

**DEVELOPMENT OF
WATER CONSERVATION
OPTIONS FOR
NON-AGRICULTURAL
WATER USERS**

Prepared for:

**Southwest Florida Water
Management District**

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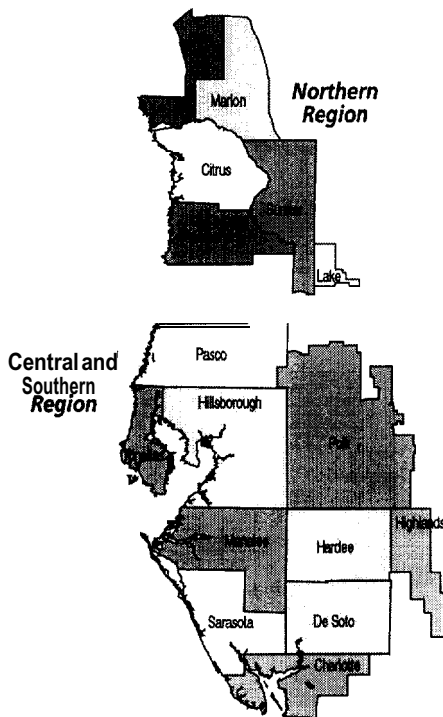
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SECTION 1

Introduction

In June 1998, the Southwest Florida Water Management District (SWFWMD) completed the Water Supply Assessment Report, and determined that a Regional Water Supply Plan was needed for the Central and Southern Planning Region. The Central and Southern Planning Region comprises of Hillsborough, Pasco, Pinellas, Manatee, Sarasota, **DeSoto**, Hardee and portions of Polk, Highlands and Charlotte counties.

Hillsborough, Pasco, and Pinellas counties have experienced significant increase in water use since the 1930s. Much of the area in these counties is dependent on groundwater pumped from the Upper **Floridan** Aquifer. This reliance on groundwater has resulted in adverse environmental impacts including lower lake levels, reduced stream flow, and destruction of wetland habitat.



Southern Water Use Caution Area (SWUCA), which encompasses much of the remaining part of the Central and Southern planning region, has experienced long-term decline in the potentiometric surface of the **Floridan** Aquifer as a result of historical groundwater withdrawals. Recent projections of future water demand indicate continued growth in the region. In order to provide for the projected growth, it is necessary for the District to identify alternative supplies of water that will ensure availability of adequate quantities of water for future reasonable and beneficial uses, while protecting the water resources and needs of the environment. Inasmuch as effective water conservation extends the availability of existing supplies, it is considered by the District to be an alternative water resource and water supply

development measure.

As part of the Regional Water Supply Plan, the District has undertaken several studies to

explore alternative water supply sources including water conservation in agricultural and non-agricultural sectors. The objective of this project was to identify, evaluate, and prioritize non-agricultural water conservation measures in the Central and Southern region of SWFWMD comprising of Charlotte, **DeSoto**, Hardee, Highlands, Hillsborough, Manatee, Pasco, Pinellas, Polk, and Sarasota counties. The conservation measures were evaluated for both public and non-public (industrial and commercial, recreation/aesthetic, domestic self-supply, and mining/dewatering) water supply sectors, and the total amount of water that could be saved from these measures were estimated for a **20-year** planning horizon.

This report provides the results of the tasks completed to accomplish the objectives of the project. The report is organized in four major sections as described below.

Prior to the evaluation of potential conservation measures, an inventory of previous, existing, and proposed water conservation measures was conducted by SWFWMD in the **10-County** area. Survey questionnaires were mailed to all permittees meeting the threshold criteria for the demand projections, inquiring about the current and projected water use, past, present, and future water conservation measures, and population projections in specific water use sectors. Data collected from these surveys was evaluated and compared with the information available in the existing literature. Section 2 of this report provides detailed information on this task effort. It should be noted that updated **data related** to private residential irrigation wells was provided by the District in March of 2000. However, this data was not considered in the study because the data was provided too late in the analysis stage.

Subsequently, the potential conservation measures that may be applicable in the study area were evaluated for individual water savings potential and cost-effectiveness. These conservation measures included both voluntary and mandatory measures. Section 3 of this report provides detailed descriptions of these conservation measures including specific references to related studies and literature.

Based on this evaluation, specific conservation measures were selected for further analysis. For the public supply sector, the conservation measures were analyzed at the utility level. For the non-public supply, sector the analysis was performed at the permittee level. At the onset of

the study, a preliminary analysis was performed to determine the maximum potential of water savings in the planning region. Fifty percent of this maximum potential savings was used as a guideline to develop the final list of conservation projects.

The detailed descriptions of the feasibility, implementation, and cost analysis of individual water conservation measures are given in Section 4. Water savings, program costs, and the **cost-effectiveness ratio (CER)** of each selected program are also given in this section. Finally, based on the merit of each measure a list of conservation projects was identified for implementation.

Section 5 summarizes the selected conservation projects and provides the estimated total program cost, projected water savings, and the overall cost-effectiveness ratio (dollars spent for every 1,000 gallons of water saved). The information is also summarized by counties to indicate the geographical distribution of the water conservation projects.

SECTION 2

Inventory and Evaluation of Previous, Existing, and Proposed Water Conservation Measures

This section provides an inventory and evaluation of the previous, existing, and future water conservation measures for the non-agricultural water users. Non-agricultural water use primarily consists of two major water use sectors:

- (1) Public Water Supply - the public utilities supply water to residential and commercial establishments, and
- (2) Non-Public Water Supply - individual entities are permitted to draw water from individual wells.

