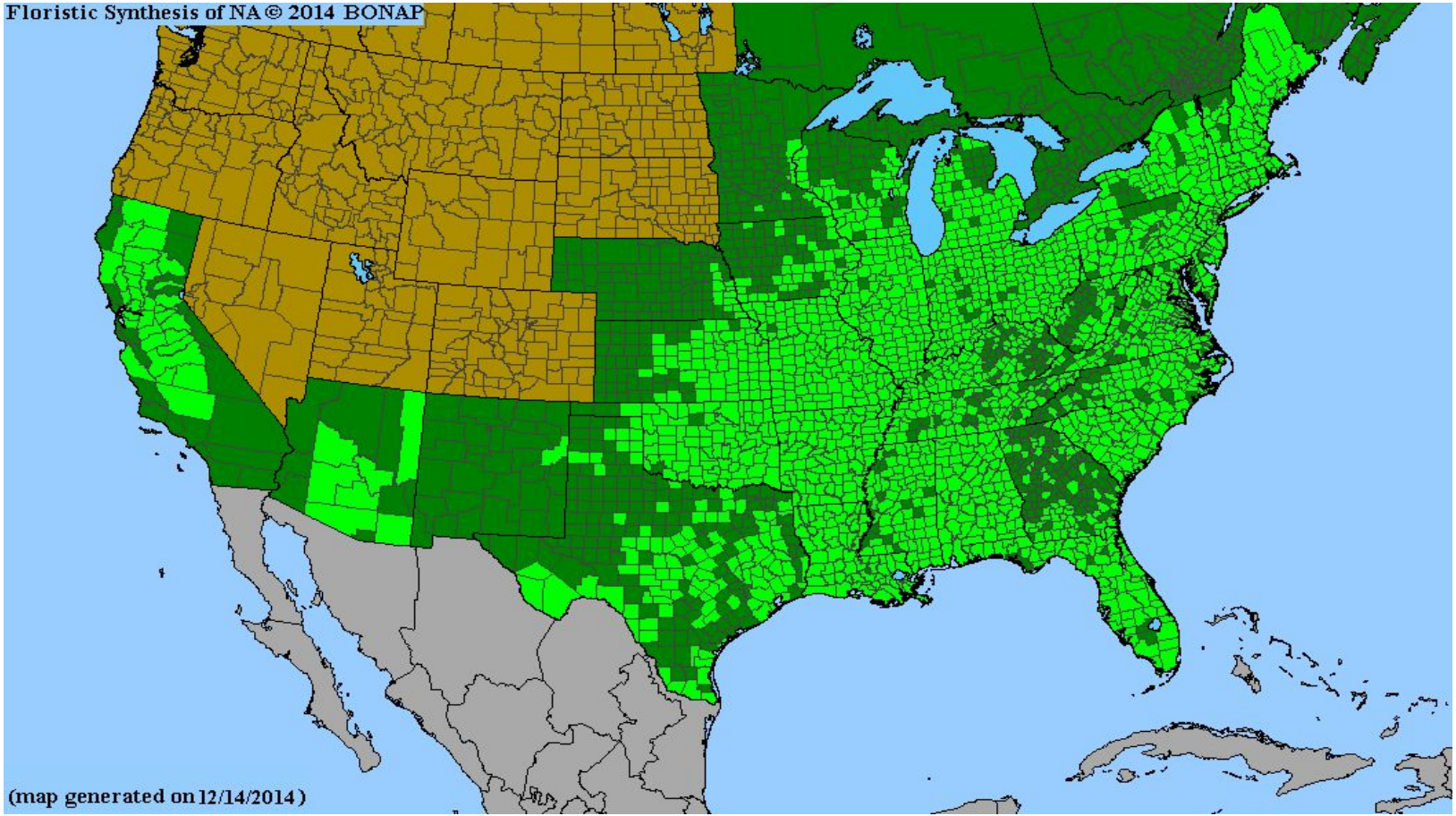
National Wetland Indicator Status

Region:	AGCP	AK	AW	CB	EMP	GP	HI	MW	NCNE	WMVE
Status:	OBL		OBL		OBL	OBL		OBL	OBL	OBL

This information is derived from the U.S. Army Corps of Engineers National Wetland Plant List, Version 3.1 (Lichvar, R.W. 2013. The National Wetland Plant List: 2013 wetland ratings. Phytoneuron 2013-49: 1-241). Click here for map of regions.

