



# Harvesting Water for Your Garden

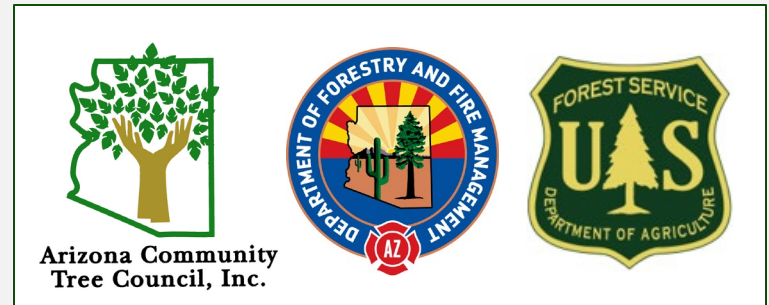
Presented by Jennifer Moreland, Master Gardener

**Master Gardeners of Yavapai County, Arizona  
Extension Cooperative Services  
University of Arizona**





# Introduction to Harvesting Water to Support Urban Trees



In collaboration with Arizona Community Tree Council,  
Funded by a grant from Arizona Department of  
Forestry and Fire Management, CCG 18-105



# Featuring an Insiders Tour of John's Rain Gardens





# Consider Rainwater Harvesting

“Residential water harvesting methods vary from simple earthworks designed to divert and catch surface runoff on the land surface to complex systems that collect water from roofs and other surfaces, direct it to storage tanks, and pump it to its destination. To begin rainwater harvesting, you must consider seasonal rainfall patterns, topography of your property, roof catchment area, water requirements of your landscape or garden, water storage (in soil or tanks), and your budget.”

Jeff Schalau

*(Now Retired)* County Agent from Agriculture & Natural Resources

Published in *Backyard Gardener*, May 27, 2015

<https://cals.arizona.edu/yavapai/anr/hort/byg/archive/waterharvesting2015.html>





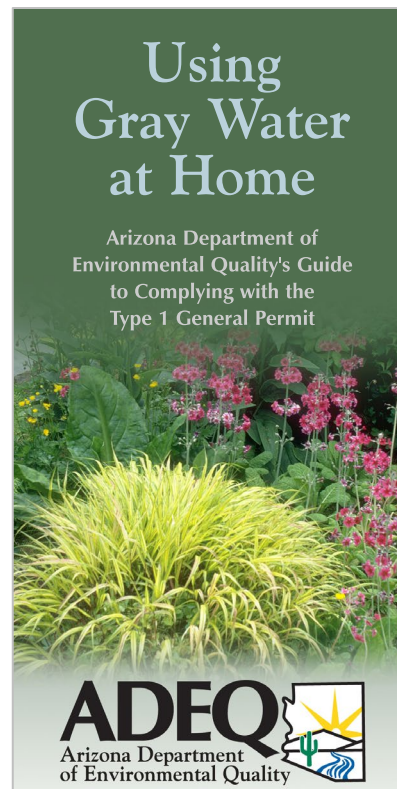
# Harvest free water to support trees and shrubs instead of watering with potable water



**RAINWATER**



**STORMWATER**



**GRAYWATER**



**AC CONDENSATE**

# Look at the difference harvested water supplies make!

Sonoran Co-Housing: Shady, abundant landscape supported by rainwater harvesting and graywater use

Conventional landscape: Less shade in a landscape that is watered with drinking water



Roger Road, Tucson, Arizona, photo dated 8/19/2018

# Beneficial Uses of the Water that Falls on Your Land

State of Arizona and Yavapai County allows Residential Land Owners to use water that falls on your property.

Slow Water Down = Less Erosion

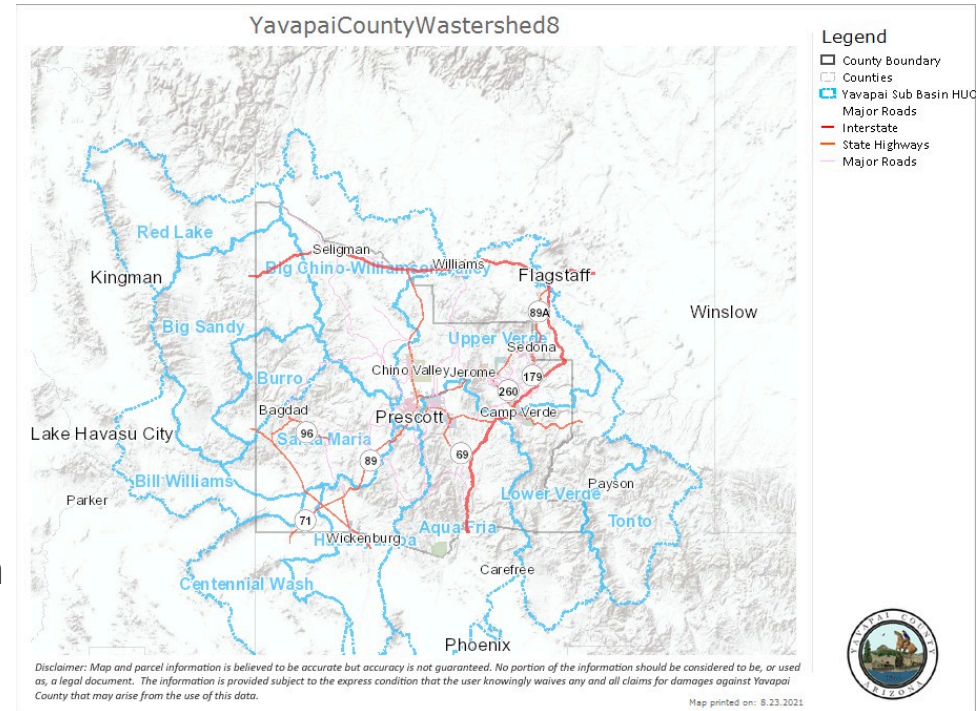
Spreading Water Out = Capture Sediment

More Infiltration into Soil = More Vegetation

Deeper Infiltration = Deeper Roots

Longer Infiltration = Recharge local aquifer

Collect Rainwater = Irrigate during Dry Season



# Does your City have Rainwater Harvesting Policies?

- **ASK!** If you live within city limits, it's better to ask before digging or storing. Most cities in Arizona are friendly to the homeowner on water conservation ideas.



Cottonwood General Plan 2025



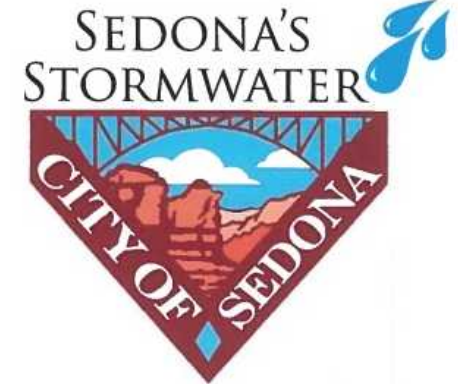
## Water Conservation Rebate Program

### Water Conservation Rebates & Incentives

<b>Rainwater Cistern (Active Rainwater Harvesting):</b> Requires the installation of a minimum 100-gallon capacity rainwater catchment tank or engineered cistern. Rainwater storage systems may not be interconnected with the City potable water system. Requires receipts of purchase, and photos of installed cisterns. Applicants must contact Public Works for guidelines prior to installation of the system.	\$0.50 per gallon of storage  \$500.00 maximum award
<b>Rain Garden (Passive Rainwater Harvesting):</b> A minimum of 50 sq. ft. must be installed with a minimum of 400 sq. ft. of stormwater redirected from the roof. Only native plants may be planted in rain garden, but catchment may also be rock lined. Rebate is for basin footprint. Applicants must contact Public Works for guidelines prior to installation of the system.	\$3.00 per square foot of basin footprint  \$500.00 maximum award

<http://www.prescott-az.gov/water-sewer/water-conservation/rebate-program/>

City of Sedona and City of Cottonwood both have friendly plans to water harvesting but city permits might be required if affecting Stormwater drainage.



## KEEP IT CLEAN

AS A RESIDENT YOU PLAY AN IMPORTANT PART!

Pollution of stormwater runoff is often caused by the daily activities of residents and tourists.





