

## Water Harvesting Techniques: Earthworks

Water harvesting earthworks are landscaping features that direct and capture the flow of water in order to increase infiltration into the landscape. Water harvesting earthworks and the plants that they support are best created to serve multiple functions. For example, create basins planted with trees on the north, east, and west side of your property; as the trees flourish, they create shade which passively cools your home! Create raised pathways that shed water into sunken basins or serve as natural berms to slow and infiltrate water.

Creating earthworks is a simple and inexpensive way to start harvesting water. Whenever you plan a water harvesting system, it is best to plant native species which are low water users and support local wildlife. Once earthworks are established, cisterns can be added to supply a steady source of water to vegetable gardens and fruit trees and serve as an additional water source during the dry season.

### Basin

A basin is a mulched depression dug into the earth and used to capture rainfall and/or greywater. Basins work best on a flat landscape as this allows for runoff to drain into the basin and infiltrate into the soil. If you are creating a basin around existing vegetation, try not to disturb the existing root structure.



Ideally, basins should be larger than the diameter of any mature vegetation's drip line, at least 1.5 times (and up to 3 times). Roots spread and the majority of water used by plants is drawn from the root zone outside the canopy drip line. Making basins larger than the drip line also makes it easier to expand the basin in the future without harming the root structure. Basins should be 10ft from all structures to ensure that captured water does not infiltrate near building foundations.

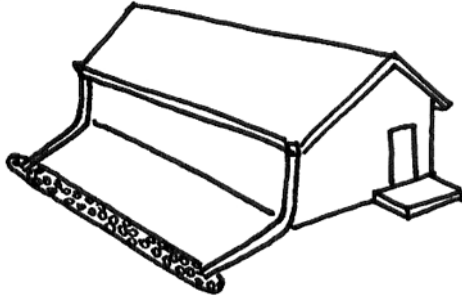
### Berm

Berms are designed to capture rainwater as it runs down a sloped area and are laid perpendicular to the slope of the landscape. Typically, berms are built in a crescent shape and compacted to keep them from eroding. Make sure you plan for overflow, because once the berm is full of water, water will seek a new route. Plan a route for the water to go where you can best use it. The purpose of a berm is to slow surface runoff to allow infiltration, but not to stop all runoff. Plan an overflow system that allows water to move easily to other landscape features located down slope from the berm.



## French Drain

A French drain is a trench filled with porous materials like rocks, gravel, or mulch. The airspace provided by these materials allows water to quickly seep below the surface and penetrate the surrounding soil. A French drain is best used to capture low to moderate water flows depending on their size and works best on flat or slightly sloped landscapes. The water captured in a French drain should be used to harvest relatively sediment free water, such as runoff from a concrete patio or roof downspout. This aspect is very important because too much sediment will fill the airspace in the trench and make it difficult for water to infiltrate into the soil. French drains are appropriate where deep irrigation is needed such as citrus and other fruit bearing trees.



## Swale

There are many different swale variations, so only a brief overview is given here. One great source for further information is *The City of Tucson Water Harvesting Guidance Manual* which can be downloaded at: <http://dot.ci.tucson.az.us/stormwater/education/waterharvest.cfm>.

The purpose of a swale is to capture small to moderate volumes of slow moving water typically caused from sheet flow runoff. Swales can be built either on-contour (see figure 1.1) or off-contour (see figure 1.2). An on-contour swale is built to slow and capture runoff causing the water to pond and slowly infiltrate the soil. An off-contour swale allows any surplus of water to move slowly down the slope of the landscape infiltrating into the soil along the way.

Swales are dug out of the earth and the excavated soil is built up either on or off contour creating a berm. Vegetation planted along the swale will benefit from the infiltration of water.



Figure 1.1 on-contour swale

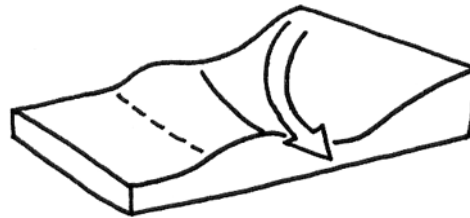


Figure 1.2 off-contour swale

## Sources

1. Lancaster, Brad, *Rainwater Harvesting for Drylands Volume 1 Guiding Principles to Welcome Rain into Your Life and Landscape*, (Tucson, Arizona: Rainsourse Press, 2006).
2. Mars, Ross, *The Basics of Permaculture Design*, (White River Junction, Vermont: Chelsea Green Publishing, 2003).
3. Phillips, Ann, Editor. *City of Tucson Water Harvesting Guidance Manual*, (City of Tucson, Department of Transportation, Stormwater Section, June 2003).
4. Waterfall H. Patricia Editor, *Harvesting Rainwater for Landscape Use*, (Cooperative Extension, College of Agriculture and Life Sciences, The University of Arizona).