There are three main sub-sectors under Public Supply: single family residences, multi-family residences (i.e., apartment complexes), and non-residential establishments (i.e., schools, hotels, office buildings, etc.). Under Non-Public Supply there are three main sub-sectors:

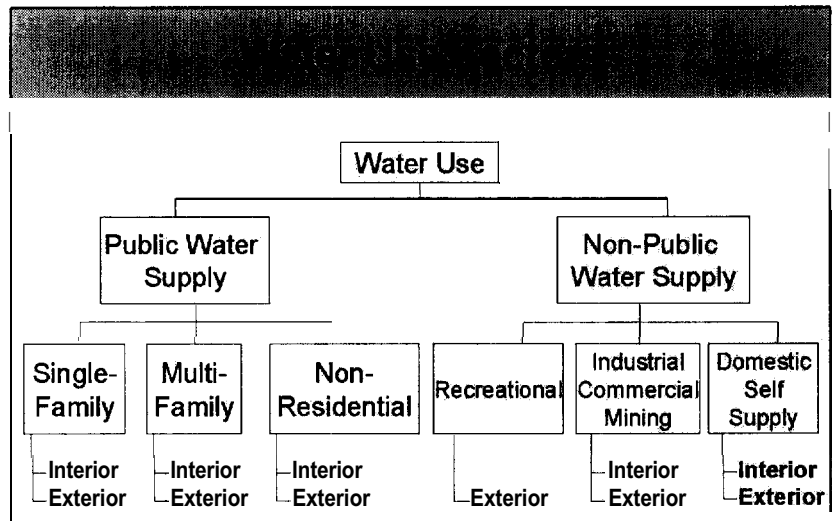


Figure 2.1 Water Use Sectors

Industrial/commercial/mining/
dewatering (including power generation),
Recreational/Aesthetic (i.e., golf courses, parks, etc.), and Domestic self supply (i.e., residential establishments that draw water from their own wells for both domestic and irrigation purposes).
Figure 2.1 illustrates the different water use sectors.

In order to collect information on previous, existing, and future water conservation measures, the District developed a survey questionnaire and solicited pertinent information from both public water use and non-public water use sectors. Under “Public Supply”, the survey was mailed only to the water supply utilities withdrawing at least 0.1 million gallons of water per day (SWFWMD, 1997a). Under the “Non-Public” water use category, the survey was mailed to the industries, commercial establishments, and mining companies which are permitted to withdraw at least 0.1 million gallons per day (SWFWMD, 1997a). Surveys for the Recreational/Aesthetic water supply sector were conducted via telephone. Appendices A-1 and A-2 provide copies of the sample questionnaires that were **sent to** the public utilities and non-public water supply permittees, respectively. The following sub-sections describe the types of information sought in the questionnaires and the results of the survey.

2.1 Public Supply

The District compiled and mailed 63 surveys in July 1999 to all public water supply utilities withdrawing at least 0.1 mgd within the study area. The information requested in the survey included the following:

- Account information: Information on the types of accounts (single-family and multi-family residential, commercial, industrial, government/public, and others as percent of total accounts) under a specific water supply utility is a good indicator of the customer base, and is necessary for identifying the potential future water conservation efforts.
- Water use information: Information on current and anticipated (through Year 2020) water use by customers of each type of account is necessary for determining the future opportunities of water conservation.
- Cost information: Information on the current cost of operation (withdrawal and treatment of water) which is necessary to determine the feasibility of implementing water conservation measures.
- Water conservation information: Information on water conservation measures which (a) have been implemented, (b) have been found to be unsuccessful, (c) are currently being

implemented, and (d) have been planned for implementation. This information included the following where applicable.

1. Description of the program, including the number and types of customers targeted, and the service/regulation or the device provided;
 2. The cost of the program;
 3. The year(s) of program implementation; and
 4. The water savings that can be attributed to the program.
- Information regarding the utility permit, current and future wholesale use, future supplies and demands, demographic projections, interconnections, existing and planned water conservation measures.

Forty-four utilities responded to the survey. The information collected provided valuable insight on the current status and future potential of water conservation in the project area. It was found that utilities in all counties except **DeSoto** and Highlands have ongoing or future plans for water conservation. Appendix B-I provides the compiled information on population estimates, prior and ongoing water conservation measures and the associated water savings, and program costs for all utilities in the project area.

Numerous surveys, however, were found to contain either incorrect or insufficient information regarding water conservation measures and demographic data (population projections, number of single-family, multi-family, and non-residential accounts, and number of multi-family units). Follow-up telephone surveys were conducted in September 1999 to complete the surveys. However, these efforts did not result in compilation of all the required information needed to formulate the water conservation options for the public supply sector. Subsequently, a number of assumptions were made to fill in the data gaps, which are given below.

2.1 .1 Assumptions for Completing Survey Data Set

Where information was not provided by the utilities, information available in District documents was used to complete the data set. Through the Cooperative Funding Program, the District offers funding assistance to utilities for the implementation of water conservation and other projects. Data from the project information provided by utilities is compiled into District reports and plans. These documents, mainly the **Retrofit** and Reuse Program Summary (SWFWMD, 1998), the draft five-year plans for the respective basin(s) in which utilities are located (SWFWMD, 19974; SWFWMD, 1999a; SWFWMD, 1999b), and the **Tri-County** Water Conservation **Initiative** program report (SWFWMD, 1997c) were used to obtain the necessary information. The following assumptions were also necessary to complete the survey data set:

- A limited number of utilities were able to provide the growth information. Therefore, in order to be consistent with the population projections made as part of the public supply demand projections for the Regional Water Supply Plan process (SWFWMD, 1999d), the growth of accounts for each utility was calculated based on those population projections. Furthermore, all increases were assumed to occur at equal rates, regardless of category (i.e., residential and commercial accounts increase at equal rates). Where data was not specifically provided, additional assumptions were made as listed below.
- Where not reported, the number of multi-family units was assumed to be equal to the calculated average of multi-family units for those utilities reporting in the county.
- Where no data was available, year 2000 accounts were calculated by dividing the service area population by the average number of persons per household estimated for that county (BEER, 1999).
- Where no data was available, the percent of each type of account was assumed to be equal to the average of the percent of accounts reported by other utilities in the same county.

