



2019
Rainwater
Harvesting
Workshop

MYTH #1

Rainwater
harvesting is
ILLEGAL!



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**The State of Texas has laws that
encourage rainwater harvesting!**

Texas Tax Code §151.355 exempts rainwater harvesting equipment and supplies from state sales tax.

Texas Property Code §202.007 prevents a homeowner's association from prohibiting the use of rainwater harvesting systems.

MYTH #2

It doesn't rain
enough here.



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enough here.

Communities in the High
Plains Water District have
an average annual
precipitation of

19 inches!

How much rainwater can I catch?

Surface area of
catchment area (sq ft)

2,000 ft²

Rainfall Amount

X 1 inch

Conversion Factor

X 0.623

1,246
gallons

0.623 is the amount of water in gallons it takes to cover one square foot of space in one inch of water.

How much rainwater can I catch annually?

$$2,000 \text{ ft}^2 \times 19 \text{ inches} \times 0.623$$

23,674
gallons

Why should I collect rainwater?

You can offset your use of limited groundwater or municipal water supplies.

Rainwater is valued for its purity and softness.

- Near neutral pH
- Low in minerals, salts and chlorine
- Can have added nitrogen

Better manage stormwater runoff.

Rainwater Uses

- Outdoor irrigation
- Livestock
- Wildlife “guzzlers”
- Farm use: cleaning equipment and mixing with fertilizers/pesticides
- Fire protection
- Indoor use
 - Non-potable: Flushing toilets
 - Potable: Extensive treatment needed



Where do I start?

1. How do I plan to use this water?
2. What is my budget?
3. Where will the system be located?



How do I collect rainwater?

