Water Conservation in Florida

The following articles, with the exception of the Drop Savers article submitted independently by Sara Johnson, were submitted by the Water Conservation Committee of FSAWWA. Norman Davis, chairman of the committee, coordinated the articles.

IS IT NEEDED?

How badly does Florida need water conservation? What are the alternatives? There is plenty of water in the state, but the problem is that it's often not where it's most needed.

Some Say There is a Scarcity of Water in Florida, But …

Pick Talley

If you agree with conservation, you are committed to the preservation of Florida's precious water resources, even though we are blessed with an abundance of freshwater in Florida. We may hope that all of the things we do to guide Florida's future water resources management will pass the common sense test when compared to Florida's water facts.

- Florida receives an average of 54 inches of rainfall annually. The national average by state is 27 inches annually. Only Louisiana receives more rainfall than Florida (57 inches).
- Florida's 54 inches of average annual rainfall is equivalent to 150 billion gallons of water per day.
- River flow into the state from Georgia and Alabama is 25 billion gallons per day.
- Total water income to Florida is 175 billion gallons per day.
- The freshwater aquifer under Florida is estimated to be the largest in the United States. It varies from several hundred feet thick in the coastal areas to 2,000 thousand feet thick in the central part of the state. The aquifer is estimated to contain more than 1 quadrillion gallons of water. The quality of the water in the Floridan aquifer in most parts of the state is superior to all other sources of freshwater available.
- Surface water flow to the Atlantic Ocean and the Gulf of Mexico is estimated at 40 billion gallons per day.
- Groundwater flow to the Atlantic Ocean and the Gulf of Mexico is estimated at 19 billion gallons per day.
- Evapotranspiration, the combination of evaporation of water and plant transpiration, is estimated at 110 billion gallons per day, equivalent to 39 inches of rainfall in the average year. Evapotranspiration varies from 20 to 40 inches in various parts of the state based on location and time of year. Many factors determine the amount of evapotranspiration in any particular location. Some of these variables include plant type, soil type, rainfall amount, depth of the water table, surface water body size, temperature, and wind.
- Total municipal use of water in Florida from groundwater supplies is 2.0 billion gallons per day; less than 1/1000th of 1 percent of the water stored in the aquifer under Florida.
- Total groundwater use in Florida is estimated at 7.6 billion gallons per day, also less than 1/1000th of 1 percent of the water stored in the aquifer.
- Agricultural water use, the largest water use category, is estimated at 3.4 billion gallons per day, or 2 percent of the total water income.
- Public municipal water use is estimated at 2.0 billion gallons per day, or less than 1.2 percent of the total water income.
- Total commercial and power plant use of water is estimated at 2.0 billion gallons per day or 1.2 percent of the total water income.
- Total water use for both surface and groundwater is estimated at 8.8 billion gallons per day. Total runoff for both surface and groundwater is estimated at 59 billion gallons per day, 6 times the total use. All water used re-enters the hydrologic cycle through evapotranspiration, aquifer recharge, or runoff. Site specific aquifer levels adjust to local withdrawals, but aquifer depletion does not occur.
- Per capita rainfall in Florida is more than 10,000 gallons per day. Total water income in Florida is approximately 12,000 gallons per person per day.
- Average per capita use in the United States for municipal utility customers is 180 gallons per day.
- Average per capita use in Florida for municipal utility customers is 150 gallons per day.

SWFWMD Region

- Average annual rain in the district is 53 inches, which is equivalent to 25.24 billion gallons per day. Rainfall averages 7,200 gallons per day per person.
- Total water use in the district is equivalent to 3.0 inches of rainfall or 1.46 billion gallons per day. Estimated total water use in 2020 is 4.4 inches of rainfall or 2.1 billion gallons per day. (Estimate from SWFWMD *Needs and Sources Study* 1991).
- Total agricultural water use in the district is equivalent to 0.95 inches or 454 MGD.
- Total public supply water use in the district is equivalent to 0.93 inches or 445 MGD.
- Total water use in the district has declined 250 MGD from 1989 to 1993, the last year of data in the current Water Use Report published by SWFWMD. This water use reduction is

from the industrial, commercial, and agricultural categories.

- In 1995 SWFWMD provided the media with data indicating the county with the lowest daily per capita total water use was Pinellas at 116 gallons. The latest district published data is for the 1993 water year. Calculations for that report indicate the following total water use on a daily per capita basis for the largest counties:

County	*Total Water Use Per Capita Per Day*
Pinellas	136
Sarasota	237
Hillsborough	326
Charlotte	347
Pasco	396
Manatee	445
Hernando	446
Polk	775

- The amount of water stored in the Upper Floridan aquifer under Pasco County is 27 trillion gallons.
- Annual rainfall in Pasco County is 55 inches per year which is equivalent to 718 billion gallons or 2.66 percent of the amount in storage.
- The amount of water available for recharge in Pasco County is 544 MGD.
- Total water use in Pasco County from the groundwater for all uses including transfer is 151 MGD.
- The total water use in Pinellas County is 125 MGD.
- Total water withdrawn from the aquifer in Pasco County for transport to Pinellas County and Hillsborough County is 64.6 MGD.
- The 64.6 MGD transported out of the county is less than 1/1000th of 1 percent of the amount of water in aquifer storage and is 3.3 percent of the daily rainfall.
- The land area in Pasco County alleged by SWFWMD to be impacted by groundwater withdrawal from well fields supplying Pinellas County is 100 square miles or 13.3 percent of the land area of Pasco County.
- Recorded groundwater level fluctuations from wet periods to dry periods in Pasco County in areas not under the influence of wellfield withdrawals are as high as 12 feet.
- Recorded lake level fluctuations from wet periods to dry periods in Pasco County not under the influence of wellfield withdrawals are as high as 24 feet (Crews Lake).
- Many of the lake and wetland water level declines in Pasco blamed by SWFWMD on wellfield withdrawals have been recorded by the U.S. Geological Survey and SWFWMD for periods prior to wellfield construction. They also appear in historical aerial photographs.
- Pinellas County s current total water use is 125 MGD[1]. Total increase of new water supply needed to meet growth through 2015 (97 percent of the Comprehensive Plan total build-out) is 14.6 MGD[3].
- Hillsborough County s current total water use is 249 MGD[1]. Total increase of new water supply needed to meet growth through 2015 (NA[2] percent of the Comprehensive Plan total build-out) is 26.3 MGD[3].
- Pasco County s current total water use is 92 MGD[1]. Total increase of new water supply needed to meet growth through 2015 (NA[2] percent of the Comprehensive Plan total build-out) is 17.6 MGD[3].

[1]Latest data published by SWFWMD 1993 Estimated Water Use
[2]NA - Information not available
[3]WCRWSA Resource Development Plan 1995

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Desalination: An Issue of Facts and Fictions

Pick Talley and Irma Reinpoldt

Desalination, the conversion of salt or brackish water to water acceptable for a particular freshwater use, has been a hot topic in southwest Florida. All of Florida's desalination projects occur in coastal areas where transmission costs of high quality fresh water are excessive for the use being served.

The issue of using desalination as an alternative source of water in the Tampa Bay area is being masked by a veil of misinformation. The public perceives that Florida is out of water and that technologies, like desalination and drinking reclaimed water, are required to meet our needs for potable supplies. Scientific evidence indicates the opposite (See "Some Say There is a Scarcity of Water in Florida," this issue).

Desalination is also hailed as the answer to the area's environmental impact woes. Desalting of brackish or salt water to provide drinking water may fulfill a basic social need, but processing it has environmental impacts.

One concern about desalination is that it may be a means of shifting environmental impacts from one area to another. Desalination is an energy intensive process, using as much as 25 times the energy required for conventional pumping from the aquifer. This energy consumption is reliant on fossil fuels, a non-renewable resource. The air pollution impact from the enormous fuel consumption of current desalination technology is also increased proportionally. Fuel acquisition to drive the desalination process is dependent on mining or other energy harvesting technologies, each causing its own environmental impacts.

By comparison, the pumpage of groundwater, which traditionally has been used by 80 percent of Floridians, produces minimal impacts, most of which are manageable, and significant impacts can be prevented by augmentation. Desalination technologies requiring nonrenewable energy sources, therefore, trade-off some manageable environmental impacts for potentially more serious ones.

A major hurdle which constrains the implementation of desalination technology is concentrate disposal. The by-product of the process is a soup of highly concentrated salt and other components. Disposal of these concentrates is the topic of continued environmental debate. Current disposal options being discussed include: surface water discharge, disposal into sewage treatment plants, deep well injection, land applications, evaporation ponds, and brine concentrators. Each of these options possess environmental concerns centered on the contamination of surface waters, groundwater, and soil by individual chemical components and the salinity of the concentrate. All of these typically expensive processes require site specific feasibility studies and regulatory permitting requirements. The disposal problem may have to be addressed through modification of DEP rules and potentially Florida statutes before the permitting of new plants can be implemented.

