

Rain Harvesting for Supplemental Irrigation

Historically, rainwater was harvested out of necessity. Where potable water systems were unavailable, rainwater or well water were the only choices. Wells ran dry or provided poor quality water, so rainwater was sometimes the best alternative.

Now, most people rely on water from a municipal provider or a water district. This costly, high quality water is also used for landscape irrigation, when rainwater harvesting could provide an alternative source.

Why collect rainwater? Rainwater pH is almost neutral in most geographic areas of the U.S. It does not have dissolved minerals from the soil or chemicals from water treatment facilities. By harvesting rainwater, you may be able to reduce erosion. Substituting rainwater for potable water in the landscape may reduce your client's overall water bill. Most plants thrive with rainwater.

Rainwater harvesting is not new. It has been practiced in the desert of southern Israel for over 4,000 years. Ancient Romans had cisterns and aqueducts. Even in this country, early 1900's farms and ranches had cisterns. So, consider adding a simple rainwater harvesting system into your next irrigation bid package.

Components for a low-cost rainwater system that stores 3,000 gallons could cost less than \$1,000. There is no need for a pump because this (illustrated) gravity feed system is just hooked up to soaker hoses in landscape beds. Some, high quality drip systems may also work, but their gallons per hour rate is usually based on a minimum of about 15 p.s.i. Remember your irrigation calculations? You only gain .43 p.s.i. per foot of elevation, so a 10-foot tall tank full of water would produce less than 5 p.s.i.

How much will it cost? Well, it depends. There are quite a few variables. Are gutters already provided? If not, what type of gutters will be installed? What type of tank will be specified and how much capacity will it have? Will there be a pressure tank and pump? How is the soil? Does a pad need to be designed to hold the weight of a water filled tank. A system diagram and parts list has been provided. An irrigator could add an easy \$1,000 profit to the next job with a simple system.



The least expensive tanks are polyethylene. They run about \$900 for 3,000 gallons in Central Texas. (\$.35 to \$1.00 per gallon, depending on size.) In our market, they are available from farm and ranch stores or rural fencing suppliers. We even have several "big box" stores that stock cisterns. Poly tanks are the most common for urban landscape watering. If you do not use the black or green ones, you have to paint the outside to reduce the growth of algae. The next type, at a little higher price, is galvanized metal. Most suppliers

have gone to epoxy liners to reduce early failure, but our experience shows that galvanized tanks do not last long in areas with frequent high humidity. Condensation forms every morning and does not disappear until late morning. Consequently, rust forms at the seams. Pinhole leaks are common. Newer methods of reducing condensation include the use of a web-like material inside the tank for drainage, with a vinyl liner to actually hold the water. This may provide a longer life to metal cisterns. Their cost is about \$.40 to \$.60 per gallon.

Fiberglass is probably next in line as we go higher in initial cost. They are usually available direct from regional manufacturers and sometimes from distributors. The lifespan is good, but you may need to occasionally repaint the outside to make them last longer.



Novices do usually not install the next few cistern types, but you may want to familiarize yourself about their availability in your market. Wooden tanks are being manufactured in the U.S. as well as being imported from New Zealand. Their cost is \$2.00 per gallon or more. They are ideal for remote locations, as they are assembled on site from a "kit". They can be disassembled and reused. Some large timber tanks are 2 million gallons in size.

Cement tanks made from cast rings that are stacked together may be available in your area. These are sometimes used in agricultural irrigation systems.





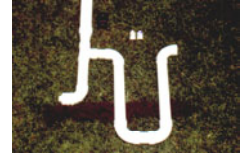
Steel fabricated tanks can be ordered through manufacturers. These need to be painted to enhance longevity.

Concrete or ferro-cement tanks can be constructed on site. Some swimming pool companies have experience making a formed bottom for a cistern, then forms are installed to support a poured concrete top. Hand lay-up or hydraulic pumping may be used for the bottom and sides. These tanks are durable and can be buried or on the surface.



Stone tanks are very expensive to build correctly, but were the method of choice years ago. They can be difficult to repair and maintain.

Components for a rainwater system include some sort of “first flush” filtration. That is a simple way to keep the leaves, bird droppings and dust on the roof out of the cistern. These range from simple to more complex. A “poor man’s roof washer” consists of PVC pipe that collects the first few gallons of water, before the cleaner water is diverted into the cistern.



A roof washer may also be constructed or purchased that uses serviceable filters to eliminate debris. These require maintenance and cost between \$300 and \$600. They are not necessary for non-potable landscape watering systems.

Any type of roofing material works for landscape watering, but metal roofs are preferred for potable water systems. The ideal roof for rainwater harvesting is smooth and non-absorbent.