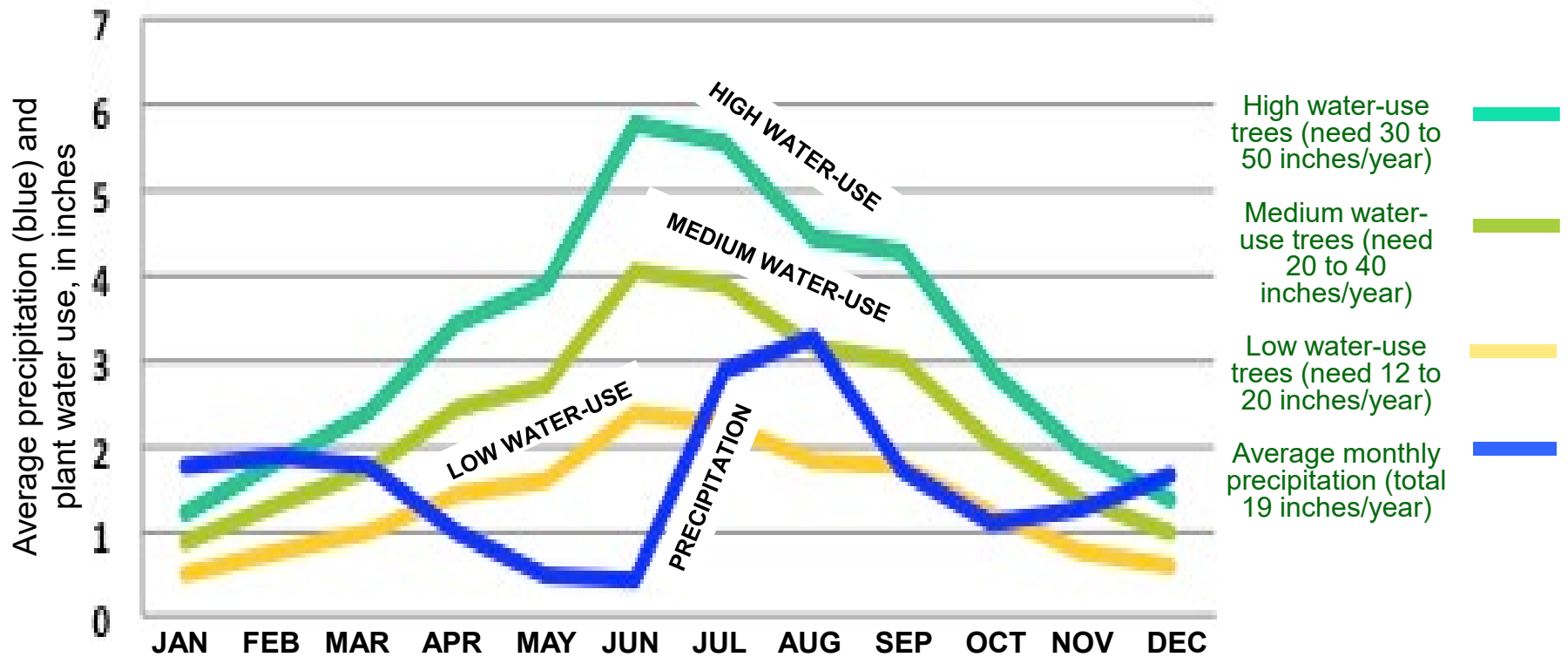


# How much precipitation do you receive?

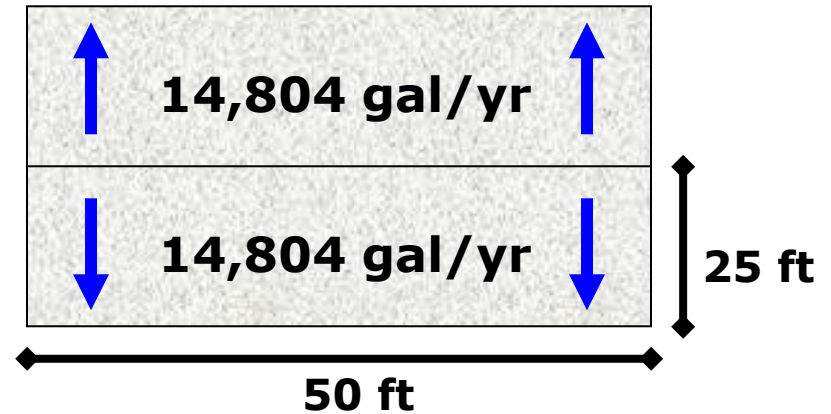
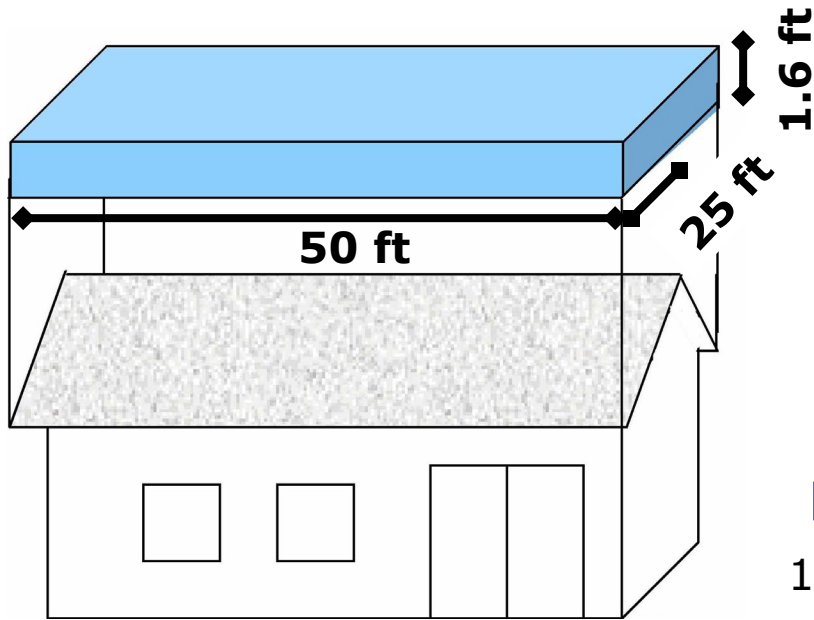
Yavapai County's average annual precipitation is 19 inches

Graph compares monthly average precipitation (blue) to monthly plant water needs. Precipitation is lowest in April to June, when trees need rain the most.

**MONTHLY YAVAPAI COUNTY PRECIPITATION AND PLANT WATER NEEDS**



# How much Rain can you Harvest from a Yavapai County roof?



*NOTE: The volume of rain falling on a roof is not affected by the roof's pitch*

## Rain falling on half the roof:

19 inches of precipitation/year in Yavapai County = 1.6 feet/year

1.6 ft depth of rain x 50 ft length x 25 ft width = 1,979 cubic ft of rain per year

1,979 cubic ft x 7.48 gallons/cubic ft of water = 14,804 gal/year

**Rain falling on the full roof =  
29,608 gallons per year!**

# Rainwater Harvesting

*Harvest rain that falls directly  
on your  
roof and yard*

FREE & CLEAN

Plant water where you need it

Your Sub-Watershed is part of  
the larger whole

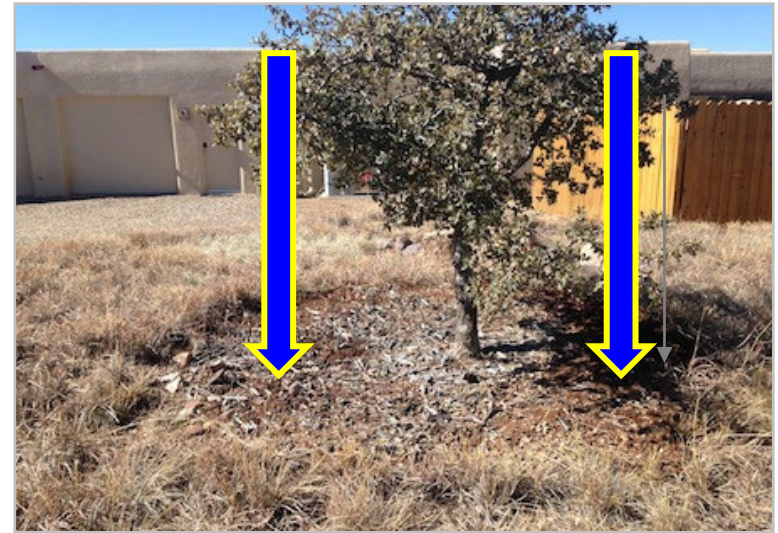
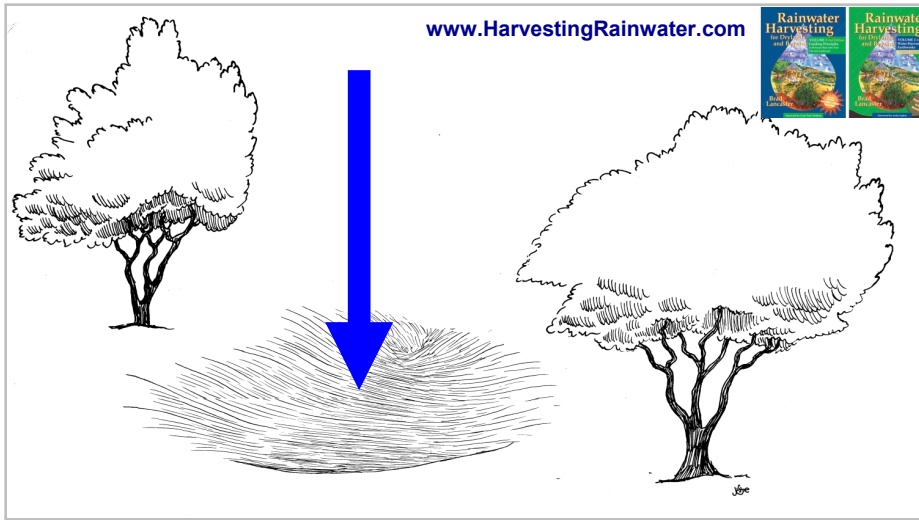
*Rainwater can be stored in  
**earthworks** (shaped earth)  
and in **tanks** (cisterns)*



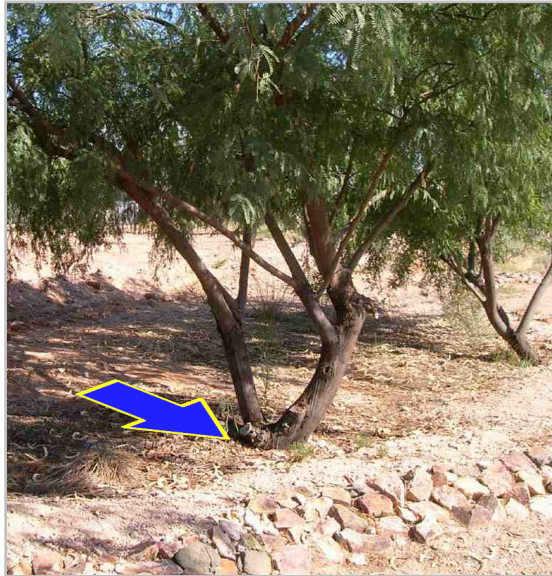
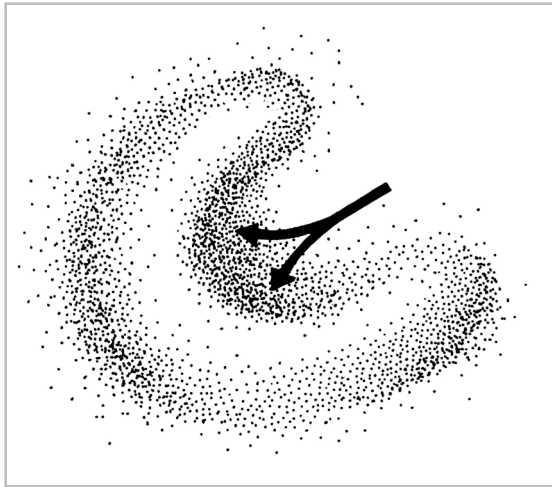
Earthworks: Soil shaped to harvest and infiltrate water.  
Also called rain gardens and “passive water harvesting”