Brackish reverse osmosis concentrates generated from groundwater sources are typically low in dissolved oxygen and high in dissolved CO_2 and H_2S, which gives off the odor of rotten eggs. Routinely encountered levels of O_2 and H_2S are directly toxic to many organisms; therefore, careful post-treatment of by-product waters are required. Post-treatment options encompassing aeration for oxygen, degasification to get rid of CO_2 and H_2S are needed to minimize corrosion potential and be compatible with receiving water life forms. Another concern is the impact of thermal pollution associated with the increased temperature of the brine and power plant co-disposal options. The environmental impacts of by-product disposal on receiving environments, whether deep well injected or applied to surface receiving waters, is the topic of considerable research. This area of research is currently being conducted to provide better scientific understanding of the effects of discharge on natural systems and will act as an appropriate basis for regulatory agency approval of disposal options.

Some officials will argue that the technologies for desalination have been around for years. Most facilities conduct operations using reverse osmosis (RO) of brackish water, not seawater. RO technology uses membranes to concentrate the salt and other substances separating variable quantities of potable (drinking) water. There are over 150 RO treatment facilities in Florida including Dunedin and Fort Myers. All of the RO plants in the Southwest Florida Water Management District experience increasing chlorides, an environmental impact causing water quality degradation. Water quality degradation increases the operating costs of RO plants.

The costs associated with desalination in its many forms is also the subject of debate. Costs are determined by the salinity of the water source, the chosen technology, its associated energy consumption, and by-product disposal. Some plants have opened

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only to find the cost of water produced is prohibitively high when compared to other options.

Despite the technological and regulatory hurdles, two potential locations for RO have been identified by the West Coast Regional Water Supply Authority: Sulfur Springs and Lithia Springs. To date, the state and EPA have not agreed as to the proper methodology and requirements to permit a desalination facility. The West Coast Regional Water Supply Authority has proposed a pilot study conceived to find the answer to many of the questions which surround desalination.

Independent of the efforts of the Regional Water Supply Authority, the USGS conducted a feasibility study of Pinellas County's RO potential in 1991. The study based on published research reported that a sustainable source of low chloride brackish water may not be available in Pinellas County. A follow-up three-year study developing data from pump tests is currently underway to further study the possibilities of developing a sustainable brackish water supply within Pinellas County.

Society, through research and eventually regulation, must wrestle with the cost benefit/environmental risk issues to define when and how environmental effects warrant preventative and corrective action. However, given the facts of current desalination technologies, the low levels of mitigatible environmental impacts produced by groundwater withdrawal are dwarfed by the cost benefit and environmental concerns inherent in desalination technologies. There is a need for responsible officials and the public to identify, understand, and address the energy, economic, and environmental concerns of current desalination technology. New technologies, now being developed in pilot projects, offer a substantial reduction of these impacts.

Pinellas County officials believe that water is a precious resource and needs to be protected and conserved. Pinellas County is one of the lowest water users in the state, having reduced consumption of water through conservation measures and education from 153 gallons per person per day in 1989 to 116 gallons per person per day in 1995. The county has been a leader in water conservation through the installation of water saving devises, comprehensive public awareness programs, and extensive reclaimed water projects for irrigation. Numerous continued conservation programs are implemented to reduce the environmental impacts caused in some cases by wellfield withdrawals.

It is time to separate the facts from the fiction concerning desalination in southwestern Florida. As technologies improve and byproduct disposal and energy concerns are resolved, desalination may be a possible alternative source in the future. But in the state possessing the most abundant fresh water resources in the U.S., this issue must be considered in a scientific and holistic environment considering the public's best interests.

Pick Talley and Irma Reinpoldt are with Pinellas County. Talley is director of utilities and Reinpoldt is the environmental planning manager.

MEASURING EFFECTIVENESS

Does water conservation work? How is the effectiveness of a water conservation program measured?

Justifying Water Conservation Through Program Evaluations

Diane Mulville-Friel
and Damann Anderson

Need for Program Evaluations

To justify water conservation as an alternative supply source, documented and accurate information on costs and benefits must be developed. A water conservation alternative reduces the level of water used or lost compared to the level that would have been expected in absence of the alternative. Water supply planners need to identify water conservation alternatives that are effective at reducing water use and socially acceptable. The most likely alternatives should be subject to additional scrutiny and prioritization and then developed into demand management (conservation) programs.

Decisions to implement certain conservation programs are often based on assumptions regarding savings expected and customer acceptance. Costs may be substantial, and managers are reluctant to spend taxpayers' dollars on programs that have only speculative returns. Water conservation program evaluations are therefore essential to provide planners and managers with data needed to select and promote alternatives that are acceptable to customers and that maximize the efficient and responsible use of a community's water and economic resources.

Water supply planners are encouraged to obtain a copy of *Evaluating Urban Water Conservation Programs: A Procedures Manual,* published by AWWA. It provides a more detailed account of water conservation measures, strategies, and analysis procedures to help address water supply and demand problems.

Program Evaluation Objectives

The objectives of program evaluations will influence methods and procedures used. Objectives vary but typically include one or more of the following:

- to compare program results against intended goals;
- to determine whether a program needs modification;
- to forecast program effects on long-term needs for resources and facilities;
- to determine whether program benefits justify costs;
- to implement and evaluate a pilot program prior to full program design and implementation.

Additional reasons for evaluations may include:

- to meet evaluation objectives and demonstrate the validity of the results;
- to promote and generate public or institutional support;
- to justify expenditures and continued funding or to procure new funding;
- to satisfy outside requirements for evaluation.

Estimates of market penetration, water savings, program costs, and other aspects of conservation alternatives do not readily exist for many conservation measures. For other measures, empirical studies have been conducted; however, these studies often produce widely divergent results for the same type of program. Results of such studies must be carefully examined before they are used to project the effects of conservation measures. Because water planners and administrators must have reliable estimates of water savings, as well as potential benefits and costs from implementing a conservation program, procedures for estimating water savings need to be standardized.

Evaluation Design Considerations

The purpose of evaluating a conservation program is to measure its effects. The most important consideration in developing an evaluation procedure is determining the validity of its design. The design of the evaluation procedure is similar to the design of an experiment: if the evaluation design is flawed, the results may be questionable or may not provide definitive answers. For example, an evaluation design that compares water use before and after implementation of a conservation program may not produce valid results unless the design has controls for weather, price changes, economic factors, and other external factors. Results of pilot program evaluations should be transferable to the entire targeted water use sector as well as other utilities or geographic locations. Also, the evaluation methodology and results should be reproducible so that findings are not dependent on the evaluation design or unique features of the program. To ensure that a study can be replicated, the evaluation design must isolate or control characteristics of the program, characteristics of the customer group, and characteristics that are external to the program design and target group (e.g., weather, price, drought).

Types of Program Evaluation Designs

Several evaluation designs can be used to obtain measurements of the success of the conservation program and its impact on water use. Usually the choice between alternative designs is based on program objectives, feasibility, reliability of measurements, and costs.

Practically all evaluation designs compare water use behavior and other population characteristics over time and between groups of customers. Temporal comparisons include the behavior and characteristics of water users before and after the program is implemented. Between-group comparisons divide water users into two groups: the treatment group of participants and the control group of non-participants. As a result four categories of conditions are created: pre- and post-treatment conditions of each group.

Several comparisons can be made among the four categories. For example, the participant group's water use before treatment can be compared to its water use after treatment; likewise, comparisons can be made between participant and control group's water use before treatment, and their water use after treatment. Several methods can be used to estimate program effects based on such comparisons. Depending upon the types of data available and information required, these methods may range from a simple comparison of mean water use to sophisticated econometric modeling aimed at predicting attitudes and behavior of water users.

Both treatment and control groups must be carefully selected to maintain validity of the research design. The manner in which they are selected depends on the type of research design proposed. There are three general types of research designs: (1) experimental, (2) quasi-experimental, and (3) non-experimental.

An experimental research design involves selecting both treatment and control groups by random sampling. True random sampling maximizes the probability that treatment and control groups are identical in every respect other than program participation, and each group is representative of the sampled population (e.g., single-family homes in service area). Because both treatment and control groups are randomly selected, an assumption can be made that any changes (exclusive of the conservation program) that occur over time or between individuals within the treatment group will also appear within the control group.

It may be difficult or impossible to achieve all conditions required for a true experimental design. Quasi-experiments have less validity than true experimental designs because they fail to control one or more of the external factors that potentially threaten the validity of the design. However, it is possible to conduct research using a quasi-experimental design that produces acceptably valid results.

When it is not economically feasible to use either experimental or quasi-experimental designs for program evaluations, non-experimental designs provide a relatively simple preliminary method of assessing conservation savings. In this type of design, the participant group also serves as its own control. Essentially, this type of design compares participants' performance after the program with their performance before the program began. A major drawback is the inability to control for factors that may have occurred simultaneously with the conservation program. The benefits of using this design is the relatively low cost of data acquisition and analysis.

Quasi-Experimental and Non-experimental Case Study Comparison

Evaluations completed for Tampa's Sen-

sible Sprinkling Program illustrate the use of quasi-experimental and non-experimental research designs (see article in this issue). Tampa retained Ayres Associates to complete an impact evaluation of a conservation program intended to reduce the quantity of water residents used for irrigating their landscapes. A non-experimental research design was used to evaluate Sunset Park (the first neighborhood to participate in the program) and a quasi-experimental research design was used to evaluate Davis Islands (the second neighborhood to participate).

