

USING RAINWATER IN URBAN LANDSCAPES: QUICK GUIDE FOR MARICOPA COUNTY

Summer Waters and Haley Paul



Photo credits: Summer Waters and Haley Paul

Rainwater harvesting is an ancient technique that has been practiced for thousands of years in desert regions. Water is a precious resource in the Valley of the Sun where the semiarid climate that characterizes most of Arizona brings plenty of clear, dry, sunny days. Harvesting rainwater involves capturing and directing precipitation, typically for use outdoors on landscaped areas. Understanding how to implement rainwater harvesting at your own home presents opportunities for using water more efficiently.

What is rainwater harvesting and why do it?

Rainwater harvesting can offset the use of potable water outdoors. In the Phoenix metropolitan area up to 70% of a household's water consumption may be devoted to outdoor uses such as in pools and landscapes. Potable water is treated to drinking water standards, which is a costly and energy intensive process. By using rainwater instead of potable water on your landscape, you conserve energy and water. Plus you can save money!

Low mineral content is another advantage of rainwater. Because other Valley water supplies are generally higher in salts, and many plants cannot tolerate high salt concentrations, rainwater is a welcome alternative for landscape plants and soils.

Finally, by keeping rainwater on your property for use in landscape irrigation, less becomes urban runoff. Rainwater that flows across rooftops, roadways, sidewalks, urban landscapes, and driveways often comes in contact with contaminants such as fertilizers, pesticides, and motor oil. The runoff then flows to a nearby water body, carrying pollution with it. By reducing the runoff from your property, you also reduce the potential for water pollution.

But it never rains!

Many people think that it doesn't rain enough in the desert to collect a worthwhile amount of water. But consider this: In a one inch rainstorm, you can collect 600 gallons of rainwater off a 1,000 square foot roof. Maricopa County receives an average of 7-8 inches of rain a year. That amounts to a lot of free water for your landscape!

Arizona has a bimodal rainfall pattern. This means that most of the rainfall we receive occurs in the winter months (December-February) and during the monsoon season (July-September). Because most rain falls during these two time periods, when it rains, it can really pour!

How do you harvest rainwater?

There are two main approaches to rainwater harvesting: *active* and *passive*.

Active rainwater harvesting

To many people, active harvesting is the most recognizable method of rainwater collection because it uses a cistern, tank, or barrel to collect and store rainwater for later use. With active harvesting, rainwater washes off a structure and is funneled to a holding container. For example, a roof with gutters directs rainwater to a downspout where it is collected in a container.

Having a screen at the opening of the container is important to keep out animals, such as mice or mosquitoes, as well as debris. If the collection surface is particularly dirty (e.g.: if there are a lot of bird droppings or asphalt roofing), or you want a high quality of water, a first flush device is important to consider.

Keep in mind that active systems can be underground as well. For those who do not want the appearance of a cistern, underground storage tanks can be utilized. However, because water is underground, a pump will be needed to bring water to the surface where it can be used in supplying water to an irrigation system or a water feature. See Figure 4 for an example of a "hidden" underground cistern.

Passive rainwater harvesting

Passive harvesting involves shaping the landscape into features such as berms, basins, contours, and swales to direct, hold, and percolate water slowly into the ground. Passive harvesting features are designed to slow the flow of water so that it can soak into the soil, providing an opportunity to irrigate landscape plants more thoroughly with rainwater. Desert adapted plants do best with infrequent, deep watering. By carefully contouring your landscape, you take full advantage of rainfall events by keeping more rainwater on site instead of immediately whisking water off of your property and into the street. As a rule of thumb, passively harvested rainwater should not remain pooled or standing for more than 72 hours due to the potential for mosquitos.

Keep an eye out for the "also known as" practices that incorporate passive rainwater harvesting techniques. These include: low-impact development (LID), green infrastructure, permaculture, and stormwater management.



Figure 1. A cistern is placed under a gutter, where it collects rainwater from the roof. The screen and first flush device capture debris and pollutants.



Figure 3. The overflow pipe—made with PVC (or ABS) material found at your local hardware store—takes water away from the cistern and the foundation of the building in the event that the cistern fills to capacity.