Passive rainwater harvesting in front yard of Lubbock home

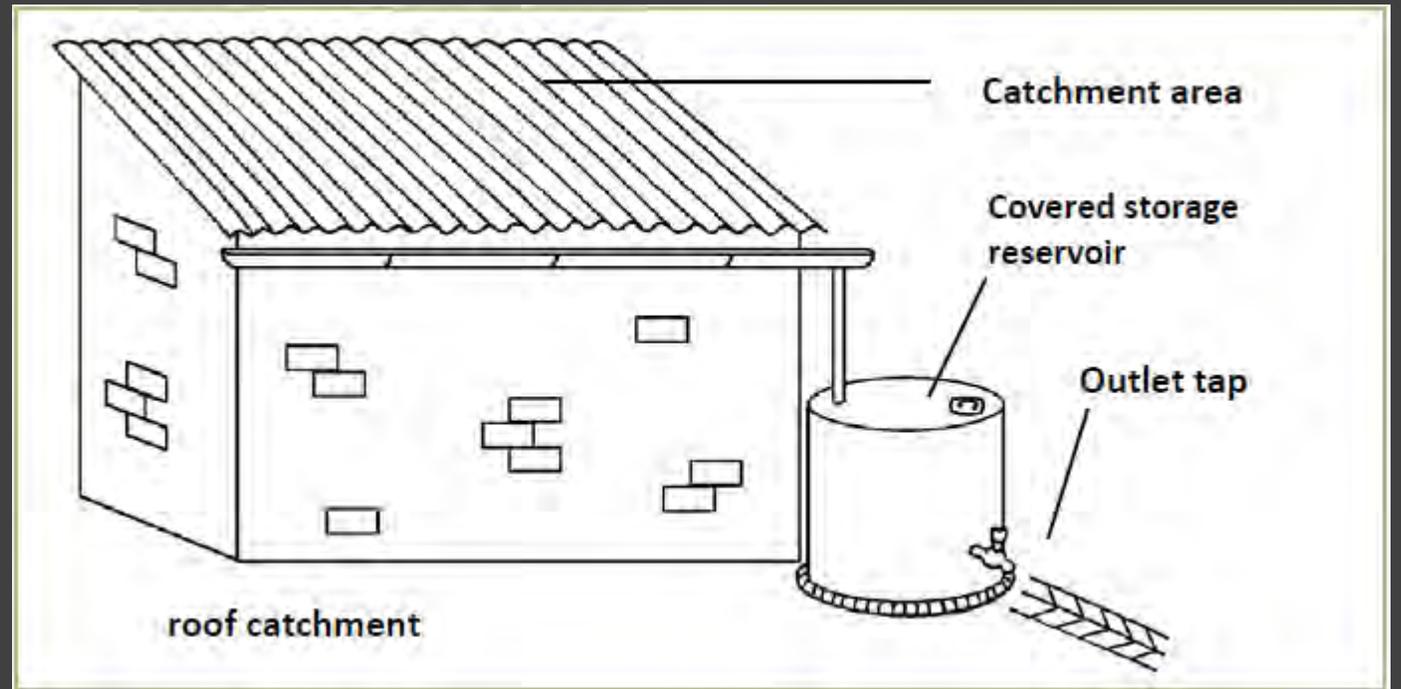


Large rainwater catchment barrels on South Plains College campus



Active System Components

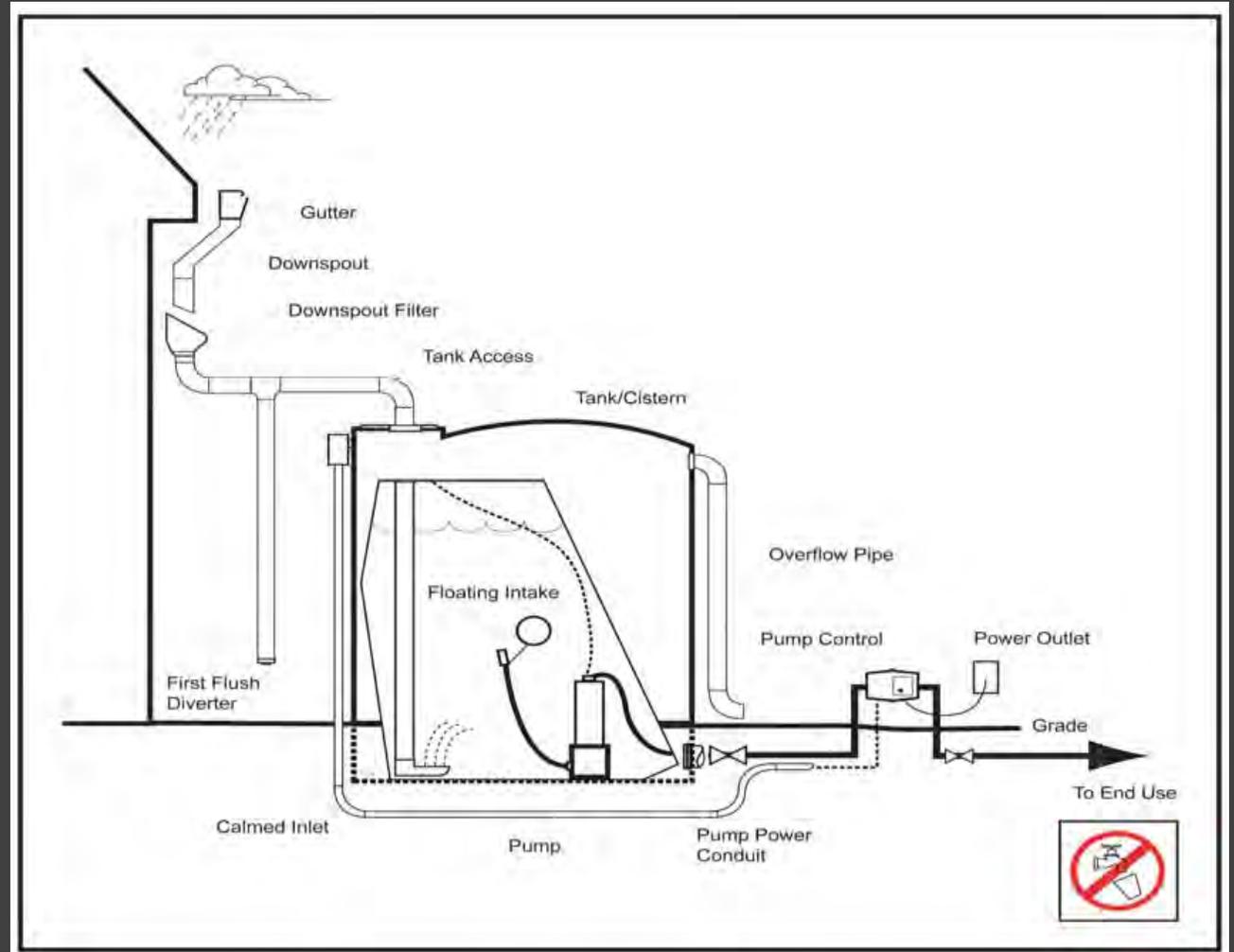
- Catchment area
- Conveyance system (gutters, downspouts)
- Storage
- Outlet



Active System Components



Advanced Active Systems



Catchment area

House, shed and barn roofs are most common catchment areas.

Roofing type doesn't matter for non-potable outdoor water uses.

- Unless it is treated with biocides

You can also divert water that falls on concrete driveways, parking lots and walk ways into underground tanks.