Participating Sunset Park households were used as their own control group. A comparison of their water use, before and after the irrigation system evaluation, suggest that households used 29 percent less irrigation water after evaluations were completed. Findings indicated no significant difference between the two periods' rainfall.

It appeared the program may have been extremely effective; however, because a non-experimental research design was used to evaluate the program, the results may have been confounded by other external factors.

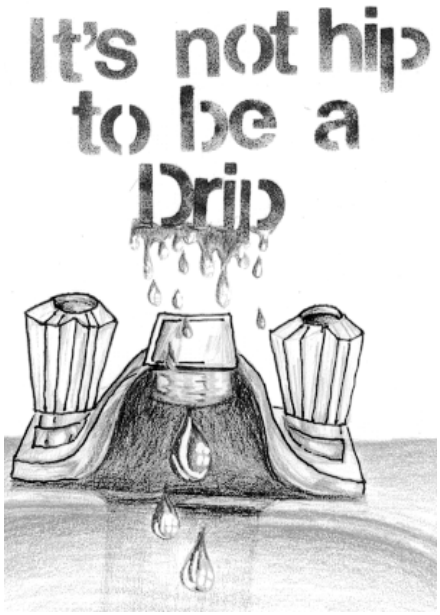
A quasi-experimental research design was used to evaluate the impacts of the program implemented on Davis Islands. In addition to households that participated in the program, a group of control households were selected for this study. Results of the pre- and post-evaluation water use comparisons showed that similar to Sunset Park, Davis Islands' participants used significantly less water (38 percent) to irrigate their landscapes during the post-evaluation period. However, the group of control households selected also used less irrigation water (31 percent) during the post-evaluation period. The apparent reduction in irrigation water use experienced by both control and participant households indicate that there may have been other external factors affecting the two groups. Potential effects of rainfall were investigated as a possible eternality. Results indicated that significantly more rain fell during the Davis Islands post-evaluation period which could have caused both study groups to use less irrigation water.

The results of the Davis Islands study leads to speculation that the increase in rainfall during the post-evaluation period may have caused both groups of study households to use less irrigation water. Results suggest that the Sensible Sprinkling Program was only responsible for a 7 percent reduction in irrigation water (i.e., the difference between the control group's 31 percent and the participant group's 38 percent difference in irrigation water use). However, there are several other possible explanations for both Davis Islands control and participant households to have used less irrigation water during the post-evaluation period. For example, all of Davis Islands may have been subject to stronger enforcement of irrigation watering restrictions during the post-evaluation period. Another possibility is that control households reduced the amount of water used to irrigate landscapes because they were influenced through word of mouth or exposure to neighbors that participated in the Sensible Sprinkling Pro-

gram. By selecting a control group for Sunset Park, it can be determined whether a similar phenomena took place. Further study of these possible external influences need to be investigated. In addition, long-term monitoring of rainfall and water use for both neighborhoods is critical to determine the longevity of this type of water conservation program.

In summary, the importance of proper water conservation program evaluations cannot be over stressed. The goal of program evaluations are to obtain accurate measurements of changes in water use clearly attributable to the conservation program. Decisions based on results of the evaluation are critical and greater precision of measurements is needed. Improving the science in water conservation will allow it to become a reliable water supply source for the future.

Diane Mulville-Friel and Damann Anderson are with Ayres Associates, Tampa.



Blue Thumb Junior Detective Program

Karen Drolet Snowman

After receiving many requests from teachers, the Orange County Utilities Water Department realized there was a need to offer a water conservation education program in the public and private schools.

As the department began the process of developing an educational program, data was gathered on a variety of programs. The AWWA Blue Thumb program was selected, and in 1993 the water department began using the program in the local elementary schools. In 1994, in an effort to bring even more enthusiasm and excitement to the program, the department developed a new angle to get increased participation from the students and the teachers. The new Blue Thumb Junior Detective Program allows students to use a hands-on approach to learning the importance of conserving water by searching for leaks or "water wasters" in their own home and school. The approach helps students to feel more involved, to see clearly how easily water is wasted, and, more important, how significant their roles are in preserving the environment.

The program consists of four class presentations on how to save water. Each presentation educates the students on water saving techniques and why it is important to conserve water. The class presentations utilize educational videos, group efforts to design water saving slogans, individual efforts for the poster contest, word search puzzles, coloring books, and a variety of other classroom exercises. Students not only learn water saving techniques, but also develop their skills in listening, teamwork, and comprehension.

During the first year the impact of the program became evident in two success stories. One little girl made water conservation flyers and handed them out door-to-door with her mother. A little boy who had difficulties with the group interaction portion of the program excelled at the individual level and won second place in the poster contest. The water department has discovered that students are concerned about the environment and want to help. The children are so receptive to the current program they often cannot wait to go home and catch "water wasters" in action.

The Blue Thumb Junior Detective Program has won two awards: the FSAWWA award for the Best Public Education Program in Florida for 1995 and second place from EPA Region IV for the Most Effective and Innovative School Program in 1995.

The program has become the main focus of the water department's school education effort. The department believes it does more than just educate the public on water conservation: it helps the public understand that saving water is an important part of preserving water and our environment.

If you would like more information about

the Blue Thumb Junior Detective Program, contact Karen Drolet Snowman, Project Administrator, Water Department, Orange County Utilities, at 407-836-6840 or 8100 Presidents Drive, Suite C, Orlando, Florida, 32809.

Karen Drolet Snowman is the project administrator for the Blue Thumb Junior Detective Program with the Orange County Utilities Water Department.

Enterprise Village

Irma M. Reinpoldt

On any bright and sunny morning, local business commuters will see bus loads of well dressed fifth graders bounding off to a day at Pinellas County's Enterprise Village. Younger students anxiously await their chance to enter the fifth grade and make a similar journey, while older students talk about their experiences for years. Some will even proudly list their accomplishment on job future applications and resumes.

Amidst the delight and anticipation felt on the bus ride are the butterflies brought on by a promise of adventure, discovery, and challenge. Like a rite-of-passage ceremony, Enterprise Village is their first experience with a school-to-business world transition. Some grapple with health care issues, others are in broadcasting, several in industrial or retail applications, even more opt for public service roles. "This is the best day of my life", says a young bank teller rapidly processing payroll transactions. "Let me ask you a few questions about recycling" asks a survey poll specialist, as her eyes dart back and forth along the crowd to find her next polling volunteer. Teachers silently guide and coach, while proudly reporting, "They're all learning so much about economics, business, and real world situations, and look at them having fun with it!"

Welcome to a model academic public private partnership involving the school district, educational foundation, business, industry, and government agencies cooperatively working in an interdisciplinary educational experience based in the economic realities of the twenty-first century. Enterprise Village is a mini-city visited each school year by about 12,000 students. Every fifth-grade student in the Pinellas County School System and numerous private schools and institutions visit the Village each year. This experience is part of the county's comprehensive kindergarten through twelfth grade economics education program. But just one visit to the Village will prove there's so much more to the experience than pure economics. Its comprehensive multi-disciplinary approach prompts many levels of awareness.

Fifth grade students begin to prepare by completing six to seven weeks of classroom instruction in check writing, banking, accounting, and business before having the opportunity to board the bus to Enterprise Village. They have read job descriptions, completed job applications for positions, interviewed for various jobs, and received their job offer letters assigning them to their new positions. Once there, students have the opportunity to own and operate businesses ranging from Block-buster Video to GTE. The field trip portion of the curriculum brings together the individual lessons with a hands-on, fun packed, busy day.

In terms of instruction, the hands-on experience based methods used, combined with self-discovery helps make abstract theoretical concepts clearer and more relevant. Classroom preparation before, and review and reinforcement after the trip, promotes even further understanding of the often complex subject matter covered by the curriculum. One adult visitor to the village was amazed at the ease students could process highly complex banking and billing transactions. Writing checks and managing ledgers were concepts the visitor had learned quite embarrassingly as a Master Sergeant in the army.

Enterprise Village in many ways is the ideal introduction to the workplace. Students, or should we say business employees, are paid three times each day . They are allowed scheduled breaks to shift paradigms from employee to consumer. After a brief stop at Barnett Bank to deposit, they are off-and-running to the Village's businesses to spend their hard earned pay by check or Enterprise Village currency.

Enterprise Village's History

Dr. Howard Hinesley returned from a trip to Kansas City in 1983 and excitedly described a student-operated mini-city he had visited called "Exchange City." Dr. Hinesley suggested that the concept would be ideally adapted to the already award-winning program of economic education in Pinellas County. The county's school district scheduled the development of Enterprise Village to be accomplished by 1988.

Business leaders were contacted by the superintendent and Gus Stavros, a dynamic and successful entrepreneur, well known for his commitment to education. The school district provided the land, staff, supplies, curriculum, and transportation. Major area businesses were invited to donate a minimum of $50,000 each towards construction of the businesses to be incorporated in the Village. During the five-year planning and development period, numerous people contributed time, expertise, and dollars, resulting in the model school-business partnership venture.

