2019 Rainwater Harvesting Workshop

NOTES AND RESOURCES

HPWD

High Plains Water District

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HOW TO GET STARTED

What can I do with rainwater?

- 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

Things to consider before you start

- How do I plan to use this water?
- What is my budget?
- Where will the system be located?

A 2,000 square foot roof will yield approximately 1,200 gallons of water during a one inch rainfall event.

How much rainwater can I catch?

Multiply the catchment area size by rainfall depth (inches) by 0.623 to determine how much rainfall you can catch.

$$\left[\text{Catchment Area (square feet)} \times \text{Rainfall Depth (inches)} \times 0.623\right]$$

RAINWATER HARVESTING SYSTEMS

Active rainwater harvesting systems allow for the catchment of rainfall runoff from a roof or other surface and diverting it into storage tanks or barrels. These systems are a great addition to help Texas home and business owners conserve water resources and better manage stormwater runoff.

Catchment Area

- House, shed and barn roofs are common catchment areas.
- Roofing type doesn't matter for non-potable outdoor water uses.
- Consider diverting water that falls on driveways, parking lots and walkways into underground tanks or rain gardens.
- You don't have to gutter your entire roof. Consider catching rainfall from just a portion of your home.
- Online tools can help you map your roof:
  - Area tool at map.hpwd.org
  - permadesign.com/calculator

Conveyance System

- Make sure gutters are sized and sloped appropriately.
  - Large steep roofs will need larger diameter gutter to move water.
- Gutter Price Estimator: www.fixr.com/costs/install-gutters
- Rain chains are a beautiful way to guide water from the roof to a rain barrel.
- Consider installing gutter guards (a mesh used to keep leaves out of the gutter system) or a downspout filter (a device that is installed in the downspout that deflects leaves) if there are trees near your roof.

First Flush

- A first flush diverter is used to catch the accumulated debris and dirty water 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.
- Fit the bottom of the first flush pipe with a screw cap or drip emitter to ensure water can drain from the pipe.
- Drain first flush away from building.

This 300 gallon rainwater harvesting system at the Wolfforth City Library is fitted with a first flush diverter and downspout filter.

Storage

- Tanks range in material, size and price.
- Darker colored barrels keep light and algae out of your tank.
- Use fine screens on all in and out openings.

Poly Tanks

- Poly tanks are the most cost-efficient and widely used cisterns.
- Most poly tanks are round, but some newer designs are slimmer and oval-shaped.
- Tank sizes and prices range:

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

- These tanks are lightweight and long-lasting.
- Fiberglass is more cost-effective for large projects than poly tanks.

Concrete Tanks

- Concrete tanks can be placed above or below ground.
- These tanks can be configured to many different sizes and even incorporated into building design elements.

Underground Tanks

- Underground tanks can be buried to protect the tank from freezing temperatures or to conceal the rainwater harvesting system.
- Additional engineering is needed to ensure tank stability.
- A pump is necessary to recover water from underground tanks.
- Poly and concrete tanks can be buried underground.
- Underground tanks can also consist of a basin lined with nonpermeable plastic and reinforced with plastic milk carton-like cells. These types of tanks are great for catching water from parking lots and can be configured to fit specific site needs.

Two 2,500 gallon black poly tanks at South Plains College in Levelland were wrapped in cedar planks to make them more aesthetically pleasing.

Connecting Multiple Tanks

- Connect multiple tanks together to expand your current system.
- Use overflow hoses to divert excess water into a new barrel.
- Alternatively, connect barrels by using a manifold at the bottom of the tanks so they fill and drain equally.

Tank Location

- Install tank on a level surface.
- If you do not plan to use a pump, raise barrel 12 to 18 inches off the ground so gravity can help flow water from the tank.
- Consider these location factors:
  - 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 the bottom of the tank to avoid disturbing sediments when using the water.
- Water can be distributed through gravity by raising the barrel off the ground to provide water pressure.
- If desired, fit spigot with a hose, soaker hose or drip system.
- If you need more water pressure or you will be moving water uphill or far from your tank, consider a pump.