- In DeSoto County, no utility data was provided. It was assumed that the demographics of the DeSoto and Hardee counties were similar; therefore, the percent of accounts in Hardee County was used to calculate the ratios of single-family to multi-family accounts for the utilities in DeSoto County.
- In absence of data pertaining to percent of single-family and multi-family accounts, water use data (i.e., the percent of water used by each type of account) was used to calculate the number of accounts in each category. It was also assumed that the percent of water use for each category was equal to the percent of customers in that category.
- Figures for the same utility that were reported separately, according to permit/service area, were combined, and the percent of each type of customer account was averaged.
- For multi-family, conservation measures applicable to interior water use are applied to the actual number of units (i.e. total number of apartments). Conservation measures applicable to the exterior water use are applied to the number of multi-family complexes (i.e. total number of apartment complexes), referred to as multi-family accounts in this study.
- The individual apartments in an apartment complex may or may not be billed individually for the interior water use. However, in most cases, the exterior water use in an apartment complex is billed as a single account. The number of multi-family accounts reported by each utility was most probably based on the billing record information. Therefore, the number of multi-family accounts reported by certain utilities were actually the number of individual apartments (units) instead of number of apartment complexes (accounts). The number of multi-family accounts for these utilities was determined by dividing the number of multi-family units by the number of multi-family units per account (Appendix B-I).

Data resulting from the survey indicated that all of the counties except for **DeSoto** and Hardee had the potential to save water through conservation. This data is presented in Appendix B-3.

2.4 Domestic Self-Supply

The domestic self-supply category includes the establishments that withdraw water from individual wells for domestic and irrigation purposes. For the purposes of this study it was assumed that this sector consists mainly of single-family residences, and the water conservation opportunities which are available for the single-family residences under public supply sector, are also available for this category. There is very little incentive for water conservation in this category and the projected payback time is significantly long. It is expected that the participation rates for conservation programs under this category would be lower than the public supply sector; however, it is recognized that there exists a significant potential of water savings in this category.

The domestic self-supply population was determined by subtracting the total utility population obtained from the surveys from the total county population obtained from the University of Florida's Bureau of Economic and Business Research (BEBR). The total utility population was determined by adding the population data for all the major utilities. Hence, the populations for the utilities that were not provided in the surveys were considered under the domestic **self-supply** category. These include those utilities that do not withdraw more than 0.1 million gallons per day. The number of accounts was calculated by dividing the population served under this category by the average persons per household in a single-family residence.

2.5 References

Bureau of Economics and Business Research (BEBR). 1999. *Projections of Florida Population by County*.

Southwest Florida Water Management District, *District Regulatory Database*.

Southwest Florida Water Management District, 1997a. *1995 Estimated Water Use in the Southwest Florida Water Management District*, January 1996.

Southwest Florida Water Management District, 1997b. Retrofit Programs and Reuse Projects, *Summary Report*. Completed Information **Entry** Form. December 1997.

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Southwest Florida Water Management District, **1999a**. **Pinellas-Anclote River Basin Five-Year Plan, FY2000, Draft**.

Southwest Florida Water Management District, **1999b**. *Manasota Basin Five-Year Basin Plan FY2000 - FY2004, Draft*, August, 1999.

Southwest Florida Water Management District, **1999c**. Responses to Written or Telephone Survey: *Public Supply Information for Regional Water Supply Plans*. July - September 1999

Southwest Florida Water Management District, **1999d**. Technical Memorandum: *Regional Water Supply Plan, Preliminary Public Supply Population & Water Use Projections*. Draft, October 1999.

Letter to Mr. David L. Moore, from Pick **Talley**, Pinellas County Utilities, July 15, 1999, Cooperative Funding **FY2000**.

Letter to Will Miller, from Norman Harcourt Davis IV, ASLA, Hillsborough County Water Dept., March 5, 1999. Subject: "Five-Year Plan for Cooperative Funding Program Conservation Program Development."

Coop Funding Form for **FY2000** Five-Year Plan submitted by Neil Mingledorff, City of Tampa, Water Department, March 1999.

SECTION 3

Identification of Water Conservation Measures that are Applicable in the Project Area

Previous, existing, and future water conservation measures implemented or planned by public utilities and non-public water users were documented in Section 2. These, and other conservation measures were reviewed and evaluated to identify specific technologies or projects which could potentially generate an average annual water savings of 50-100 MGD over a **20-year** planning horizon within the project area. These conservation measures included both voluntary and mandatory measures and offered both interior and exterior water savings.

Following is the “LONG LIST” of conservation measures which were considered for review and evaluation in this section. These conservation measures were evaluated independently for each sub-sector as given below.

