Rainwater Harvesting Demonstration
Zilker Botanical Garden

HISTORY

For centuries, people have relied on rainwater harvesting to supply water for household, landscape, livestock, and agricultural uses. Before large centralized water supply systems were developed, rainwater was collected from roofs and stored on site in tanks known as cisterns. With the development of large, reliable water treatment and distribution systems and more affordable well drilling equipment, rainwater harvesting systems have been all but forgotten, even though they offer a source of pure, soft, low sodium water. A renewed interest in this time-honored approach has emerged in Texas and elsewhere due to:

- the escalating environmental and economic costs of providing water by centralized water systems or by well drilling;
- the human and plant health benefits of rainwater; and
- the potential cost savings associated with rainwater collection systems. [1]

SITE SELECTION

The City of Austin has been promoting water conservation for several years by selling rain barrels, offering rebates for larger systems and conducting tours of commercial and residential rainwater harvesting systems. There was need for educational and demonstrational rainwater harvesting systems in a visible place where the public can get information and learn to build a rainwater harvesting system. This system will not only benefit the garden plants, but will also help homeowners or others understand whether or not a rainwater harvesting system is right for them, and which features and types of materials they prefer. The rainwater harvesting system at Zilker Botanical Garden was built by volunteer Master Gardeners and funded by the Austin Water Utility Water Conservation Programs.

ECONOMICS OF RAINWATER HARVESTING

Although desirable, rainwater harvesting is not always an economical choice when compared to potable water provided by the City of Austin. In general, the average cost of a rainwater harvesting system including piping, gutters and the tanks is approximately $1 per gallon. These tanks have been selected to show a variety of styles, types, and prices available.

- Gray Fiberglass tank, 2000 gallons. Fiberglass is sturdy and can be used for larger tanks. The lifespan is >20 years. The cost is approximately $.75 per gallon.

- Black and green high density polyethylene (or "poly") tanks, 2500 gallons each. "Poly" tanks must be colored or painted to prevent algae growing inside the tank. These tanks come in a large variety of sizes to fit into any home or landscape site. (See photo). Polyethylene tanks have significantly reduced the price of small to medium size systems. The lifespan of these tanks is >20 years. Price varies per gallon depending on the size of the tank, but can be less than $.50 per gallon.

The fiberglass and poly tanks can be painted, or surfaced with stone, stucco or wood trim to fit into any home or landscape.

When considering a home rainwater collection system, rainwater tank and storage size needs to relate to the size of the roof, and the amount of landscape to be watered. A typical urban rainwater harvesting system is 2000 to3000 gallons for supplemental irrigation use. It usually takes about 3000 gallons of water to irrigate a typical home lawn/landscape with 1" of water. In other words, you would empty one of these tanks watering only 1-2 times.

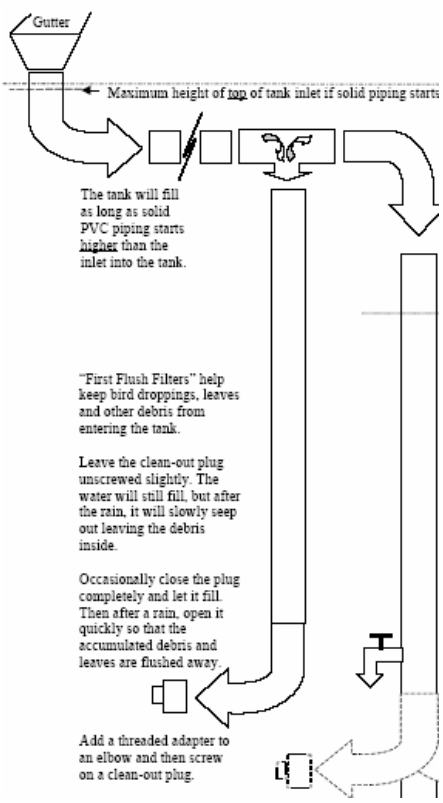
Although the size of these tanks at Zilker Botanical Garden may seem considerable, any less would not have provided a significant amount of water. These tanks have a combined storage capacity of 7,000 gallons. If this system fills up approximately 6 times per year, it will take over 22 years to pay for the cost of this system. Smaller systems often have a "pay back" rate of 20 years or more.

WHY HARVEST RAINWATER?