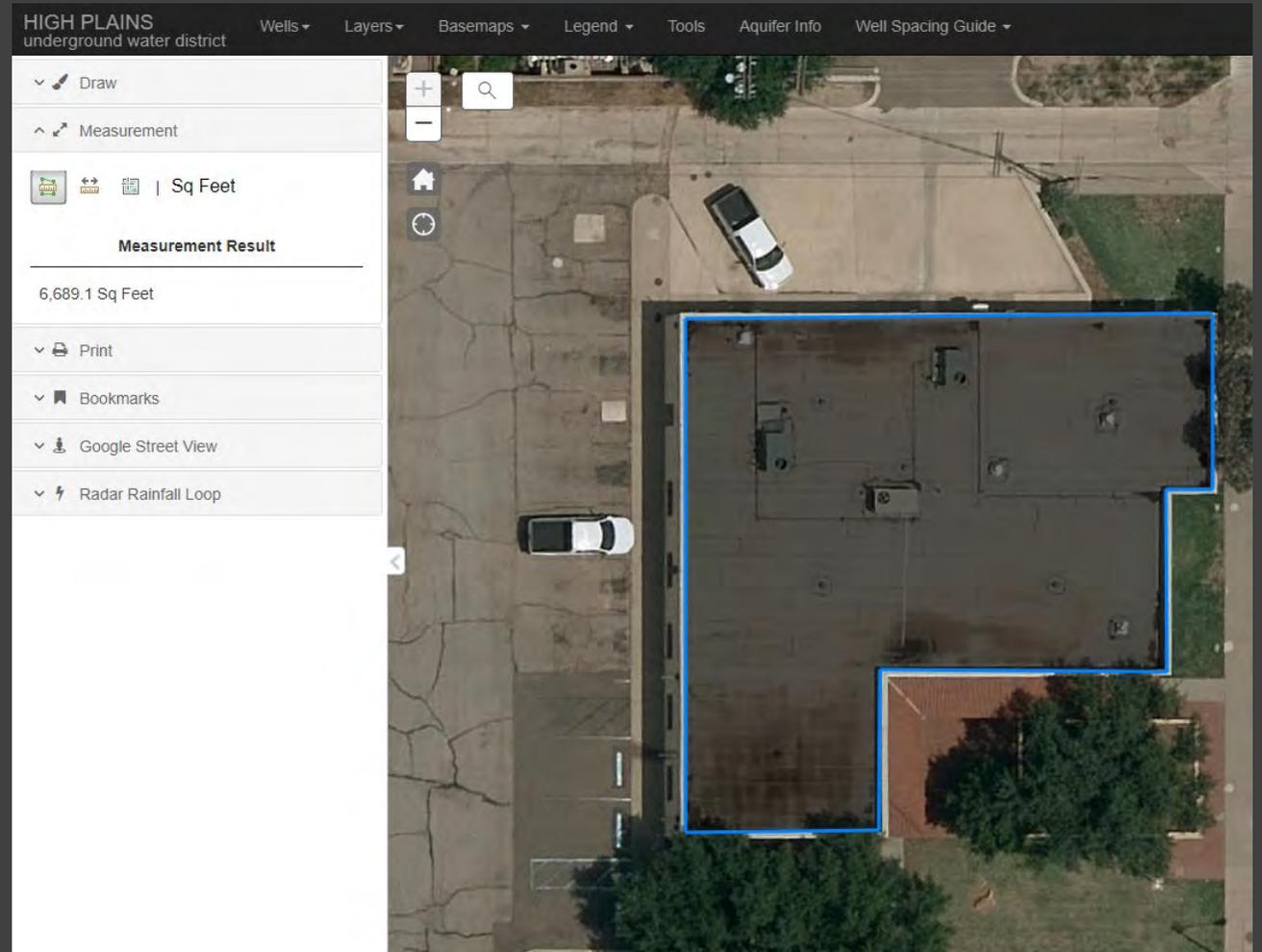
Catchment area

If you're not sure how you want to configure your catchment area and want to try different scenarios, check out online mapping tools.

