

# **Optimizing Long Term Demand Management Goals through Implementation, Evaluation, and Performance**

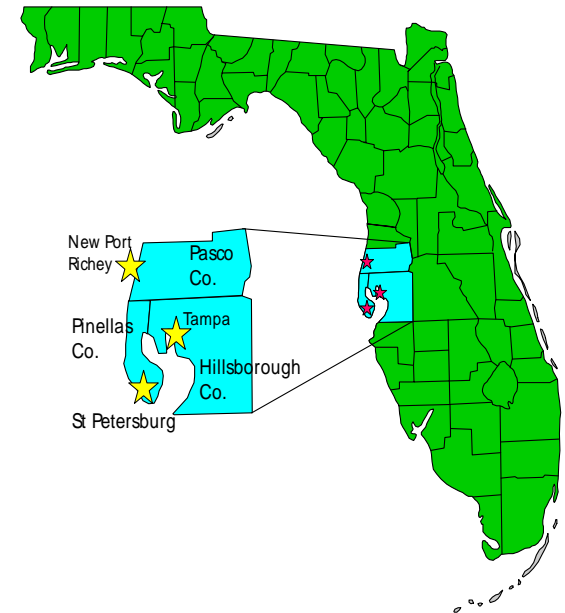
**Green Cities Florida  
May 21, 2009**

**Dave Bracciano  
Tampa Bay Water**

# Presentation Goals

- **Demand management goal establishment**
- **Conservation measures**
- **Specifications you should use**
- **What and where to find new types of technology**
- **Determining if technology is tested**
- **Sources of information**

- **Regional water wholesaler serving 6 Member Governments in the Tampa Bay region**
- **Growing population**
  - 2.4-2.5 million people served
- **Growing Member demand**
  - 245 mgd now (lower during drought)



# Why Create Goals and Implementation Strategies?

- **Permitting requirements**
- **Lower future average demand increases**
- **Reduce current demand**
- **Lower peak demands**
- **Environmental impacts/sustainability**

# Tampa Bay Water's Historical Goals

- **Master Water Plan Adopted December 1995 with conservation goals**
- **Demand Management Plan, 1997**
- **Demand management program developed in 1998 (based on use of best management practices)**
- **Partnership Agreement with SWFWMD and Members adopted in 1998**
- **Compile member five year conservation plans, 1999 to date (annually)**

# **Master Water Plan Development Study Project:**

## **Demand Management Plan Update**

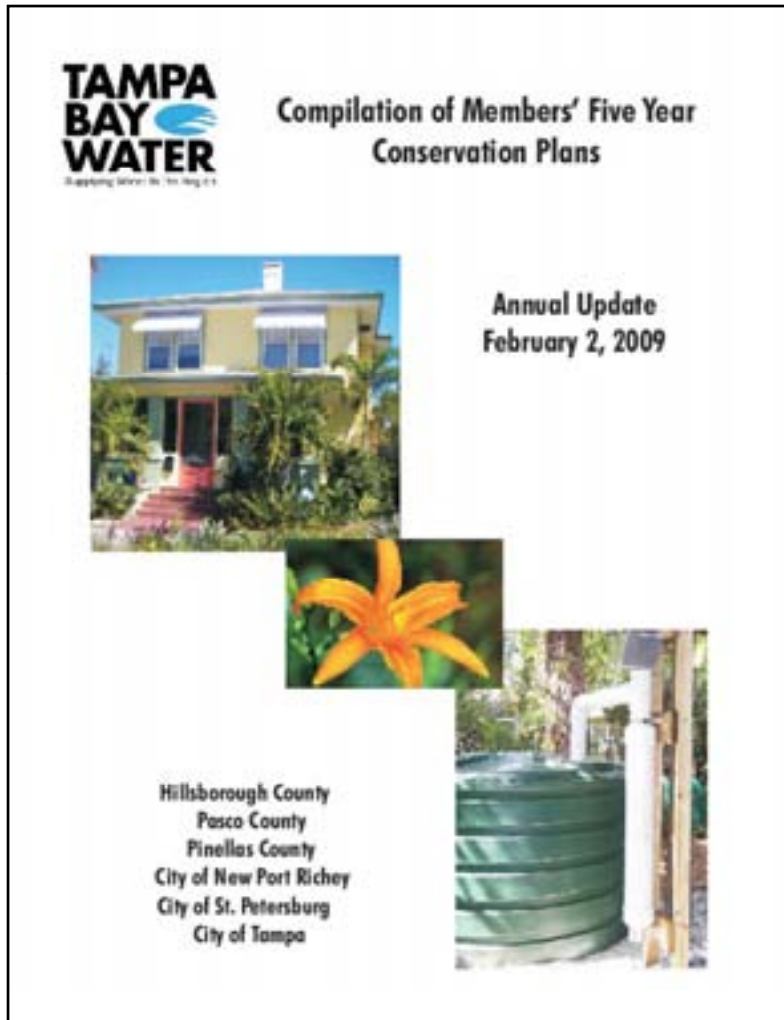
**Board Workshop**

**April 2009**

- **Protect Current Supply – source water protection**
- **Regional Reclaimed Water Planning**
- **Develop Future Supply – 7 water supply projects selected**
- **Conserve Current Supply - Demand Management Plan update**

- **Water shortage management**
  - Tampa Bay Water’s Water Shortage Mitigation Plan (WSMP)
  - Member government actions
  - District “orders”
- **Long term water use efficiency**
  - Regional Demand Management Plan
  - Master Water Planning Process

