

**Water Conservation & Pollution  
Prevention Assistance Grant  
Final Report  
April 28, 2006**

Prepared for:  
Withlacoochee Regional Water Supply Authority  
Florida Organics Recycling Center for Excellence (FORCE)

Prepared by:  
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## **I. Project Progress and Timeline**

The funds for this project were originally secured in October 2004, with a timeline to be accomplished by July 2005. Due to delays in the completion of the project site, the West Central Florida Agriculture Education, Marketing and Development Center, the completion of the project has also been delayed until April 2006.

In addition to delays caused by construction, the key contacts involved in the original grant also changed during this time period. Dr. Joan Bradshaw now works for UF/IFAS Extension out of the Citrus County Office, and Bernard Dew retired as the Sumter County Administrator. The Sumter County Extension Director, Ed Jennings also left that position, moving to a Livestock agent position serving four counties. Even with the delays and the changes in personnel, the project has been completed except for the promotional activities. After the landscape matures the promotions and tours of the gardens will begin.

The construction of the demonstration landscape began on February 1, 2006, one day after the Sumter County Extension Office moved into the new building. Prior to the construction, a team of extension agents and Sumter County Master Gardeners worked to produce a design for the landscape. Also, prior to the move, research began on rainwater harvesting systems and a cistern system was located for purchase.

## **II. Accomplishing the Overall Program Focus**

Conserving water and protecting our water resources is the theme and focus of this landscape project. This landscape was designed to be a demonstration of attractive landscaping principles that are an alternative to high water use landscapes.

### **a) The beneficial use of compost and mulches to conserve water.**

The project used several different mulches and also organic compost made available by FORCE. Approximately 50 yards of organic compost was incorporated into the soil, along with other soil amendments, prior to planting. Weed cloth, gravel, pine straw and pine bark were all used in various parts of the demonstration over the compost to preserve the moisture in the soil.

**b) The aesthetic and maintenance benefits of native and drought tolerant planting in place of high water use turf grass.** No turf was planted in this landscape and native plants were planted through out the demonstration area. Planter boxes were filled with native Walter's Viburnum, and are flanked by Simpson's Stopper shrubs. Native lantana and blueberries are used in the front landscape, along with native magnolia, holly and palm trees. Many other unusual native plants are featured in the landscape and are labeled with both common and scientific names so that a visitor to the gardens might be able to locate them at a native plant nursery.

**c) The use of low volume irrigation and rain sensors to conserve water in the landscape.** A low volume systems has been installed with rain sensors and is a visible part of the demonstration of water conservation.

**d) Methods of capturing and retaining rainfall on site using rain barrels and downspouts on the building directing water flow into planting beds.** The most noticeable feature of the landscape is the cistern system, which has installed on the west side of the building and left above ground so that it can be viewed as part of the demonstration. After a great deal of research, the system was purchased from BRAE Rainwater Technologies. BRAE also provided an analysis of the Initial Cost, Life-Cycle Cost and Water Savings for this particular landscape.

The planning group decided to look for a cistern system when it was noticed that a great deal of rainwater was being directed from the roof of the 38,000 square foot building into a retention pond at the corner of the property. Two decorative downspout systems were placed on the side of the building and connected to two 3,000 gallon cisterns. The cisterns are attached to the low volume irrigation system that supplies water to the approximate half acre landscape. The overflow from the cisterns has been directed underground to feed a "bog garden" that will demonstration various plants that naturally grow well in a water saturated area.

According to the BRAE study, this system would supply 57% of a half acre of turf grass irrigation with a demand of 436,000 gallons per year. We project that the landscape, which has no turf grass, will be 100% supplied with water by these cisterns. The payback of the initial investment will be reached in 7-8 years and will then save Sumter County \$1000 per year in water fees.

**e) Reduction in offsite transport of sediment, nutrients and pesticides through storm water runoff.** The demonstration landscape will be maintained with minimum pesticide use and the use of mulches will prevent large amounts of water run off during storms.

**f) Use of appropriate rates and methods of applying fertilizers and irrigation.** The irrigation system is equipped with rain sensors and additional water will not be applied when natural rains have occurred. In addition, a weather station with rain gauge has been installed so that the amount of rainfall can be observed and recorded. When possible, organic or slow release fertilizers and compost will be used in the landscape at the rates recommended by the University of Florida.

**g) Use of integrated pest management to minimize pests and apply chemicals only when appropriate.** The demonstration garden is located at the front door of the extension office and will be scouted daily by Master Gardener volunteers and extension personnel for any pests that might be present. Biological controls and insecticidal soaps will be used when the pest population reaches an undesirable amount. If plants become habitual targets of pest populations, they could be removed and replaced with a different plant that is less of a problem.

**h) Water use monitoring and record rainfall data via weather station and irrigation control system.** As previously mentioned, this data will be collected by using the rain gauge in the weather station.