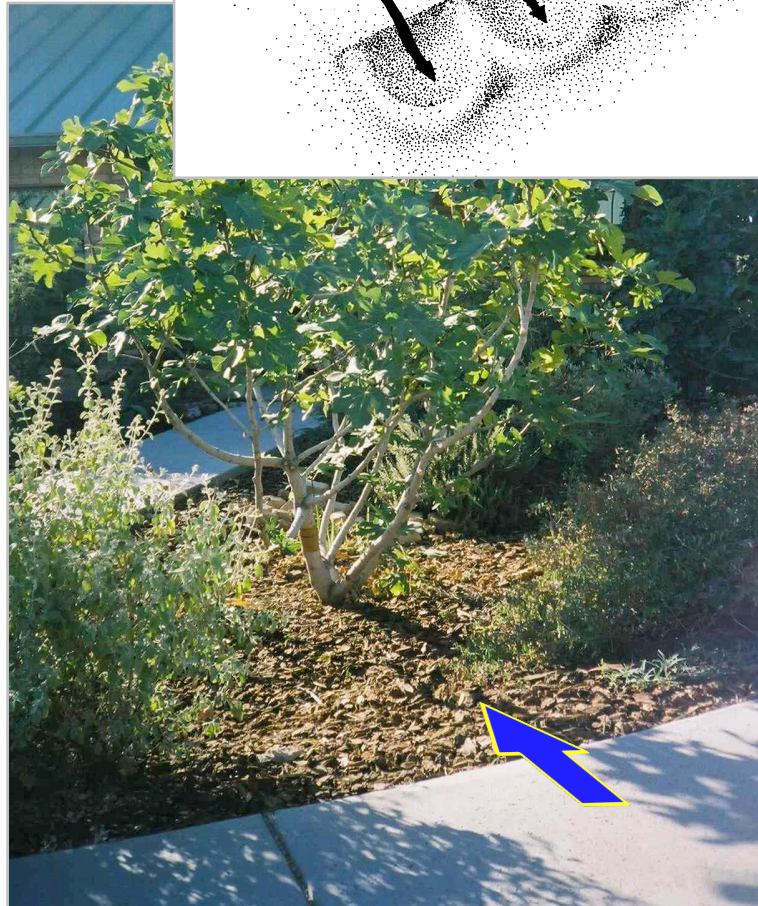
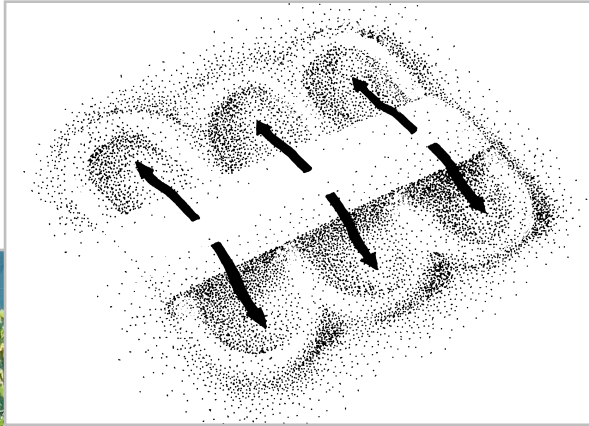
# Earthworks: Microbasins without berms, built on flat land



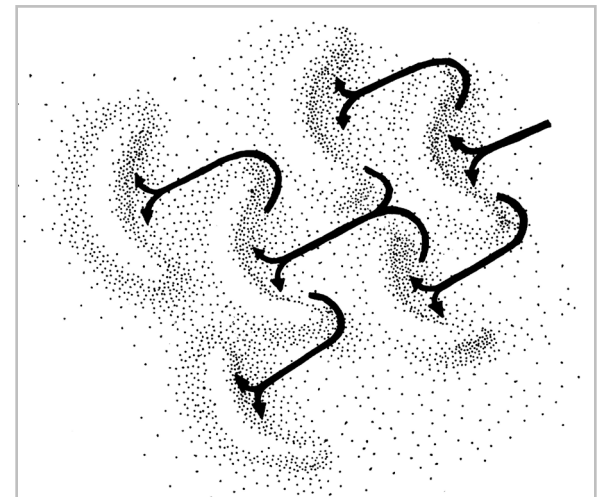
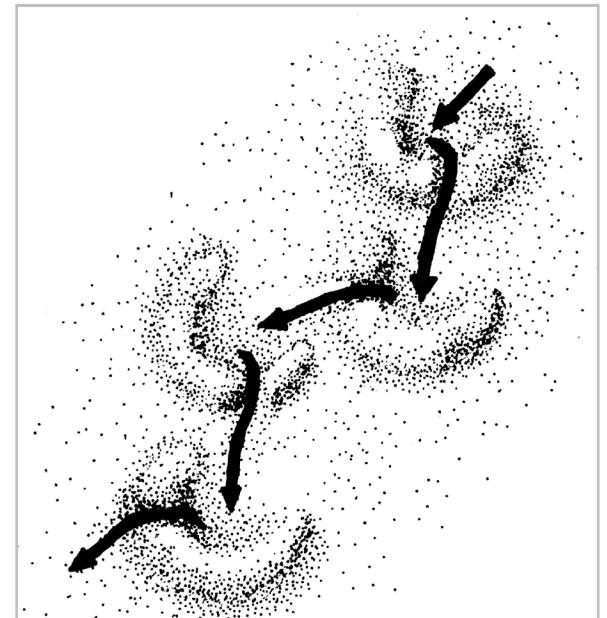
# Earthworks: Microbasins with berms on gentle slopes



# Earthworks: Microbasins next to raised paths

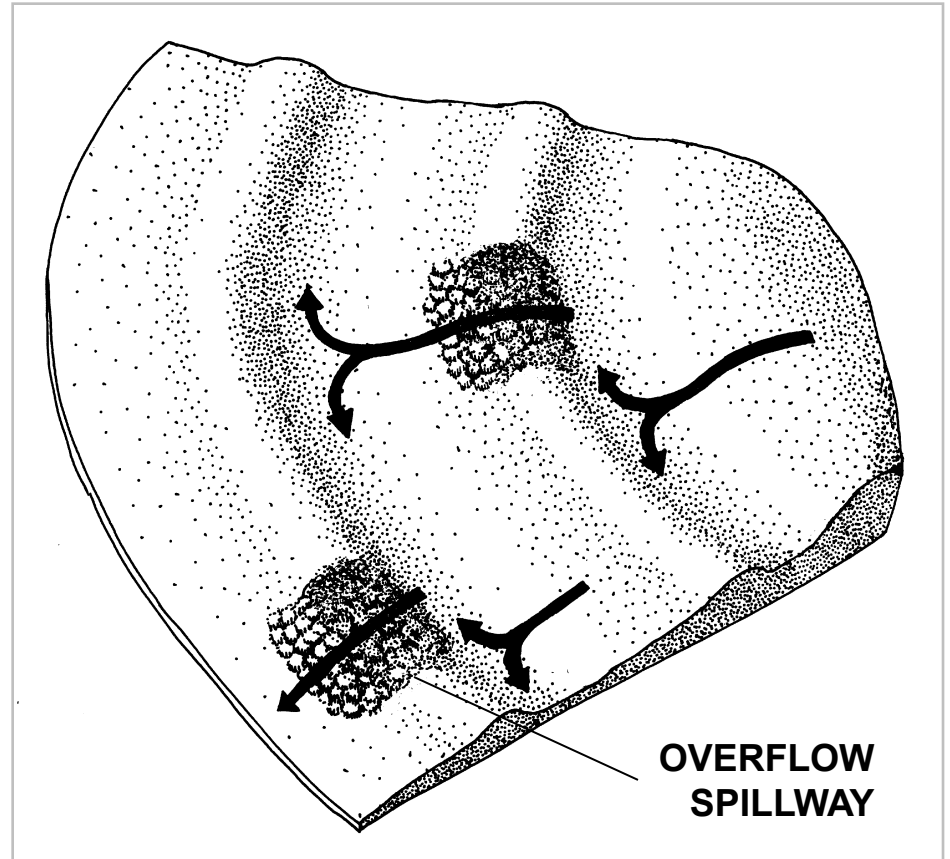


# Earthworks: Microbasins in series, on slopes

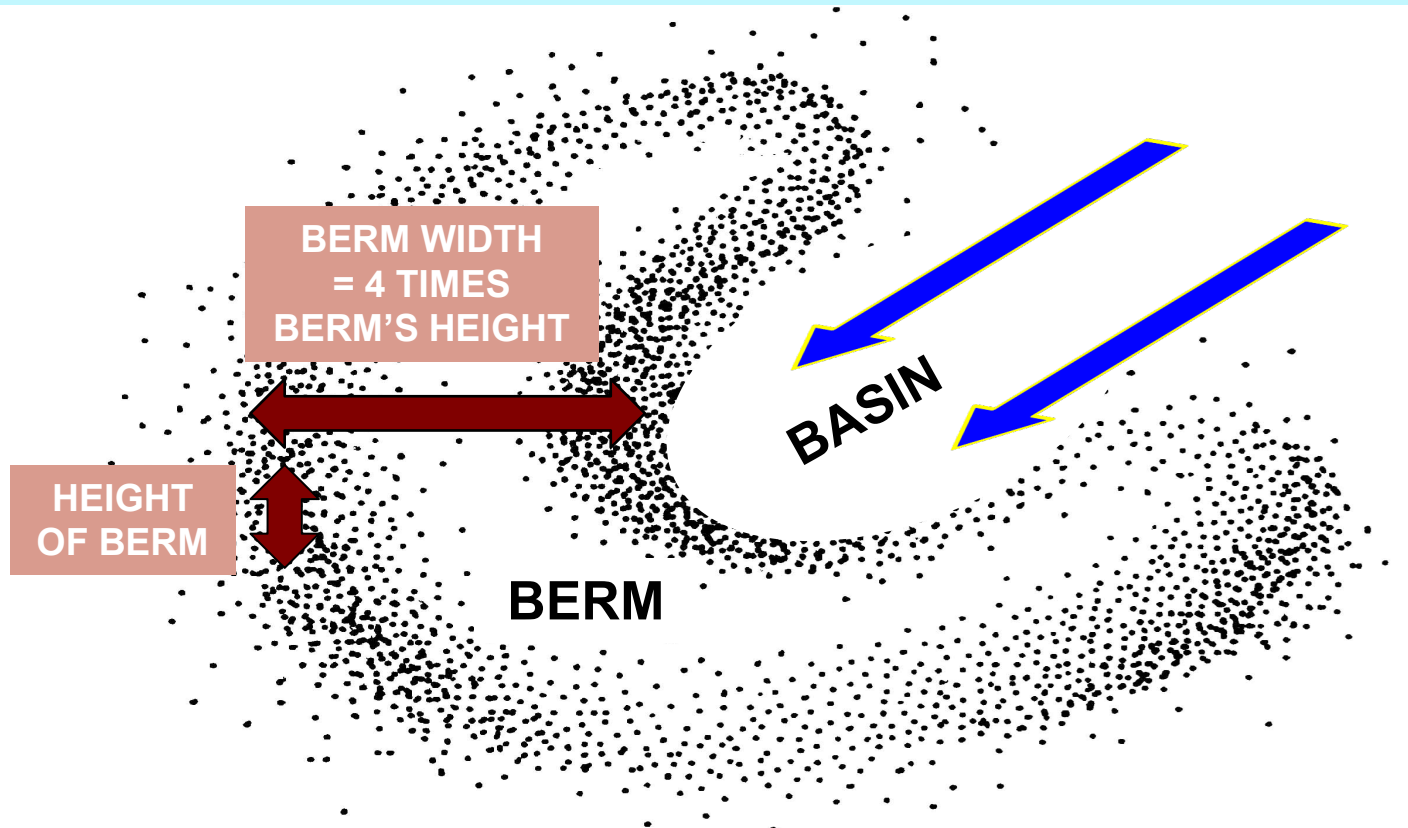




# Earthworks: Swales on gently sloped land



# Basic earthwork construction



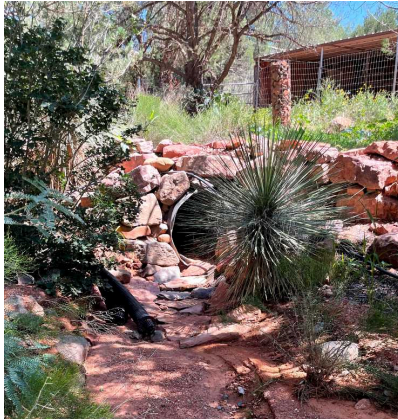
- Dig when soil is moist (not when soil is dry and hard)
- Build berms four times as wide as they are tall
- Compact the soil of the berm
- Do *not* compact the bottom of the basin
- Make sure the slope going into the basin is gentle