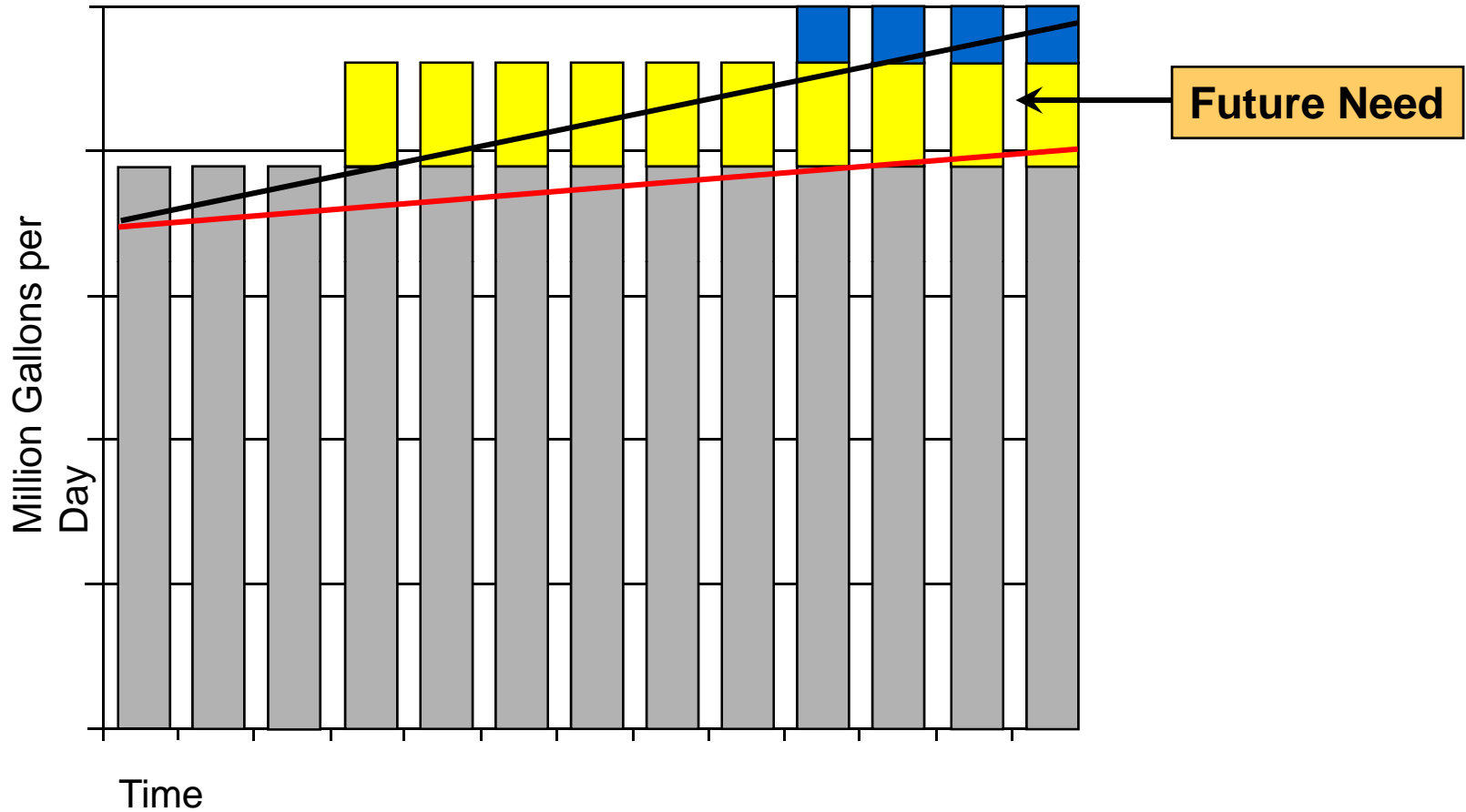
# Members have embraced conservation



- **Wide range of options have been implemented**
- **Estimated 23 mgd of potable demand offset between 1996-2008**
- **Savings to-date establish baseline**

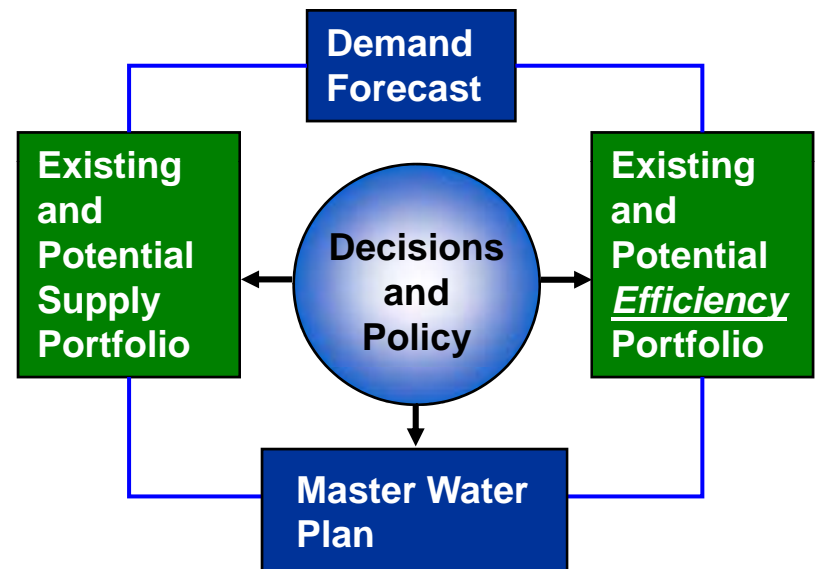
**Additional opportunities to improve efficiency exist**

# Conservation can defer capital investments and reduce future needs



- **Future supply needs can be met through new supply projects and/or conserved water**
- **Conserved water has economic benefits**
  - 1 mgd saved = \$10m capital cost deferment
  - 1 yr. deferral of \$100m capital project saves \$5m in interest
- **Avoided cost for energy and chemicals**