In 1993 "social responsibility" was added to the Enterprise Village curriculum resulting in an opportunity for Pinellas County Utilities, a leader in water conservation, partnering with SWFWMD, to create the Enterprise Village Water Resources Department representing water conservation and resource management.

Rebecca Clayton, senior education coordinator with SWFWMD, and I assisted school district curriculum writers in designing and implementing true-to-life learning scenarios for the new water resources department.

A Typical Day

Although the exterior of the building resembles a modern school building, the interior of the Village looks like a shopping mall with Stavros Square in the center court and businesses all around.

Students are responsible for obtaining necessary supplies from the village warehouse, purchasing needed business forms from the Better Business Forms company, ordering phone service from competing telecommunication giants GTE and AT&T, and starting up their business accounts. Health care provider, water, electricity, and solid waste accounts must be anticipated courtesy of the Morton Plant Healthcare Services, the water resources department, Florida Power, and Browning Ferris Industries. Office furniture and accessories must also be considered, care of Kane Furniture.

The water resources department has two position types: customer service managers and conservation specialists. The customer service manager is responsible for the operation of the public water supply serving homes, offices, and businesses located in the village. They are the focal point for interaction with local businesses concerning all water related issues. Unlike some of the other businesses who need to complete a loan application for business start-up capital, the money needed to operate the water resources department comes from water bills received from Enterprise Village customers. It is the customer service representative's responsibility to read meters in each of the businesses, do the record keeping, prepare and deliver bills, collect and process payments, and conduct the businesses' accounting ledgers. To reduce the bills of significant users, the manager supervises the conservation specialists who assist businesses by finding ways to reduce consumption.

Similarly, the role of the conservation specialists is to administer the village's water and resource conservation activities. They help businesses conserve water to lower water bills to protect the environment. To reduce consumption, the specialists conduct water audits, develop a Village Conservation Plan, and develop and run conservation news releases on the Village's radio station, cable TV, and daily newspaper, the *Enterprise Village Times*. The conservation specialists also prepare and deliver a "state of the Village" address at the mayor's town meeting at the end of the day stressing the importance of water conservation and resource protection.

Three times each day managers prepare paychecks and employees are paid for their labor with checks redeemable at the Village Bank. As consumers, each student must deal with non-business choices about spending of time and money.

Choosing between a poster purchased at the Tampa Bay Buccaneer Store or balloons and Eckerd pharmacy seems trivial compared to many of the other decisions made during the day. Perhaps more important were the lessons of individual responsibility like voting in the daily election or those lessons in charity provided by the United Way. And what about that ill-fated legal situation that occurred in the Village's lawyer's office?

As the day ends at Enterprise Village, learning does not. The positive experiences at the Village become the foundations for further study about the free enterprise system, an individual's responsibility to the community and environment, and return to the classroom.

To learn more about the Enterprise Village Water Resources Department call Enterprise Village at 813-581-3760; Pinellas Utilities at 813-464-3578; or the Southwest Florida Water Management District at 800-423-1476.

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Water Wonders—Tampa's In-School Education Program

Kathy M. Fry and Mary Margaret C. Hull

The city of Tampa's "Water Ambassador Program is the umbrella program for in-school water conservation education initiatives. Water Wonders, the interactive educational component of the program, targets Hillsborough County School District third grade students. However, it may be adapted to reach age groups from kindergarten through eighth grade.

In 1994-95, the first academic year of the program, approximately 31 schools, 185 teachers, and 4,450 students and their families were reached. In its second academic year, the program expanded to reach over 7,000 students and their families.

The School Enrichment Resource Volunteers in Education (SERVE) of Hillsborough County is a private, nonprofit agency that coordinates a countywide Speakers Bureau and school-based tutoring program for the county's public schools. SERVE relieves city staff from the critical time-consuming task of coordinating the Water Wonders program in the schools. The program is available four months out of the school year during two week periods of time.

The goal of Water Wonders is to inspire children to think about ways to save water and take action. The children are empowered by becoming "Water Ambassadors." The 45 minute interactive presentation, made up of things that children enjoy most: parades, games and activities, teaches children about water issues and concepts

Students discuss water usage, where it comes from, and ways each person can save water at home and school. For example, the students watch an eight-minute cartoon video, called "Water Follies," and then play the NameItGame, in which they identify water saving actions or concepts that they have learned from the video. This is one method of reinforcing the water conservation concepts into actions students can take to conserve water. At the end of the program students and teachers receive a "Save It Kit" with assorted conservation materials.

In the Water User's Parade the students dress up as a person fishing, landscape architect, farmer, scuba diver/snorkeler, water "cop"(an enforcer of irrigation restrictions), tourist, and a home shower-taker. The students also play games such as the Rain Game: through this sound-movement activity the children become parts of the water cycle and understand that rain is the driving force behind Tampa's water supply.

The presentation of water concepts in this quick moving and entertaining format captures the students attention. Additionally, teacher evaluations collected and compiled after each program demonstrate that this participatory format is more conducive to both student and teacher learning.

An additional benefit of the Water Wonders Program is that it inspires interest in

other city of Tampa Programs. For example, the Water Wonders Program:

- Supports a network for greater community interaction and collaboration on water-related issues. Community water conservation messages are enhanced through integration with other organizations' programs and resources, such as: the public school system, the cooperative extension service, water management districts, county utilities, science and art museums, the Florida Aquarium, the public library system, and other community youth organizations.
- Encourages cooperation. Public agencies and organizations promoting wise water use can tap into a network of water workshops and support one another's educational initiatives.
- Facilitates in distribution of water saving devices to homes and promotes school tours to the city's historic surface water treatment plant.
- Is cost effective. It requires one staff person spending about 175 hours annually teaching and coordinating, and educational materials conveying your water conservation message.
- Encourages participation in the water department's other in-school water conservation education programs. These include: Water Conservation Theatrical Presentation (grades K-6), Speakers Bureau (grades K-12), Poster and Poetry Contest (grades 4-9), Water Conservation Calendar (grades 4-9), Water Treatment Plant Tours (grades 3-12), and Fire Hydrant Painting Party and T-shirt Design Contest (grades 9-12).
- Supports the development of a water ethic in primary school students.

Tampa's comprehensive water conservation program includes education to promote behavioral changes to achieve conservation. In the sociable and fun learning environment, children learn behaviors they can adopt to contribute to the effort of conserving water.

One of the challenges of the education program is how to maintain the water conserving behaviors once they have been taught. The most effective method is through continual reinforcement. Teacher interest, enthusiasm and follow-up in the classroom are important tools for reinforcing the water conservation message. Ideally, parents are also role models for water conservation, although feedback from the program indicates that it is the students that often become the role models for the parents.

The importance of water conservation is also reinforced by using a multidisciplinary approach. Students are aided in understanding the importance of water conservation not only by the importance of their individual actions, but by becoming an ambassador for a broader environmental message that includes the protection and conservation of water resources as a habitat for wildlife. Through this methodology, students can relate individual actions to the importance of water in a broader context.

Future Program Enhancements

Evaluations from the program indicated that teachers did not have the time or expertise to evaluate the myriad of water conservation and environmental materials available. Additionally, area-specific educational materials were not available. Tampa has taken the next step of providing teachers with water resource information that emphasizes water saving actions. The "Hillsborough River Run" focuses on the city's potable water source, the Hillsborough River. This kindergarten through fifth grade educational game assists teachers by offering minimal planning time and providing, among other materials, an activity booklet with master worksheets, a 32 by 22-inch game board, and a resource list of local water experts and information for free and low cost information. This phase of the program will be implemented in the 1996-97 school year .

The "Water Ambassador" Program is the umbrella for Tampa's water conservation education programs, and is a crucial first step in teaching future generations to incorporate water conservation into their lifestyles.

For more information, contact the Tampa Water Department, 306 East Jackson Street, SE, Tampa, Florida 33602, 813-274-8762.

Kathy M. Fry, J.D. is consumer affairs manager and Mary Margaret C. Hull is an environmental specialist for the Tampa Water Department.

CUSTOMER RELATIONS

Any conservation program is doomed to failure without cooperation from a utility's customers—the end users of water.

Building Public Awareness

Kathy M. Fry

Tampa's water department began celebrating National Drinking Water Week in 1981 with a fire hydrant painting party. Today, this annual event has expanded to include a multitude of activities to increase public awareness about quality drinking water and water conservation. The entire Water Department participates in this event with a core "Task Force" composed of members from the Consumer Affairs, Administrative, Engineering, Production and Distribution divisions of the department planning the details. Through the generous sponsorship of private businesses the department raised over $5,000 in support of the event in addition to prizes that were donated for the winners.

The majority of the activities involve students in both public and private Hillsborough County schools ranging from kindergartners through seniors in high school. The highlight of the week is the fire hydrant painting party. This year marked the 15th annual contest and included the participation of 50 high school teams. Retired fire hydrants, which have been painted white, are set-up in downtown Tampa along the busy pedestrian mall. Beginning in the morning the teams receive their paint, brushes, and add-on items for a special category and are given one hour and forty-five minutes to complete their designs reflecting water conservation, water sources, and city themes. By 11:30 a.m. this year the hydrants were complete and judges from the community, including a news anchor, radio personality, and journalist, chose the winners, while the students celebrated with a pizza party.