Other than cost, most people in Austin choose to collect rainwater for various reasons, including that using rainwater:

- is environmentally friendly,
- is a long term water solution for landscape water use,
- is better for plants,
- can be used in the winter time as supplemental water without changing one's wastewater average,
- is cleaner water than surface water free of pollutants, contaminates and soil/debris,
- can be self-sufficient,
- conserves energy from potable water processes,
- fosters an appreciation for this essential and precious resource,[1]
- prevents erosion; capturing the rainfall instead of letting it run-off the property, taking valuable soil with it.

Austin's potable water is moderately "hard" (100 mg/l per cubic meter of calcium carbonate) and has a high pH of 9.5. Potable water is not as good for plants as rainwater, which has a neutral pH of 7, less salts, and may have nitrogen from lightening storms. Here at Zilker Botanical Garden, the azaleas and other plants in the Garden will benefit from using rainwater instead of potable water.



First Flush Filter Shown at left

SYSTEM DESIGN

Rainwater is collected from the Garden Center roof, approximately 5000 sq. feet, through gutters and PVC piping. This will collect approximately 3000 gallons of water from a 1" rain. Some water is lost to evaporation, some adheres to the roof, and some water goes into the first flush filters. Each tank is fed by its own intake from the roof with its own first flush filter (roof washer) built in. The gutters are covered with leaf guards to prevent large debris from entering the system. First flush filters collect the smaller debris from the initial rainfall, and after the first flush filters fill up with water, the cleaner water is diverted to the tanks.

The drip irrigation is connected to potable water for backup. A reduced pressure zone (RPZ) back flow device has been installed to protect the potable water supply.

Because all three tanks are interconnected the tanks will all fill to the same level. A water level indicator (clear PVC) is provided to indicate the amount of water in the tanks. The electric pump is enclosed in a pump house to keep it from freezing in cold weather. A miniature Timber Tank [tm] model The pump is installed with a water meter, and will irrigate acid-loving plants like azalea and fern plants in the garden. The meter will keep track of how much water has been used for research purposes. The pump will supply the pressure to use existing drip irrigation, or to water by hand. The overflow will be used to water the garden, fill the water ponds, or fill the water barrels also included in the system.

MAINTENANCE

While a rainwater system does not require a lot of maintenance, it does take a time commitment for the system to work right. Every effort needs to be made to keep the water as clean as possible, before it enters the tanks. The first flush filters need to opened, and the debris removed, at least once a year, or more if there are a lot of leaves, pollen or debris from the roof. Live oak trees, which drop their leaves in March, hang over the roof of the Garden Center, so after early spring would be a good time to clean the filters or after an extended period of rain. Any loose debris from the roof should also be removed periodically.

In freezing weather all pipes and pumps need to be drained. Pumps may need to be wrapped or covered for more protection. Pipes may need insulation if they cannot be drained, or are inconvenient to drain.

INSTALLATION

Is Rainwater Harvesting for you?

If you are considering a rainwater system, you need to consider:

- roof area available,
- space available for the tanks (many sizes are available),
- landscape area and plants to be watered,
- cost considerations, and
- time commitment for maintenance and use.

The City of Austin only promotes rainwater harvesting systems used for landscape irrigation. If a system is not properly installed for the proper use, it will be a large waste of money. Systems that are built and then abandoned become "white elephants" in the home landscape. This system is open to public throughout the year. Special educational seminars will be held to promote water preservation and conservation, and to instruct people on how to build a rainwater harvesting system economically.

To determine the optimum tank capacity, you need to know the average summer rainfall in your area and the roof square footage. Use the perimeter measurements of your house (do not consider the angle of the roof.) 1000 sq. ft. of roof can collect 600 gallons of water from a 1-inch rain. During the summer months, we receive an average of 10 inches of rain. This would provide 6000 gallons of water (600 gallons x 10 in = 6000). Some rainwater is lost to evaporation, to the roof surface, or in the first flush filters.

For your calculations, multiply the following: square footage of rainwater collection area of your roof_____sq. ft. x .6 = _____ gallons that can be collected from a 1-inch rain. Multiply your answer by 10 for the average gallons that can be collected in one summer in Austin.

For more information contact the Water Conservation Programs with the Austin Water Utility. Visit our website at www.cityofaustin.org/watercon or call (512) 974-2199.

Thank you to the Master Gardeners that installed the system, the Parks and Recreation Department, the Zilker Botanical Garden Horticulture Council, and the Austin Water Utility for making this demonstration exhibit possible.

1 Texas Water Development Board, "**Texas Guide to Rainwater Harvesting**". Used with permission.