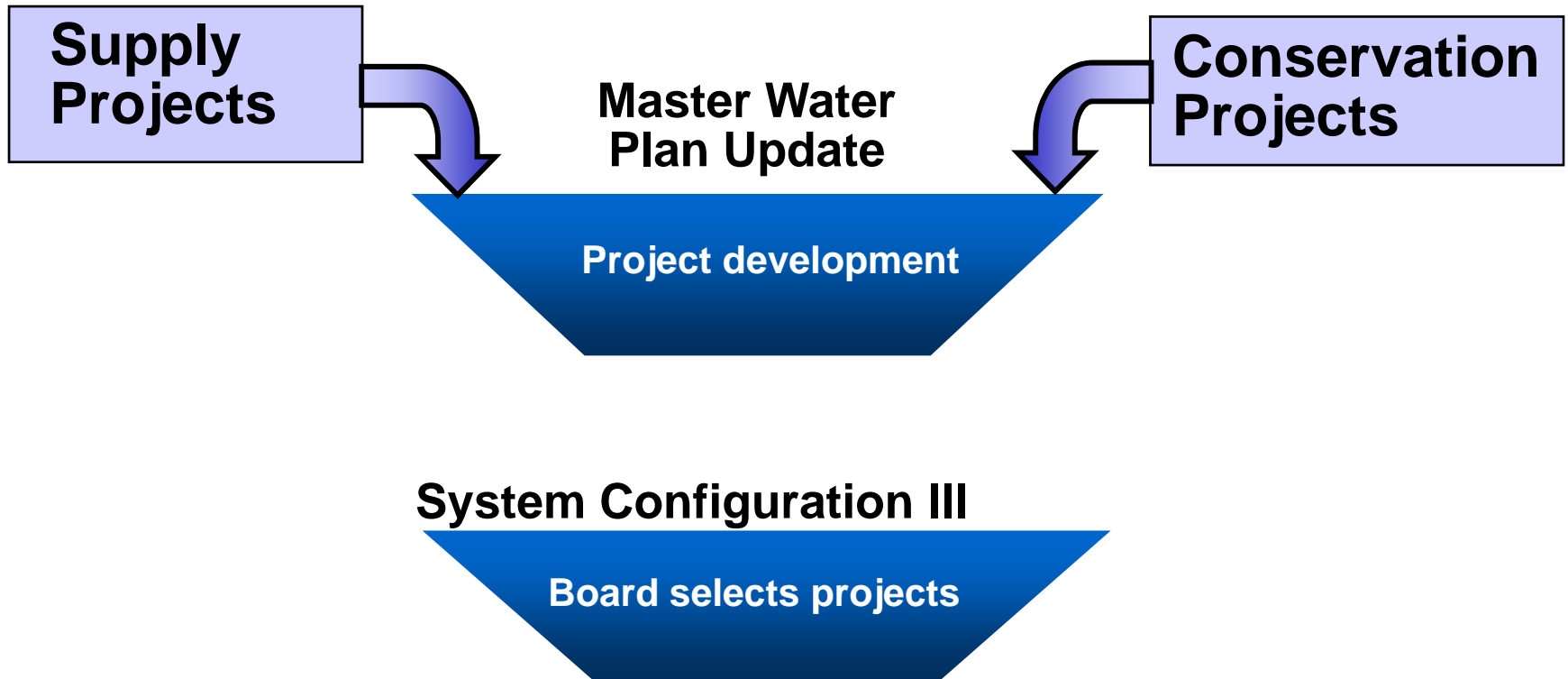
- Identify and evaluate regional water conservation potential
- Integrate demand management into water supply planning process
- Explore implementation options
- Seek Board direction and policy guidance



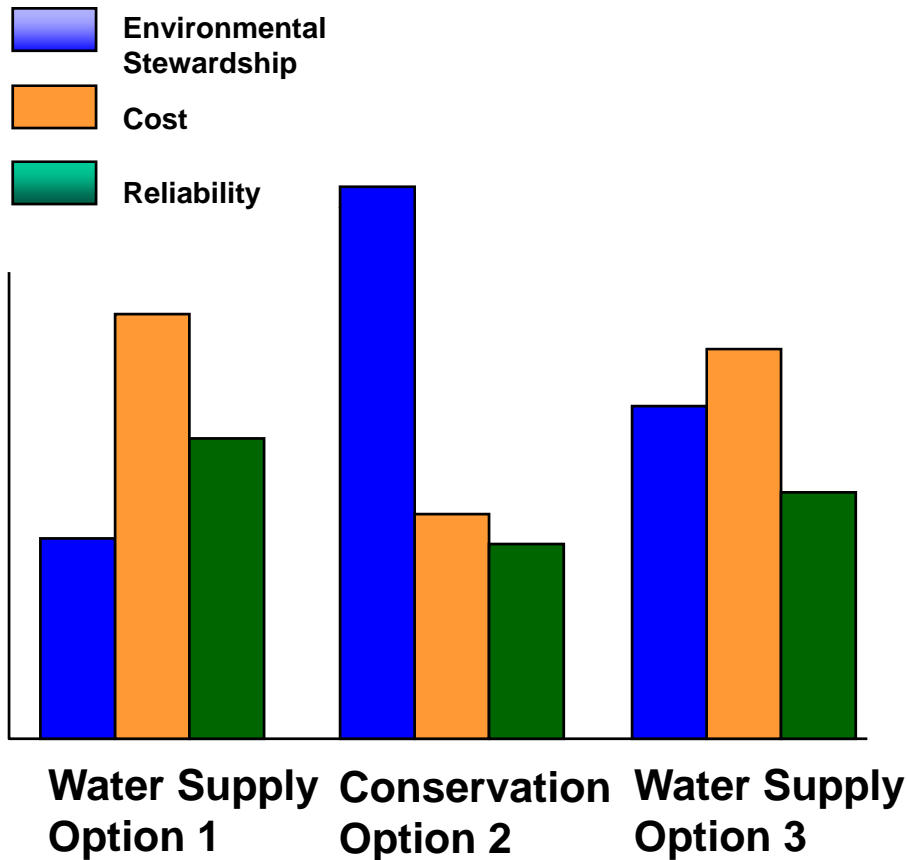
## Other major water suppliers have successfully used this approach

- **East Bay Municipal Utility District**
- **Seattle Public Utilities**
- **New York City**
- **Metropolitan Water District of Southern California**
- **Southern Nevada Water Authority**
- **City of Austin Public Utilities**

