# 2010
# Regional Water Supply Plan
## Southern Planning Region


Southwest Florida
*Water Management District*

# The 2010 Update of the

# Regional Water Supply Plan

## Board Approved
## July 2011

*This document was prepared by the Planning Department with contributions from the Resource Projects, Communications and Finance Departments, and with assistance from Cardno ENTRIX.*

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## Abbreviations

| | |
|---|---|
| AMO | Atlantic Multi-decadal Oscillation |
| APT | Aquifer Performance Test |
| AR | Aquifer Recharge |
| ARR | Aquifer Recharge and Recovery |
| ASR | Aquifer Storage and Recovery |
| AWT | Advanced Wastewater Treatment |
| BEBR | Bureau of Economic and Business Research |
| BLS | Below Land Surface |
| BMP | Best Management Practices |
| CCI | Construction Cost Index |
| CFI | Cooperative Funding Initiative |
| CFRSF | Celery Field Regional Storage Facility |
| CFS | Cubic Feet per Second |
| CWM | Comprehensive Watershed Management Initiative |
| CWCFGWB | Central West-Central Florida Groundwater Basin |
| CWM | Comprehensive Watershed Management Initiative |
| DACS | Department of Agriculture and Consumer Services |
| DOH | Department of Health |
| ENR | Engineering News Record |

| | |
|---|---|
| EPA | U.S. Environmental Protection Agency |
| EQIP | Environmental Quality Incentive Program |
| ESWS2 | Enhanced Surface Water System 2 |
| ET | Evapotranspiration |
| ETB | Eastern Tampa Bay |
| F.A.C | Florida Administrative Code |
| FARMS | Facilitating Agricultural Resource Management Systems |
| FASS | Florida Agricultural Statistics Service |
| FDACS | Florida Department of Agriculture and Consumer Services |
| FDEP | Florida Department of Environmental Protection |
| FFA | Florida Forever Act |
| FIPR | Florida Institute of Phosphate Research |
| FPC | Florida Power Corporation |
| FPL | Florida Power and Light |
| F.S. | Florida Statutes |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| GPD | Gallons per Day |
| GPCD | Gallons per Capita per Day |
| GPDPH | Gallons per Day per Hole |
| GPF | Gallons per Flush |
| GPM | Gallons per Minute |
| HFCAWTP | Howard F. Curren Advanced Wastewater Treatment Plant |
| HR | Highlands Ridge |
| HWA | Heartland Water Alliance |
| I & I | Inflow and Infiltration |
| IAS | Intermediate aquifer System |
| I/C | Industrial/Commercial |
| ICI | Industrial, Commercial and Institutional |
| IFAS | Institute of Food and Agricultural Sciences |
| IRMWSP | Integrated Regional Master Water Supply Plan |
| LFA | Lower Floridan Aquifer |
| LTPRG | Local Technical Peer Review Group |
| LWPIP | Lowest Wetted Perimeter Inflection Point |
| MARS | Manatee Agricultural Reuse Supply |
| M/D | Mining/Dewatering |
| MFL | Minimum Flows and Levels |
| MGD | Million Gallons per Day |
| MG/L | Milligrams per Liter |
| MIA | Most Impacted Area |
| NGF | National Golf Foundation |
| NGVD | National Geodetic Vertical Datum |
| NPDES | National Pollution Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| NTB | Northern Tampa Bay |
| NWSI | New Water Sources Initiative |
| O&M | Operation and Maintenance |
| OFW | Outstanding Florida Water |
| OPPAGA | Office of Program Policy Analysis & Governmental Accountability |
| PAC | Powdered Activated Carbon |