# Example: John's Arroyo Water Harvesting (Passive)

Arroyo run-off waters crosses lower southeast corner of lot acreage

Culvert directs gushing water off mountain arroyo entering property on eastern property line.



Culvert exiting property on southern property line.



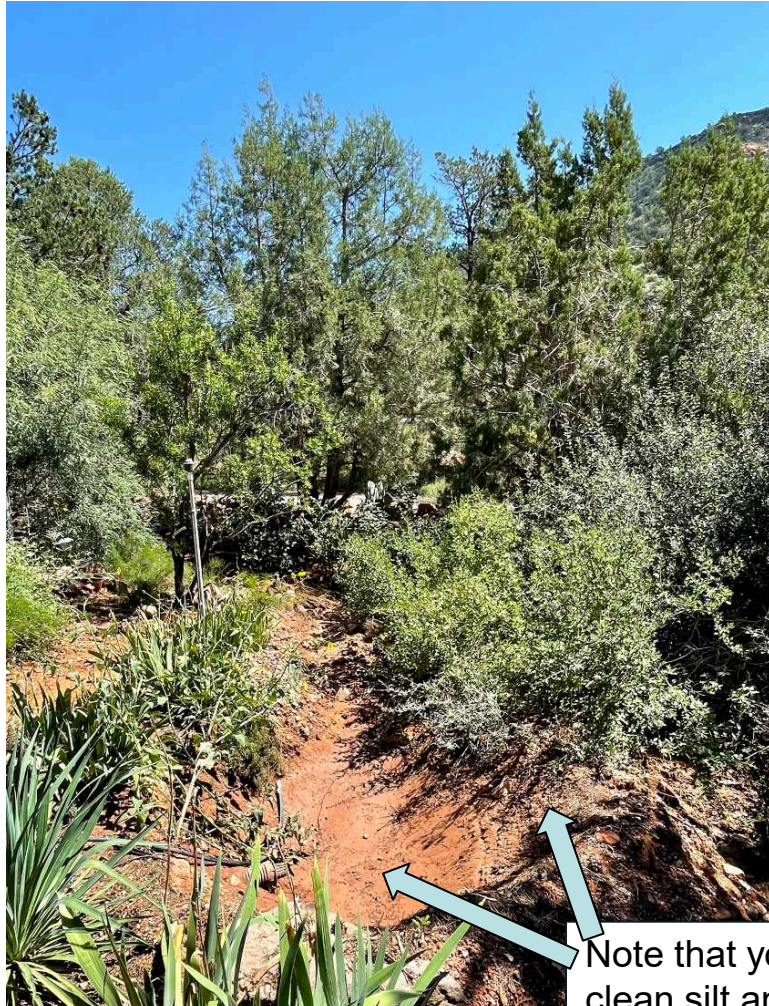
**SWALE** moves water down to a small **BASIN** with a rock & sediment **BERM** and an **OVERFLOW** to an exiting **SWALE**.





# Example: John's Arroyo Water Harvesting (Passive)

Curved Swales and Basin slows down water for soil infiltration.



(left) New vegetation added...  
Desert Willow, Lilacs, Buddleas,  
Irises, Yuccas

(below) New Native Shrubs  
found the residual sediment...  
Serviceberry, Desert Scrub Oak



Note that you may need to  
clean silt and weeds from  
the swale and basin  
structure to keep it from  
filling up.



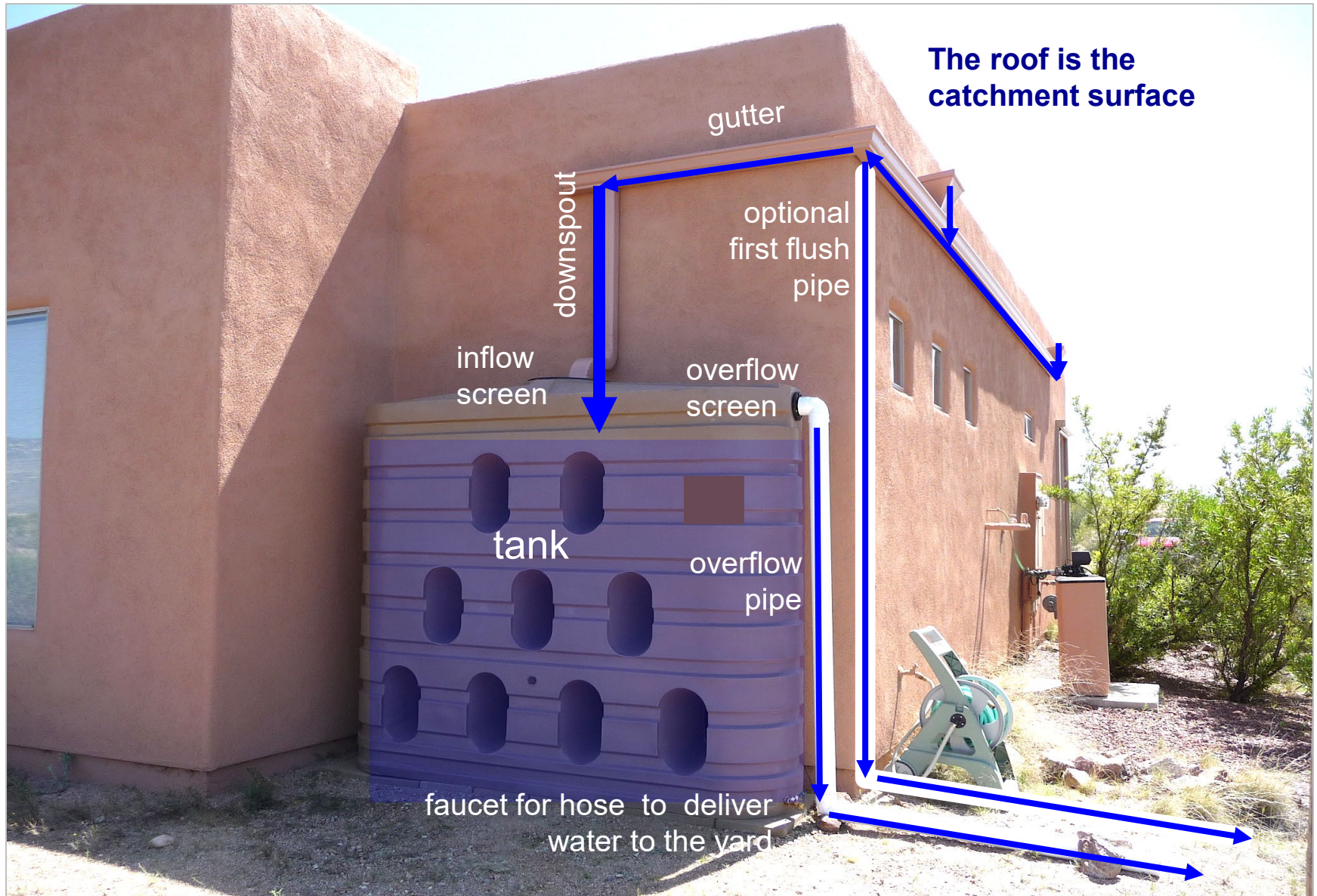
# Rainwater Tanks (also called cisterns and “rain barrels”)

Tanks store water collected from roofs for later use



Photo Credit: Southern Arizona Rain Gutters

# Typical components of water harvesting tanks



# Tank filled with rainwater that enters through underground pipe

Metal tank with plastic liner fills from a roof downspout and an underground pipe that is routed up into the bottom of tank



# A variety of above-ground tank materials and sizes





# Example: John's Roof Water Harvesting (Active)

The southeast half of the roof water is captured into 3 tanks setup in serial.

Gutter initially routes the roof water through a First Flush Diverter.

*\*Screening is very important starting at the top.*

The diverted dirty water is piped underground to a open BASIN.

The cleaner water flows into the polyethylene Tank 1.

Tank 1 overflows by gravity through another buried pipe into Tank 2.

...



# Example: John's Roof Water Harvesting (Active)

The southeast half of the roof is captured into 3 tanks setup in serial.

Tank 2 overflows by gravity downhill into Tank 3.