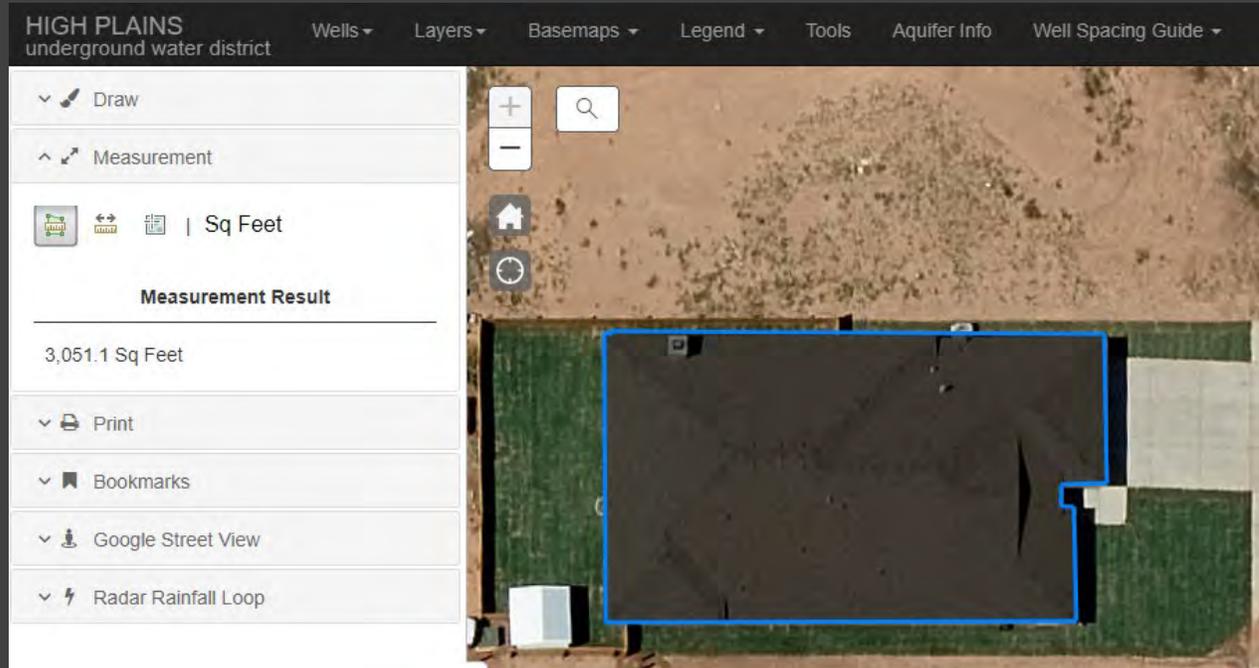
- Map.hpwd.org

PermaDesign calculates your annual potential catchment

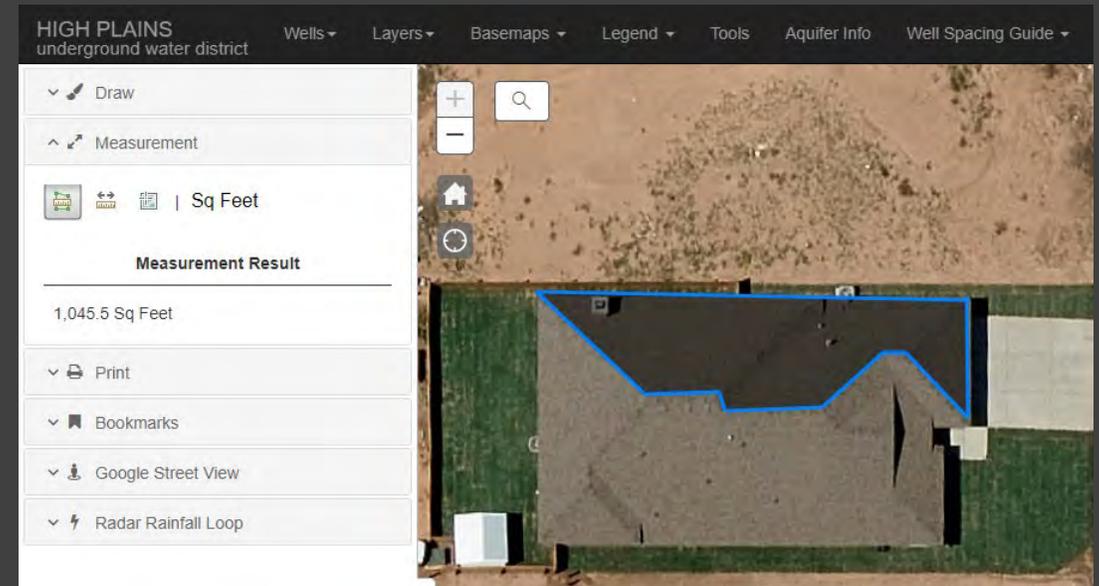
- permadesign.com/calculator



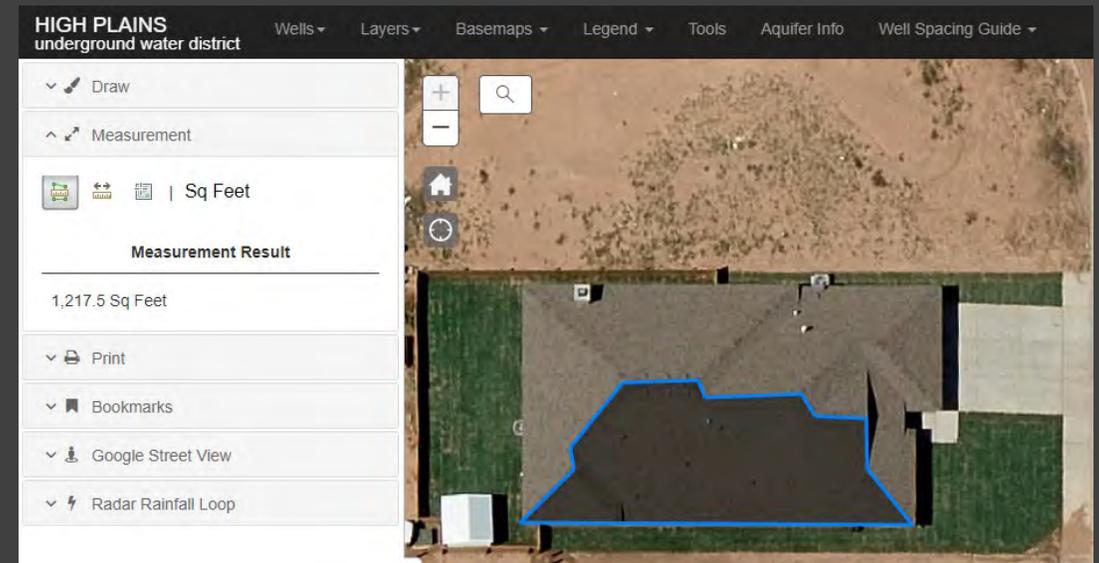
Catchment area



Total Roof Area: 3,050 ft²



North Roof Area: 1,045 ft²



South Roof Area: 1,215 ft²

Conveyance System

Make sure gutters are sized and sloped appropriately.

- Large steep roofs will need larger diameter gutters to move water.

Make sure downspout to tank is stabilized and protected from wind and sun.

Gutter Price Estimator:
www.fixr.com/costs/install-gutters



Rain Chains

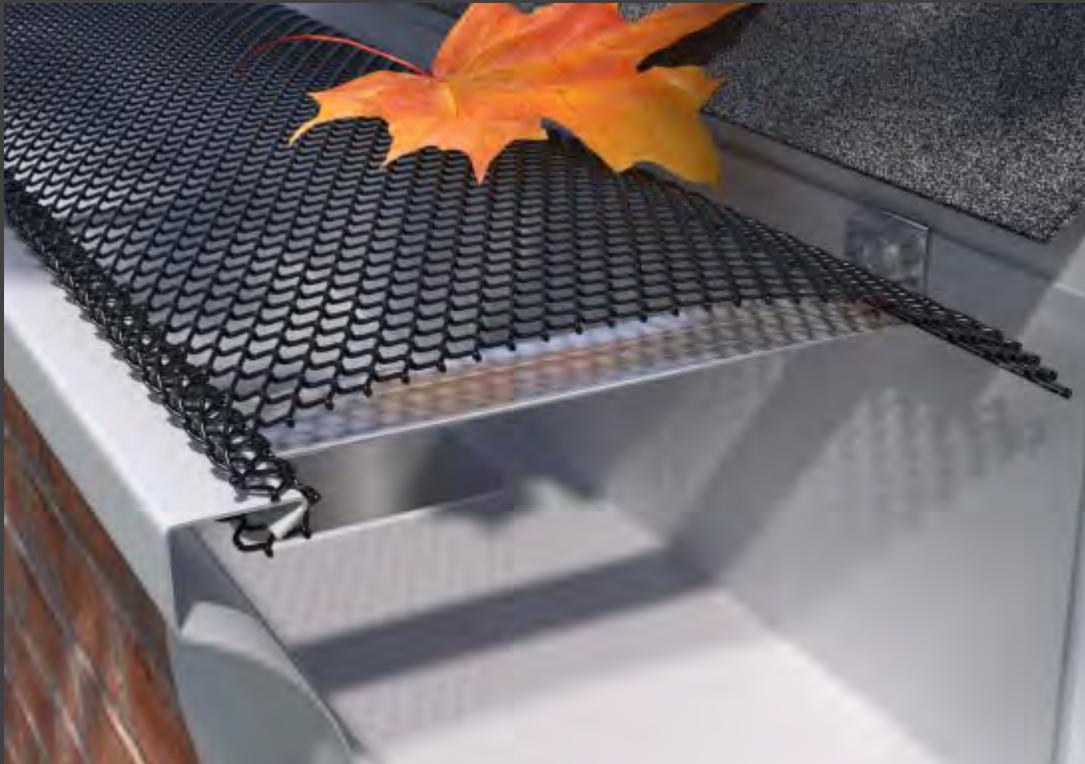
Used to guide water from the roof to the ground or to a rain barrel

Beautiful alternative to gutter downspouts



Debris Filter

Gutter Guards



Downspout Filters



First Flush/Roof Wash

- Used to catch the accumulated debris from the catchment area before rainwater is allowed to enter the storage tank.
- First flush diverters should remove approximately 10 gallons of water per 1,000 square feet of catchment area.
- Drain first flush pipe away from building foundations.



First flush diverter fitted with drip emitter at Wolfforth City Library.

Storage

System sizes can range from 10 gallons to thousands of gallons.

Different materials:

- Poly tanks
- Fiberglass
- Corrugated steel
- Galvanized tin
- Concrete tanks
- Underground tanks



Poly Tanks

Most cost-efficient

Choose darker tanks, as white tanks can encourage algae growth.

Most poly tanks are round, but some newer designs are slimmer and oval shaped.