High school students also compete in the T-shirt design contest commemorating Water Week. This year a fire hydrant painting party design as well as a drinking water design were chosen.

There are activities for younger students as well. This year over 500 elementary school students submitted posters hoping for a spot in the annual Water Conservation Calendar. Last year 15,000 calendars were distributed. Additionally, over 140 students submitted poetry for inclusion in the calendar. The students are to include water conservation messages in their entries. Winning entries include gems such as:

Fix the toilet when you flush,
Don't let it run when you brush.
Use only a little when you bathe,
Turn off the faucet when you shave.
Take a bottle of water to the park,
Turn off the sprinklers after dark.
Jason Wilcox
St. Lawrence Catholic School

Water is very important, can't you see,
It's very necessary for you and me.
Don't fill the bathtub to the top,
Save lots of water when you wash and mop.
So, take my advice and make a contribution,
Because water conservation is the solution.
Cristina Toro
St. Lawrence Catholic School

Conserving water is the right thing to do,
It can be done by others and you.
Conserve by turning off your faucets and hoses,
You don't have to neglect your roses,
Just reduce your use of water, as you ought to.
Nikki Woodyard
Van Buren Jr. High School

The winners from all of the contests are honored in the "Mayor's Award Ceremony," held this year at the Florida Aquarium. Tampa Mayor Dick Greco stressed how fortunate we are to have sufficient supplies of quality drinking water and urged students not to take this precious resource for granted. Prizes included plaques, T-shirts, and donated tickets and coupons for theme parks, area museums, and restaurants.

In addition to the contests, the younger students are also treated to special performances of an interactive water conservation play. This year the play "A Mermaid's Tale" held two special public performances during Drinking Water Week. In this play a mermaid who has gained her legs forgets the importance of fresh water and is threatened to be returned to the sea if she fails to mend her water wasting ways. The quick action and participatory nature of the play enhances the students' ability to retain the water conservation messages and actions. The play is sponsored by the Tampa's Water department and SWFWMD as part of the city's in-school education effort.

To educate the public on water quality the city's Hillsborough River Water Treatment Plant holds an open house during Drinking Water Week. The historic plant is one of the largest surface water treatment facilities in the southeastern United States. Last year 65.57 MGD of treated water was pumped through 1,866 miles of pipe. This year over 300 people toured the plant during May.

Drinking Water Week activities continue to expand to reach even more of the community. This year the department co-sponsored a jazz concert (which was appropriately rained out) and also joined with the county in educating the public about low-flow fixtures, toilet rebate programs, and Xeriscape principles by providing experts to answer questions in local Home Depot stores. Tampa's water department continues to seek innovative means to educate the public on drinking water and water conservation.

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Sensible Sprinkling: A Neighborhood Landscape Water Conservation Program

Neil Mingledorff, Jr., Diane Mulville-Friel, and Damann Anderson

Many homeowners are unaware of how much water their plants require or how long to water. As a result, most end up over watering. The Tampa Water Department, in conjunction with private businesses and other government agencies, developed a six part, extensive education program called Sensible Sprinkling to educate homeowners on efficient landscape water use. Through irrigation evaluations the water department discovered that the majority of water savings can be accomplished by reducing the amount of time a landscape is watered while still maintaining healthy plants and turf. The program's unique approach provides awareness of the need for conservation and the knowledge to take the necessary action. The program's education effectiveness is achieved by providing a site specific landscape water conservation plan for each homeowner.

Single family homes, the largest category of water users, account for 35% of Tampa's water demand. For those homes with in-ground irrigation systems, approximately two-thirds of their total water use is for landscaping. Since the majority of high water users are clustered in established neighborhoods, a program was developed to reach the residents through their homeowners association. A neighborhood is identified for the program by the number of residents with separate irrigation meters. The program is then introduced to the homeowners association for their acceptance. The association provides a residential listing which enables the city to mail each resident a brochure describing the program. The entire program is free, and interested residents indicate which elements they would like participate in by returning a response card. The goal is to reduce landscape water use by at least 25%. From June 1993 to May 1996, approximately 650 homeowners in six neighborhoods have participated.

Sensible Sprinkling - The Six Elements

Water conservation is promoted to the individual homeowners through individual meetings to discuss their landscape and irrigation needs as well as providing evaluations and literature. This action takes place with a six part approach:

(1) Irrigation Evaluations. A detailed inspection of the irrigation system is performed to determine if there are any system inefficiencies. Common inefficiencies include broken pipes or sprinkler heads; misaligned or mismatched heads; poor distribution uniformity; and foliage interference with sprinklers. Also, an irrigation watering schedule

is calculated to prevent over watering. The presence of the homeowner during the evaluation provides the best opportunity for education about the system and existing problems. A written report is prepared which includes: recommendations for improving the efficiency of the system; a seasonal watering schedule; best management practices for turfgrass; and estimated water and dollar savings. This element comprises the backbone of the program.

(2) Landscape Evaluations. Landscape evaluation focuses on grouping plants according to their water requirements and making suggestions for reducing turf areas. The landscape contractor meets with the homeowner to evaluate the site and to recommend changes using a combination of photos from books or a computerized plant selector program. This assists homeowners in selecting from an extensive list of plants. After the evaluation, a written report is mailed with the water-wise recommendations and a plant list.

(3) Rain Shut-off Switches. Installation of rain shut-off switches for automatic irrigation systems can provide significant water savings. These devices will temporarily shut off an automatic system when there is sufficient rainfall, preventing unnecessary watering.

(4) Water-Wise Landscape Demonstration Sites. Demonstration sites are permanently landscaped areas used to promote the principles of Xeriscape landscaping. Not only do these sites promote water conservation and provide information such as a plant list for the site, a plant guide, and irrigation information, they have the additional advantage of providing a year-round educational opportunity. The city chooses sites located within a neighborhood which will be available for self guided tours. A grand opening dedication promotes each site and is publicized throughout the city.

(5) Landscape and Irrigation Workshops. Workshops are presented occasionally to reinforce the concepts promoted in our evaluations. Hands-on workshops give each homeowner the chance to gather additional information on landscape maintenance, water-wise landscaping and irrigation system design and repairs.

(6) Neighborhood Trainee. A resident may be selected by the neighborhood association to be trained by the city as a Sensible Sprinkling Neighborhood Representative. The representative is available on weekends or weekday evenings to answer residents' questions which may include adjusting their irrigation controllers, simple irrigation repairs and water-wise landscape information. When the program brochure is mailed to residents announcing the Sensible Sprinkling program, the Neighborhood Representative's name and telephone number is listed.

Water Savings

To determine the effectiveness of the program, water use was monitored in two neighborhoods before and after conducting the Sensible Sprinkling program. Sunset Park was the first neighborhood to be evaluated. Based on 12 months of water use data prior to irrigation system evaluations and 12 months after the evaluations, participating Sunset Park homes used 21% or 152 gallons per house per day (ghd) less water, in total, after the evaluation (Table 1). Using Tampa's average of 2.3 people per house, the data suggests a per capita water savings of 66 gallons per day. The city-wide per capita usage is 112 gallons per day.

To obtain a more accurate estimate of water use from irrigation system changes, households with separate lawn irrigation meters were grouped and their average pre and post-evaluation water uses were compared (Table 1). The 149 Sunset Park households with separate lawn meters used 174 ghd less (29%) in lawn irrigation water between the pre and post-evaluation periods, based on the data collected.

Overall, households with separate lawn meters used more water than homes with only one meter (Table 2). The difference in pre-evaluation total water use most likely

Table 1: Sunset Park and Davis Island Water Use Data Pre and Post Irrigation Evaluations

Study Group	Total Water Use[1] Diff. Pre - Post		Irrigation Water Use[2] Diff. Pre - Post	
	ghd	%	ghd	%
Sunset Pk. Participants	152	21	174	29
Davis Is. Participants	183	27	216	38
Davis Is. Controls	105	17	58	31

[1]Difference between pre- and post-evaluation total water use for all study homes (i.e., 208 Sunset Park, 114 Davis Island Participants, 112 Davis Island Controls).
[2]Difference between pre- and post-evaluation irrigation water use for all study homes (i.e., 149 Sunset Park, 72 Davis Island Participants, 64 Davis Island Controls).

reflects the fact that customers with separate lawn meters did not pay sewer charges for irrigation water, and therefore probably used irrigation water more indiscriminately. Having to pay sewer charges on lawn irrigation water may create an incentive to conserve water.

Average rainfall and temperature data were used to compare weather conditions and assess whether the pre-evaluation period differed significantly from the post-evaluation period. There was no statistical difference between the rainfall and temperature recorded during these two time periods. This suggests that residents were more aware of rainy periods in the post-evaluation period and did not irrigate at those times. The installation of rain shut-off devices on 50 irrigation systems as well as homeowner education regarding watering habits are most likely the primary reasons for the result.