**Max 750 gallons of captured roof water!**

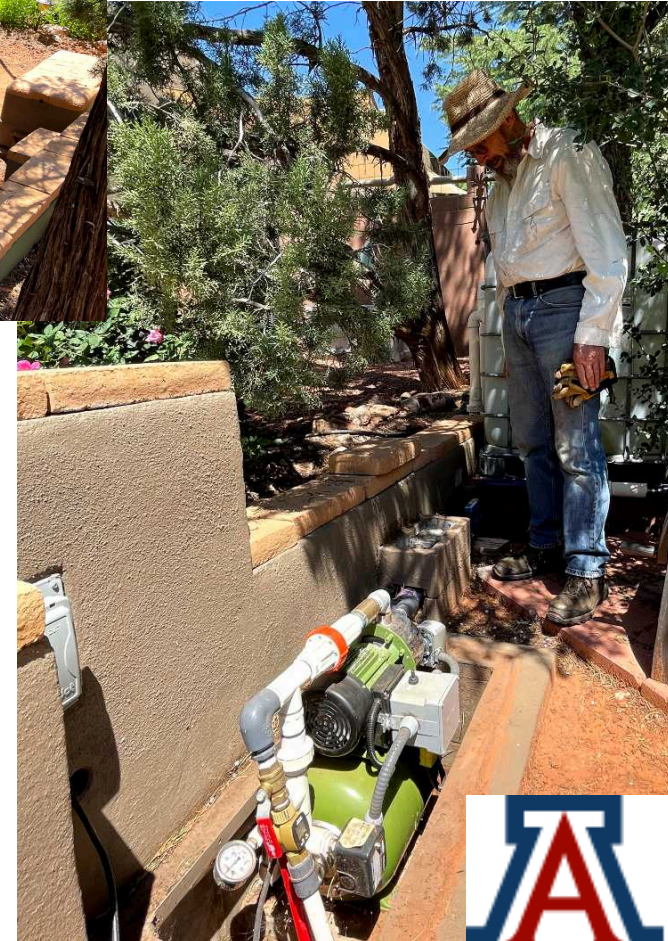


*\*Gravity fed systems work best with BALL VALVES Or GATE VALVES*

Tank 3 overflows into a DIVERSION SWALE that feeds a BASIN.



John has built a motorized pump and timer to operate irrigation lines running back uphill to the patio ornamental gardens.



# Example: John's Roof Water Harvesting (Active)

Tanks do require maintenance to clean, collect and use for irrigation.

Annually EMPTY TANKS to hose out ALGAE that grows on the interior walls.

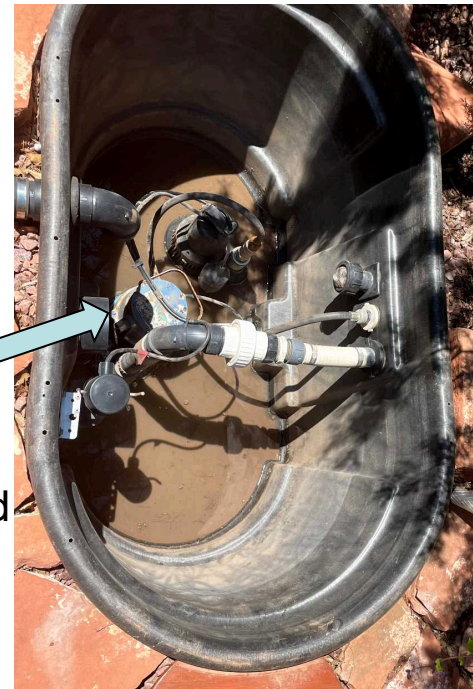
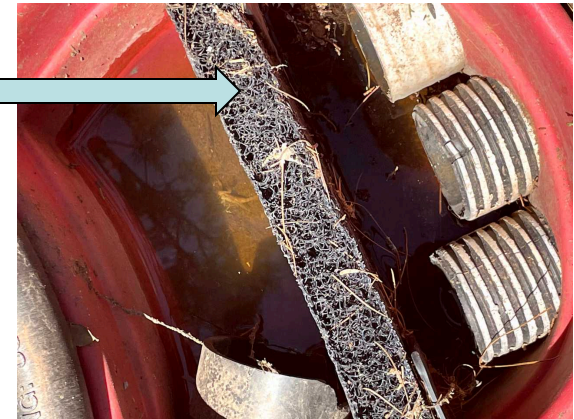


Annually CHECK FITTINGS on all pipe connections for splitting and leakage.

Seasonally INSPECT & CLEAN Scuppers & Gutters.

Seasonally CLEAN SUMP PUMPS and bottom of OPEN BASINS to scrap off sediment and insects.

After Every Hard Rain, INSPECT & CLEAN SCREENS at all pipe inputs of debris and larger sediment.



Watch for failures in any electrical controls...  
Rats eat wiring;  
Motors stop;  
Valves stick;  
Etc.



# Stormwater Harvesting

*Stormwater is rainwater that runs off large roofs, streets, driveways, parking lots and other large impermeable “hardscapes”*

FREE & ABUNDANT

Harvesting stormwater helps reduce downstream flooding

*Stormwater is usually stored in earthworks, but can also be stored in tanks*



# Types of Hardscapes

Hardscapes include roofs, driveways, streets, patios, sidewalks, and other expanses of concrete and asphalt. Large volumes of water run off these surfaces and can be harvested to help support vegetation.



# Curb cuts along streets support trees and shade streets



# Curb cuts transformed this public right-of-way



Native trees and shrubs planted on this public right-of-way are supported by street runoff harvested by curb cuts leading stormwater into adjacent basins.



Lancaster  
residence,  
Tucson



# Example: City of Prescott Storm Water Harvesting (Passive)

(Right) **Curb Cuts** allow stormwater to enter, flow through & exit a vegetation area.



(Left) **Microbasins & Curb Cuts** Line road and sidewalk to shed stormwater into a vegetation area for soil infiltration.

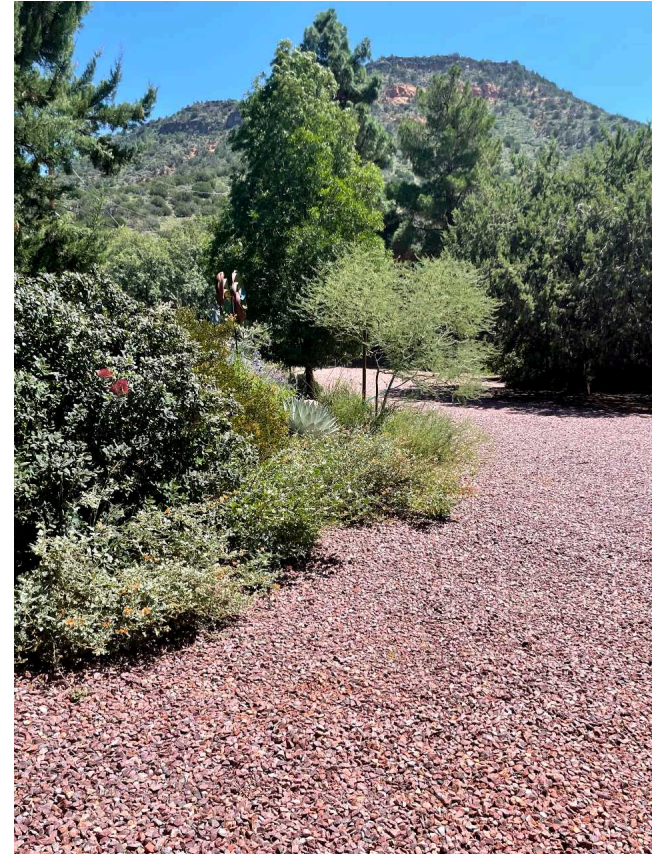




# Example: John's Storm Water Harvesting (Passive)

**Road Runoff** was a gushing problem eroding the natural sediment off of the northeast lot corner.

A **Large Swale** was implemented using heavy equipment to move earth.



Swale is filled with deep gravel to level the walking surface and a Side Berm creates "S" shaped path.





## Graywater Harvesting

*Harvest graywater from your  
washer, shower and bathroom  
sink*

FREE

Available Year Round

Pipe to Earthworks or  
Store in Rain Barrels

## Using Gray Water at Home

Arizona Department of  
Environmental Quality's Guide  
to Complying with the  
Type 1 General Permit



# Graywater Harvesting regulations vary within Yavapai County



§

## Graywater rules for different locations in Yavapai County

Prescott: Graywater use NOT permitted

Prescott Valley: No local restrictions on graywater use, but the town discourages the practice.

Sedona: No local restrictions that supersede ADEQ guidance

Yavapai County: No restrictions

# Graywater Definition from ADEQ

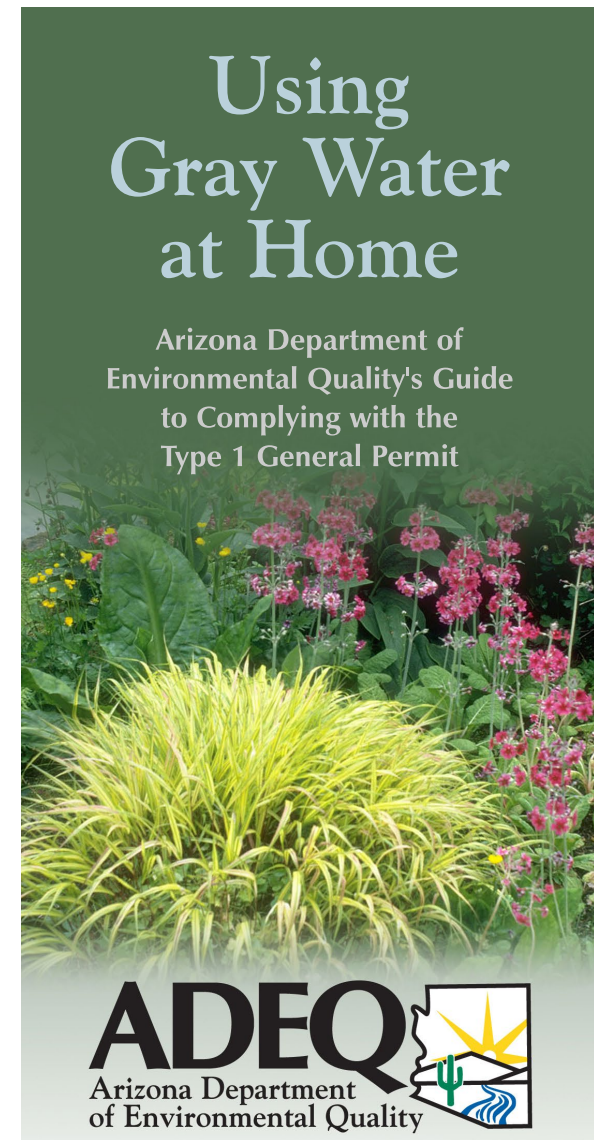
In 2001, the Arizona Department of Environmental Quality (ADEQ) adopted regulation for the use of Graywater.