Poly Tank Price Estimates

Size	Price
65 gallons	\$80-\$100
500 gallons	\$400
1,000 gallons	\$600
2,500 gallons	\$1,000
6,500 gallons	\$4,000
11,000 gallons	\$7,000

Fiberglass Tanks

Lightweight and long-lasting

More cost-effective for large
projects



Corrugated Steel and Galvanized Tin

Heavy duty

Aesthetically pleasing

Typically has an interior bladder for rainwater



Concrete Tanks

Above or below ground

Can be configured to many different sizes and even incorporated into building design elements



Underground Tanks

Great for cold climates

A pump is necessary.

Extra engineering is needed to ensure tank stability.



Underground Tanks

Basin lined with nonpermeable plastic and reinforced with milk carton-like cells.

Can be configured into any design to fit specific needs

Great for catching water from parking lots



Multiple Tanks

Great for adding on to your current system

Use a manifold so barrels/tanks fill and drain evenly.



Storage



Use a very fine screen on all in and out openings.

Tank Location

Place on level surface.

Where are your downspouts?

Where is your end use?

Do you want the tank to be seen from the road?

Will the system be protected from wind, sun and extreme temperatures?



Outflow

Space spigot several inches off of bottom of tank to avoid disturbing sediment.

Can be gravity fed and fit with hose or soaker hose

- Raise barrel off ground to provide a little bit of water pressure.

Can include pump



Pump

How will your pump be powered?

- Electricity
- Solar
- Gas or diesel

Permanently installed vs. portable

Floating intake



Overflow Pipe

Have place for water to overflow

- At least 10 feet from foundation of buildings

Perfect to flow into a passive rainwater harvesting system (rain garden)



The overflow at Samuel Jackson Inc. feeds a raingarden.



Potable Use

Maintain all sediment, UV and other filters

Make sure you test at least once a year or when there is a change in appearance, smell, or taste.

Make sure you follow all local, state and federal laws.

- ARCSA/ASPE/ANSI 63: Rainwater Catchment System Standards



RAIN GARDENS

SLOW IT. FLOW IT. GROW IT.

Passive Rainwater Harvesting

Collects the largest volume of rainwater at the lowest cost per gallon

Designs can help solve problems:

- Reducing flooding and erosion
- Help recharge groundwater
- Clean and naturally filter stormwater runoff
- Grow plants that provide shade, food, wood, windbreaks and visual screening



Basins

Depression in the ground meant to collect rainwater

If you are managing large amounts of water, consider additional basins downslope.

Can be used with or without berms



Creating a Berm

- Use as much of the soil taken from the basin as possible.
- Construct gentle side slopes so the garden blends into the surroundings.
- Compact the soil that forms the berm to create a sturdy barrier.
- Cover with vegetation or mulch to prevent erosion.



Location

Locate 10 feet from structures.

Have at least four feet of grass before the entrance to trap sediment and debris.

Choose a location in full to partial sun.

- Speeds evaporation and infiltration.



Size

Generally, basins are twice as long as they are wide, with the length along the contour of the land or along the slope.

Size and depth of your rain garden is dependent on the slope of the land, the amount of catchment area, and soil texture.

The best depth is 4 to 8 inches.



Land Slope	Basin Depth
4 % or less	3 to 5 inches
5 to 7 %	6 to 7 inches
8 to 12 %	8 inches

Soil

- If you have soil that is heavy in clay, create a large shallow basin to allow even infiltration.
- Improve infiltration:
 - Incorporate compost into the soil at the bottom of the basin.
 - Avoid soil compaction in basin.



Mulch

Add a thick layer of mulch to planting area.

Use rocks to control erosion caused by fast flows.