| | |
|---|---|
| PCU | Polk County Utilities |
| PG | Power Generation |
| PRMRWSA | Peace River Manasota Regional Water Supply Authority |
| PSI | Pounds per Square Inch |
| QWIP | Quality of Water Improvement Program |
| REDI | Rural Economic Development Initiative |
| RFP | Request for Proposal |
| RO | Reverse Osmosis |
| ROMP | Regional Observation Monitoring Program |
| RTS | Regional Transmission System |
| RWSP | Regional Water Supply Plan |
| SA | Surficial Aquifer |
| SCADA | Supervisory Control and Data Acquisition |
| SPJC | Shell, Prairie and Joshua Creek |
| SWCFGWB | Southern West-Central Florida Groundwater Basin |
| SWFWMD | Southwest Florida Water Management District |
| SWIMAL | Saltwater Intrusion Minimum Aquifer Level |
| SWTP | Surface Water Treatment Plant |
| SWUCA | Southern Water Use Caution Area |
| TBC | Tampa Bypass Canal |
| TBW | Tampa Bay Water |
| TDS | Total Dissolved Solids |
| TECO | Tampa Electric Company |
| TMDL | Total Maximum Daily Loads |
| TRSIS | Tailwater Recovery and Seepage-water Interception System |
| UFA | Upper Floridan aquifer |
| UG/L | Micrograms per Liter |
| ULF | Ultra Low-Flow |
| ULFT | Ultra Low-Flow Toilet |
| USDA | U.S. Department of Agriculture |
| USF | University of South Florida |
| USGS | United States Geological Survey |
| WEIS | Water Efficient Landscape and Irrigation System Rebates |
| WMD | Water Management District |
| WMIS | Water Management Information System |
| WPA | Water Planning Alliance |
| WRAP | Water Resource Assessment Project or Water Restoration Action Plan |
| WSRD | Water Supply and Resource Development Program |
| WUCA | Water Use Caution Area |
| WUP | Water Use Permit |
| WWTF | Wastewater Treatment Facility |
| WWTP | Wastewater Treatment Plant |
| ZLD | Zero Liquid Discharge |

Southwest Florida Water Management District

# Chapter 1: Introduction

*The Peace River Manasota Regional Water Supply Authority's recently completed 6-billion-gallon off-stream reservoir.*

The Regional Water Supply Plan (RWSP) for the Southwest Florida Water Management District (District) is an assessment of projected water demands and potential sources of water to meet these demands for the period from 2005 through 2030. The RWSP has been prepared in accordance with the Florida Department of Environmental Protection's (FDEP) 2009 Format and Guidelines for Regional Water Supply Planning. The RWSP consists of four geographically based volumes that correspond to the District's four designated water supply planning regions: Northern, Tampa Bay, Southern and Heartland (Figure 1-1). This volume is for the Southern Planning Region, which includes DeSoto, Manatee and Sarasota counties and the portion of Charlotte County within the District. This document is the 2010 update to the District's RWSP for the Southern Planning Region. The District previously completed RWSPs that included the Southern Planning Region in 2001 and 2006. The purpose of the RWSP is to provide the framework for future water management decisions in the District. The RWSP for the Southern Planning Region shows that sufficient alternative water sources (sources other than fresh groundwater from the Upper Floridan aquifer) exist to meet future demands and replace some of the current withdrawals causing hydrologic stress.

The RWSP also identifies hundreds of potential options and associated costs for developing alternative sources as well as fresh groundwater. The options are not intended to represent the District's most "preferable" options for water supply development. They are, however, provided as reasonable concepts that water users in the planning region can pursue to meet their water supply needs. Water users can select a water supply option as presented in the RWSP or combine elements of different options that suit their water supply needs, provided such options are consistent with the intent and direction of the RWSP. Additionally, the RWSP provides information to assist water users in developing funding strategies to construct water supply projects.

The requirement for regional water supply planning originated from legislation passed in 1997 that significantly amended Chapter 373, Florida Statutes (F.S.). Regional water supply planning requirements are codified in Part VII of Chapter 373 (373.709), F.S., and this RWSP has been prepared pursuant to these provisions. Key components of this legislation included:

- Designation of one or more water supply planning regions within the District
- Preparation of a Districtwide water supply assessment
- Preparation of an RWSP for areas where existing and reasonably anticipated sources of water were determined to be inadequate to meet future demand, based upon the results of the water supply assessment

