Capturing Rainwater for Landscape Irrigation in Georgia

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Introduction

There is increasing interest in rain water harvesting as an alternative water supply source particularly for landscape irrigation. Landscape designers and installers are wondering if this could be a new service, product or aspect of design that would be of interest to their customers. In Georgia, from 1998 to 2002, there were five years of excessively dry weather that greatly increased the interest of homeowners in having automated irrigation systems for their homes. At the same time that more irrigation systems were being installed, Georgia was deciding to restrict outdoor water use, the largest use of which is irrigation.

Home owners and high-end commercial locations still want to have green healthy landscapes even during drought when use of potable water may be restricted and would be most needed by landscapes. One possible solution for this landscaping dilemma is to harvest rainfall on site as an irrigation source.

Most studies and development of rain water harvesting guidelines have come from the western US, island countries and developing countries where water supplies are limited. However, harvesting rain water in a humid climate could become a more financially feasible practice due to decreasing water supply availability and increased need for storm water management in urbanized areas particularly. In areas with heavy or increasing urbanization where there are lots of impervious surfaces from which rain water could be harvested, the value of rain water harvest systems may become increase as municipal water becomes more restricted or more expensive to use. A rain harvesting system not only can be an alternative water supply. In humid regions, rain harvesting may also provide some storm water mitigation particularly in urbanized areas.

Rain Harvest – Irrigation System Description

The University of Georgia Griffin Campus (UGA Griffin Campus) installed a rainwater harvesting system for an office building where the harvested rainwater is the supply for a micro-irrigation system. The irrigation system supplies water for the landscape surrounding the building. In addition to rainwater, the condensate from air conditioning in the building was also routed into the harvest system. The rainwater harvest system was retrofitted to the existing building that was over 30 years old on the UGA Griffin Campus without changing any of the building structure. The roof area of the building is approximately

The building that the rainwater is harvested from is a two story building with a roof that slopes slightly to the back of the building. There are 3 gutters located down the back of the building that carry the water off of the roof. To capture the rain water from the roof, the original gutters were routed into new PVC pipes that carry the rainwater to a buried plastic cistern behind the building. The PVC pipe (6 in diameter) was connected to the old gutters about 8 ft. above the grade. A debris trap was set at the connection point between each of the original gutters and the PVC collection pipes. This trap would capture the first flush from the roof and the debris that would be washed off at the beginning of each storm. Then after the first flush of water filled the trap, the rest of the water would flow through the PVC pipes to the cistern storage.

The PVC pipes went from above ground to buried about 3 ft deep. Below ground all three pipes were connected into a pre-fabricated plastic storage cistern. The storage cistern was buried with a 24 in diameter cap that came to the surface for getting into the cistern to clean it out. The cistern holds approximately 2400 gallons of water. The water can exit the cistern in two ways. One exit is for an overflow situation during a storm when the cistern fills to the top. This overflow was a 5 in diameter PVC pipe exiting from the top of the cistern which comes out at the ground surface about 8-10 ft away from the cistern at grade. The other possible exit for the water in the cistern is from a 1 Hp submersible pump suspended in the cistern that pumps the water into a micro-irrigation system that supplies water to the landscaped area surrounding the building.

Water exiting the overflow pipe flows into a landscaped bed that captures much of the overflow. The overflow that stays in the landscaped bed infiltrates into the soil. Surrounding the bed is an expanse of 30 or more feet of established Bermuda grass that slopes gently (less than 2 %) away from the landscape bed. Once the landscaped area which is flat has retained as much rainwater as it can hold the overflowing water will continue to move through the Bermuda grass to an adjacent street. From observation, the heavy stand of Bermuda grass has prevented any erosion and actually holds much of the overflow in place to infiltrate such that virtually none of the overflow makes it to the street.

The landscape that the irrigation system applies water to is a mixture of trees, perennials and woody ornamental plants. In an early design there was going to be small patch of turf that would be watered by drip tape, but the cost of the irrigation equipment for this area was determined to be prohibitive, so the turf area does not receive any irrigation at this time. The total estimated design water requirement for the landscape was about 310 gallons per day. The 1 Hp pump provides much more capacity of flow than is needed for the irrigation system since no zone would need more than 70 gallons per hour. The landscape has 8 zones. The applicators for all zones are 1 GPH pressure compensating drip emitters.

The landscape, irrigation system and rain harvesting system have been in place for about one growing season so far. In this first growing season because it was a wet year, very little irrigation water has been applied, so the rain harvest system has not had a real test so far. It's benefits will be seen when there is another drought year in Georgia which could happen any time.

Future Plans

The next phase of this project is to implement a monitoring system for the rain harvest system and actually measure how much storm water gets saved and recycled with various weather patterns and whether the cistern can support the area of landscape that it has been designed for or whether it may be possible to extend the irrigation system to cover more landscape in the future with the capacity of the cistern.

The monitoring system consists of a sensor in the cistern that measures the volume of water in the cistern, a flume measuring device that measures any overflow water volume and a inline pipe flow meter measuring the amount of the water that gets used as irrigation water for the landscape. The monitoring equipment is going to be installed this winter so that monitoring can begin in the 2005 growing season.

There are several aspects of the original design that may be able to be improved once the results of the monitoring of the system have been analyzed. For example, the size of the cistern, the size of the pump and the estimate of water use for the landscape may be over-designed for the humid climate of Georgia. If any of these things could be reduced then the cost of the system would be reduced accordingly, and the rain harvest system might be a more feasible addition to the overall landscape design.

Currently, a major deterrent to installation of rain harvesting systems for irrigation is the additional cost to the irrigation system. With the price of municipal potable water increasing, a rain harvesting system for landscape irrigation becomes a more cost effective option. Compared to recycling of treated wastewater, the plumbing costs for retrofitting a building with a rain harvest system are minimal, so in locations where potable water restricted from being used as irrigation water in humid to semi-arid climates, harvesting rain water would seem to be a viable alternative, particularly for smaller landscapes.