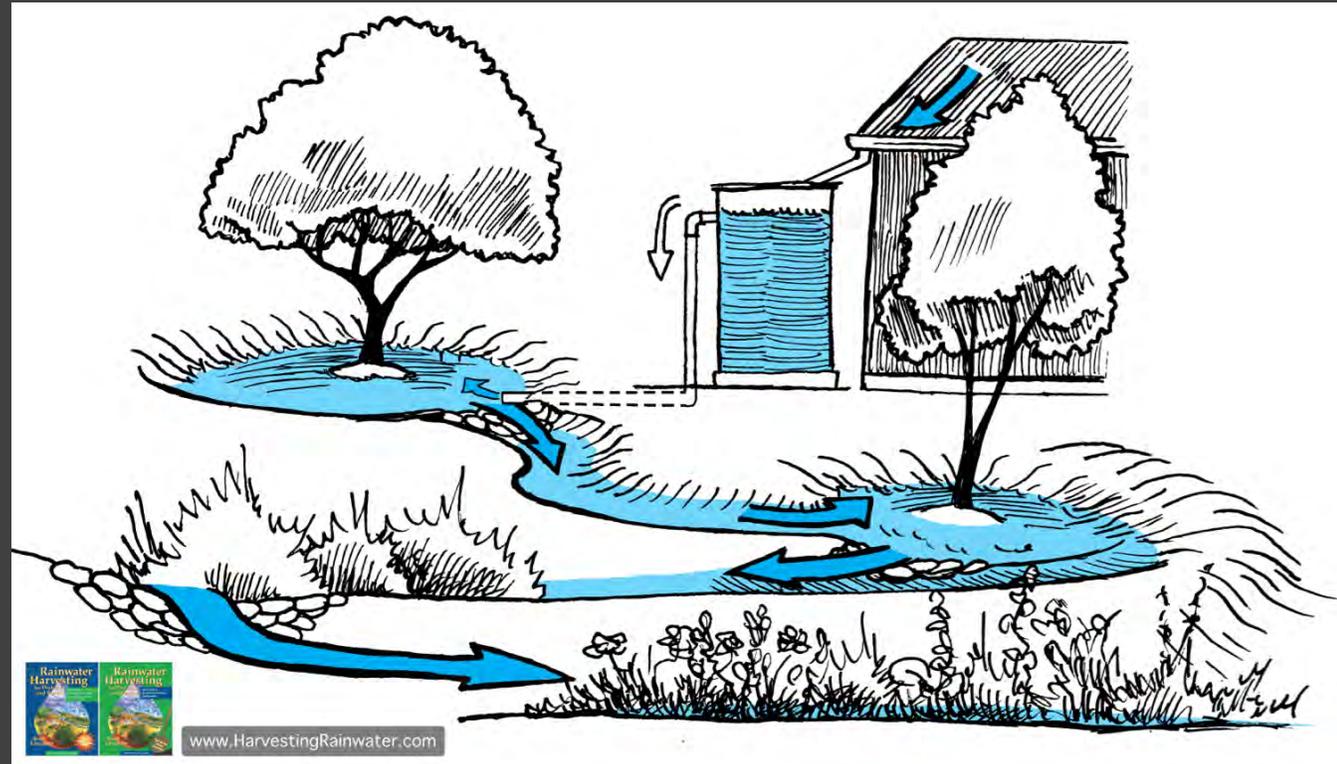


Overflow

Consider where excess water will go.

Make sure berms and other barriers will handle overflow.

Start development at the top elevation of the site and manage water in small increments downslope.



Planting

Use 1 to 2 year old plants that have established root systems.

For shallow basins, consider incorporating reseeding annuals.

Group plants by “microclimates”

- Water, sun, wind and temperature requirements



Plant Recommendations

Blue Grama

Sideoats Grama

Shenandoah's Switch Grass

Karl Foerster's Feather Reedgrass

Inland Sea Oats

Artemisia Powis Castle

Prairie Coneflower

Gaillardia

Black-eyed Susan

Yarrow

Knockout Rose



Maintenance

Rain Garden Maintenance

Add additional irrigation during dry periods.

Pull weeds.

Remove trash.



Rain Garden Maintenance

Cut back the plants in the spring.

Replenish mulch annually.

May need to re-dig the basin or flush dirt out after 10-12 years.



What about
mosquitos?



Maintenance

Clean gutters, screens, filters and first flush regularly.



Maintenance

Keep trees trimmed.



Maintenance

Flush out or insulate conveyance pipes and tanks during winter to avoid freezing.



Maintenance

Don't store water for extended periods of time.

Stagnate water will breed bacteria.



Maintenance

Install a backflow preventer if connecting into irrigation system or municipal supply.

Check local codes.



Codes, Ordinances and Standards

Follow local, state and federal codes and ordinances.

ARCSA/ASPE/ANSI 63: Rainwater Catchment System Standards

Call before you dig!

Helpful Resources

Texas A&M AgriLife Rainwater Harvesting
rainwaterharvesting.tamu.edu

American Rainwater Catchment Systems Association
arcsa.org

Rainwater Harvesting for Drylands and Beyond
<http://www.harvestingrainwater.com/>

Katherine Drury

806-762-0181

katherine.drury@hpwd.org

Examples

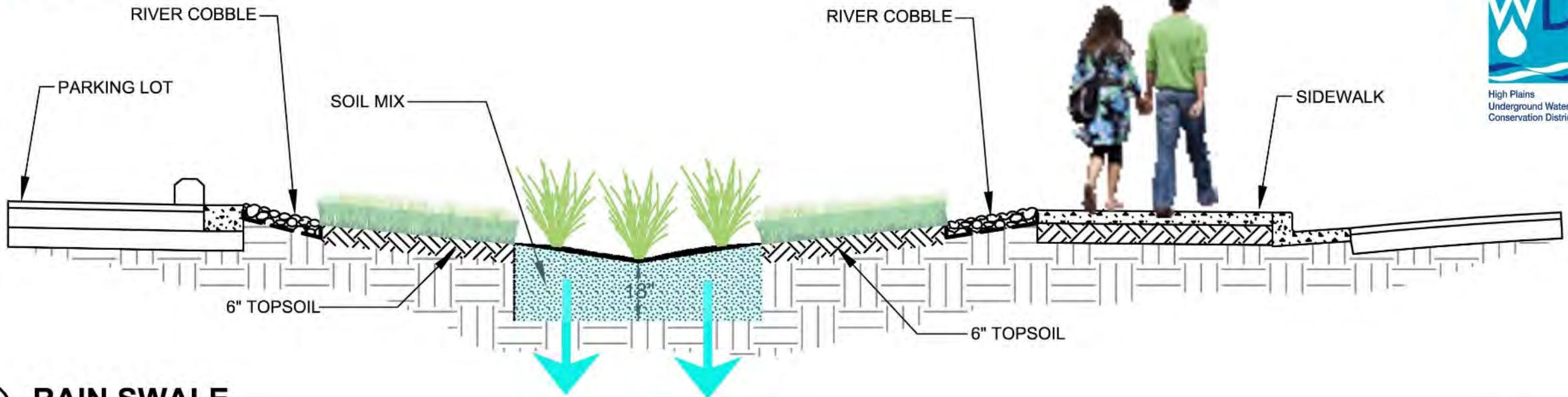
HPWD Office

- Lubbock, TX
- 25x150 ft swale
- Approximately 8,000 sq ft parking lot
- Designed to catch 1 inch of rainfall (5,000 gallons!)



HPWD Office- Lubbock

PRAIRIE WORKSHOP LLC
LANDSCAPE ARCHITECTURE + CONSERVATION PLANNING
www.prairieworkshop.com



RAIN SWALE
NOT TO SCALE

Lubbock Water Utilities Office

- 402 E Municipal Dr, Lubbock
- 1,500 gallon galvanized steel tank
- Wide array of drought-tolerant and native plants



South Plains College Garden

- Levelland, TX
- 5,000 gallon capacity
- Built for flood control and use in garden
- Transformation of poly to wood
- Equal water levels



Durham Ranch

- Abernathy, TX
- 18,450 catchment area from barns
- 6- 5,000 gallon tanks
- Gravity pipe system to cattle troughs
- Cost share funding through NRCS EQIP
- 2015 TWDB Texas Rain Catcher Award Winner