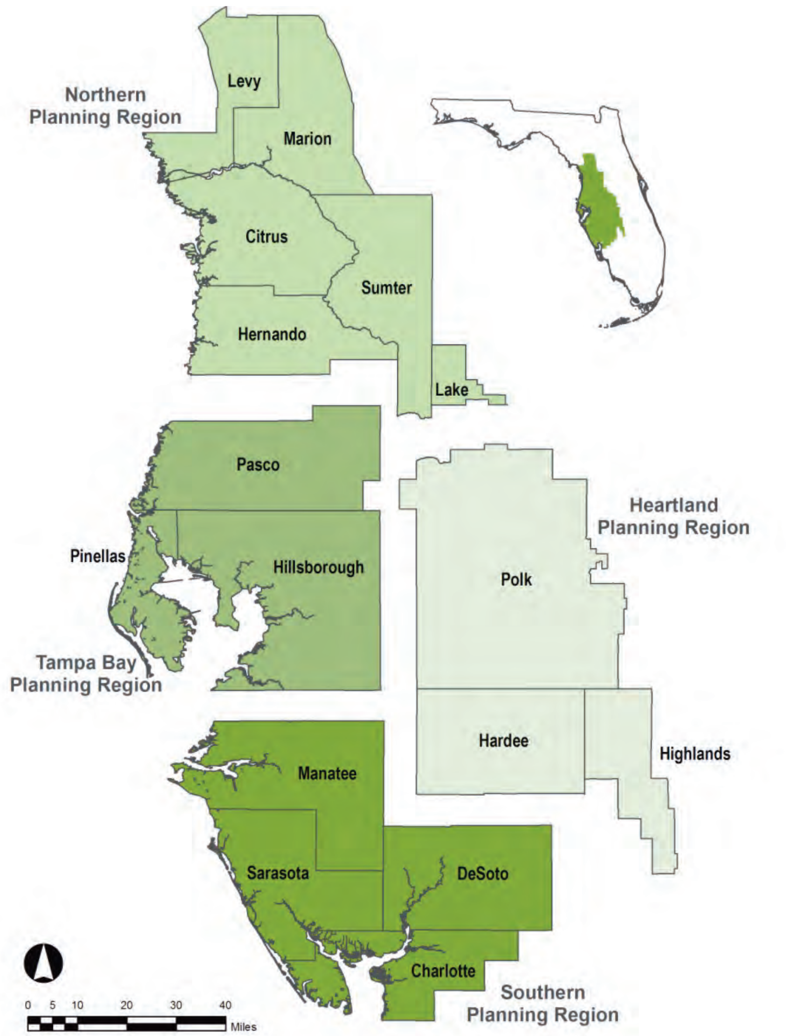


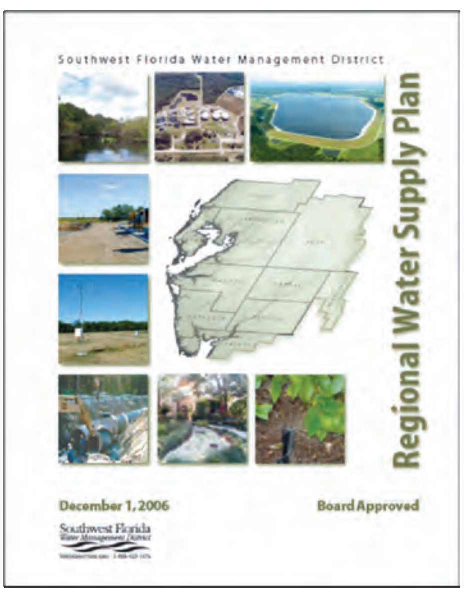

Figure 1-1. *Location of the four water supply planning regions within the District*

Regional water supply planning requirements were amended as a result of the passage of Senate Bill 444 during the 2005 legislative session. The bill substantially strengthened requirements for the identification and listing of water supply development projects. In addition, the legislation intended to foster better communications among water planners, local government planners and local utilities. Local governments are now permitted to develop their own water supply assessments, which the water management districts (WMDs) are required to consider when developing their RWSPs. Finally, a trust fund was created that provides the WMDs with state matching funds to support the development of alternative water supplies by local governments, water supply authorities and other water users.

## Part A. Introduction to the Southern Planning Region RWSP

The following describes the content of the Southern Planning Region RWSP. Chapter 1 is an introduction to the RWSP, which contains an overview of the District's accomplishments in implementing the water supply planning objectives of the 2006 RWSP; description of the land use, population, physical characteristics, hydrology and geology/hydrogeology of the area; and a description of the technical investigations that provide the basis for the District's water resource management strategies. Chapter 2, Resource Protection Criteria, addresses the resource protection strategies the District has implemented or is considering implementing, including water use caution areas (WUCAs) and the minimum flows and levels (MFLs) program. Chapter 3, Demand Estimates and Projections, is a quantification of existing and projected water supply demand through the year 2030 for public supply, agricultural, industrial/commercial, mining/dewatering, power generation, and recreational/aesthetic users and environmental restoration. Chapter 4, Evaluation of Water Sources, is an evaluation of the future water supply potential of traditional and alternative sources. Chapter 5, the Water Supply Development component, contains a list of alternative water supply development options for local governments, utilities and other water users that includes surface water and stormwater, reclaimed water and water conservation. For each option, the estimated amount of water available for use and the estimated cost of developing the option are provided. Chapter 6 is an overview of water supply development projects that are currently under development and receiving District funding assistance. Chapter 7, the Water Resource Development Component, is an inventory of the District's ongoing data collection and analysis activities and water resource projects that are classified as water resource development. Chapter 8, Funding Mechanisms, provides an estimate of the capital cost of water supply and water resource development projects proposed by the District and its cooperators to meet the water supply demand projected through 2030 and to restore MFLs to impacted natural systems. An overview of mechanisms available to generate the necessary funds to implement these projects is also provided.