# Conservation projects will be integrated into the project selection process



## Evaluation Criteria



- **Selected conservation projects must be:**
  - Proven technology
  - Measurable (cost, reliability, reach, etc.)
  - Capable of deferring capital expenditure (reliable)

# Water conservation projects will be compared using the same criteria, including cost

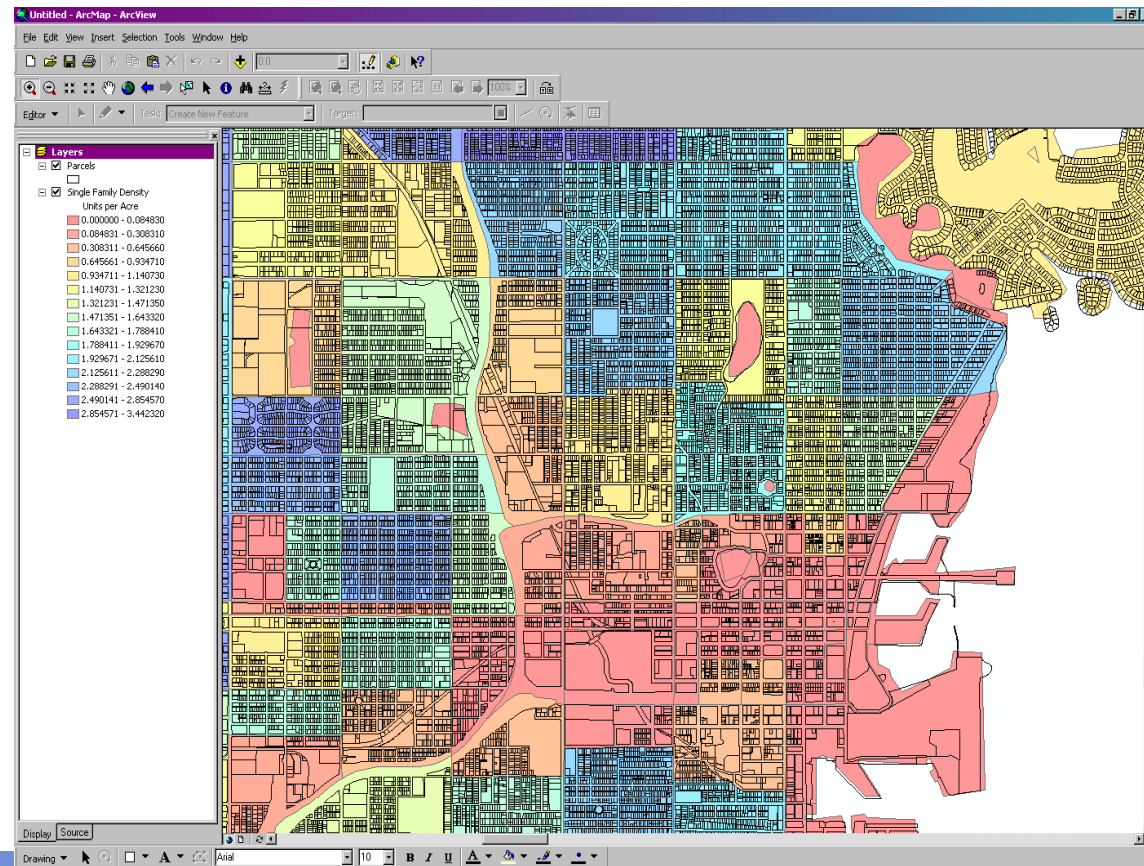
<b>Project</b>	<b>\$/1000 gallons</b>
Water Conservation	\$0.25 - \$3.25
Small Footprint Reverse Osmosis – Pinellas County	\$7.91 - \$8.20
Tampa Bay Seawater Desalination Expansion	\$5.66 - \$6.99
Gulf Coast Desalination	\$7.61
Additional Potable Groundwater from Existing Wells	\$1.24
Thonotosassa Wells	\$2.25
Alafia Expansion	\$3.97 - \$10.26
Aquifer Recharge	\$4.39 - \$7.06

# What is Used to Identify Regional Conservation Potential

- **Use billing system data**
- **Data include:**
  - **Total use/month and year**
  - **Treatment and conveyance losses**
  - **Total billed water use/month/year**
  - **Water use by sector**
- **Tag accounts with conservation data and metrics**

# Driving Demand- Density of Homes, irrigation systems, price

## Single Family Density per Acre





# Conservation Program- General Expectations

- **Supported by government & the public-surveys**
- **Effective at reducing demand**
- **Affordable and cost-effective**
- **Equitable**
- **Optimize the use of public funds-quantifiable programs only**
- **Costs <next increment of supply**
- **Reduce wastewater flows/discharge**
- **Reduce energy use**

- **Benchmark the public**
- **Politically acceptable planning**
- **Drive implementation strategy**