Atmos Energy

- Lubbock: 66th and Milwaukee
- Catch rainwater and air conditioning condensate
 - 3,400 gallons of condensate is reclaimed every month.
- More than 25,000 sq ft of catchment
- 30,000 gallon tank
- Used to flush toilets indoors and irrigate landscape
- Building is LEED Certified



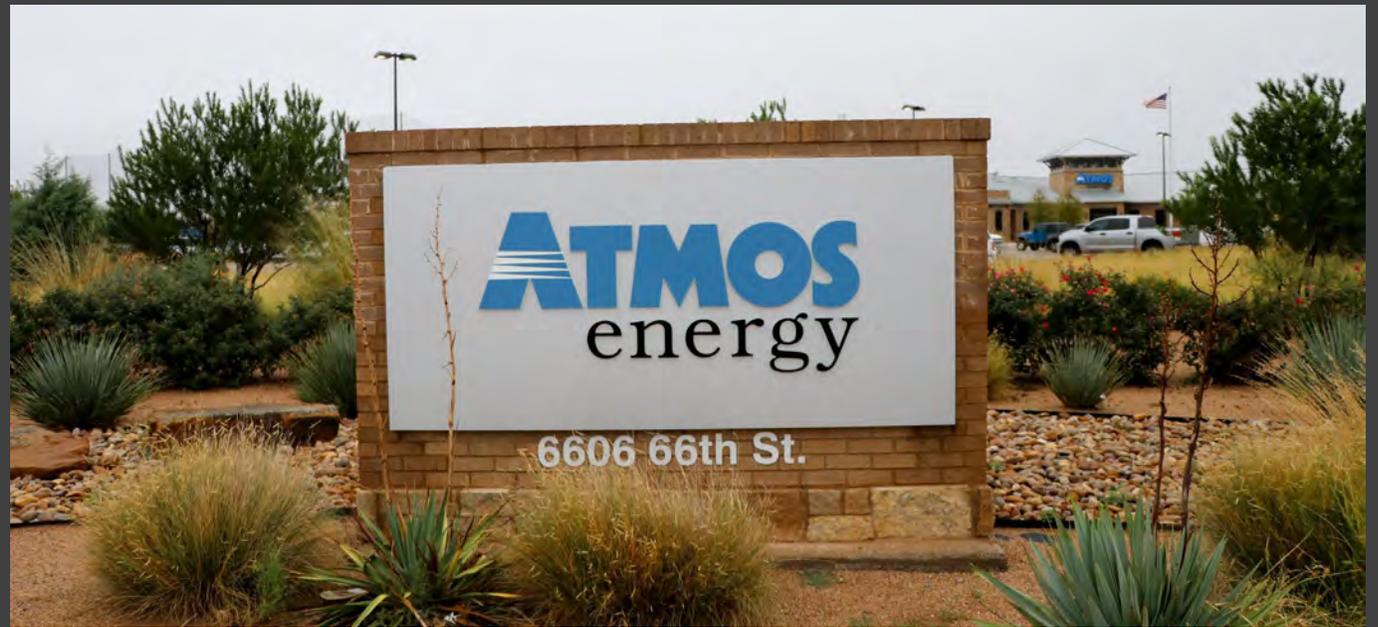
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Samuel Jackson Inc.

Lubbock cotton gin equipment manufacturer

48,000 sq ft of catchment area

90,000 gallons (6-15,000 gallon tanks)

Water is used indoors and to manufacture cotton ginning equipment

Overflow into rain garden

Haven't turned on wells in two years

2019 TWDB Blue Legacy Award Winner



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2019 TWDB Blue Legacy Award Winner



FirstBank Southwest

- Amarillo: Southwest 45th Avenue and Teckla Boulevard
- 36,000 square foot catchment area
- 26,600 gallons of storage
- Landscape irrigation
- 2019 TWDB Rain Catcher Award Winner



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Panhandle Greenhouses

- 11900 S Washington St, Amarillo
- System built in 2012
- 36,000 gallon capacity
- 1 inch of rain= 10,000 gallons
- In 2018, they caught 106,000 gallons of rainwater.



Sharing Hope Ministry

- 2300 SW 7th Ave, Amarillo
- More than 12,000 gallons worth of storage
- Rainwater used in community garden



George W. Bush Presidential Center

Dallas: SMU Campus

15 acre park

Large rain garden and native plant displays (90 species)

250,000 gallon underground cistern

Reduces potable water consumption for irrigation by 73% (6.126 million gallons) per year.