A. Public Supply

Voluntary Measures

- Water-Efficient Clothes Washer Rebate (Interior Savings)
 - Single Family
 - Multi-Family

- Plumbing Retrofit Kits (Interior Savings)
 - Single Family
 - Multi-Family

- Ultra Low Volume (ULV) Toilet Rebates (Interior Savings)
 - Single Family
 - Multi-Family
 - Non-residential

- Water-Efficient Landscape and Irrigation System Rebates (Exterior Savings)
 - Single Family
 - Multi-Family
 - Non-residential

- Residential Water Use Surveys (Interior and Exterior Savings)
 - Single Family
 - Multi-Family

- Industrial, Commercial, and Institutional (ICI) Surveys (Interior and Exterior Savings)
 - Non-residential

- Large Landscape Water Use Surveys (Exterior Savings)
 - Non-residential

- Rain Sensor Shut-Off Devices (Exterior Savings)
 - Single Family
 - Multi-Family
 - Non-residential

Mandatory Measures

- Water Budgeting (Exterior Savings)
 - Single Family
 - Multi-Family
 - Non-residential

B. Non-Public Supply - Industrial/Commercial/Mining/Dewatering

Voluntary Measures

- Industrial, Commercial, and Institutional (ICI) Surveys (Interior and Exterior Savings)
- Large Landscape Water Use Surveys (Exterior Savings)
- Ultra Low Volume (ULV) Toilet Rebates (Interior Savings)
- Ultra Low Volume (ULV) Urinal Rebates (Interior Savings)

Mandatory Measures

No mandatory measures were considered.

C. Non-Public Supply – Recreational/Aesthetic

Voluntary Measures

- Large Landscape Water Use Surveys (Exterior Savings)
- Rain Sensor Shut-Off Devices (Exterior Savings)

Mandatory Measures

- Water Budgeting (Exterior Savings)

D. Non-Public Supply – Domestic Self-supply

Voluntary Measures

- Water-Efficient Clothes Washer Rebate (Interior Savings)
- Plumbing, Retrofit Kits (Interior Savings)
- Ultra Low Volume (**ULV**) Toilet Rebates (Interior Savings)
- Water-Efficient Landscape and Irrigation System Rebates (Exterior Savings)
- Residential Water Use Surveys (Interior and Exterior Savings)
- Rain Sensor Shut-Off Devices (Exterior Savings)

Mandatory Measures

- Water Budgeting (Exterior Savings)

Figure 3.1 provides a schematic illustration of how these conservation measures were grouped in terms of exterior or interior savings and voluntary or mandatory measures. It is to be noted that under interior water conservation measures the National Energy Policy Act of 1992 (EPACT) was considered in place of mandatory measure, since enactment of EPACT has ensured installation of low flow plumbing fixtures since 1994. In Figure 3.1, residential water use surveys and ICI surveys are shown as common to both interior and exterior measures, since they are designed to reduce both interior and exterior water usage.