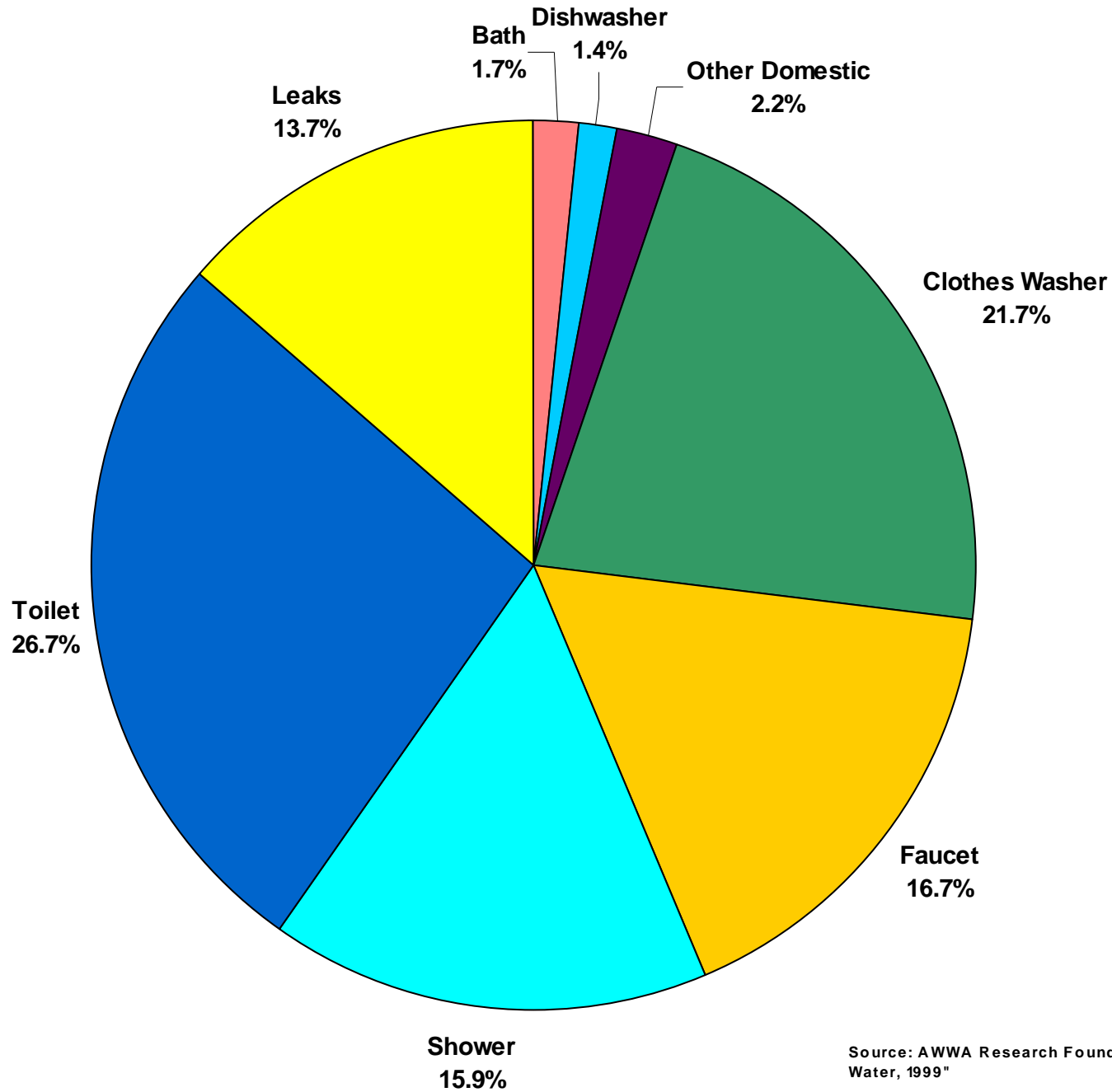
- ***What is the most important reason to conserve water?***
- ***Have you participated in a program sponsored by your utility?***
- ***If no, why not?***
- ***Questions regarding rebate programs***

- **Definition: quantifiable programs that actively reduce potable water use in any sector**
- **Passive programs-reduce demand through natural replacement with required high efficiency fixtures/appliances- EPA Act, green build requirements**

# Example of Active Programming

- **Government implements/incentives**
- **Rebates, giveaways, vouchers**
- **Affects SF, MF, and commercial sector**
- **Assure that modifications are made**

# Indoor Water: How Much Do We Use?



- **Energy Policy Act of 1994**
  - **Total # customers/sector**
  - **Billing information- sectors**
  - **Historic service area population/age of home** (free riders-3% per year)
  - **Census population- determine the numbers of persons per household**

## How much water does a fixture use?

- Water use is measured per person-not fixture
- $\text{Savings} = \text{Savings/person} * \text{pph}$
- X number of persons/household or account (SF)/unit (MF)

$\text{Savings rate} = \text{savings/account or unit}$

# Calculating Savings-REUS

## ULFT change-out

- 10.5 gallons/person/day (100% penetration)
- Average 5.05 flushes/person/day

## Showerheads\*

- 4.5 gppd (100% penetration)

\* end use analyses indicates good penetration in many municipalities

## ***Example***

- **Source:** *U.S. Census Bureau*
- Single-Family Residential 2.5 pph
- Multi-Family Residential 2.0 pph
- SF household=account
- MF household=unit

**SF** account savings= $2.5 * 10.5 = 26.2$  gpad

**MF** unit savings= $2.0 * 10.5 = 21$  gpud

$$C/E = P_{09} / S_{20yr}$$

**Where:**

**C/E= Program Cost effectiveness \$/1000 gallons**

**P<sub>09</sub>=Total present worth costs in 2009 dollars**

**S<sub>20yr</sub>=Total 20 year water savings in 1000 gallon increments**

**Why \$/1000 gallons? Compares to cost of water and increments of new supply.**

## Toilet Program Costs (example)

- **Rebate program costs=overhead, rebate and processing**
- **Cost/rebate structure- highest value- 1<sup>st</sup> rebate GOAL: Average over 2 rebates/account\***
- **Average cost/account or unit**
- **\$157 to \$213/account**

\* additional socioeconomic information can lower this requirement and increase cost effectiveness

# Residential Clotheswashers

**Savings rate 15.7 gallons/load**

- **1.04 loads/day/account-SF**

- **0.69 loads/day/unit-  $MF_{in}$**

- **0.31 loads/day/unit- $MF_{com}$**

- **16.3 gpad-SF**

- **10.8 gpud- $MF_{in}$**

- **Common area savings rate 12 gallons/load**

- **$MF_{com}$  savings= 3.7 gpud**

## **SF**

- **\$100 to \$200/account**

## **MF<sub>in</sub>**

- **\$100 to \$200/unit**

## **MF<sub>com</sub>**

- **\$10-20/unit**

**Example: 1 Multi-family account/complex, 100 units, and two common area laundry facilities with a total of 10 washers. A 100 dollar rebate is provided to replace all 10 washers in the two common area laundry facilities. Cost \$1000.  
Cost/unit affected by rebate-  $\$1000 / 100 = \$10/\text{unit}$**