Figure 2. Curb cuts in a parking lot passively harvest rainwater by diverting it into a swale where native vegetation can take advantage of the supplemental water.

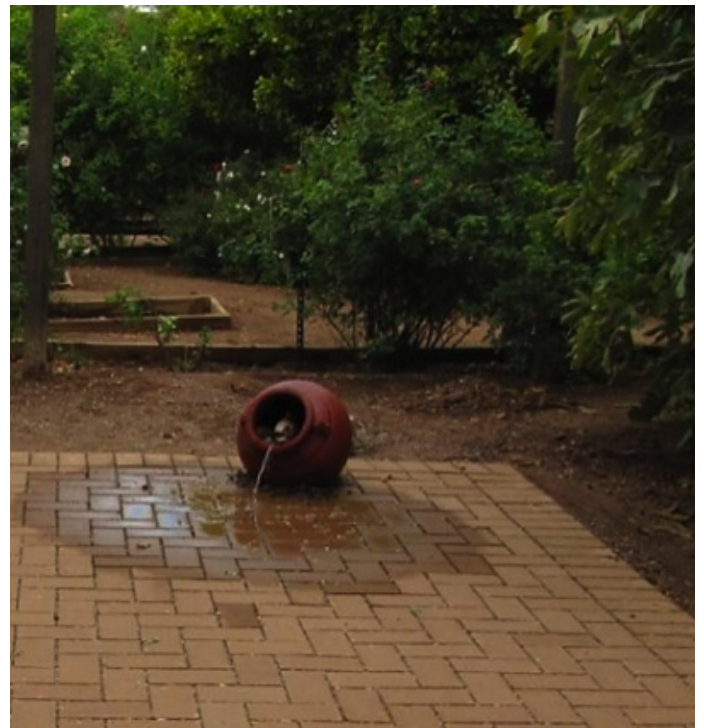


Figure 4. A permeable paver patio at the UA Cooperative Extension office in Maricopa County sits atop a storage container capable of holding 750 gallons of rainwater, which is used to supply the water feature.

Planning ahead

Planning and preparing for all of the rainfall you are capable of collecting and utilizing is critical to implementing a successful rainwater harvesting project, whether you choose to use active or passive rainwater harvesting techniques. You may even decide to use a combination of both. Calculating the potential rainwater supply for your area as well as your landscape's water demand will help you determine how many barrels, cisterns, or tanks you need, and how big those containers should be. It will also help you design for overflow and determine plant palette.

Remember that in Maricopa County, annual rainfall averages 7-8 inches. To calculate your annual rainwater collection potential, first measure your collection area (for example, a 50-foot-long by 20-foot-wide roof is 1,000 square feet). Then multiply your collection area by your annual rainfall, along with 0.6 (this number converts inches to gallons). Collection areas can be parking lots, roofs, yards, or any other area from which you are collecting rainwater and diverting it for use into your landscape.

So, for example:

$$\begin{aligned} &1,000 \text{ ft}^2 \text{ roof} \times 7 \text{ (inches of annual rainfall)} \times 0.6 \text{ (conversion factor)} \\ &= 4,200 \text{ gallons a year rainwater collection potential} \end{aligned}$$

For a more extended calculation that includes a runoff coefficient specific to different collection surfaces, please visit the University of Arizona Cooperative Extension's *Harvesting Rainwater for Landscape Use* (page 20). More information on this publication can be found in the "Additional Resources" section.

Calculating your collection potential also helps you plan for overflow in the event that a storm exceeds your system's collection capacities. Overflow, mentioned above, is critical in the rainwater harvesting planning process. No matter how well you plan, a time will likely come when a storm brings more rainfall than your system can hold. Be prepared for a high intensity rainfall event! For an active system, this means installing a pipe that takes excess water away from the cistern and away from the foundation of a house. For a passive system, consider how the property was originally designed to manage stormwater. Keep in mind that flooding can damage your home, which is why planning for overflow is so important. The key to successful rainwater harvesting is collecting only what you need and allowing the rest to follow the appropriate path away from your property when necessary.