In addition to the landscape that features water conservation methods, signs and lighting are being used to tell the story of the landscape. Markers with the nine Florida Friendly Landscaping Principles have been installed as well as a kiosk shelter where a visitor can relax in the shade while reading the signs and brochures. A fact sheet with the details of the plants used in the garden, as well as the type of irrigation and rain collection system is being developed for garden visitors.

The garden is located at the Sumter County Fairgrounds, and many visitors are welcome and expected. The garden is not fenced and visitors can come and walk through the gardens on a self-guided tour. As the gardens mature, we are planning a garden kick-off and advertisement campaign to let the public know about the water conservation gardens.

This project was designed so that it could be used in other extension offices or other places of business or homes. For information regarding vendors or details about the construction of the demonstration garden, please contact:

Susan A. Kelly  
UF/IFAS Sumter County Extension  
(352) 793-2728  
7620 SR 471 Suite 2  
Bushnell, FL 33513

### **C. Potential Water Savings**

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Refer to SECTION A Rainwater System Cost Estimates for Alternatives 1 and 2.

### **3. System Schematic**

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System Schematic: SEE APPENDIX A

### **4. Written Summary**

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This summary is based on Sumter County Cooperative Extension goals (1) to reduce long term operating costs through conservation, (2) to demonstrate water quality protection through rooftop runoff reduction practices, and (3) achieve a 40%<sup>6</sup> reduction in landscape irrigation demand. Alternative 1 with a system capacity of 6,000 gallons, at an initial cost of \$6,699.89, is recommended and is estimated to meet and exceed Sumter County's environmental goals.

Alternative 1 provides the capability of supplying 57% of the projected 1/2 acre turf grass irrigation demand ranging from 7,000-64,000 gallons or approximately 436,000 gallons per year. Alternative 1 will reach payback in approximately 7-8 years and accrue annual water savings of 247,118 gallons. Thereafter, Sumter County Extension would realize a positive return estimated to exceed \$1,100 in annual water fee savings.

Detailed Cost Estimates for Alternatives 1 and 2 are provided in Section A.

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<sup>6</sup> Goal provided on completed Project Information Sheet

## B. Simple Payback Cost Analysis

This Cost Analysis does not factor in the high value of this *educational demonstration of water conservation and water quality protection practice.*

### Alternative ONE: 6,000 Gallons Cistern

Year	1	2	3	4	5	6	7	8	9
Initial Cost	(6,700)								
Max Water Savings <sup>5</sup>	782	821	862	905	951	998	1048	1100	
Stormwater Fees (none)									
Accumulated Loss/Gain	(5918)	(5097)	(4235)	(3330)	(2379)	(1381)	(333)	767	

**Payback: 7.4 Years**

### Alternative TWO: 12,000 Gallons Cistern

Year	1	2	3	4	5	6	7
Initial Cost	(9,551)						
Max Water Savings	1372	1379	1386	1393	1399	1406	1413
Stormwater Fees (none)							
Accumulated Loss/Gain	(8179)	(6800)	(5414)	(4021)	(2622)	(1216)	197

**Payback: 6.7 Years**

#### Payback Cost Analysis Notes:

- Routine maintenance is minimal, no additional manpower cost incurred.
- Electricity cost for water pump is minimal.
- Unable to calculate Potential Reduction in Fire Insurance Premium for fire hydrant connection
- Water Rates are based on Bushnell Commercial user rates of \$3.00 per one thousand gallons
- Estimates do not factor increasing costs of water which can vary from 5-30% per year
- Assumes 0.5% annual water rate increase

<sup>5</sup> Assumes 5% annual inflation rate

## **1. Calculate cistern size using detailed rainfall data specific to project site**

Using 30-Year local weather data for the project site and the non-potable, potential irrigation water demands, we have the following findings and recommendations:

The Rainwater Cistern (water storage tank) capacity was calculated based on a monthly demand ranging from 7,000-64,000 gallons for irrigating a ½ acre of turf grass or approximately 436,000 gallons per year. The local 30-year average rainfall total is approximately 46.56 inches per year.

Two capacity alternatives are provided for consideration based on site conditions and core project goals.

**Alternative One** has a cistern capacity of 6,000 gallons and is designed to collect runoff from 25% of the 38,000 SF facility rooftop area. This system will meet an estimated 57% of projected irrigation needs at a collection efficiency of 90%.

**Alternative Two** has a cistern capacity of 12,000 gallons and is designed to collect runoff from 50% of the 38,000 SF facility roof area. This system will meet an estimated 86% of projected irrigation needs at a collection efficiency of 90%.

Monthly cistern levels, potential water savings and runoff reduction estimates are provided below for each alternative 1 and 2.