Gutters run about \$30 per foot for plastic, up to \$15 per foot for copper. You do not need to pay for downspouts if you are immediately building the rainwater system, because the downspouts need to be solid PVC piping starting at least 6” higher on the wall than the inlet into the tank. Gutter screens or leaf omitting caps may be necessary in areas with trees.

Pumps cost from \$200 to \$600, but are not required in a simple system. A 3/4 hp pump will pump water 400 feet, depending upon terrain. Provision must be made for an in-tank float switch and a process to protect the pump in freezing weather. Install the pump as close to the tank as possible.

Maintenance would include frequent cleaning of the first flush filter. If you have screens, clean them also. Most systems that have been installed for 5 years, have not required tank cleaning, but if silt builds up, use a wet/dry vacuum or borrow a small kid.

Where mosquitoes are a problem (let me know where you live where they are not a problem), Bt tablets and granules are available in pond supply stores. You just need a little each month. How can you begin? Hire a consultant or experienced rainwater installer for your first few jobs. Let them know up front that at some point you expect to be installing complete systems on your own. Rather than actually installing systems, you might just contract with qualified installers for your rainwater equipped job and add in profit to the bid submittal.

Why not connect a small rainwater system into the irrigation system? 3,000 gallons would be gone in just one irrigation cycle in a typical landscape.

My experience with these systems is limited to non-potable uses in areas with moderate winters. In areas with frequent freezing temperatures, consult with a qualified local rainwater installer.

Dick Peterson
 Environmental Program Coordinator
 Austin Energy Green Building Program
 721 Barton Springs Road
 Austin, TX 78704
 Phone: 512.322.6172
 Fax: 512.505.3711
 Website: www.ci.austin.tx.us/greenbuilder

Rainwater Harvesting Resources

Organizations:

American Rainwater Catchment Systems Association:

<http://www.arcsa-usa.org>

International Rainwater Catchment Systems Association:

<http://www.ircsa.org>

Books, Magazine Articles & Videos:

City of Tucson Water Harvesting Guidance Manual:

<http://www.ci.tucson.az.us/planning/whm.pdf>

Harvesting Rainwater for Landscape Use, Patricia Waterfall,

Arizona Department of Water Resources:

<http://www.water.az.gov/adwr>

Rainwater and You, Group Raindrops. Order through Makoto

Murase, Ph.D.,:

murase-m@jcom.home.ne.jp

Rainwater Harvesting for Drylands, Brad Lancaster:

<http://www.harvestingrainwater.com>

Rainwater Harvesting for the Mechanically Challenged,

Richard Heinichen:

<http://www.rainwatercollection.com>

Rainwater Collection Systems:

<http://www.oikos.com/catalog/videos/rainwater.html>

"Rainwater Harvesting", Daniel Winterbottom, from

Landscape Architecture, April, 2000:

<http://dnr.metrokc.gov/wlr/PI/pdf/Rainwater-Harvesting.pdf>

Texas Guide to Rainwater Harvesting:

[http://www.twdb.state.tx.us/assistance/conservation/Alternative](http://www.twdb.state.tx.us/assistance/conservation/Alternative_Technologies/Rainwater_Harvesting/Rain.htm)

[Technologies/Rainwater_Harvesting/Rain.htm](http://www.twdb.state.tx.us/assistance/conservation/Alternative_Technologies/Rainwater_Harvesting/Rain.htm)

"Water Saving in the Garden", King County Department of

Natural Resources and Parks, King County, Washington:

<http://dnr.metrokc.gov/wlr/PI/pdf/cistern-water-saving.pdf>

Tanks:

American Tank, polyethylene tanks:

<http://www.watertanks.com>

Norwesco, Inc., polyethylene tanks, 14 plants throughout U.S.

and Canada via local distributors:

<http://www.norwesco.com>

Red Ewald, Inc., fiberglass tanks:

<http://www.redewald.com>

Tanks (cont.):

Timber Tanks America, Inc., wooden tanks:

<http://www.timbertanks.com>

Xerxes Corporation, fiberglass tanks:

<http://www.xerxescorp.com>

Roof Washers, Diverters, First Flush Filters, Gutters, Gutter Leaf Excluders:

FloTrue International Corporation:

<http://www.flotrue.com>

Gutter Helmet:

<http://www.gutterhelmet.com>

Gutter Shield:

<http://www.aok.org/shield.htm>

GutterTopper:

<http://www.guttertopper.com>

K-Guard Leaf Free Gutter System:

<http://www.kguard.com>

LeafGuard:

<http://www.leafguard.com>

Permaflow Gutter Guard System:

<http://www.permaflow.com>

WaterFall Gutter Guard System:

<http://www.waterfall.crane-plastics.com>

Waterloov by Gutter Covers Company:

<http://www.waterloov.com>

Wedge Downspout Screen:

<http://www.avlis.com>

Wisy Products:

<http://www.wisy.de>

Other Information:

Mosquito Dunks:

<http://www.summitchemical.com>

<http://www.bugpage.com/mosquito.html>

or at a local home store or pond supplier.