## Toilet Program

- SF \$0.78 to \$1.05/1000 gallons
- MF \$1.05 to \$1.21/1000 gallons

## Clotheswasher Rebates

- SF \$0.83-\$1.67/1000 gallons
- MF<sub>in</sub> \$1.25-\$2.50/1000 gallons
- MF<sub>com</sub> \$0.35-\$0.70/thousand gallons

## Toilet Specifications

- 1. Minimum-All fixtures meet EPA Water Sense HET's(1.28 gpf w/350 gm threshold)**

# Water Sense Labeled HET's- High Efficiency Toilets

- **Water Sense is a third party certification and labeling program**
- **Achieve sustainable water savings from toilet fixture replacements (20%)**
- **Ensures a high level of customer satisfaction with flushing performance**

- **HET Toilets**
  - **99<sup>th</sup> percentile waste flushed**
  - **350 gm minimum requirement**
  - **Labeling nationwide in retail outlets**
- [epa.gov/watersense/pp/plumbing.htm](http://epa.gov/watersense/pp/plumbing.htm)**





- **Verify installation**
- **Remove/eliminate old fixtures**
- **Identify implementation in billing system**
- **Post evaluation-include performance acceptance**

- **SF and MF<sub>in</sub> programs can be implemented with electric utility**

## **Issues**

- Free ridership
- Movement of washers
- CE

- **MF<sub>com</sub> programs cost-effective**

## **Issues**

- Commercial accounts
- Ownership of washers

# How to Evaluate Washer Programs



**MEF=Modified Energy Factor, a combination of Energy Factor and Remaining Moisture Content.**

**WF=Water Factor (number of gallons needed for each cubic foot of laundry)**

**WF <6.0 best available**

**Qualifying List- [www.cee1.org](http://www.cee1.org)**

**Rebate higher for increased WF**

## SHOWERS

- **Single head/system**
- **2.0 gpm heads recommended**
- **Water Sense Spec being developed**
- **Match flow with pressure compensating valve**



# Shower panel or shower tower



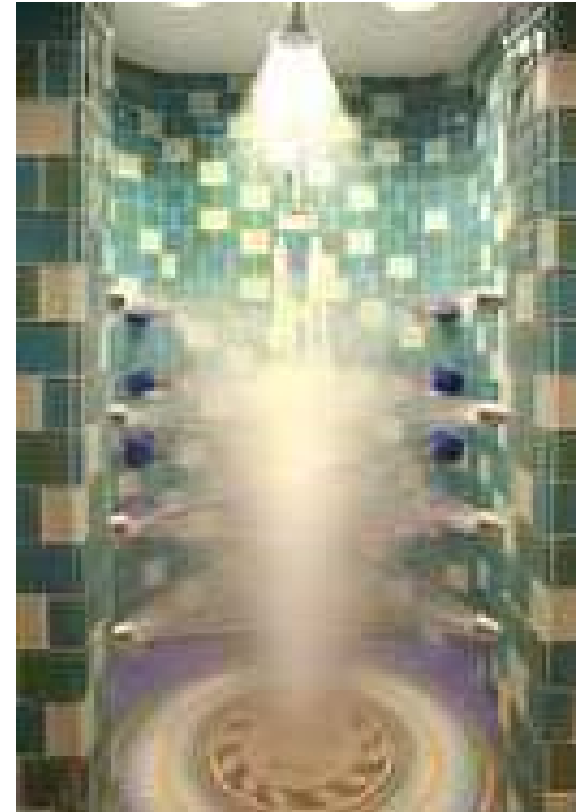
Not water efficient





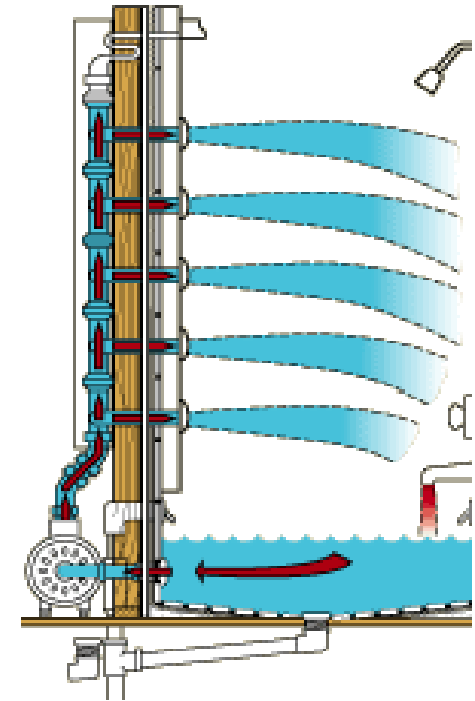
Not expressed as a showerhead

# Showers/Body Spa



Not expressed as a showerhead

# Showers/Body Spa with recirculation



Conservation included in a high-end product

- **These systems becoming more popular**
  - ~ 4% of new houses multiple showerheads
- **Tankless water heaters make high flow systems possible without running out of hot water**



## **Green Home Recommendation**

- **WF 5.8**
- **Future Energy Star requirement**
  
- **Generally not a water issue  
since use is 1 gpcd**

- **.5 gpm faucets (required by law)**
- **HEU's (bmp)- Look for Water Sense**
- **Waterless Urinal Issues**
- **Flush valve bowl combinations**
- **[www.a4we.org](http://www.a4we.org) go to Resource Library-residential fixtures**

- **Testing through AWE, FSTC, and others**
- **Waterless woks**
- **Connectionless Steamers**
- **Sensor operated faucets and flush valves**



- **Irrigation Association SWAT Testing**
- **EPA Water Sense product development**
- **University of Florida Testing**
- **Greywater Systems**
- **Cisterns**