Overflow

- Allow excess rainwater to overflow into another barrel or into your landscape.
- Aim for overflow to be 10 feet or more from the foundation of a building.
- Consider installing a rain garden to catch overflowing water.

Six 15,000 fiberglass tanks at Samuel Jackson Inc. direct overflow into a large rain garden filled with native and drought-tolerant plants. These tanks provide enough water for this Lubbock cotton gin equipment manufacturer to build and clean their products, and run their day-to-day business operations.

RAIN GARDENS

Rain gardens, or passive rainwater harvesting systems, collect the largest volume of rainwater for the lowest construction cost per gallon. These designs can help reduce flooding and erosions, help recharge groundwater, clean and naturally filter stormwater runoff, and grow plants.

Basins

- Basins are depressions in the ground meant to collect rainwater.
- If you are managing large amounts of water, use more than one basin.
- Generally, basins are twice as long as they are wide, with the length of the basin along the slope of the land.
- The size and depth of your rain garden is dependent on the slope of the land, the amount of catchment area, and soil texture.
- The optimal depth for basins is 4 to 8 inches.
- Incorporate compost into the bottom of the basin to improve drainage.
- Basins can be used with or without berms.

Location

- Locate rain gardens 10 feet from structures and foundations.
- To avoid sedimentation and debris accumulation in the basin, plant several feet of grass before the entrance to the basin.
- Choose a location in full to partial sun in order to speed up evaporation.

Mulch and Planting

- Add a thick layer of mulch to the planting area.
- Use rocks to control erosion caused by fast flowing water.
- Group plants by microclimates, and consider plants' water, sun, wind and temperature requirements.
- Use 1 to 2 year old plants that have established root systems.
- Grasses and other hardy perennials are popular plant options for rain gardens.

Berms

- Berms are areas of raised ground that help contain and guide rainwater.

- Berm Construction:
  - Create the berm with as much of the soil 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.

The rain garden at the High Plains Underground Water Conservation District Office (29th Street and Avenue Q) can catch 5,000 gallons of rainwater.

MAINTENANCE

Maintenance is key to keeping active and passive rainwater harvesting systems in top performance.

Rainwater Harvesting System Maintenance

- Clean gutters, screens, filters and first flush diverters regularly.
- Keep nearby trees trimmed.
- Flush out or insulate conveyance pipes during winter to avoid freeze damage.
- Don't store water for extended periods of time. Stagnate water can breed bacteria.
- Install a backflow preventer if connecting a rain barrel into an irrigation system or municipal supply. Check local backflow prevention codes.

Rain Garden Maintenance

- Add additional irrigation during dry periods.
- Remove weeds and trash.
- Cut back perennials in the spring.
- Replenish mulch annually.
- Consider re-digging or flushing the collected dirt from the basin every 10 to 12 years, or when infiltration slows.

Mosquitos

- Mosquitos can enter any opening in a barrel larger than a window screen, and can breed in standing water in a puddle the size of a bottle cap.
- 24 to 48 hours after a rainfall event, check all areas of standing water for mosquito larvae. Use a white cup or container to scoop some of the water up, and check for larvae. Mosquito larvae, typically c-shaped, can be seen wiggling or bouncing just beneath the surface of the water.
- Use a mosquito dunk in barrels or rain gardens that have larvae.
- If you are having to use mosquito dunks frequently in your rain garden, consider making your basin wider and more shallow, or incorporate compost into the bottom of the basin to improve infiltration.

A cattle rancher in Abernathy, TX catches 30,000 gallons of rainwater for his cattle. These tanks are not equipped with pumps, but use gravity to supply water to troughs. One tank will provide enough water for 18 to 20 cows for 20 to 25 days. This system was partially funded by USDA-NRCS EQIP funding.

RESOURCES

- Ivey Rain Barrel FAQs and Installation Information: rainwatersolutions.com/collections/rain-barrels
- Texas A&M AgriLife Rainwater Harvesting, rainwaterharvesting.tamu.edu
- American Rainwater Catchment Systems Association, arcsa.org
- Rainwater Harvesting for Drylands and Beyond, harvestingrainwater.com
- Katherine Drury, katherine.drury@hpwd.org

WORKSHOP NOTES

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