How much water does my landscape need?

There is no one-size-fits-all answer to this question. Water demand can vary greatly depending on the plants you choose for your landscape. If you use native and desert adapted plants, your landscape will need less water than if you have a large area of turf grass or non-desert adapted plants, like Ficus trees. For a useful guide on watering your landscape, refer to *Landscape Watering by the Numbers*, which was developed by Water—Use it Wisely. There is a tool available online to help you determine how much water your irrigation system currently applies, and how much water your landscape plants need. Be sure to turn your irrigation controller off after it rains in order to take full advantage of precipitation on your landscape. While you're at it, familiarize yourself with the irrigation controller. You should be adjusting your controller with the seasons to take climate into account. For example, landscapes need less water in the winter than in the summer. If you are unsure about how to adjust your controller or determine your landscape water needs, consult a trained landscape professional for an irrigation tune-up. All of these publications and resources are available under the "Additional Resources" section located at the end of this document.

Getting started: Groups that are here to help

There are organizations in Maricopa County that hold workshops, tours, events, trainings, and hands-on projects to help you learn more about passive and active rainwater harvesting systems. The contact information for these groups is listed in Table 1.

Where can I go for examples?

Rainwater harvesting demonstration sites in Maricopa County abound. These demonstration sites can help you get a better idea of what you could do on your property or in your community. The contact information for these sites is listed in Table 2. This information is meant as guidance; the sites and organizations listed are not maintained or endorsed by the University of Arizona unless otherwise noted.

Where can I get materials?

Local hardware and home improvement stores offer many of the items you will need to begin harvesting rainwater. A tip: look online as well as in the store for these specialty supplies.

Additionally, there are local landscaping and rainwater harvesting companies that offer services to build your dream rainwater harvesting system.

Table 1. Organizations in Maricopa County

Organization	Contact Information
University of Arizona Cooperative Extension, Maricopa County	http://extension.arizona.edu/maricopa/water (602) 827-8200
Municipal Water Conservation Offices	http://amwua.org (602) 248-8482
Watershed Management Group	http:// watershedmg.org/ (520) 396-3266
Valley Permaculture Alliance	http://phoenixpermaculture.org/ (602) 325-1230

Table 2. Demonstration sites in Maricopa County

Site/ Organization	Location/ Contact Information
Outdoor Water Conservation Demonstration Area at the University of Arizona Cooperative Extension, Maricopa County	4341 E. Broadway RD Phoenix, AZ 85040 (602) 827-8200 OPEN TO THE PUBLIC
Glendale Xeriscape Garden at the public library, Tree Trail with passive harvesting features	5959 W. Brown ST Glendale, AZ 85302 (623) 930-3535 OPEN TO THE PUBLIC
City of Scottsdale Xeriscape Demonstration Garden with various rainwater harvesting features	5401 N Hayden Rd Scottsdale, AZ 85250 (480) 312-5650 http://www.scottsdaleaz.gov/Water/Conservation/Garden/GarTopics/RainHarvesting OPEN TO THE PUBLIC
Musical Instrument Museum with passive harvesting examples in the parking area	4725 E. Mayo Boulevard Phoenix, AZ 85050 (480) 478-6000 FEATURES ON DISPLAY OUTSIDE MUSEUM
Regents apartment complex with passive harvesting from the parking lot	15555 N. Frank Lloyd Wright Blvd. Scottsdale, AZ 85260 (480) 614-6500 VISITORS MAY WANT TO CHECK IN AT LEASING OFFICE
Ryan and Ericka Wood residence	480-874-2272 ryan@cerowood.com PLEASE CALL AHEAD
Valley Permaculture Alliance's Sustainable Home Tours	Locations and features vary http://www.phoenixpermaculture.org/ SUBJECT TO TOUR SCHEDULE
Glendale Community College North Campus rainwater retention basin	5727 West Happy Valley Road Glendale, AZ 85310 (623) 845-4000 VISITORS MAY WANT TO CALL AHEAD
City of Scottsdale's Interpretive Center at the McDowell Sonoran Preserve features a 20,000 gallon underground cistern and artistic gutters	18333 N. Thompson Peak Pkwy. Scottsdale, AZ 85255 (480) 312-7722 OPEN TO THE PUBLIC
City of Scottsdale's Fire Station 2 utilizes permeable pavers	7522 E. Indian School Road Scottsdale, AZ 85251 (480) 312-FIRE (3473) VISITORS MAY WANT TO CALL AHEAD
Tempe Women's Club Park demonstrates passive harvesting with berms and swales	1265 N College Ave Tempe, AZ 85281 http://www.tempe.gov/conservation/DemoGarden/features.htm OPEN TO THE PUBLIC