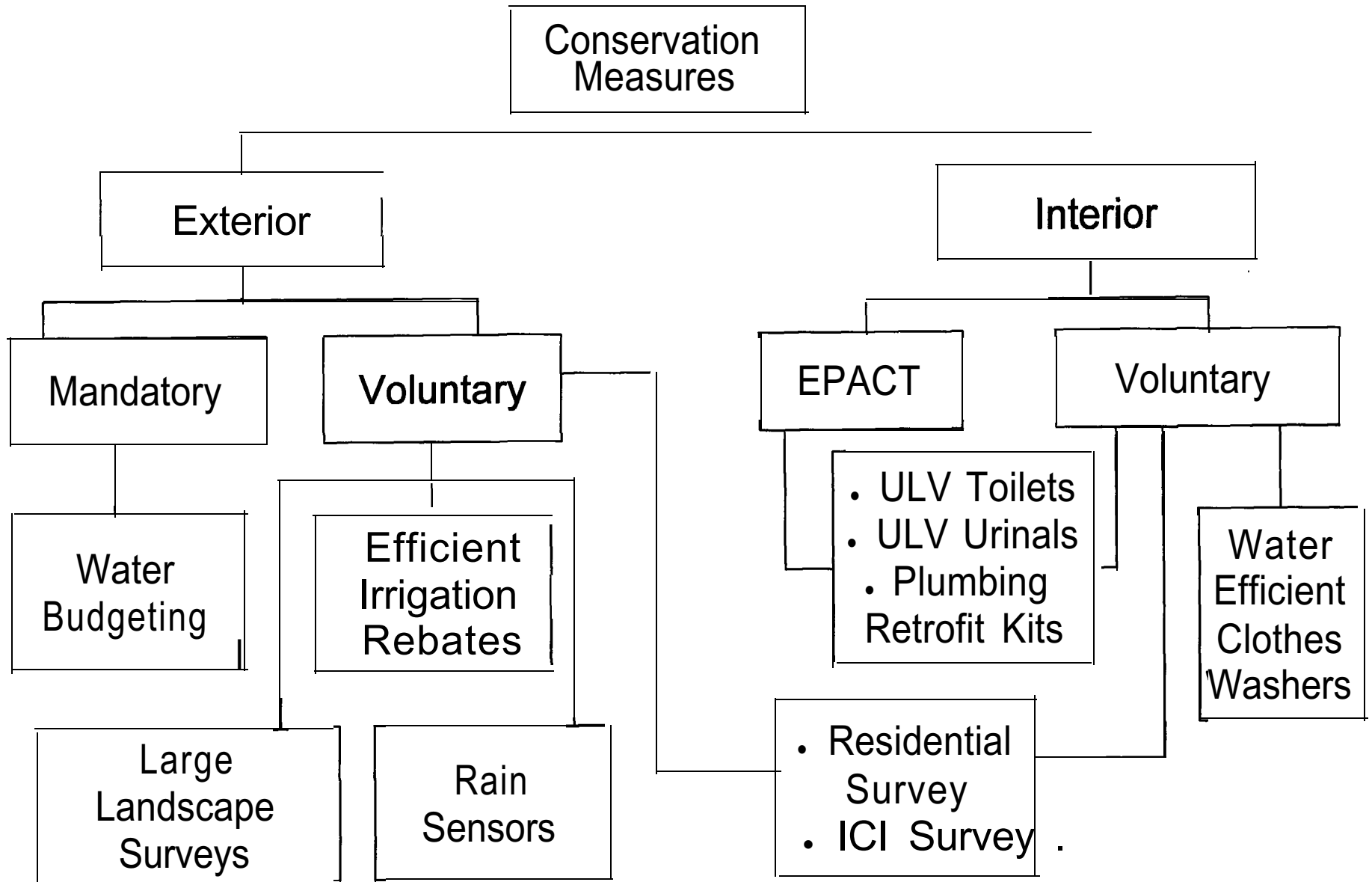


Figure 3.1 Applicable Conservation Measures

Review and Evaluation of Conservation Measures

Each of the water conservation measures listed above was evaluated independently with respect to the following criteria:

- Water savings rates in applicable water use sectors
- Participation rates where applicable
- Estimated annual average water savings
- Beneficial life of the measure
- Program costs and cost-effectiveness (**\$** / 1,000 gallons of water saved)

It is important to note that the interactions between two conservation measures could play an important role in determining the overall water savings. For example, overlap of savings may occur for those who participate in both water efficient irrigation system rebates and residential water use surveys. However, for the purpose of this project, each measure was evaluated individually and the full potential of water savings for each measure was considered separately. It is recognized that this method could result in partial duplication of savings, if, for example, more than one exterior water conservation measures are selected for a water use sector.

It was not possible to take into account the interaction **among the** measures without first selecting the conservation measures. But to select the conservation measures it was necessary to evaluate them independently. Finally, to account for any possible overlap, the participation rate for the conservation measures were assumed to be significantly lower than complete saturation.

It should also be noted that each program was evaluated individually in terms of program costs. In case one or more of these programs are implemented and administered simultaneously, the actual fixed cost that would be needed to implement the programs would be less than the sum of the individual fixed costs of the measures. This would result in improved cost-effectiveness ratios (CER) for all the measures being implemented simultaneously.

The CER for a given measure or a group of selected measures also depend on the level at which the measures are implemented. For example, a landscape rebate program may be implemented at the utility, county, or the District level. A program implemented at the county

level would most likely result in improved cost-effectiveness due to reduction in fixed program costs. Similarly, a program implemented at the District level would tend to improve the **cost-effectiveness** even further.

Detailed descriptions of all the conservation measures under the long list are presented below. Each sub-section contains a description of the program, the basis for water savings rate(s), the basis for program costs, the expected water savings over twenty years, and the program **cost-effectiveness**.

Table 3.1 summarizes the water savings rates for all conservation measures for all sectors for all the counties within the project area. Appendix C1 and C2 provides the supporting data that was used to generate the water savings rates.

Table 3.1: Summary of water conservation measures, applicable water use sectors, and corresponding water saving rates.

Water Conservation Measure	Water Saving Rates (gpm/d)									
	Charlotte Co.	DeSoto Co.	Hardee Co.	Highlands Co.	Hillsborough Co.	Manatee Co.	Pasco Co.	Pinellas Co.	Polk Co.	Sarasota Co.
Water Efficient Clothes Washer Rebates										
Public Supply - Single-family - Interior	12.7	14.9	16.8	13	14.3	13.1	12.9	12.4	14.4	12.4
Public Supply - Multi-family - Interior	12.7	14.9	16.8	13	14.3	13.1	12.9	12.4	14.4	12.4
Non-Public Supply - Domestic Self Supply - Interior	12.7	14.9	16.8	13	14.3	13.1	12.9	12.4	14.4	12.4
Plumbing Retrofit Kit Distribution										
Public Supply - Single-family - Interior	20.1	23.6	26.5	20.5	22.6	20.6	20.3	19.6	22.8	19.6
Public Supply - Multi-family - Interior	20.1	23.6	26.5	20.5	22.6	20.6	20.3	19.6	22.8	19.6
Non-Public Supply - Domestic Self Supply - Interior	20.1	23.6	26.5	20.5	22.6	20.6	20.3	19.6	22.8	19.6
ULV Toilet Rebates										
Public Supply - Single-family - Interior	31.4	48.2	34.4	31.9	33.6	29.3	31.9	31	33.6	31
Public Supply - Multi-family - Interior	46.4	51.1	55	47	49.7	47.2	46.8	45.6	50.1	45.6
Public Supply - Non-residential - Interior	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6
Non-Public Supply - Indus./Comm./Mining - Interior	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6
Non-Public Supply - Domestic Self Supply - Interior	28.3	33.3	37.3	29	31.9	29.1	28.7	27.7	32.1	27.7
ULV Urinals Rebates										
Public Supply - Non-residential - Interior	59	59	59	59	30	59	40	75	59	59
Non-Public Supply - Indus./Comm./Mining - Interior	59	59	59	59	30	59	40	75	59	59
Water Efficient Landscape and Irrigation System Rebates										
Public Supply - Single-family - Exterior	132	132	132	132	132	132	132	132	132	132
Public Supply - Multi-family - Exterior	324	324	324	324	324	324	324	324	324	324
Public Supply - Non-residential - Exterior	976	976	976	976	978	976	978	976	976	970
Non-Public Supply - Domestic Self Supply - Exterior	132	132	132	132	132	132	132	132	132	132
Residential Water Use Survey										
Public Supply - Single-family - Interior/Exterior	22	22	22	22	26.2	22	22.3	25.5	22	22
Public Supply - Multi-family - Interior/Exterior	15.6	15.6	15.6	15.6	14.1	15.6	19.7	16.6	16.6	15.6
Non-Public Supply - Domestic Self Supply - Interior/Exterior	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2
ICI Water Use Survey										
Public Supply - Non-residential - Interior	2,308	2,308	2,306	2,308	2,308	2,308	2,308	2,308	2,308	2,308
Non-Public - Indus./Comm./Mining - Interior	2,308	2,308	2,308	2,308	2,306	2,366	2,366	2,306	2,308	2,308
Large Landscape Survey										
Public Supply - Non-residential - Exterior	426	426	426	426	426	426	426	426	426	426
Non-Public Supply - Indus./Comm./Mining - Exterior	426	426	426	426	426	426	426	426	426	426
Non-Public Supply - Recreational - Exterior	426	426	426	426	426	426	426	426	426	426
Water Budgeting										
Public Supply - Single-family - Exterior	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0
Public Supply - Multi-family - Exterior	192	192	192	192	192	192	192	192	192	192
Public Supply - Non-residential - Exterior	578	578	578	578	578	578	578	578	578	578
Non-Public Supply - Recreational - Exterior	576	576	576	576	576	576	576	576	576	576
Non-Public Supply - Domestic Self Supply - Exterior	78	78	78	78	78	78	78	78	78	78
Rain Sensor Shut-off Devices										
Public Supply - Single-family - Exterior	103	103	103	103	103	103	103	103	103	103
Public Supply - Multi-family - Exterior	103	103	103	103	103	103	103	103	103	103
Public Supply - Non-residential - Exterior	103	103	103	103	103	103	103	103	103	103
Non-Public Supply - Indus./Comm./Mining - Exterior	103	103	103	103	103	103	103	103	103	103
Non-Public Supply - Domestic Self Supply - Exterior	103	103	103	103	103	103	103	103	103	103
Non-Public Supply - Recreational - Exterior	103	103	103	103	103	103	103	103	103	103