George W. Bush Presidential Center

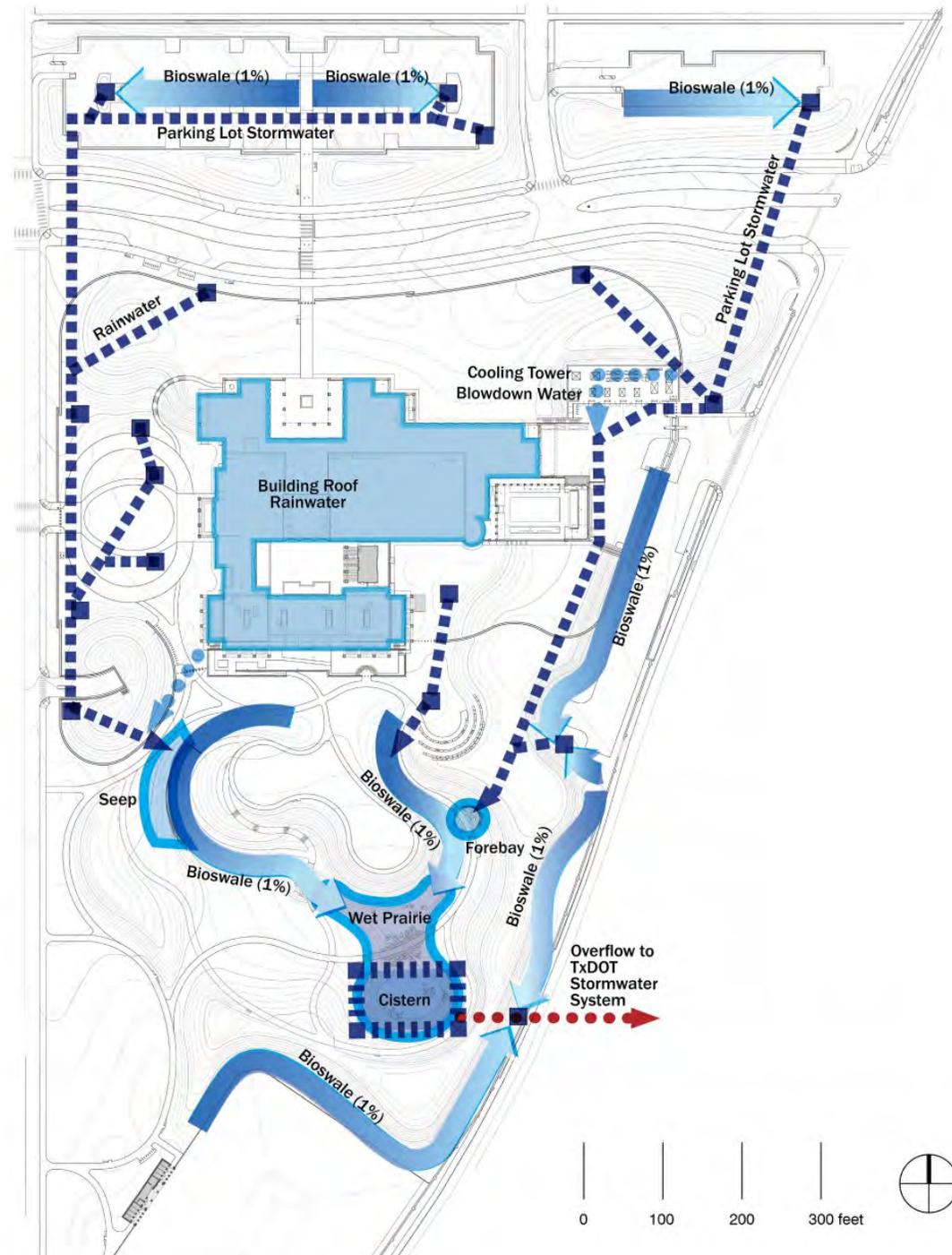
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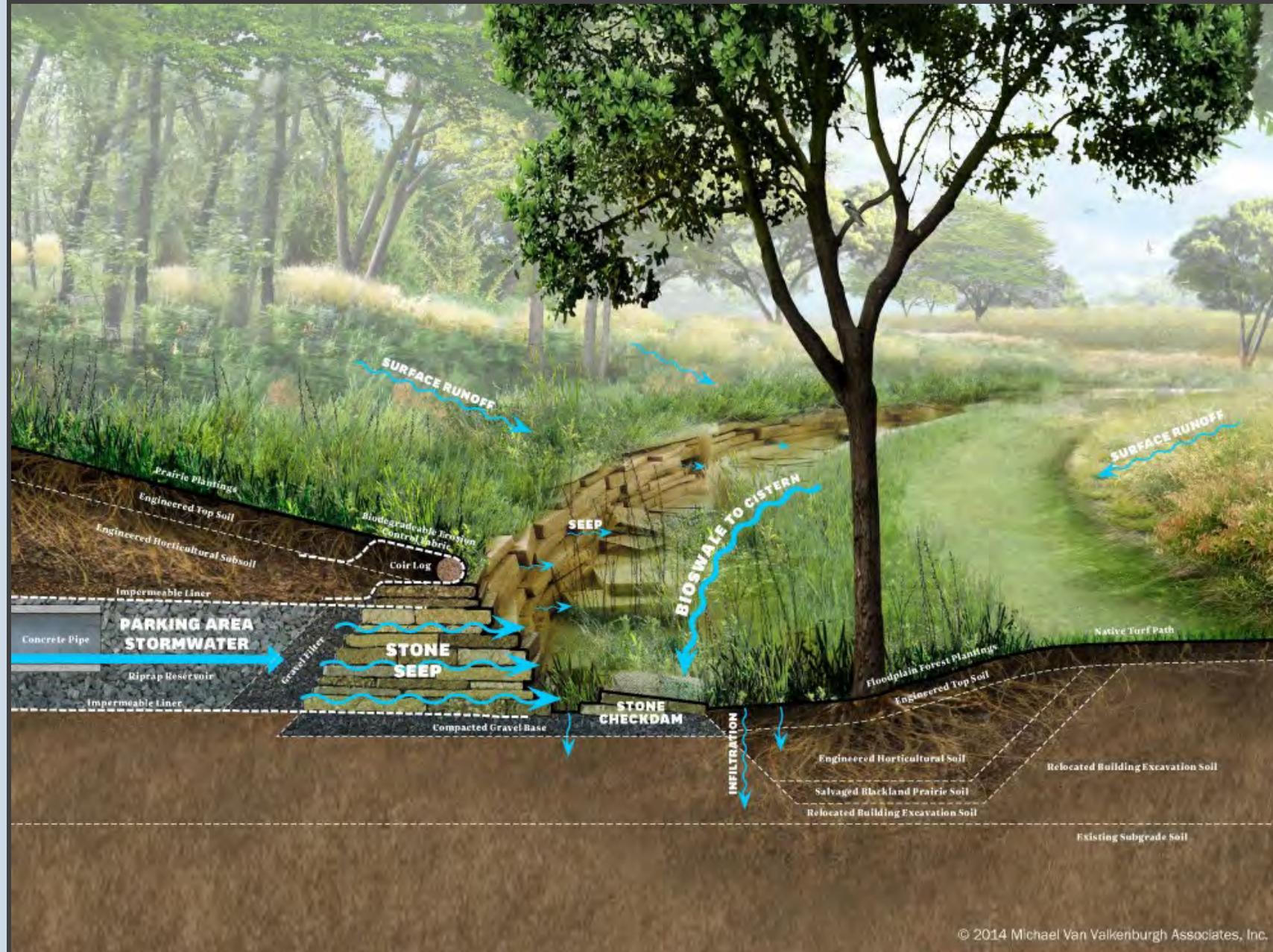
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