Additional Resources

University of Arizona

- *RainScapes: The Ultimate in Water-Efficient Landscaping*
<http://cals.arizona.edu/pubs/garden/az1539.pdf>
- *Harvesting Rainwater for Landscape Use*
<http://cals.arizona.edu/pubs/water/az1344.pdf>
- *When it Rains it Runs Off: Runoff and Urbanized Areas in Arizona*
<http://cals.arizona.edu/pubs/water/az1542.pdf>
- *Layperson's Guide to Arizona Water*
http://ag.arizona.edu/AZWATER/WRRC_Events_News/LPG/Layperson%27s_Guide_to_Arizona_Water.pdf
- Listing of Smartscape Certified landscape professionals
http://www.amwua.org/ss_directory.html
- Educational photo album of the installation of a rainwater harvesting system at the University of Arizona Cooperative Extension in Maricopa County
<http://on.fb.me/HmZQcX>
- Live weather data streaming from the University of Arizona Cooperative Extension, Maricopa County weather station
<http://www.weatherlink.com/user/smartscape/>
- Rainlog.org is a cooperative rainfall monitoring network for Arizona maintained by citizen scientist data contributors.
<http://Rainlog.org>

State of Arizona

- Water conservation systems tax credit | Arizona Department of Revenue
<http://www.azdor.gov/TaxCredits/WaterConservationSystems.aspx>

Cities within Maricopa County

- Landscape Plants for the Arizona Desert | Arizona Municipal Water Users Association
http://www.amwua.org/landscape_plants.html
- Water conservation rebates | Select cities
<http://amwua.org/rebates.html>
- Landscape Watering by the Numbers | Water-Use it Wisely
http://amwua.org/landscape_watering_brochure.html
- Monthly irrigation e-mail reminder | City of Mesa
<http://mesaaz.gov/Home/EmailLists.aspx>
select "Landscape Watering Reminder"

Other organizations

- *Green Infrastructure for Southwestern Neighborhoods* | Watershed Management Group
<http://watershedmg.org/node/179>
- The Online Rainwater Harvesting Community
<http://www.harvesth2o.com/index.shtml>
- American Rainwater Catchment Systems Association
<http://www.arcsa.org/index.asp>
- Brad Lancaster | Rainwater harvesting author and expert
<http://www.harvestingrainwater.com/>

Need additional help?

- Contact the Water Resources Extension Agent for Maricopa County
 - (602) 827-8200
 - swaters@cals.arizona.edu
 - <http://extension.arizona.edu/maricopa/water>



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
TUCSON, ARIZONA 85721

SUMMER WATERS

EXTENSION AGENT, WATER RESOURCES

HALEY PAUL

PROGRAM COORDINATOR, SENIOR, ANR/SMARTSCAPE

CONTACT:

SUMMER WATERS

SWaters@cals.arizona.edu

This information has been reviewed by University faculty.
cals.arizona.edu/pubs/water/az1566.pdf

Other titles from Arizona Cooperative Extension can be found at:
cals.arizona.edu/pubs

Any products, services or organizations that are mentioned, shown or indirectly implied in this publication do not imply endorsement by The University of Arizona.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Jeffrey C. Silvertooth, Associate Dean & Director, Economic Development & Extension, College of Agriculture and Life Sciences, The University of Arizona.

The University of Arizona is an equal opportunity, affirmative action institution. The University does not discriminate on the basis of race, color, religion, sex, national origin, age, disability, veteran status, or sexual orientation in its programs and activities.