SECTION 5

Summary and Recommendations

The key objective of this project was to inventory, evaluate, and prioritize non-agricultural water conservation measures and develop an implementation plan for the Southern and Central Planning Region of SWFWMD. It was found that a combination of voluntary and mandatory water conservation measures could realize a potential water savings of 75 - 95 MGD over a 20-year planning horizon in the ten county project area.

5.1 Water Savings Summary

5.1 .1 Savings from Voluntary Conservation Measures

Table 5.1 provides the water savings summary for each county from the voluntary conservation measures. The total water savings for each county is the sum of water savings for the Public, Industrial/Commercial/Mining, Recreational, and Domestic Self-Supply sectors. Water savings in the Southern Water Use Caution Area (SWUCA) was estimated as approximately 34 mgd as compared to a total of 75 mgd in the entire project area. Almost 50% of the water savings in SWUCA were found in Polk and Sarasota counties.

5.1.2 Savings from Mandatory Conservation Measures

Table 5.2 provides the water savings summary for each county from the mandatory measures. The only mandatory measure considered in this study was water budgeting. By implementing water budgeting an additional 20 mgd savings could be realized in the project area. In SWUCA water budgeting showed a potential savings of over 9.0 mgd.

51.3 Savings from Public Supply Sector

Table 5.3 summarizes the savings from the conservation measures applied in the public water supply sector. Out of the five voluntary measures water efficient landscape irrigation system showed the highest potential of water savings (22 mgd) with a very attractive CER (**\$0.35/1000** gallons). Rain sensor rebates and plumbing retrofit kit (PRK) give-aways were found to be the most cost effective measures with a CER of **\$0.22/1000** gallons. Overall the total voluntary measures showed a potential savings of 60 mgd at an effective CER of **\$0.47/1000** gallons. Mandatory measures in public supply sector was found to be very cost effective, and showed a potential savings of 16 mgd with a CER of **\$0.16/1000** gallons.

Overall, the conservation projects under public supply sector could generate a potential savings of over 76 mgd with an average CER of **\$0.41/1000** gallons.

5.1.4 Savings from Non-Public Sector

Table 5.4 summarizes the savings from the conservation measures applied in the non-public water supply sector. As found in the public supply sector, Rain sensor and PRK were found to be the two most cost effective voluntary measures in the domestic self supply category. Similarly, the water efficient landscape irrigation system rebates measure showed the highest potential of water savings (approx. 5 mgd) with a CER of **\$0.60/1000** gallons. In ICMD, the ICI survey showed the most potential of water savings with a CER of **\$0.29/1000** gallons. In recreational/ aesthetic the landscape survey was found to save the most amount of water (1.33 mgd) with a CER of **\$0.14/1000** gallons. Overall, the total voluntary measures in the non-public supply sector showed a potential savings of approximately 15 mgd at an effective CER of **\$0.52/1000** gallons. Mandatory measures in the non-public supply sector were found to **save** 4 mgd at a CER of **\$0.29/1000** gallons.

Overall, the conservation projects under the non-public supply sector could generate a potential savings of approximately 19 mgd with an average CER of **\$0.47/1000** gallons.