What kind of rain garden could you put this plant in?

Try it, Part IV (Image credit: bonap.net)



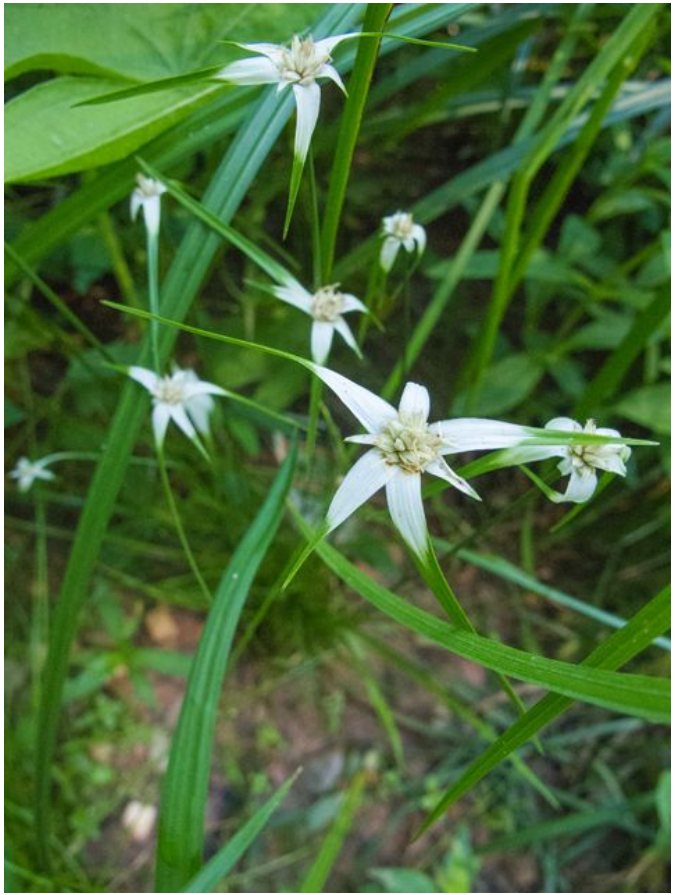
Plant lists: Grasses and Sedges

Function: move water and mechanical filtration

Site: tops of berms to anchor in place; throughout dry creek bed to shore up sides and move/direct water; accent plants in basin of rain garden

Suggested plants:

- Muhly grasses (big muhly, deer muhly, seep muhly, gulf muhly)
- Sedges (carex texensis, carex cherokeensis, Whitetop Sedge)
- Bushy bluestem and little bluestem
- Eastern gamagrass for deep clay soils
- Switchgrass for rocky soil



Plant lists: Small trees

Function: Tree roots absorb water efficiently. Stabilizing roots form a network with perennial grasses and herbaceous plants, preventing erosion. The following lists are non-exhaustive.

Suggested species for clay or worse drainage:

- Yaupon holly (Ilex vomitoria)
- Possumhaw (Ilex decidua)
- Wax myrtle (Morella cerifera)
- Dwarf palmetto (Sabal minor)

Suggested species for rocky soil or excellent drainage:

- Anacacho orchid (Bauhinia lunarioides)
- Red buckeye (Aesculus pavia)
- Roughleaf dogwood (Cornus drummondii)
- Paloverde (Parkinsonia aculeata)

Plant lists: Large, shrubby perennials

Function: absorb water, make soil spongy. Anchor and hold soil down. Attract pollinators and provide seasonal interest.