Cistern Modeling:

<http://www.treepeople.org/trees/cistern2.htm>

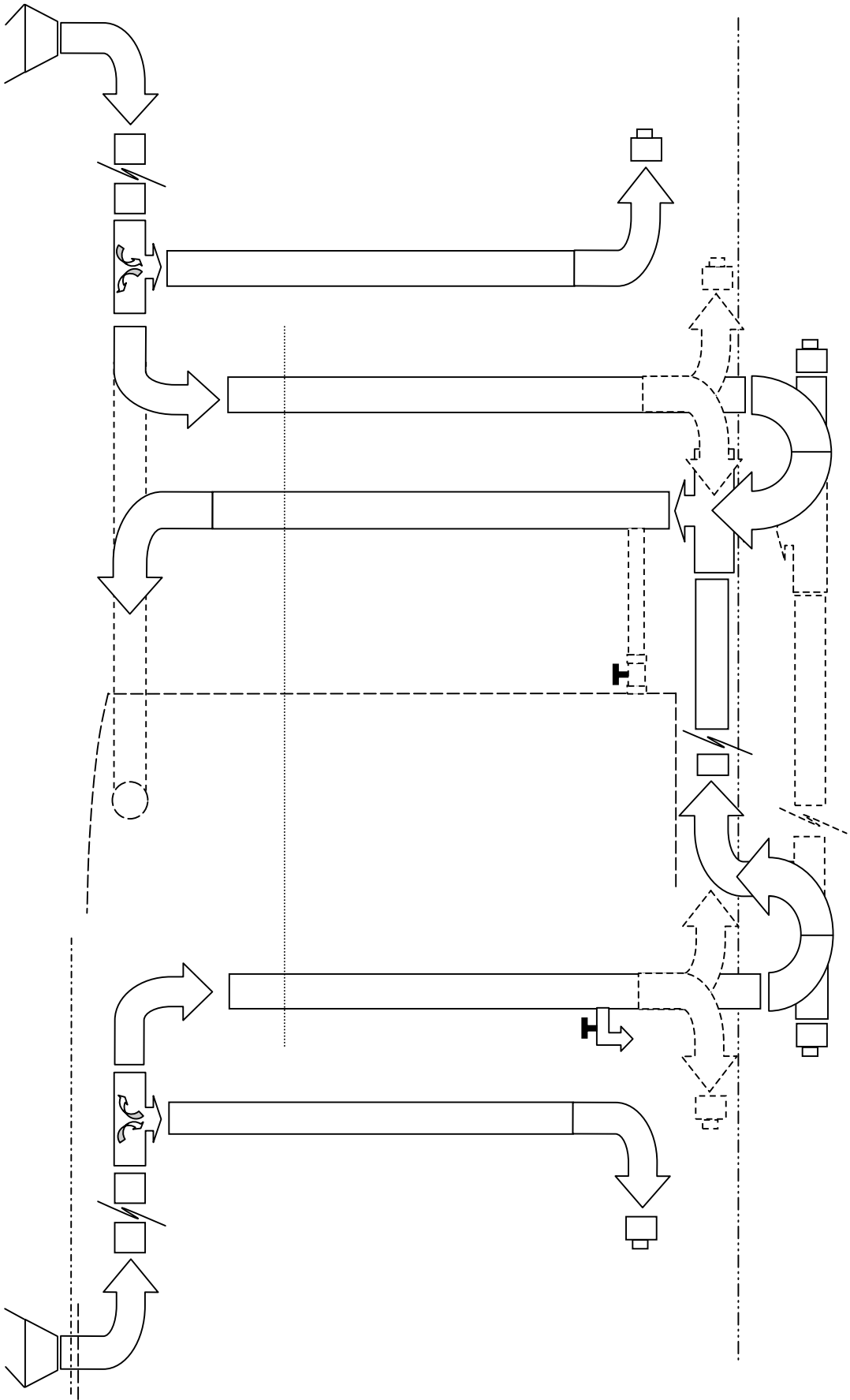
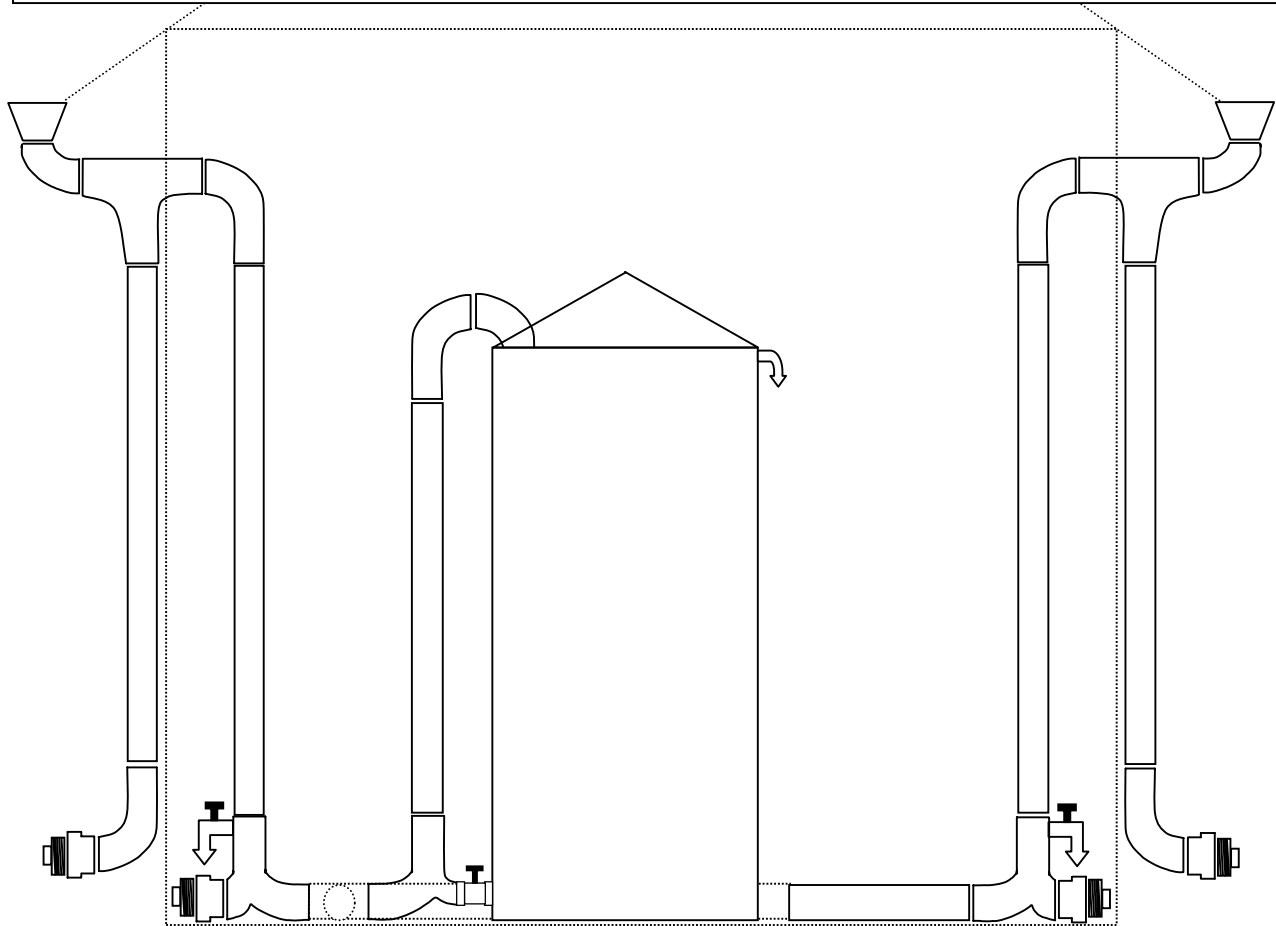


Diagram of a Simple Rainwater Collection System for Landscape Use

There are many ways to harvest rainwater for landscape use. This simple system provides for an additional valve controlled inlet into the tank. Most tanks come with a 2" bulkhead fitting at the bottom. In this illustration, when the valve is open, water will fill the tank from the bottom. If there is a large volume of water, the top inlet will also flow. With the valve open, water will flow out the two hose bibs. When selecting fittings, think of which way the water is flowing. Several shapes may be available and one may be better than the other. Schedule 40 PVC may be used, but the thin wall drain pipe and fittings are lighter weight and may cost less.



Estimated Costs for a Small System

3,000 Gallon Poly* Tank	<\$1,000
2 downspout pipe system	<\$200
Labor to install	<\$200
Total for Rainwater System	<\$1,400
Gutters not included	

Your price for this system as an option, can be \$3,000 or more.

*Poly tanks are used in areas where freezing weather is limited. Fiberglass tanks are about \$1 per gallon in this size. If you have long periods below freezing, check with other rainwater harvesters in your area about freeze protection.



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