5.1.5 Cost-Effectiveness Ratio

Table 5.5 provides the range of cost-effectiveness ratios (**CERs**) and the associated potential water savings for all conservation measures. The majority of the water savings from voluntary measures (47.7 MGD) were found to have **CERs** less than \$0.50 / 1000 gallons. An additional water savings of 26 mgd could potentially be achieved for **CERs** ranging between \$0.50 and \$1.00/1000 gallons. Overall, it was found that 99% of the potential water savings from voluntary conservation measures could be realized at a CER less than \$1.00/1000 gallons.

For mandatory water conservation measures, the entire savings of 20.6 MGD could potentially be achieved for a CER less than \$0.50 /1000 gallons.

5.2 Recommendations

5.2.1 Implementation Plan

The water conservation measures in this report were evaluated considering a moderately aggressive implementation plan of five years, beginning with Year 2000. As a general rule, the available water conservation opportunities were divided equally over the five-year program period for implementation. At the end of the five-year program period the full potential of the conservation measures was assumed to have been achieved. The savings rates will remain constant after the fifth year of the program since no more measures will have been added. Therefore, the savings rates at the end of the program period can be approximated by the **20-**year savings rates.

The implementation plan provided in this report is a broad guideline of projects that could be implemented to achieve cost-effective water conservation in a five-year period. The plan does not attempt to prioritize conservation measures with respect to time. It is recommended that the counties/utilities, depending on their specific needs, develop their individualized implementation plans, and prioritize the conservation measures within the program period and also among the different water use sectors.

It is important to recognize that the maximum benefit of conservation would be achieved if all the conservation programs are completed within the first year. Hence, while developing individual plans, attempts should be made to shorten the program period as much as possible. For bigger utilities, this, however, could present a management problem because of the magnitude of the program and the extent of resources that would have to be mobilized to implement the projects simultaneously. For smaller utilities, where the number of measures available per year is relatively small, it may be possible to reduce the program period to one or two years.

The conservation measures were evaluated at the utility level for the public supply sector. For the non-public sector the conservation measures were evaluated at the county level. Since, there are measures which are common to both public and non-public supply sectors it would be beneficial to coordinate the implementation plans at the county level so that the fixed costs (such as research, training, advertisement) are minimized. It may also be possible to develop a regional implementation plan for specific conservation projects that are applicable to a wide spectrum of water users.

It is recommended that a monitoring protocol is developed as an integral part of the implementation plan. The monitoring plan would incorporate methodologies to evaluate the performance of any conservation project from the time of implementation and track water savings over the program period.

5.2.2 Funding Opportunities

The conservation projects are funded conventionally by the District through its cooperative funding program. There are also several other opportunities of funding to implement small scale demonstration projects and educational programs to increase water conservation awareness from various local and state agencies. Federal agencies such as the Department of Energy also sponsor conservation projects through the existing funding mechanisms. Listed below are some of the funding opportunities for which these conservation projects may qualify. These opportunities consist of loans and grants to governments or utilities that undertake certain conservation measures as specified by each of the funding programs.

1. *Clean Water State Revolving Fund Program (Environmental Protection Agency)*

This program consists mainly of loans to communities that engage in a wide range of water quality infrastructure projects. Eligible projects include groundwater protection projects, under which conservation programs may qualify. Conservation measures that may be eligible include plumbing retrofit kits, efficient landscape irrigation equipment, water use ordinances, meters and public education.

2. *Federal Energy Management Program (FEMP) (Dept. of Energy)*

FEMP provides a series of services to assist government agencies in achieving their goal for energy and water conservation. The types of assistance offered by the program consists of managerial assistance, energy performance contracts with selected energy service companies that will save water and energy, and technical assistance such as audits.

3. *Pacific Northwest National Laboratory (through the Dept. of Energy)*

The program provides services that will encourage market transformation for energy saving appliances. Government agencies, state and local governments or utilities that purchase water efficient clothes washers or water efficient fixtures in bulk are eligible for this program. The program offers assistance in introducing the technology to the mainstream market by providing manufacturer incentives, assistance in demonstration projects, education, and training.

4. *Resource Conservation and Development (Natural Resources Conservation Service, Dept. of Agriculture)*

This program provides technical assistance (e.g. program coordination, management, etc.) and project loans and grants (if funds are available) for various resource conservation projects.

5. *Water Conservation Field Services **Program/Efficiency** Incentives Program (Bureau of Reclamation, Dept. of Interior)*

This program is generally offered to those water systems that contract through the Bureau of Reclamation. Grants may be awarded for various water conservation projects including education, planning, and implementation.

Other sources of funding may also apply if the projects are part of a strategic plan to encourage overall community and economic development (e.g. create jobs, better housing, etc.). These programs include Empowerment Zones Programs designed to assist communities, state and local governments that have strategic plans for revitalization. This program may be offered through several federal agencies including the Department of Housing and Urban Development, Department of Health and Human Services and Department of Agriculture. Other similar programs include the Rural Economic Development Loans and Grants (Dept. of Agriculture), Public Works and Development Facilities Grants Program (Dept. of Commerce), and the Community Development Block Grants (Dept. of Housing and Urban Development).

Each of the above programs has specific requirements including the type of conservation measures, the size of the project area, and the appropriation of approved grants or loans. Many of these programs are also restricted to loans and grants to those entities that fall within certain population limits and economic hardships.

A cursory review of these programs indicates that the availability of funding through these programs are relatively small in comparison to the current level of funding offered through the co-operative funding program from the District. Hence, the major source of funding for conservation projects will continue to be the Water Management District in the study area.

Based on the planning level analysis performed in this study, it is also determined that the current level of funding provided by the District will be inadequate to implement all of the prioritized conservation projects. Therefore, other funding opportunities will have to be considered.