Graywater is wastewater collected separate from sewage flow that originates from:

- Bathroom sink
- Shower
- Bathtub
- Clothes washer

Per ADEQ, water discharges from these sources are considered “blackwater,” **NOT** Graywater, and should be discharged to sewer or septic systems:

- Kitchen sink
- Dishwater
- Toilet

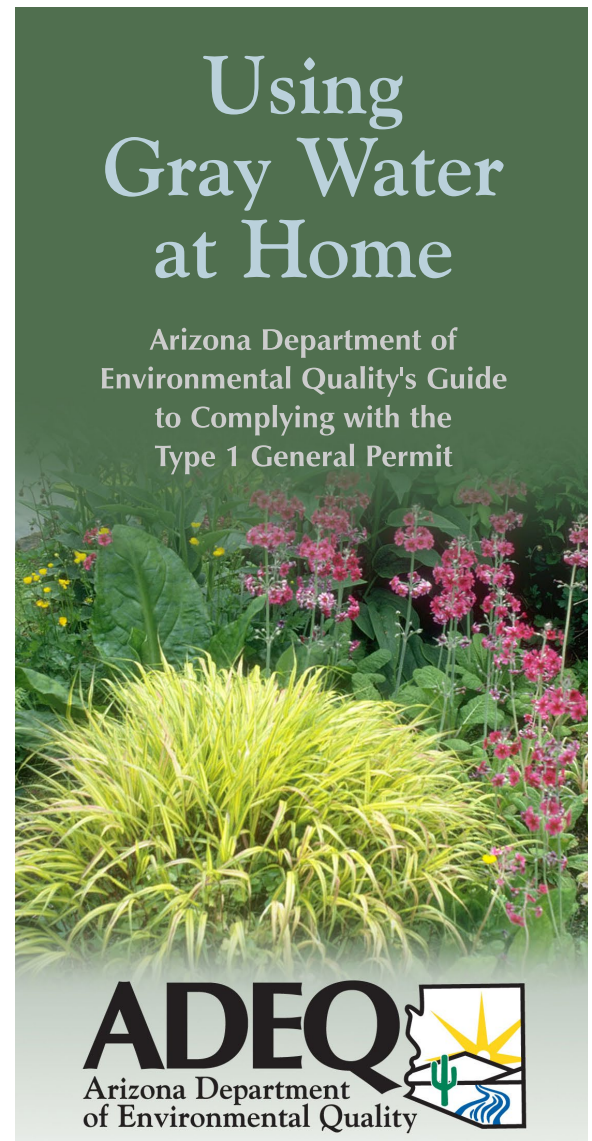


# Graywater Definition from ADEQ

Arizona Department of Environmental Quality (ADEQ) regulation additionally states:

With sources of water that have allowable use, you must comply with these rules:

- 1) Your house may NOT be in a flood zone.
- 2) Graywater must stay on your property.
- 3) Graywater cannot be used on food plants except citrus and nut trees.
- 4) In case of failure, Graywater must be diverted to a septic system or sewer.
- 5) Graywater Storage must be covered for mosquito control and safety.



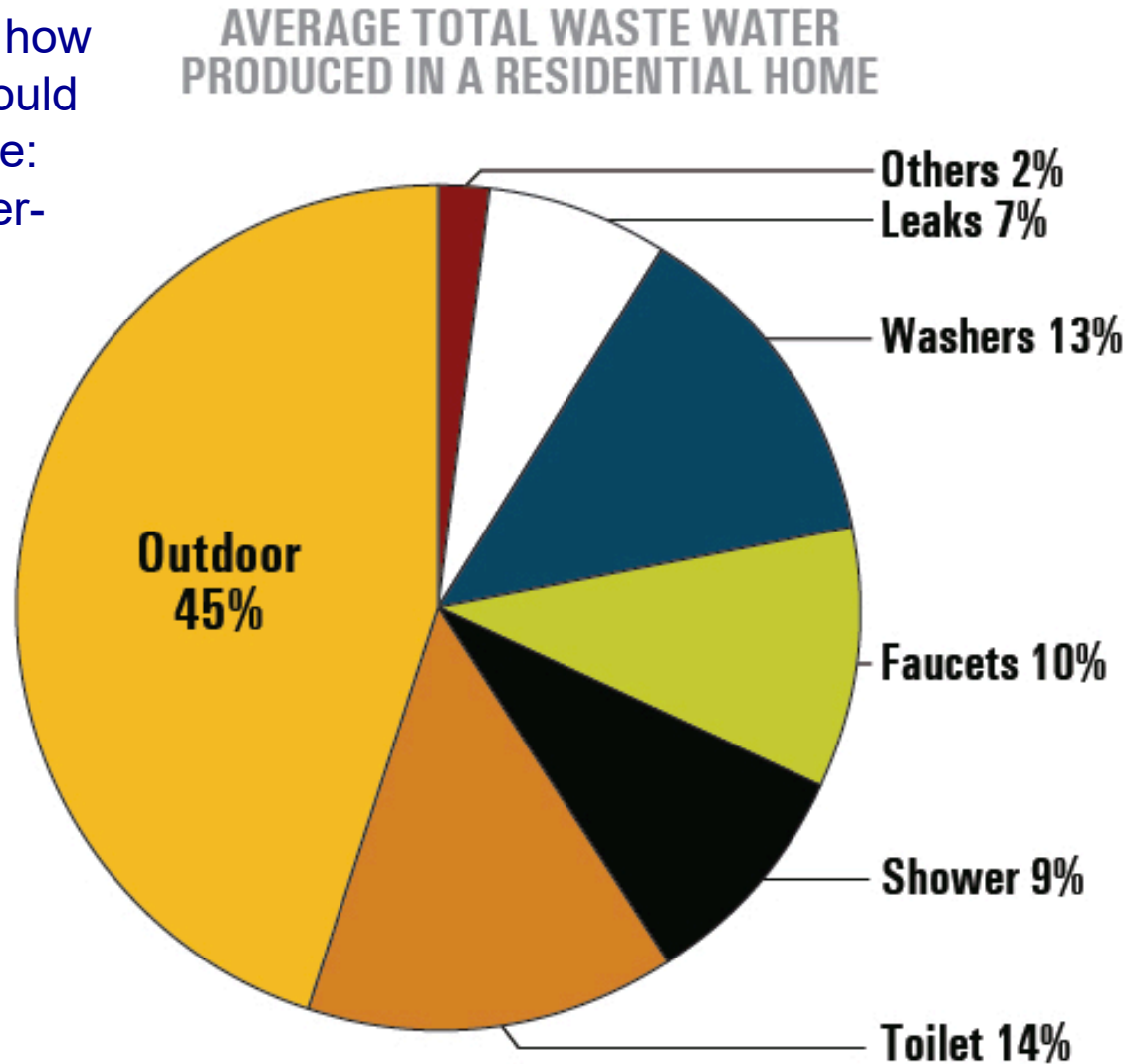
# Graywater Harvesting: How much do we have?

Use the home water use calculator to figure out how much graywater you could harvest from your home:  
<https://www.home-water-works.org/calculator>

How many of these water-using devices involve washing with soaps and detergents?

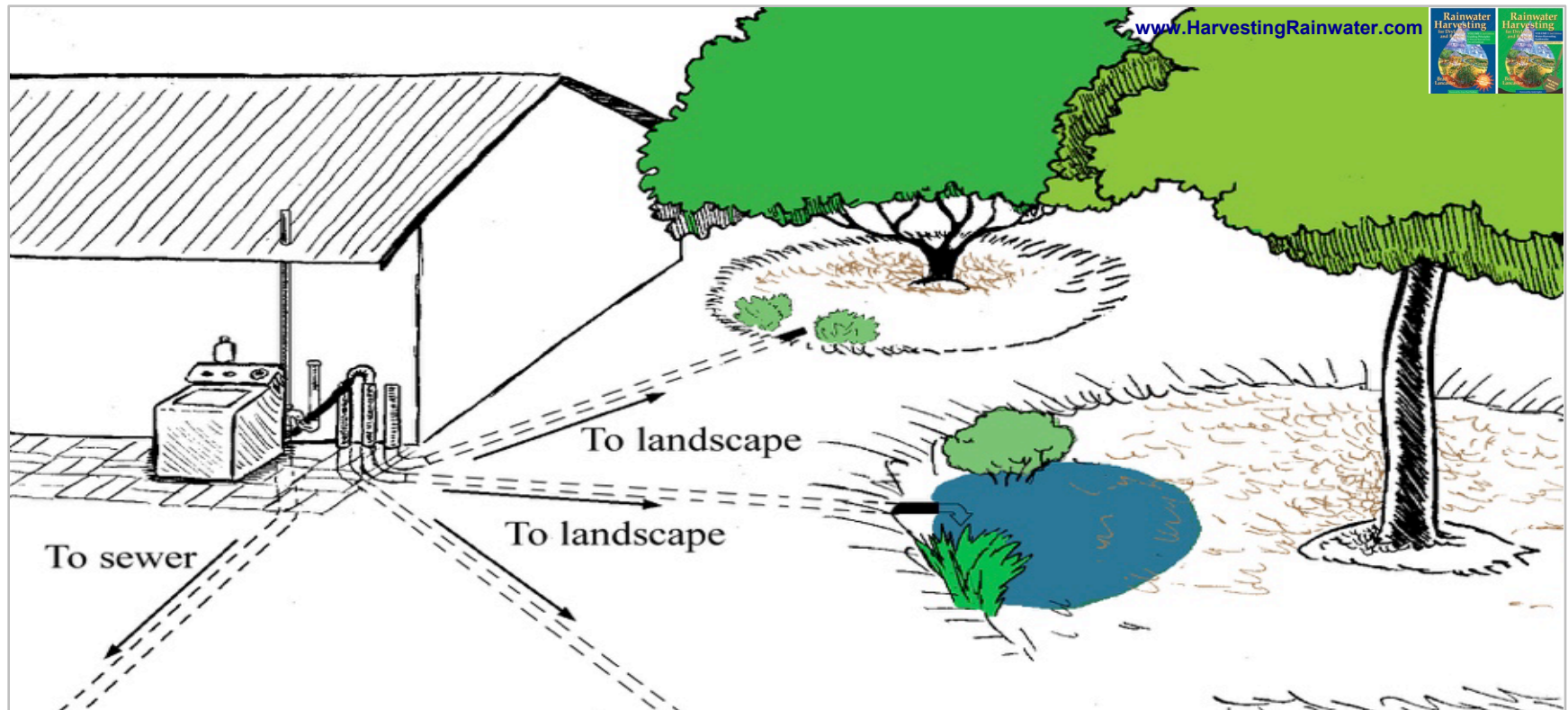
Answer: ALL OF THEM

To use Graywater safely in your yard, buy only safe soaps and detergents that are labeled “Septic-Safe”.



# Graywater considerations for plants

- Dilute salts in Graywater by harvesting Rainwater in Graywater basins
- Can drip irrigate citrus&nut trees, groundcovers, ornamental trees and shrubs and some bedding plants with Graywater
- Can irrigate salt-tolerate plants and native desert plants (but not cacti)
- Do not surface irrigate plants that produce food
- Do not use Graywater on salt-sensitive plants or those that need acidic soils.



