

PASSIVE WATER HARVESTING



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Passive water harvesting is the practice of slowing water down and encouraging it to soak into the ground. With simple land contouring (often called “earthworks”) that catch and direct stormwater runoff, stormwater can be used beneficially, encouraging plant growth in landscapes and natural areas, healing erosion cuts, and can even replace the need to irrigate with tap water. Passive water harvesting systems consist of a catchment area, a distribution system and a landscape holding area. Runoff is directed from the catchment area to the holding area where water can be immediately used by landscape plants. Catchment areas include soil surfaces, roofs, roads and sidewalks. Passive water harvesting can be used along with a rainwater storage system (“active” rainwater harvesting) or can be used alone.

There are several advantages to this type of water harvesting:

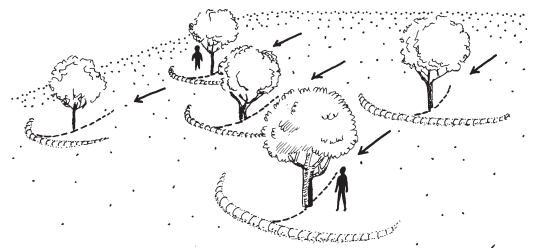
- i Inexpensive
- i Simple to build
- i Low maintenance
- i Turns your land into a sponge!

Goals of passive water harvesting:

- Slow the runoff down
- Spread the water out
- Soak the water in

Use the following strategies to achieve the goals of passive water harvesting:

Berms and Swales, also known as mounds and dips, are created perpendicular to the flow of water. The ground is shallowly excavated outside the plant drip line to hold water, while the berm helps detain the water a while longer. Plant trees and shrubs in raised areas on or near the basin edge and do not allow water to stand around plant trunks or stems.



Crescent-shaped landscaped holding areas on a slope.

If using a berm with a swale, soil excavated from the swale can be used to build the berm. Berms can be constructed of soil, rock, straw bales, or other materials.

Create **infiltration basins**. These catchment areas include shallow basins or depressions, sunken beds (called “raingardens”) around plantings to supply water to several plants at once, or donut rings around individual plants. Hide these basins under mulch.

Rainwater Management and Harvesting Principles

Detailed principles to help create your earthworks

START MANAGING WATER AT TOP OF WATERSHED

- Define the site "watershed" including off-site drainages that contribute to or receive runoff from your site
- Manage water at the top, and in small increments throughout the site to reduce the volume and force of water collecting at the bottom
- Work with upstream neighbors to encourage them to conduct water harvesting at their site, or capture their water as it enters your site and put it to use

CREATE MULTIPLE SUBWATERSHEDS

- Water is easier to manage at many small points than at one large point
- Where possible, use existing topography to create multiple small subwatersheds at your site to collect water
- Where natural topography isn't sufficient, create multiple subwatersheds by altering land slope

SPREAD AND INFILTRATE THE WATER

- The least expensive place to store water is in the soil
- Channelized, silt-laden water has erosive power, so spread the water out at intervals to slow its flow and allow sediments to drop out of suspension
- Water that is spread out over soil has more places to infiltrate into the soil
- The more water that infiltrates into the soil, the less has to be managed as surface stormwater
- Water stored in the soil should be in locations where it supports vegetation

PREPARE FOR OVERFLOW

- In the desert southwest, there can be very heavy localized rains that cause extreme flooding
- Water harvesting structures that receive water from moderate to large catchment areas need to allow excess water to flow safely out
- Overflow devices need to be sized to handle extreme events and armored (e.g. lined with rock) to prevent erosion
- Overflow devices need to be maintained

MULCH TO REDUCE EVAPORATION

- Much of the water that sinks into soil is quickly evaporated in the hot season
- A layer of mulch will reduce evaporation causing the water to stay in the soil where it is available to support plants
- Mulch can be a 3- 6 inch thick layer of organic material (bark, compost, straw) or 2 inch thick inorganic material (rock, gravel)
- Organic mulches help build soil as they decompose, and need to be renewed periodically
- Plants that drop their leaves help build organic mulches for themselves but may still need additional mulch
- If rock is already present at a site this might be a good source for inorganic mulches

PUT RAINWATER TO BENEFICIAL USE

- Think of the ways you use water at your site and figure out how you can use harvested rainwater for them
- Rainfall is low in salts compared to groundwater and plants grow better with rainwater than with groundwater
- Rainwater stored in soil is ideal for supporting plants