In 1994, a second neighborhood, Davis Islands, had 160 homeowners participate in the program. Similar to the Sunset Park study, pre and post-irrigation evaluation water use comparisons were made for Davis Island participants. After monitoring the water usage for 114 of these homes, the difference between the pre and post-evaluation periods averaged 183 ghd, or 27% less during the post evaluation period (Table 1).

For the Davis Islands neighborhood, a control group was used for comparisons. The total home water reduction for this group was 17%, which is also a significant difference (Table 1).

Of the Davis Island participant households, 72 had separate irrigation meters and showed an irrigation water reduction of 38%. The control homes that had separate irrigation meters reduced irrigation usage by 31%. As was the case with participant households, control homes with lawn meters experienced a greater total water use reduction than homes without lawn meters (Table 2).

The rainfall comparisons for Davis Islands indicate that the average daily rainfall for the post-evaluation period (0.16 inches) was significantly higher than the pre-evaluation period (0.11 inches). This could have been a factor in both the participant and control groups post evaluation water use differences. It appears that the Sensible Sprinkling Program had an effect on water use; however, it is difficult to quantify due to the apparent rainfall differences. Another possibility is the influence the participant group may have had on the control group since their homes were located near. It is therefore difficult to measure the effectiveness of the program with the Davis Islands participants.

Questionnaires - Rating the Program

A questionnaire was sent to all participating residents in the Sunset Park neighborhood to evaluate their satisfaction with the program and to determine which recommendations they followed. The results showed a higher percentage of the changes were made by changing the irrigation times to reduce over watering. As a result, the reports to Davis Island homeowners had a detailed chart showing the estimated water savings if they followed all the recommendations and highlighted the savings from the irrigation changes alone.

Program Costs

In the first two years of the program, the irrigation evaluations were provided by regional and federal agencies at no charge. The landscape evaluations were performed by master gardeners who volunteered their time. In 1995 these agencies were unable to continue providing their services. As a result, the city contracted out both the irrigation and landscape evaluations at a cost of $162 and $75 each, respectively.

Conclusion

The six elements of the Sensible Sprinkling Program provide a thorough education process for homeowners and the water savings demonstrate its effectiveness. The primary component is the irrigation evaluation. Approximately three quarters of the water savings is accomplished by reducing over watering, which is easily accomplished by properly adjusting irrigation schedules. It is important to note that the most effective element in water use reduction can be accomplished by the homeowner at no cost.

For more information, contact Neil Mingledorff, Tampa Water Department, 306 E. Jackson Street, #5E, Tampa, Florida 33602, or call (813) 274-8762.

Neil Mingledorff, Jr., C.L.I.A. is an environmental specialist with Tampa's water department. Diane Mulville-Friel, A.I.C.P., is an Environmental Scientist and Damann Anderson, P.E., is vice president of applied technologies, Ayres Associates, Tampa.

Table 2: Total Water Use Recorded for Study Households With and Without Separate Lawn Meters

Study Group	Total Water Use (ghd) Homes With Lawn Meters: No Homes	Pre Avg.	Post Avg.	Diff. Pre-Post	Homes Without Lawn Meters: No. Homes	Pre Avg.	Post Avg.	Diff. Pre-Post
Sunset Pk. Participants	149	827	645	182	59	485	412	73
Davis Is. Participants	72	790	562	228	42	473	366	107
Davis Is. Controls	64	766	608	158	48	403	368	35

Implementing A Toilet Rebate Program In-House

Linda Seashore Larsen

Wanting to expand its conservation program, Sarasota County Utilities Department (SUD) earmarked funds towards a toilet rebate program. The "Get WET" (Water Efficient Toilet) program began November 15, 1994. All components were managed within the department, including the program blueprint, spreadsheets for tracking, data input, program and evaluation design and printing, as well as program publicity. Arrangements were made to issue checks directly to the customer. A staff person on "light duty" was recruited to conduct inspections of toilet installation.

Because Sarasota County does not have an inexpensive and easily available source of potable water, conservation is critical. After researching retrofit programs across the country, as well as in Florida, it was decided to plan a toilet rebate program.

In 1994, when a request to the Manasota Basin Board for cooperative funding for a toilet rebate project was denied, SUD decided to implement a program within the department. Funds of $125,000 were budgeted to provide rebates in the amounts of $100 for the replacement of one toilet, and $200 for two. There were no limits for retrofitting multi-family dwellings. All monies were expended within three months. Selection of the toilet and installation were the choice of the homeowner.

The program received such a positive response that additional funds of $50,000 were made available for 1995 and again quickly expended. Get WET began its third phase in October 1995 with $125,000 budgeted for rebates. All monies were rebated within four months, but the inspections and check processing continued until March 1996.

Because no grant monies or funds from other sources were used, the Get WET program was offered only to the 39,000 retail water customers of SUD.

In November 1994, an insert included with all bills briefly described the program and a phone number was given for addi-

tional information and-application requests. A short message on the water bills was all the advertisement needed for phases two and three. Due to the popularity of the program and the concept of water conservation, those customers missing out on a phase frequently checked by phone. Word of mouth and homeowner association newsletters became the best advertisement. Some private plumbing companies, without endorsement or approval from SUD, used the program as a marketing tool.

After they returned a completed application form with a receipt for purchase, customers' names were entered into a spreadsheet program. An inspector then scheduled an appointment to check for installation. At the time of inspection, an evaluation sheet was given to the customer.

Customer information was sent to the finance department for check processing. Checks were mailed directly to the customer within thirty days.

Applications received after funds were expended were held pending additional monies. Nearly 45 percent of those participating mailed in an evaluation which is useful for future planning and to gauge customer satisfaction.

Other than customers wanting their rebates checks right away, the only difficulty involved mass advertising by an out-of-county plumbing company that caused confusion about who was eligible, who was actually funding the program, and who was selling and installing toilets.

Three thousand high volume toilets have been replaced and 75 customers have sent in applications in anticipation of a future program. All allocated funds went to rebate customers. By replacing existing high volume toilets, it is calculated that approximately 19 million gallons of water are saved each year for the life expectancy of the toilet, which is twenty to thirty years.

Evaluations received indicate wide customer acceptance (95%) of the ULV toilet. Several customers liked it so much that they replaced another and got a second rebate. The majority of respondents (75%) indicated that the reason they participated in the program was to save money and/or the environment.

The general consensus is that SUD made a tremendous impact on customer relations, especially with new customers. It took significant time and money to implement the program, but the benefits of continued water conservation last for years.

With an estimated savings of 17 gallons per day per ULV toilet, 15 toilets, which cost SUD $1500 in rebates, will save enough water to serve a new single family house. It costs Sarasota County $3,148 to build the infrastructure to serve a single home with potable water and $1,076 for sewer service. Therefore, the cost/benefit ratio is 1500/4224, or 1:2.8.

It is expected that a medium size utility able to set aside certain resources could duplicate this project successfully. The tasks include: designing a program to work in a specific situation (i.e., issue checks or make credits on bills), answering phone and mail requests, data entry and tracking, and installation inspection. The SUD program was never one person's sole task. Many people worked on parts of it during some duty hours. It does require good communication skills, good customer relation skills, and some technical knowledge to answer questions and do inspections.

The unusual part of the program is that it took what was available in funds and made the most efficient use of in-house resources to achieve significant and long-lasting water conservation results.

Linda Seashore Larsen is in charge of water conservation programs for Sarasota County Utilities Department and vice chairperson of the FSAWWA Water Conservation Committee.

ICI PROGRAMS

Industrial, commercial, and institutional water customers are often large consumers of water and therefore are an important source of water savings.

ICI Conservation Programs: Where To Begin

Kathy Foley

There's been a growing emphasis on nonresidential water conservation over the last few years. Already established in places like California, Oregon, and Massachusetts, conservation programs

are proving that industrial, commercial and institutional (ICI) customers are a valuable source of water savings. Water professionals are tuning in to the possibilities here in Florida with its tourist centers and industrialized pockets. Still, nonresidential programs are relatively uncharted territory.

A typical ICI program consists of water audits of selected facilities. Engineering consultants are hired to perform the audits and provide the facility with a report detailing some recommended water efficiency improvements. A lead agency, such as a utility, provides the audits to the ICI customer free of charge, and there is often no requirement for the customer to implement any of the recommendations. Even with this information, it's difficult to know just were to begin. A pilot program is a good idea for an agency just beginning its nonresidential conservation efforts. It can provide decision makers with a good indication of who is using water, how they're using it, and how savings can be achieved. Whether you hire professionals to facilitate a pilot program, or you do everything yourself, there are some basics to consider.