# Example: John's Graywater Harvesting (Active)

Clothes Washer drainpipe was stubbed to outside wall of patio for catchment.



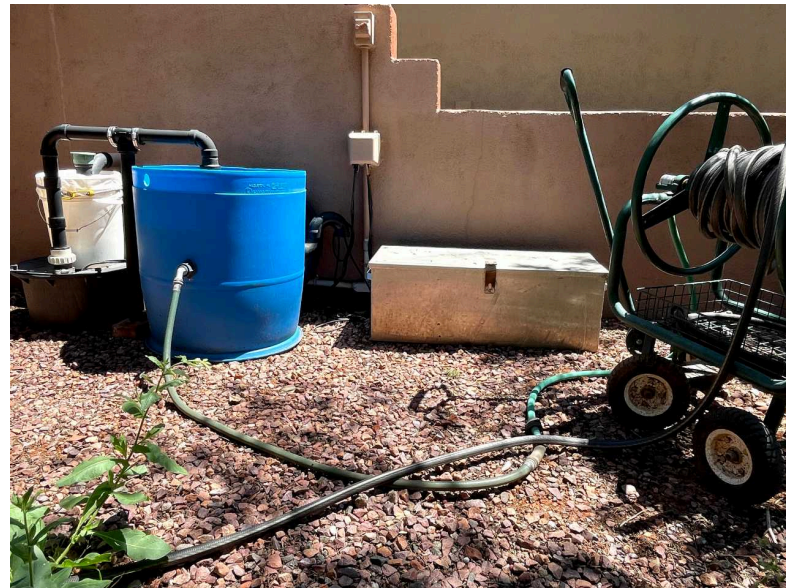
Graywater falls through mesh and synthetic evaporative cooler pads to act as a filter...

...enters a buried 20gal sump tank with a sump pump & float valve.

Graywater is pumped into half Rain Barrel falling through another series of screens and filters.

**Maintenance:** every 2 months, pump tanks dry and brush out soap scum with 1 gallon of diluted bleach solution.

Pump out cleaning water in a safe bucket.





# Example: John's Graywater Harvesting (Active)

John monitors the level of Graywater in the half Rain Barrel because he knows when laundry is running.

He manually turns on a pump installed in the bottom of the half barrel...

Graywater is pumped through a garden hose for disbursement.



**Select, position and plant  
your trees and shrubs**

***“Plant the water” first***

***Then put the  
right tree  
in the right place  
at the right time***

***Learn more  
About Xeriscaping and  
beneficial Native Plants  
for your Garden***




# Learn about your low water use native and naturalized plants



Arizona Cypress, a native, low water use tree

*Low Water Use  
Drought Tolerant Plant List*

*Official Regulatory List for the Arizona Department  
of Water Resources, Prescott Active Management Area*



*2200 East Hillsdale Road  
Prescott, AZ 86301*

*(928) 778-7202  
[www.azwater.gov](http://www.azwater.gov)*

Photo - Jim Morgan

# Learn about your low water use native and naturalized plants



## Yavapai County Native & Naturalized Plants

Yavapai County Cooperative Extension



[Home](#) | [Plant Communities](#) | [Plant Lists](#) | [Search Forbs/Subshrubs](#) | [Search Grasses](#) | [Search Woody Plants](#) | [Additional Resources](#) | [About this Website](#)



Cacti



Grasses



Forbs and Subshrubs



Shrubs



Agaves and Yuccas



Trees



Woody Vines



Noxious and Invasive Plants



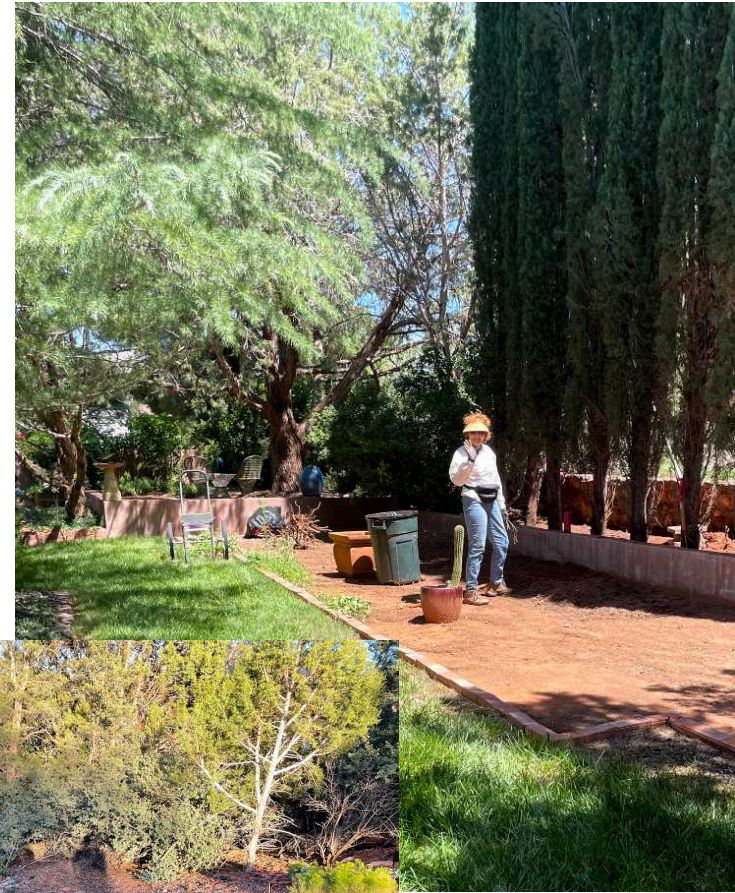
Gardens Featuring Xeric Plants

# Example: John's Xeriscaping and Rain Gardens

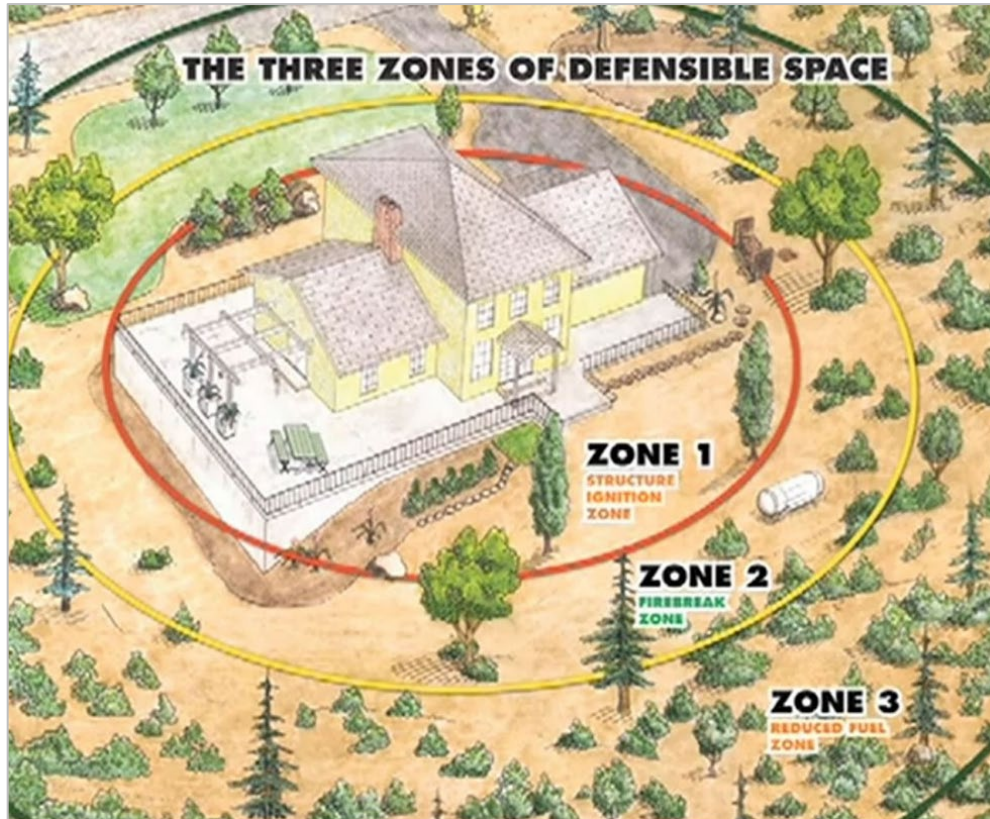
Reduce water needs in landscaping.

Garden with less water. Use water wisely.

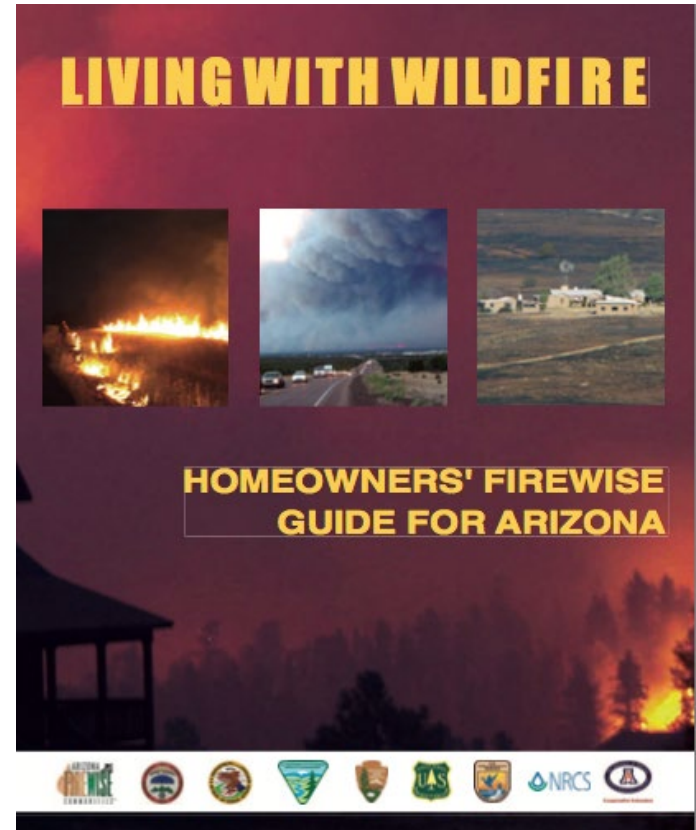
Edibles vs Ornamentals vs water requirements



# Be Firewise!



ZONE 1: Structure Ignition Zone  
ZONE 2: Firebreak Zone  
ZONE 3: Reduced Fuel Zone