**Alternative One: 9,500 SF CA<sup>2</sup>**  
 Cistern Capacity: 6,000 Gallons

### Monthly Cistern Levels for 9,500 SF CA

Month	Rainfall (inches)	Supply and Demand		With Cistern			Without Cistern	
		Collection Potential (gallons)	Volume Used (gallons)	Municipal (gallons)	Cistern Level (gallons)	Overflow (gallons)	Water Usage	Overflow
JAN	2.35	12,518	11,534	0	984	0	11,534	12,518
FEB	2.51	13,370	7,463	0	6000	891	7,463	13,370
MAR	3.19	16,992	17,097	0	<b>5895</b>	0	17,097	16,992
APR	2.11	11,239	39,079	21945	0	0	39,079	11,239
MAY	3.30	17,551	64,181	46630	0	0	64,181	17,551
JUN	6.43	34,224	48,441	14217	0	0	48,441	34,224
JUL	6.82	36,238	48,712	12385	0	0	48,712	36,238
AUG	6.93	36,887	63,503	26616	0	0	63,503	36,887
SEP	6.15	32,759	46,270	13511	0	0	46,270	32,759
OCT	2.51	13,370	43,014	29664	0	0	43,014	13,370
NOV	1.97	10,494	30,937	20444	0	0	30,937	10,494
DEC	2.31	12,278	16,147	3869	0	0	16,147	12,278
<b>ANNUAL</b>	<b>46.56</b>	<b>248,009</b>	<b>436,377</b>	<b>189260</b>		<b>891</b>	<b>436,377</b>	<b>248,009</b>

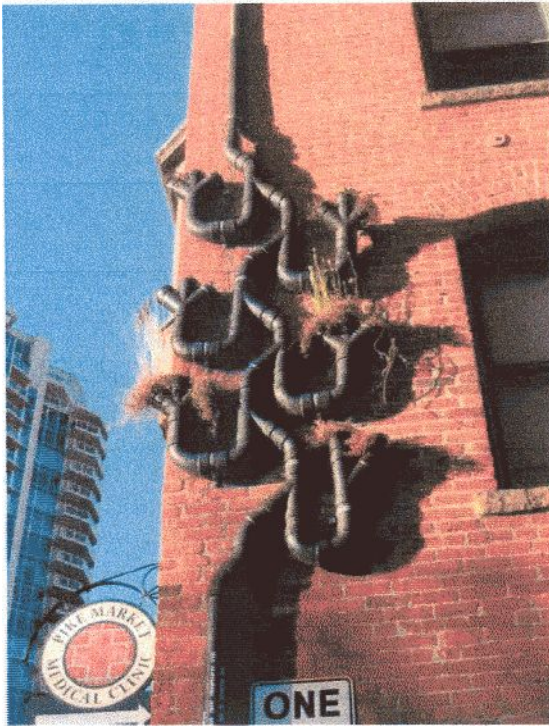
### Annual Data for 9,500 SF CA

	Volume (gallons)	
Rainwater Utilized:	247,118 <sup>3</sup>	
Annual Volume Required:	436,377	
Municipal Water Required:	189,260	57% Reduction
Water to Storm System:	891	99% Reduction

<sup>2</sup> CA= Collection Area measured in SF (square feet)

<sup>3</sup> Volume used added with a cistern at full capacity

**Piping examples for collecting rooftop runoff**



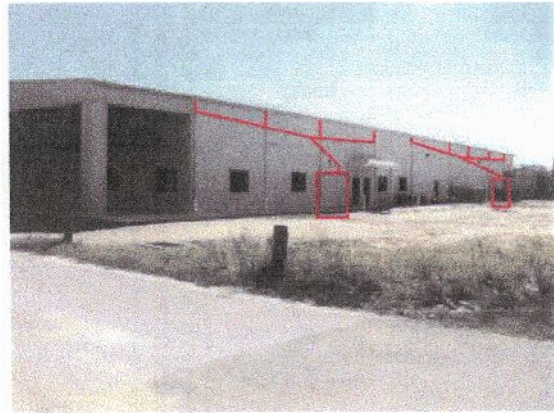
("Downspout 1" in Seattle, WA)



("Downspout 2" in Seattle, WA)



(Option One CA=1/4 of roof area)



(Option Two CA=1/2 of roof area)

Connecting two above ground cisterns, having a total storage capacity of 12,000 gallons, would allow the project to maximize collection potential while reducing a higher percentage of runoff that would otherwise contribute to site stormwater system.

**UF/IFAS Sumter County Extension Office has moved!**

**Come see us at our new location, the West Central Florida Education Marketing and Agricultural Development Center!**

**7620 SR 471 Suite 2  
Bushnell, Florida 33513  
(352) 793-2728**

**Our horticulture agents and our Master Gardener volunteers are in the process of installing a new Florida Native landscape and water conservation demonstration area. The landscaping and demonstration gardens will be watered using rainwater harvested from the roof using a cistern system. The funds for this project were provided by the Withlacoochee Regional Water Supply Authority and Florida Organics Recycling Center of Excellence.**