## Part B. Accomplishments Since Completion of the 2006 RWSP




This following is a summary of the District's major accomplishments in implementing the objectives of the RWSP in the planning region since the 2006 update was approved by the Governing Board in December 2006.

### *Section 1. Alternative Water Supply Development, Conservation and Reuse*

1.0 Alternative Water Supply

In 2003, the District entered into an agreement with the Peace River Manasota Regional Water Supply Authority (PRMRWSA) to co-fund a major expansion of the PRMRWSA's facilities in DeSoto County. The expansion consisted of two projects: a six-billion-gallon off-stream reservoir and expansion of potable water treatment facilities to boost capacity from 24 mgd to 48 mgd. These projects, which were recently completed, give the

PRMRWSA the ability to withdraw and store water from the Peace River in sufficient quantity to deliver the full 32.7 mgd allowed in its water use permit to customers in its four-county service area. The projects also are critical components of the District's Southern Water Use Caution Area (SWUCA) recovery strategy, which promotes the use of alternative water supplies to meet growing public supply demands in coastal communities while reserving limited groundwater supplies for agriculture and other inland users.

Another recently completed alternative water supply project was the expansion of the City of Punta Gorda's water treatment plant capacity from 8 mgd to 10 mgd. Once constructed, the project will secure the city's water supply well into the future and provide excess capacity, that potentially could be shared with the other regional partners, provide rotational capacity and resting of sources, and help with emergency supply interruptions..

2.0 Water Conservation

The District continues to promote and cooperatively fund water conservation efforts to make more efficient use of existing water supplies. In the public supply sector, this includes cooperatively funded projects for plumbing retrofits, toilet rebates, rain sensor device rebates, water-efficient landscape and irrigation evaluations, soil moisture sensor device rebates, and pre-rinse spray valve rebates. Cumulatively, these projects have saved more than 14 mgd Districtwide as of Oct. 1, 2009. Since 2006, District-funded conservation projects have been undertaken with Manatee and Charlotte counties and the City of North Port.

In the agricultural water use sector, the District's primary initiative for water conservation is the Facilitating Agricultural Resource Management Systems (FARMS) Program. Established in 2003 in partnership with the Florida Department of Agriculture and Consumer Services, FARMS is a cost-share reimbursement program for production-scale best management practices to reduce groundwater use and improve water quality. To date, more than 40 operational projects Districtwide are providing a groundwater offset of more than 6 mgd. Additional projects in the planning, design or construction phase are expected to yield another 8 mgd of offset. Although the program is now Districtwide, the priority areas are in the Southern Planning Region, including the Myakka River watershed and the Shell Creek, Prairie Creek and Joshua Creek watersheds.

3.0 Reclaimed Water

The District has continued its highly successful program to cooperatively fund projects that make reclaimed water available for beneficial reuse. These include design and construction projects for transmission mains and storage facilities, as well as feasibility studies, reuse master plans, metering and research projects. Cumulatively, these projects will result in the offset of more than 147 mgd Districtwide. Reclaimed water projects have been jointly undertaken with all four counties and most of the larger cities in the planning region since 2006.

### *Section 2. Support for Water Supply Planning*

The District has been actively involved in providing technical support to local governments as they prepare statutorily required Water Supply Facilities Work Plans as part of their comprehensive plans. District staff worked with the Department of Community Affairs, the Department of Environmental Protection and the other WMDs to develop a guidance document for preparing the work plans. Staff has provided ad hoc assistance to local governments and has recently instituted a utility outreach program to assist utilities with planning, permitting and information/data needs.

### *Section 3. Minimum Flows and Levels (MFLs) Establishment*

1.0 Established MFLs

MFLs established in the planning region since 2006 include minimum flows for the upper Braden River in 2007 and for Dona Bay/Shakett Creek in 2009. In 2010, minimum flows are scheduled to be established for the lower Peace, Little Manatee, lower Myakka and Manatee rivers, and the Shell Creek estuary.