Species for clay and worse drainage:

- Texas mallow (Malvaviscus arboreus)
- Oakleaf hydrangea (Hydrangea quercifolia)
- Buttonbush (Cephalanthus occidentalis)
- Coralberry (Symphoricarpos orbiculatus)

Species for rocky soils and excellent drainage:

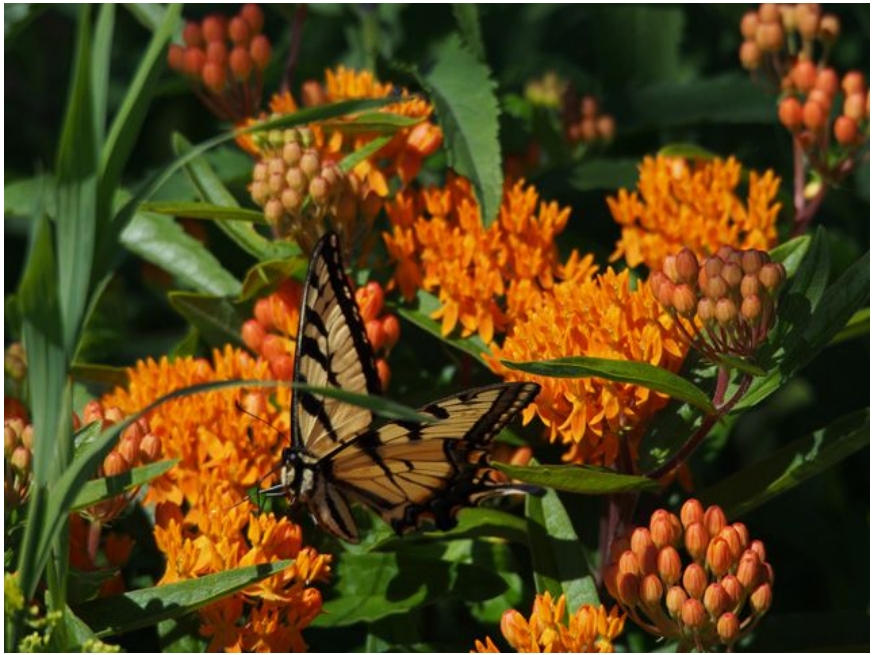
- Twistleaf yucca (Yucca rupicola)
- Autumn sage (Salvia greggii)
- Flame acanthus (Anisacanthus quadrifidus)
- Rock rose (pavonia lasiopetala)

Plant lists: small, herbaceous perennials

Function: absorb water, make soil spongy. Anchor and hold soil down. Attract pollinators and provide seasonal interest. Big, fibrous, often spreading root systems interlock with other plants.

Suggested species (non-exhaustive)

- Mealy blue sage (Salvia farinacea)
- Big Red Sage (Salvia pentstemenoides)
- Fall obedient plant (Physostegia virginiana)
- Fall aster (Symphyotrichum oblongifolium)
- Goldenrod (Solidago sp.)
- Frogfruit (Phyla nodiflora)
- Swamp milkweed (Asclepias incarnata)
- Butterflyweed (Asclepias tuberosa)
- Cardinal flower (Lobelia cardinalis)
- Winecup (Callirhoe involucrata)
- Bee balm (Monarda sp.)
- Echinacea



Maintenance and Care

Protect your living soil!

Water to establish

Weed diligently until plants are thick enough to act as mulch

Manage suckering and self-multiplying species

Leave the leaves!

Allow to be messy in winter to provide food for birds and habitat for sleeping butterflies, bees, and beneficial insects

Ask your questions

We have answers.

Citations

Mechell, J., & Lesikar, B. (2008, August). Rainwater Harvesting. Texas A&M Agrilife Extension.

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Nueces River Authority (2016, April). Your Remarkable Riparian. Third Edition.