- Recognize the differences between residential and ICI programs. Residential water use is relatively the same from household to household, and the "one program fits all" concept can work. ICI water use has several variables. Different types of businesses use water differently, but consumption can differ even within the same user category. Other factors, such as the size of the facility, number of employees, and number of shifts also affect water use. Additionally, ICI users must often follow a chain of command and adhere to standard payback criteria when making decisions to modify practices or equipment.
- Define target categories. It's important to define the nonresidential categories that comprise a customer base. Some water providers classify customers simply as residential, public or commercial, which leaves a lot open to interpretation. In the Southwest Florida Water Management District (SWFWMD) ICI program (inset), the regional agency was working with 19 public water suppliers in three counties. One supplier's public may be another's institutional, and so on. The SWFWMD redefined the categories of users for the purposes of its program, and will summarize water savings potentials according to that definition. Be sure the selected categories help to accomplish the objectives.
- Determine which ICI customers to target. This depends on the program objectives. For example, programs seeking the biggest water savings possible in a short amount of time may target significant users (customers with an average consumption above a pre-set threshold, such as 25,000 gpd); whereas a program attempting to reduce water use in the spring may target users that typically have increased production in the spring. In the SWFWMD case study, the objective was to determine the overall ICI savings potential in three urban counties. The target, then, was a representative sample of ICI users across the selected categories.
- Program Evaluation. Of course, program evaluation is a final, crucial part of any conservation program. Obviously the water savings potential would be a major part of the evaluation focus. In a pilot program, the other information is equally, if not more, useful to the program manager. It's a good idea to ask questions such as why did the customer participate; why were the recommended changes implemented or not implemented; and, what payback period is acceptable? Information about the decision making process will help determine how a full-scale program should be approached.

Case Study

In 1994 SWFWMD began to look toward nonresidential water users on public supply systems for answers to some questions about water conservation:

- how do industrial, commercial and institutional (ICI) water users actually use water?
- what, if any, savings opportunities exist in ICI facilities?
- how can these savings be realized?

To answer these questions, the Tri-County Water Conservation Initiative pilot project was developed. The Initiative's target area was three counties on the southwest coast of Florida, with a mixture of highly urban areas and areas prone to development. SWFWMD is a regulatory agency with the responsibility of managing the water resources in its 16-county region. Because it's not a water supplier, it had to begin by gathering customer information from the 19 local water utilities in the tricounty area. After tabulating the number of significant users (ICI customers using more than 25,000 gallons/day), four categories were initially chosen as the program's focus: (1) manufacturer; (2) school; (3) office building; and (4) hospital. "Restaurant" and "hotel/motel" were added due to their sheer numbers and their collective water use in the area, for a total of six categories.

A professional engineering consultant was hired to perform varying levels of water use evaluations on selected facilities. SWFWMD formed three-way partnerships with each facility and its water/ wastewater provider. This provided the needed flow of information to carry each evaluation successfully from beginning to end and expanded the budget, since each partner typically paid between 1/3 and 1/2 of the cost of the evaluation. Final reports have been issued for seven sites. The results are shown in the accompanying table.

It's too early in the pilot program for SWFWMD to decide how its ICI conservation efforts will be directed. Based on the results of the initiative to date, ICI water use is clearly a tangible source of water savings.

Kathy Foley is a water resource analyst with the Southwest Florida Water Management District.

Facility Type (1#)	Combined Use (gal/yr)	Annual Saving (gallons)	($)	Cost of Changes ($)	Payback (yr)
Manufacturer (2)	119,558,000	15,936,000	80,570	16,900	0.2
School (2)	22,160,000	4,460,078	16,280	6,026	0.4
Office Building (1)	468,500	46,000	590	84	0.2
Restaurant (2)	4,667,804	1,231,023	4,500	4,500	1.0
TOTAL	**135,654,304**	**21,673,101**	**101,940**	**19,060**	**0.2**

REGIONAL COORDINATION

Water conservation programs are often needed across political boundaries.

The Conservation Coordination Consortium—A Model for Regional Cooperation

Kathy M. Fry and David E. Bracciano

The Conservation Coordination Consortium (CCC) was formed in 1994 as a means to promote regional approaches to conservation and to increase communication between the West Coast Regional Water Supply Authority and its six member governments. While the role of utilities and the role of the authority differ in terms of customer bases, the goals of both include water conservation as a means to address critical water supply issues.

The West Coast Regional Water Supply Authority is a regional water supply authority created in 1974 by legislation (FS 373, 1974) and a five party interlocal agreement between elected officials in Hillsborough, Pasco and Pinellas counties and the cities of St. Petersburg and Tampa. The city of New Port Richey was added as a non-voting member in July 1982. The authority's mission is to provide its member governments with adequate and reliable supplies of high-quality water to meet the area's present and future needs in an economically and environmentally sound manner.

The authority is a not-for-profit agency and is the largest wholesale water supplier in Florida. Its member governments serve about 1.8 million residents in the Tampa Bay area. The authority supplies and develops water supplies to assist its membership in meeting their individual and combined water use demand. By 2015, the consumer population is projected to be more than 2.2 million people.

The authority and its member governments' water use is regulated under the permitting standards set by SWFWMD. These standards include mandatory water conservation programs that must be implemented by each permittee. Conservation program requirements are specific to the type of proposed use (agriculture versus public supply) and are developed by the permittee.

The authority's role is to provide water to its six wholesale customers, meeting their economic constraints while fulfilling its mandate to minimize environmental affects of water production. Although wholesale cost to the end customer is an important consideration, it is tendered by the specific mandate to "minimize environmental affects of excessive withdrawal of water from concentrated areas of withdrawal"(FS 373). One way to minimize environmental affects is to adequately define the role that water conservation plays in this minimization and how the authority can affect conservation.

Utilities have a different charge than that of the authority. The goal of utilities is to provide safe, high quality drinking water directly to the public. The goal statement of the city of Tampa Water Department illustrates this commitment and duty to the customer: *To provide potable water that is unquestioned in quality and sufficient in quantity, ensuring customer satisfaction, while maintaining the environmental integrity of the source.*

This statement highlights the differences between the authority and the city of Tampa. As a full service utility, Tampa is charged not only with the production of water but pursuant to the Safe Drinking Water Act, also bears the responsibility for the quality of the drinking water "to the customer's tap." In terms of supply, Tampa is the only authority member that is self-sufficient and the only member with a surface source of water; the Hillsborough River. In addition to providing quality water to ensure customer satisfaction, the goal includes doing so in the most cost effective manner possible. Although the water department is not charged with protection of the environment per se, it is evident that in order to continue providing water the environmental integrity of the source must be maintained.

The city of Tampa's membership in the West Coast Regional Water Supply Authority is unique in that the city does not receive any water from permits held solely by the authority. However, as the only member currently with "excess" water, the city's participation in the authority is vital in formulating solutions to the regional water situation. A part of this role includes the city's participation in the CCC.

The CCC was formed in January 1994 as a response to the West Coast Regional Water Supply Authority Board of Directors' decision for authority staff to increase its role in initiating and facilitating comprehensive water conservation programs. The goal of this action is to promote regional approaches to water conservation and to increase communication between and among member governments.

The CCC is structured around the six member governments. Specifically, it is composed of the conservation representatives of the authority and each member government, Institute of Food and Agricultural Sciences Cooperative Extension Service agents, SWFWMD conservation representatives, and USDA Natural Resources Conservation Service(NRCS) conservation staff. This structure allows the member governments to have input and offer direction to the authority as to how funds are allocated. It also provides the membership and the authority with a mechanism for receiving input from regulatory and expert sources that enhance the decision making process and provide steering for future programs.

The CCC's monthly discussions lead to better understanding of conservation programs between the members in a cooperative non-adversarial setting. This exchange facilitates membership efficiency by (1) minimizing duplication of effort; (2) enhancing problem solving by drawing on professional experiences; (3) discussing future options and coordinated planning efforts for conservation; and (4) evaluating regulations with the SWFWMD and technical representatives so local and regional perspectives can be evaluated.

The authority funds, supplied by members, are allocated for specific water conservation and public awareness efforts undertaken by the authority. Input provided by the CCC members is used to evaluate potential program expenditures and offer feedback on implementation of specific programs. Upon approval from the authority's board to proceed with the project, authority staff and its member governments on the CCC used this procedure successfully to negotiate and select a consultant to develop a comprehensive demand management plan for the region. This effort requires each member provide information and feedback on the consultant's work throughout the development of the plan.

The CCC process provides opportunities for intergovernmental coordination and cooperation. This tool allows regional efforts to progress while preserving the autonomy and customer province of member governments. It also provides a means to conduct, streamline, and develop general conservation activities that go beyond specific geopolitical boundaries. For example, an irrigation evaluation program was developed by the University of Florida with funding from the authority and supervision by the NRCS. The program was assessed by the evaluation of over 400 residential and commercial irrigation systems by the city of Tampa. The program was revised and rewritten and is being used by the authority membership and other governments throughout the state.

Consortiums are best implemented in areas where resources are allocated beyond geopolitical boundaries. They promote cooperation and offer solutions to regional issues. As populations increase and boundaries between governmental entities become less distinguishable, the need for intergovernmental and agency interaction becomes critical.

Kathy M. Fry, J.D., is consumer affairs manager, Tampa Water Department and David E. Bracciano is a resource analyst, West Coast Regional Water Supply Authority

ENFORCEMENT

How does a governmental body enforce conservation measures?