- **LEED- Leadership in Energy and Environmental Design**
- **Green Build Initiative**
- **ASHRAE Standards**
- **Florida Green Build Coalition**
- **Florida Water Star**
- **EPA Water Sense**
- **Others**

- **Join the Alliance for Water Efficiency**  
**[www.a4we.org](http://www.a4we.org)**
- **Conserve Florida**  
**[www.conservefloridawater.org](http://www.conservefloridawater.org)**
- **Canadian Water Works Association**  
**[www.cwwa.ca](http://www.cwwa.ca)**

- **Promote the efficient and sustainable use of water**
- **Be a clear and authoritative national voice**
- **Provide comprehensive information on products, programs, and practices**
- **Represent the interest of efficiency in codes and standards process**
- **Transform the market for fixtures and appliances**

- **Coordinate with Green Building Initiatives to institutionalize water efficiency**
- **Train water conservation professionals**
- **Educate water users and improve the consumers understanding of the need for efficiency**
- **Conduct needed research**
- **New Strategic Plan being written**

- **Three standing committees:**
  - **Education and Outreach Committee**
  - **Water Efficiency Research**
  - **WaterSense and Water Efficient Products**
- **First face to face meeting of committees in October, 2007 in Las Vegas**
- **Regular business by conference calls**
- **Manage priorities and projects of AWE**



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## AWE Resource Library

### Water Conservation Programs

There are a wide variety of water conservation programs that have been implemented in North America. Most utilities who have an active water conservation program have chosen a menu of conservation measure options to comprise their program. The AWE Resource Library pages listed below offer information on various water conservation programs as well as links to the latest research and information about this important topic.

#### Water Conservation Programs - Technology

[Device Distribution Programs](#)

[Direct Installation Programs](#)

[Manufacturer Buy Down Programs](#)

[Rebate and Voucher Programs](#)

#### Water Conservation Programs - Education and Information

[Partnership Programs](#)

[Public and Consumer Education Programs](#)

[School Education Programs](#)

[Site Survey and Audit Programs](#)

### Definition of Terms

Looking for a quick definition of a water or conservation related term or concept? The AWE Glossary has an extensive list of the most commonly used terms in the biz.



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## AWE Resource Library

### Residential Water Use, Fixtures, and Appliances

Residential water use, both single-family and multi-family, is often the largest single demand sector for a water utility. The AWE Resource Library pages listed below offer information on residential water use and conservation savings as well as links to the latest research and information about this important end user category.

#### Indoor

[Evaporative Cooling](#)

[Faucet Fixtures](#)

[Home Water Treatment](#)

[Hot Water Distribution Systems](#)

[Humidifiers](#)

[Residential Clothes Washers](#)

[Residential Dishwashers](#)

[Residential Leakage, Detection, and Mitigation](#)

#### Outdoor

[Landscape and Irrigation Library Content Listing](#)

[Swimming Pools and Spas](#)

[Water Brooms](#)



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## Toilet Fixtures Introduction

Toilet fixture replacement has been a staple of the water industry's initiatives to reduce potable water consumption since the late 1990s. It still represents one of today's most popular water efficiency initiatives, as the first "program of choice" by water providers embarking on their initial foray into hardware-related conservation. In these programs, older 3.5- and 5.0-gallons per flush (gpf) toilet fixtures in residences are replaced with 1.6-gpf fixtures. Today, some water providers with aggressive replacement programs are already approaching a level of "saturation" in their residential sector wherein the majority of toilet fixtures are 1.6-gpf models. Therefore, a number of water providers have moved on to other more-efficient products and higher priorities in their conservation programs.

### Density of Use - Residential

As the number of bathrooms in housing steadily increases, and, in some cases, the number of occupants decreases, development of cost-effectiveness information related to toilet replacement programs must address just which toilets within a residence should be replaced, e.g., all of them, the most-used toilet, the oldest toilet, the toilet with the highest flush volume, or some other replacement criteria. To aid in this analysis, we have compiled some national numbers on toilet "density" in residential housing. [Download the table that shows the increase in density during the period from 1970 to 2003.](#)





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## Toilet Performance Testing - MaP

### Maximum Performance Testing of Popular Models

Everyone wants a toilet that "does the job" in a single flush. MaP Testing of toilets was developed to identify how well popular toilet models perform bulk removal using a realistic test media, and to grade each toilet model based on this performance. The test results provided here list numerous toilet fixtures and the flushing performance of each fixture. This is essential information for anyone buying a new toilet and for agencies offering financial incentives for the purchase of efficient fixtures.

[Read more about MaP Testing here.](#)

## UNAR

### Unified North American Requirements for Toilet Fixtures

UNAR is a voluntary qualification system adopted by water authorities that believe it is critical to:

## MaP Testing Downloads



UNAR Guidelines and Specs



LADWP ULFT Supplementary Purchase Specification



UNAR Qualified ULFTs sorted by manufacturer



UNAR Qualified HETs sorted by manufacturer

## UNAR Downloads



Full MaP Report, 11th ed. - 6 mb



Condensed MaP Report, 11th ed. - 2 mb



Toilet fixtures sorted by performance



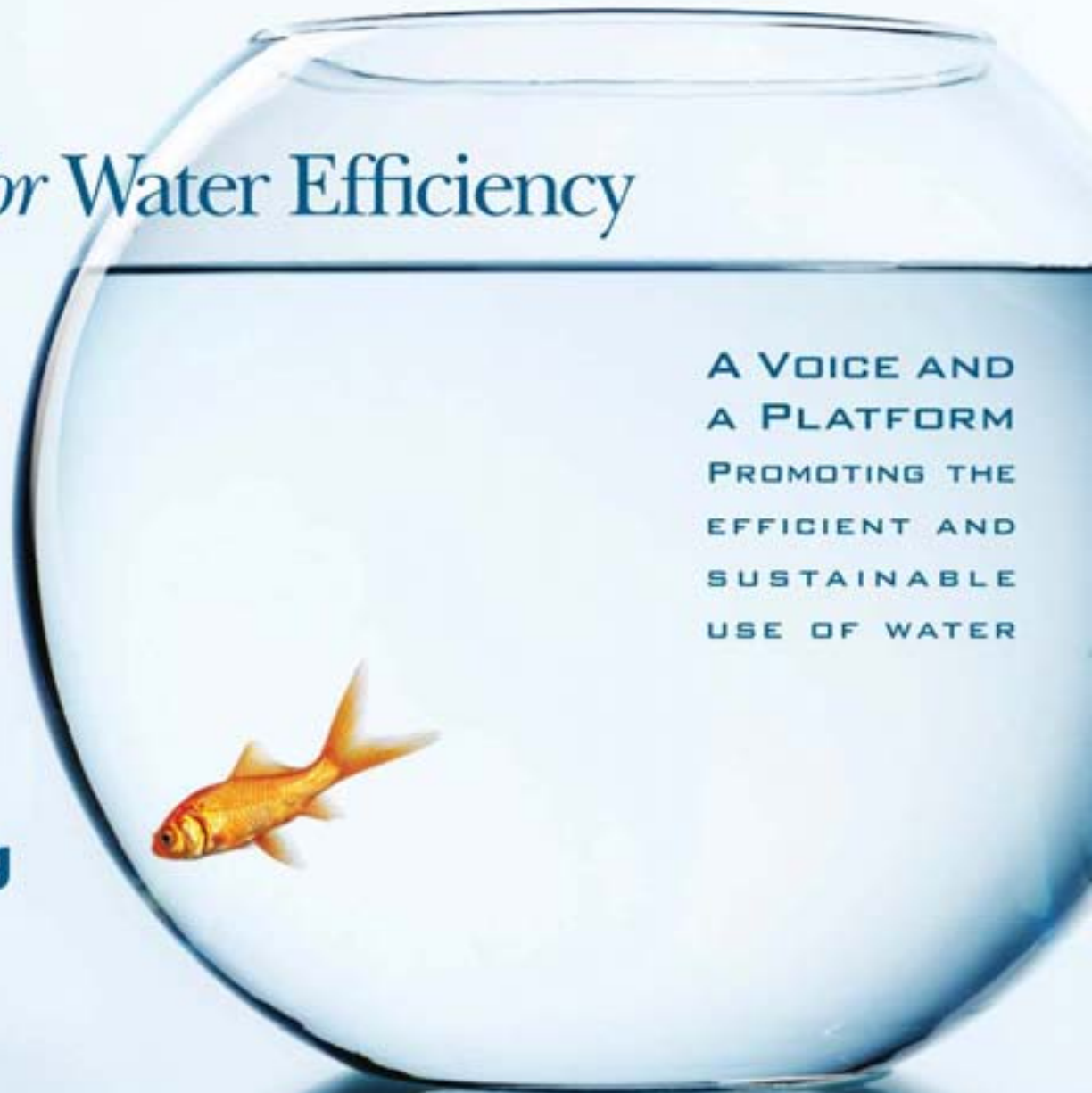
# Alliance *for* Water Efficiency

A VOICE AND  
A PLATFORM  
PROMOTING THE  
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USE OF WATER

**[www.a4we.org](http://www.a4we.org)**

(773) 360-5100

CHICAGO



**Questions?**

**Dave Bracciano**

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- **Water Efficiently**
- **Mulch**
- **Recycle\***
- **Fertilize Appropriately\***
- **Control Pests Responsibly\***
- **Reduce Stormwater Runoff**
- **Provide Wildlife Habitat**
- **Protect The Waterfront\*\***



## General Specs

- **Landscape certified Florida Yard**
- **Irrigation System meets Florida Irrigation Society standards and state requirements**
- **Irrigation system schematic attached at controller box**
- **No irrigation system with appropriate plant materials reduce use greatest**
- **With **automatic** irrigation-Use of control technologies required**

# Water Efficiency on the Outside



- Proper plant grouping
- Micro-irrigation
- Good zonation

Minimal/functional turfgrass

**Irrigation System Evaluated to Insure it Meets FIS Standards!**

# Improperly Installed Rain Sensor





**Properly Installed Functioning  
Rain Shut-off Device**

# Sprays on 6" Riser



# Summary of UF Testing

- **Soil moisture sensor irrigation reduction compared to 2 d/wk seasonal adjustment & no rain sensor**
  - 70-90% during normal to rainy conditions
  - 28-83% during dry conditions
- **Rain sensors (MiniCLIK) irrigation reduction compared to 2 d/wk seasonal adjustment & no rain sensor**
  - 31-34% during normal to rainy conditions
  - 13-24% during dry conditions
- **ET controller irrigation reduction compared to 2 d/wk seasonal adjustment**
  - 27-60% rainy conditions (short time frame)
  - 35% - 43% long-term savings

# How the Technology Can be Applied

- **SMS control works on sites that exhibit proper installation of the devices. Good SF application!**
- **ET controllers have potential when set up properly in rainy conditions (few issues).**
- **ET controllers do modify the irrigation schedule seasonally in response to changing climatic demand.**
- **ET controllers less complex on large sites**

- **Dealing with increased irrigation during extreme water shortage**
- **Minimum water use for plant survival- support research**
- **Water restriction regulations**
- **Insuring proper device use**
- **Technology transfer**
- **Cost on new homes**

- **EPA Water Sense**
- **Irrigation Association SWAT**
- **Statewide Standards and Training**
- **Installation specifications- IA**

# Let's Look at the Landscape



- Mulch 2-3"
- Non-cypress organic mulch
- Proper plant groupings
- Self mulching
- Habitat area



# Cisterns and Rainbarrels



Functional  
rain  
barrel/cistern  
system that  
will be used  
to irrigate  
parts of  
landscape



# Outdoor Efficiency-Other Examples



# Outdoor Efficiency-Other Examples



# Outdoor Efficiency-Other Examples



# Outdoor Efficiency-Other Examples





**Florida Certified Green Home-Water Wise  
Certified Florida Yard**