Currently there is no significant vehicle in place through which a non-public water user could obtain funding for a major conservation project. There are also very little incentives for non-public water users to conserve water. This, in combination with the non-availability of funding, makes water conservation very challenging in the non-public sector. It is recommended that further studies be performed to identify conservation incentives and funding opportunities in the non-public sector.

Table 5.1: Water savings summary for the voluntary conservation measures.

County	Water Savings (MGD)				Total Savings /County	SWUCA Savings
	Public	Industrial, Comm, Mining	Recreational	Domestic Self-Supply		
Charlotte	2.37	0.009	0.083	1.24	3.70	3.70
Desoto	0.11	0.005	0.000	0.57	0.69	0.69
Hardee	0.14	0.003	0.000	0.33	0.47	0.47
Highlands	0.79	0.001	0.105	0.48	1.38	1.38
Hillsborough	11.23	0.027	0.381	3.17	14.81	4.11
Manatee	4.81	0.005	0.156	0.10	5.07	5.07
Pasco	5.72	0.014	0.143	2.02	7.90	---
Pinellas	18.40	0.004	0.270	1.53	20.20	---
Polk	9.82	0.091	0.508	1.70	12.12	10.34
Sarasota	6.66	0.008	0.247	1.42	8.34	8.34
Total Savings/Sector	60.05	0.167	1.893	12.56	74.87	34.89

¹ Includes Charlotte, Desoto, Hardee, Highlands, Manatee, and Sarasota counties. For Public Supply and Domestic Self-Supply 64.9% Polk County and 27.1% Hillsborough County; for Indus Comm, and Mining 97.6% Polk County and 50.6% Hillsborough County, for Recrea /Aesth • 69.0% Polk County and 50.0% Hillsborough County.

TOTAL REGIONAL SAVINGS

TOTAL SWUCA SAVINGS

Table 5.2: Water savings summary for the mandatory conservation measures.

County	Water Savings (MGD)			Total Savings/County	SWUCA Savings ¹
	Public	Domestic Self-Supply	Recrea./Aesth.		
Charlotte	0.3	0.3	0.05	0.65	0.65
Desoto	0.04	0.13	0.00	0.17	0.17
Hardee	0.04	0.07	0.00	0.11	0.11
Highlands	0.35	0.11	0.08	0.54	0.54
Hillsborough	3.68	0.73	0.28	4.69	1.34
Manatee	1.17	0.02	0.11	1.30	1.30
Pasco	1.45	0.48	0.10	2.03	---
Pinellas	4.99	0.34	0.22	5.55	---
Polk	2.67	0.4	0.30	3.37	2.87
Sarasota	1.72	0.31	0.19	2.22	2.22
Total Savings/Sector	16.41	2.89	1.33	20.63	9.20

~~Charlotte, Hardee, Pasco, Pinellas, Polk, Sarasota, and Volusia counties for~~
 Public Supply and Domestic Self-Supply - 84.9% Polk County and 27.1% Hillsborough County; for Recrea./Aesth. - 89.0% Polk County and 50.0% Hillsborough County

TOTAL REGIONAL SAVINGS **TOTAL SWUCA SAVINGS**

Table 5.3 Summary of Water Conservation Projects - Public Supply

Conservation Measure	Potential Savings (MGD)	20-Year Program Cost (\$ million)	CER (\$/1000 gal)
ULV Toilets	18.34	115.07	0.86
Plumbing Retrofit Kits	7.10	11.65	0.22
Rain Sensor Shut-Off Device Rebates	11.63	18.97	0.22
Water Efficient Landscape and Irrigation System Rebates	22.12	57.23	0.35
Large Landscape Water Use Surveys	0.88	4.68	0.73
Subtotal Voluntary Measures	60.07	207.60	0.47
Water Budgeting	16.41	18.86	0.16
Total	76.48	226.46	0.41

Table 5.4 Summary of Water Conservation Projects - Non-Public Supply

Conservation Measure	Potential Savings (MGD)	20 Year Program Cost (\$ million)	CFR (\$/1000 gal)
Domestic Self-Supply			
Plumbing Retrofit Kits	0.97	2.04	0.29
ULV Toilets	1.91	9.7	0.7
Water Efficient Landscape and Irrigation System Rebates	4.89	21.26	0.6
Residential Water Use Surveys	0.97	12.98	1.8
Rain Sensor Shut-Off Device Rebates	3.82	5.62	0.2
Sub-Total Domestic Self-Supply	12.56	51.6	0.56
Industrial, Commercial, Mining and Dewatering			
ICI Surveys	0.138	0.29	0.29
Large Landscape Water Use Surveys	0.028	0.34	1.66
Sub-Total Industrial, Commercial, Mining and Dewatering	0.166	0.63	0.52
Recreational/Aesthetic			
Large Landscape Water Use Surveys	1.33	1.33	0.14
Rain Sensor Shut-Off Device Rebates	0.56	1.86	0.46
Sub-Total Recreational/Aesthetic	1.89	3.19	0.23
Sub-Total Voluntary Measures			
Water Budgeting	4.22	9.07	0.29
Total	18.84	64.7	0.56

Table 5.5: Cost effectiveness ratio (CER) ranges and the associated water savings.

CER Range	Water Savings (MGD)
Voluntary	
\$0.00 - \$0.50	47.70
\$0.50 - \$1.00	26.00
\$1.00 - \$1.50	0.00
\$1.50 - \$2.00	1.00
Mandatory	
\$0.00 - \$0.50	20.60