Follow Firewise guidelines for Arizona Homeowners to keep your site safe

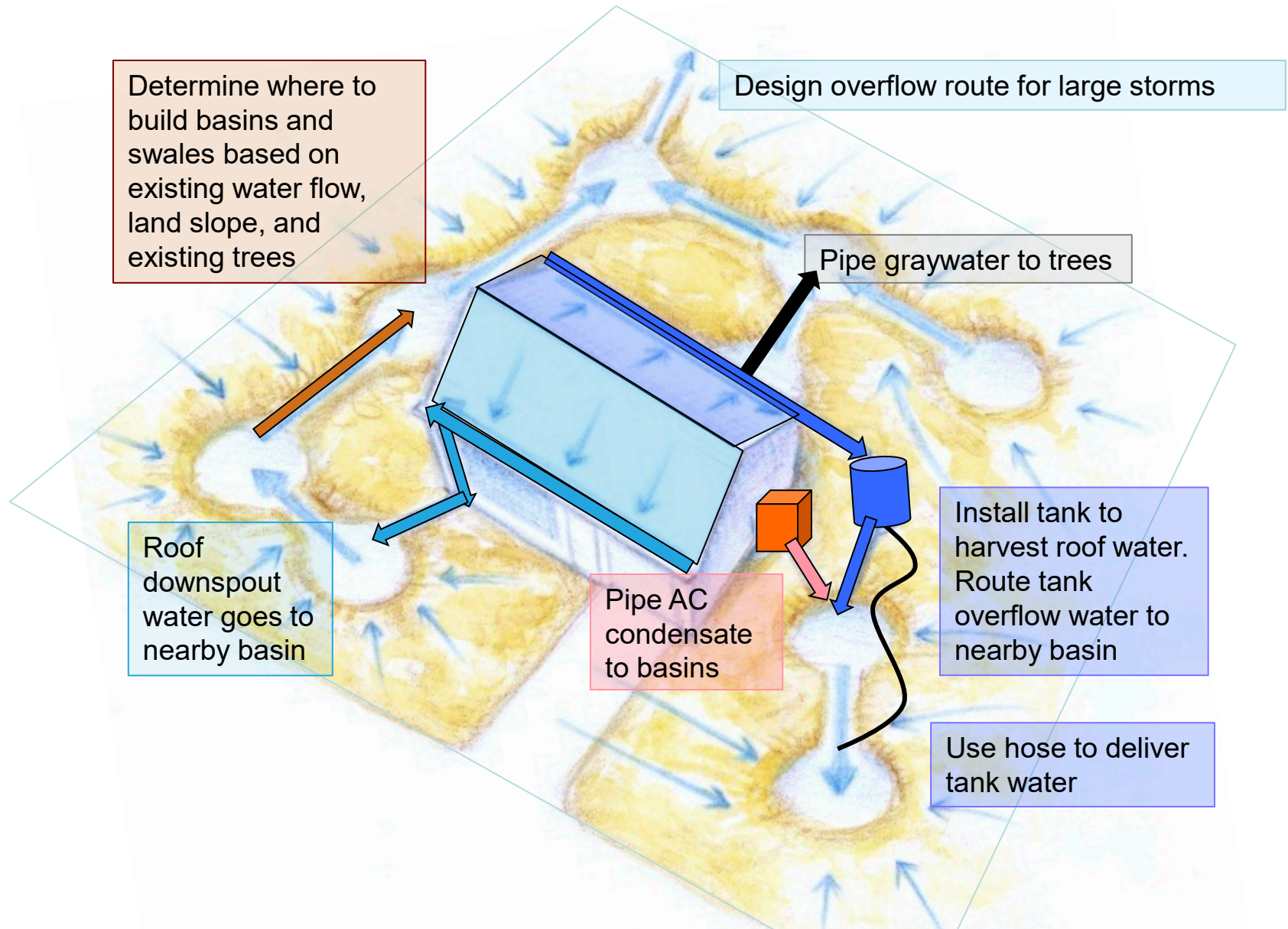
# Next Steps toward Implementation

Just getting started? Or Adding the next level of water harvesting?

- 1) Sketch out a simple drawing of your lot showing structures and driveway.
- 2) Clearly mark entry and exit points of rainwater flowing in & out of the land.
- 3) Draw current rainwater flow patterns from observation of monsoon rainfall.
- 4) Pencil in desired water flow patterns.
- 5) Circle areas that can reasonably be dug for basins or support rock dams.
- 6) Mark where Rain Barrels may be located / needed.

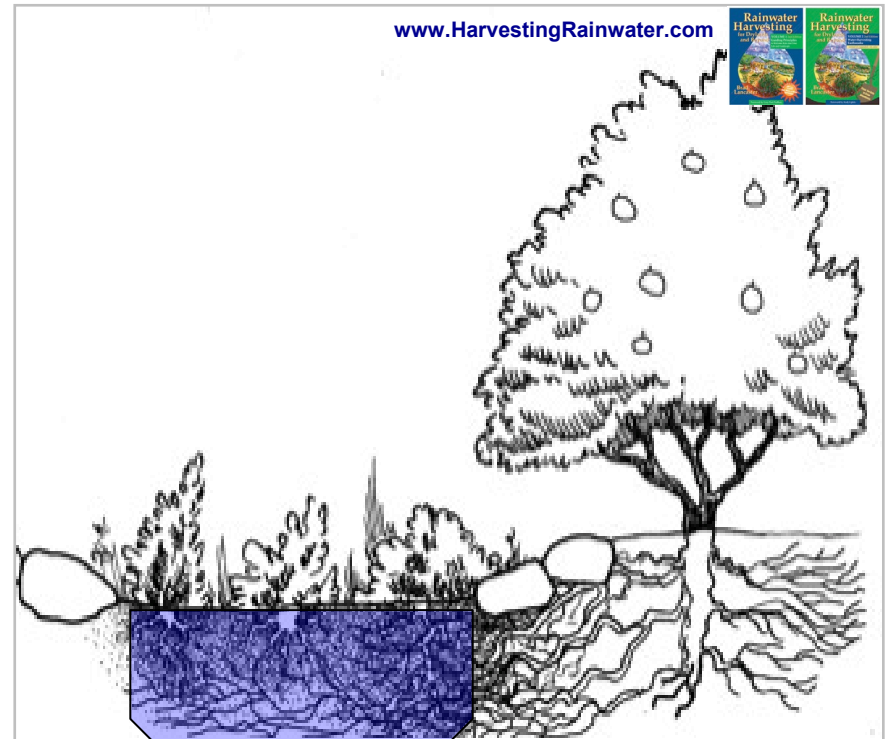
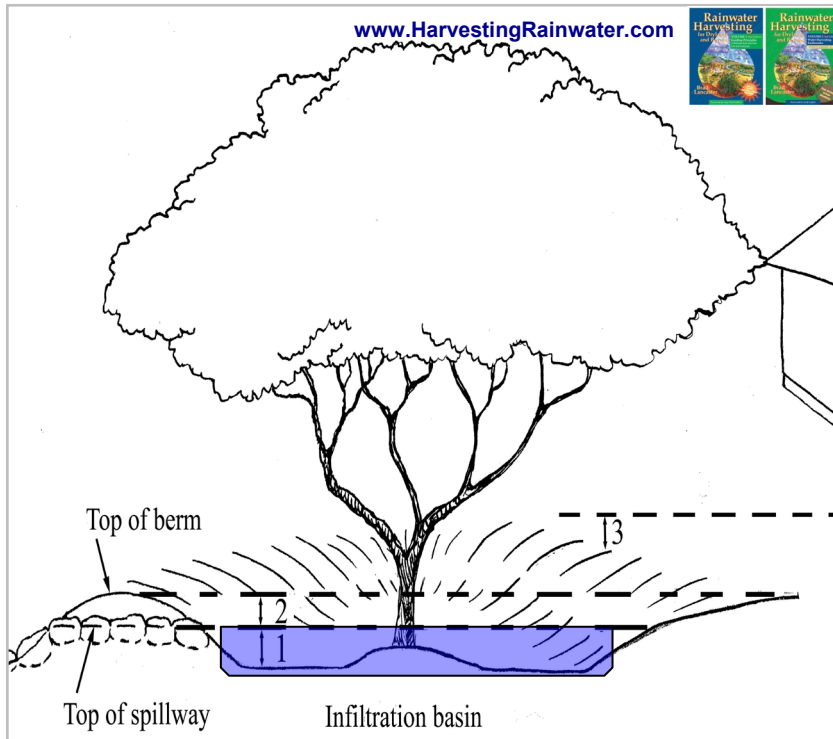


# Develop your water resources strategy





# Plan to place trees within or next to basins



- Can plant inside basins on raised pedestal to keep root crowns dry
- Can plant on raised terraces within basins
- Can plant next to basins where roots will grow toward soil moisture
- Don't plant cacti inside basins
- Don't plant in drainage or spillways

# Start Simple and Small

Use your FREE (and cheap) resources first...

- 1) Move rocks with your feet while you walk the property.
- 2) Align downed trees influence water flow.
- 3) Grab a shovel or pick axe to create a swale or basin.
- 4) Can you move larger rocks to create a row for One Rock Dams?
- 5) Create microbasins to the side of your walkways.
- 6) Collect leaf litter and small prunings for mulching around vegetation.
- 7) Install gutters and direct the downspouts into basins next to trees.
- 8) Visit local garage sales and thrift stores for rain buckets and remnant pipes.
- 9) Call a Master Gardener at the Help Desk...

<p><b>Camp Verde Help Desk</b> <a href="mailto:VerdeValleyMG@gmail.com">VerdeValleyMG@gmail.com</a> 928-554-8992</p>	<p><b>Prescott Help Desk</b> <a href="mailto:PrescottMG@gmail.com">PrescottMG@gmail.com</a> 928-445-6590 ext 222</p>
--	--



# Thank you



Arizona Community  
Tree Council, Inc.



**Prepared by Arizona Community Tree Council  
Funded by a grant from Arizona Department of  
Forestry and Fire Management  
CCG 18-105**

In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited basis apply to all programs.) To file a complaint of discrimination, write USDA, director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

For more information about our programs,  
visit our website at  
[extension.arizona.edu/yavapai](https://extension.arizona.edu/yavapai)

**The University of Arizona  
is an equal opportunity provider.**

**Learn more at:  
[https://extension.arizona.edu/legal-  
disclaimer](https://extension.arizona.edu/legal-disclaimer)**



**Cooperative Extension**

Yavapai County