Hillsborough County Water Use Restrictions Enforcement Program

Norman Davis

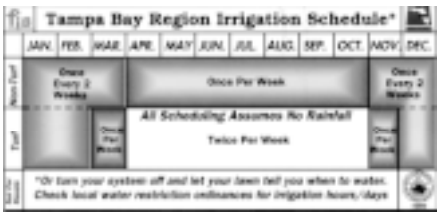
The use of water outdoors is generally considered to be discretionary as compared to "essential" uses indoors. The development and adoption of water use restrictions primarily has been directed towards the wise use of water in the landscape, particularly focused on educating individuals on irrigation efficiency. Water restrictions are typically mandated on a regional level by one of the state's water management districts. Enforcing these restrictions, however, has generally been delegated to the level of the local government, often complicated by the fact that violation of restrictions statutorily constitutes a crimi-

nal offense. For this reason, law enforcement personnel have been inclined to concentrate their efforts on more serious crimes. However, Florida Law allows for individual local governments to adopt a civil citation process for certain infractions to facilitate enforcement activities without preoccupying the time of peace officers. Hillsborough County took advantage of this judicial construct and developed an effective mechanism to encourage the compliance with mandatory restrictions while providing an educational-based program.

On July 14, 1993, the Hillsborough County Board of County Commissioners unanimously approved amending Section 4 of [Water Conservation] Ordinance 91-27 so that the violation of water use restrictions in the unincorporated portions of the county is considered a civil infraction. The enforcement is authorized by trained personnel of the county. Penalties are established through Resolution #R93-0137, allowing for a simple means to adjust the penalties should conditions warrant such action. First and second violations currently may be assessed a fine of $35 with an additional $2 administrative fee. Third and subsequent transgressions require a mandatory court appearance with the fine to be set by the Hearing Master, up to $500. Also, any undismissed or unpaid citations, once processed through the clerk of the circuit court, are scheduled for a hearing two months after the issuance of the citation, generally on the third Thursday of the month. The Hearing Master may also impose court fees at up to an identical amount of the penalty.

The enabling ordinance and resolution for the establishment of penalties are available to interested parties by contacting the author.

Citations may be dismissed and warnings rescinded through proper justification to be exempt from water use restrictions at that time. Typically dismissals are provided to new residents, for watering-in of new plant material, pesticides or herbicides, system deficiencies (once corrected), and for power failures. Dismissals are approved through the county Water Conservation Coordinator with oversight of the county attorney's office. All dismissals are handled through formal correspondence, providing a copy of the county's water restriction brochure and a sticker for the property owner's irrigation controller which advises them of the recommended irrigation frequency for their plant material. The sticker was developed by the West Coast Regional Water Supply Authority in cooperation with the University of Florida Institute of Food and Agricultural Sciences and the Florida Irrigation Society, at the request of the Hillsborough County Water Conservation Committee.



The recommendations are meant to assist in increasing water conservation efforts through recommending irrigation frequencies which will promote optimum plant health. The adhesive sticker may be placed in, on or near the irrigation controller, and the magnetic sticker can be used as a refrigerator magnet, or placed on a nonelectronic irrigation controller. Both are designed to remind the user to modify their irrigation schedules routinely throughout the year.

Enforcement of water use restrictions is only one facet of a truly comprehensive water conservation program. Implementation and adherence to water use restrictions are based more on education of citizens to encourage them to change their water-use habits than on the issuance of citations, collection of fines, and court appearances. The success of an enforcement program is measured not by the number of citations issued or dollars collected, but rather by the reduction in water demand by citizens who accept the need to conserve water and a declining rate in the reporting of violations.

Therefore, it is not anticipated that there will be a substantial revenue from penalties. Any such revenues are deposited to a water conservation fund to be utilized in furthering conservation. The county commissioners have authorized the utilization of these funds to provide rebates to property owners in the county to install automatic rain-sensing shut-off devices on irrigation systems. This rebate program was recognized through the conferral of a 1995 Awards for Excellence Program sponsored by the Water Conservation Committee of the FSAWWA Technical & Education Council.

Hillsborough County provides water to two service areas, the Northwest and the South-Central, which are geographically split by the incorporated service areas of Tampa and Temple Terrace in the northern portion of the county. Even so, the entire 1,097 square-mile unincorporated area of the county is patrolled by enforcement staff. The need for two enforcement personnel, equipped with vehicles, radios, and portable computers was initially identified to administer the rule effectively. However, due to an emergency situation in regards to alleged overpumping on the West Coast Regional Water Supply Authority's water use permits, the program was fast tracked at the end of August 1993, utilizing existing field service technicians and meter readers as enforcement officers. This offered an opportunity to fine-tune the elements contained in training documents and procedures. Two permanent "Water Efficiency Technicians" (WETs) were hired in February, 1994, and subsequently, a third position was authorized, as well as temporary personnel as needed to supplement their efforts.

At the request of the board of county commissioners, the Public Utilities Department staff prepared a public service program to get the enforcement of water use violations message communicated to all of unincorporated Hillsborough County. Recognizing that there are numerous media outlets, this plan incorporates the need to address a broad brush approach to effect the greatest contact rate. The specific elements of this public awareness plan include staffing, media releases, billing notations, billing inserts, announcements on local government cable television, public service announcements, placards, display ads and other outreach activities.

County vehicles equipped with sonic leak detection equipment, meter calibration devices, irrigation audit kits, public awareness print media, and other materials allow the WETs to provide conservation assistance as needed, and through previously scheduled activities. This brings the full array of conservation opportunities to the public at all times. To facilitate the reporting of violations by the public, the Public Utilities Department established a call-in line which can take messages up to five minutes in length. The enforcement personnel are paged in the field automatically, and can access the voice box from the field to respond in a timely fashion. The hotline number has been printed on business cards to be able to provide it to the many volunteers who desire to assist.

Almost immediately upon the formal adoption of this policy, SWFWMDs water shortage coordinator commended the county on its proactive measure in bringing water conservation awareness to the forefront as a priority within its jurisdiction. Through coordination with the three incorporated communities in Hillsborough County, the irresponsible use of water in the landscape is now gaining great attention. All local governments in Hillsborough County are geared towards enforcement actions, either through the civil citation process or through code enforcement. The effectiveness of this measure is illustrated by a reduction of 23 gpcd for watering days, and 44 gpcd for non-watering days. A further indication of the effectiveness of this program is directly tied to penalties collected. During the Fiscal Year 1995, over $18,000 was collected. Half-way through Fiscal Year 1995, less than $2,000 has been collected.

This program can easily be implemented by other local governments. Hillsborough County is happy to provide copies of its local ordinances and advice on procedural implementation to any inquiries.

The enforcement of water use restrictions on the part of Hillsborough County was strongly encouraged by the SWFWMD. Once the county implemented the program, the effect on the public was immediately felt through all levels of the public. Specific inquiries were made of all elected officials, the media attempted to grandstand the efforts, and deliberate efforts had to be made to work with the various property management companies in the area. Over all, the program has been a success, and the compliance with water use restrictions continues to grow. As additional needs for water use enforcement/education are identified, the existing staff will be trained and/or utilized as needed.

More information about this program can be obtained by contacting Norman Davis, Water Conservation Coordinator,

Hillsborough County Public Utilities Department, 925 East Twiggs Street, Tampa, Florida 33602.

Norman Davis is the water conservation coordinator for Hillsborough County. He currently chairs the FSAWWA Technical/Educational Council's Water Conservation Committee and holds the Governmental Interests Seat on the board of directors of the Florida Water Wise Council.

FURTHER INFORMATION

Water Conservation Program Resource Guide

Rene Mathews and Norman Davis

Do you feel at a loss in developing recommendations for water conservation programs? Water conservation is a vital planning element for any water utility. The myriad of water conservation mechanisms includes both supply-side and demand-management options. While general measures are mandated by regional water management districts as conditions of water use permits, utilities must struggle with the specific means to achieve the measures.

When it comes to implementing specific programs, decision makers often want to base decisions on experiences of other utilities. Also, the experience of others is invaluable in directing the implementation of programs. For those responsible for the management of water resources, contact points for successful programs are necessary. This was the impetus to the development of the "Conservation Resource Guide" by the Water Conservation Committee of FSAWWA. Printed by SFWMD, it is available to interested persons.

The guide is intended to provide a quick reference of municipalities, utilities, and consultants who have experience in implementing specific conservation programs. It is divided into various categories of water conservation programs, as follows:

- Economic Incentives
- Utility Management
- Regulatory Codes
- Wastewater Reuse
- Landscape and Irrigation Programs
- Plumbing Retrofit Programs
- Commercial/Industrial Programs
- Education Programs
- Research

Contacts for each entry are provided so that information can be requested directly, encouraging dialogue to help ensure the success of upcoming water conservation programs, and the ultimate protection of Florida's water-related resources. This should help alleviate pitfalls experienced by others.

Copies of the "Conservation Resource Guide" can be obtained from Rene Mathews, Hazen and Sawyer, P.C., 2101 Corporate Boulevard, Suite 301, Boca Raton, Florida, 561-997-8070.

Rene Mathews is with Hazen and Sawyer, Boca Raton, Norman Davis is the Hillsborough County water conservation coordinator.