START SMALL AND ADJUST YOUR SYSTEMS AS NEEDED

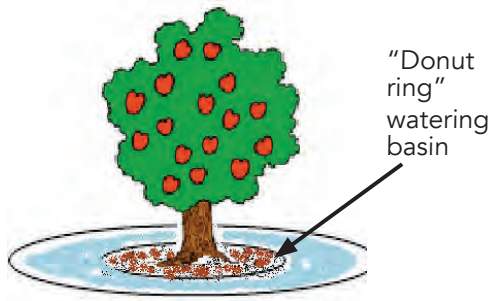
- It's best to try out ideas on a small scale first then adjust them as you see how they function when it rains
- Take the lessons you learn from small scale trials into larger scale systems when you are ready
- Inspect and maintain your systems regularly and especially after big rains



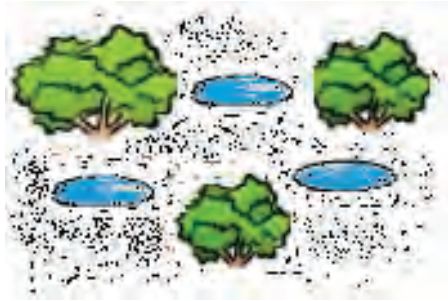
"You have to think like a beaver. If it doesn't work just right the first time, go back and make it better." Ben Lomeli

CREDITS

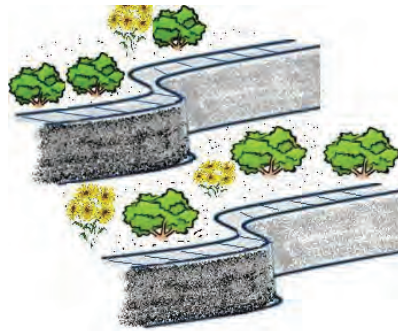
Rainwater Management and Harvesting Principles compiled by the teachers of the Sonoran Permaculture Guild in Tucson. For more information visit www.sonoranpermaculture.org. Used by permission.



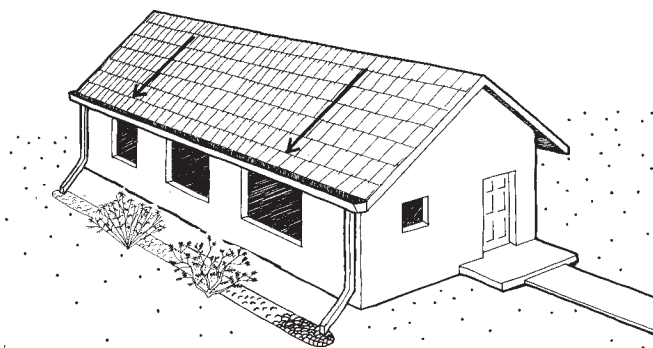
Shallow basins in-between plants



For sloped areas, build **terraces**. The multiple levels will slow runoff for plants and allow it to soak into the ground at each level.



Consider **permeable hardscape** materials like porous pavement, un-mortared bricks or paving blocks with holes in them to prevent runoff and encourage penetration. Use impermeable surfaces to direct runoff to useful areas.



Simple system—Roof catchment, gutters, downspouts and french drain.

French drains or dry wells are holes or trenches filled with gravel. Use French drains to direct water away from areas allowing water to infiltrate into the soil in a more appropriate location and supply water to plants. Keep water away from building and wall foundations.

Integrate earthworks by making them multi-functional. If a landscape is designed properly with berms, swales and the right plants, it can be a beautiful, natural landscape that relies solely on harvested rainwater.

Dry streambeds meandering through landscapes with rock "speed bumps" along the channel will slow runoff and encourage infiltration for use by nearby plants. Streambeds can have aesthetic value, creating a focal point in your landscape and provide the illusion of water.



ARIZONA Water Rights

It is OK to capture water that originates on your property. BUT per ARS 45-141, waters of all sources, flowing in streams, canyons, ravines or other natural channels cannot be captured unless you have legal appropriation rights. If you detain appropriated waters with passive harvesting structures, you must allow the water to pass through the structures.

Resources

UA Publications (<http://cals.arizona.edu/pubs/>):
 RainScapes, AZ1539
 Harvesting Rainwater for Landscape Use, AZ1344
 Rainwater Collection – Basic Components of a Rainwater Storage System, AZ1565

Additional resources: waterwise.arizona.edu
 Rainwater Collection – Calculating Water Supply and Demand to Estimate Storage Needs

References

Rainwater Harvesting for Drylands and Beyond, Vol. 2
 B. Lancaster
 Harvesting Rainwater for Landscape Use, P. Waterfall
 Sonoran Permaculture Guild, Tucson, AZ.