2.0 MFLs Recovery Initiatives

The District's SWUCA recovery strategy was approved in 2006. As described in Chapter 2, the strategy relies on a wide range of activities, which collectively are aimed at achieving MFLs for all priority water resources in the SWUCA by 2025. Key areas of progress since 2006 include completion of much of the land acquisition and permitting for the Lake Hancock Lake Level Modification Project. This project will raise the level of the lake to increase storage capacity so that water can be released in the dry season to increase low flows in the upper Peace River. Once land acquisition is completed, the control structure on the lake will be replaced and subsequent operations will mimic a more natural hydrologic regime in the watershed. Other recent activities related to the SWUCA recovery strategy include completion of a study of karst features in the riverbed of the upper Peace River, initiation of a pilot lake augmentation project for Lake Lotela in Highlands County, analyses of water storage opportunities on old phosphate lands, and initiation of a watershed management plan for the Peace Creek watershed. Resource monitoring is ongoing and a SWUCA recovery progress report is provided to the Governing Board annually.

### *Section 4. Quality of Water Improvement Program (QWIP) and Well Back-Plugging*

Since the 1970s, the QWIP has prevented waste and contamination of water resources (both groundwater and surface water) by plugging abandoned, improperly constructed artesian wells. The program focuses on the southern portion of the District where the Upper Floridan aquifer is under artesian conditions, creating the potential for mineralized water to migrate upward and contaminate other aquifers or surface waters. The program plugs approximately 200 wells per year and more than 4,000 wells have been plugged since inception.

*Artesian conditions in the Upper Floridan and intermediate aquifers in the southern portion of the District can cause wells to flow at high rates.*

A related effort, now part of the FARMS Program, involves the rehabilitation (or back-plugging) of agricultural irrigation wells to improve water quality in groundwater and surface waters and improve crop yields.

The program initially targeted the Shell Creek, Prairie Creek and Joshua Creek watersheds to decrease the discharge of highly mineralized water into Shell Creek, the City of Punta Gorda's municipal water supply. The program has retrofitted 63 wells as of September 2009, with 46 of these in the target watersheds.

### *Section 5. Regulatory and Other Initiatives*

The District approved enhancements to the water conservation provisions of its water use permitting rules in 2009. These changes include applying certain requirements in WUCAs Districtwide, adding new requirements and enhancing others. Key provisions include reporting requirements, limits on distribution losses and requirements for conservation plans in all use sectors. The District has developed new modeling tools for projecting permanent and functional population for any selected area such as a utility service area, municipal boundary, watershed or region. This will help District staff, local governments, utilities and other users better estimate and project population and future water demand. As part of this effort, a new demographics web page has been created to assist users (*www.WaterMatters.org/demos*).

## Part C. Description of the Planning Region

### *Section 1. Land Use and Population*

The Southern Planning Region is characterized by a diversity of land-use types (Table 1-1), ranging from urban built-up areas — such as the cities of Bradenton, Palmetto and Longboat Key in Manatee County; the cities of Sarasota, Venice and North Port in Sarasota County; and Punta Gorda in Charlotte County — to predominantly agricultural land uses in the inland portions of these counties and in most of DeSoto County. Significant phosphate mining activities occur in the planning region, primarily in Manatee County; however, mining operations are anticipated to move southward into DeSoto County as phosphate reserves at existing mines are depleted.

The population of the planning region is projected to increase from approximately 858,500 in 2005 to just under 1.2 million in 2030. This is an increase of approximately 341,000 new residents — a 40 percent increase over the 25-year planning period. The majority of this population growth will be due to net migration.

Southwest Florida Water Management District

Table 1-1. *Land use/land cover in the Southern Planning Region (2007)*

| Land Use/Land Cover Types (1999) | Percent | Acres |
|---|---|---|
| **Urban and Built-up** | 20.26 | 319,663.424 |
| **Agriculture** | 32.84 | 518,166.035 |
| **Rangeland** | 10.00 | 157,767.456 |
| **Upland Forest** | 11.76 | 185,548.903 |
| **Water** | 3.96 | 62,415.089 |
| **Wetlands** | 17.96 | 283,379.516 |
| **Barren Land** | 0.15 | 2,348.264 |
| **Transportation, Communication and Utilities** | 1.38 | 21,726.488 |
| **Industrial and Mining** | 1.69 | 26,597.651 |
| **TOTAL** | **100.00** | **1,577,612.826** |

Based on: SWFWMD 2007 LULC layer (SWFWMD, 2007)

## *Section 2. Physical Characteristics*

Land surface elevations gradually increase from sea level at the gulf coast to a high of 136 feet in northeastern Manatee County. This change in topography over this area is evidence of former marine shorelines, called terraces. Each terrace consists of poorly drained flatlands with many swamps, ponds and lakes. Over large areas of Charlotte and Manatee counties, canals were constructed to drain some of these swampy areas for agriculture. Further to the east, DeSoto County is topographically very similar to Charlotte and Manatee counties, with poorly drained marine terraces increasing in elevation to the east. Most of the undeveloped sections of the planning region are pine flatwoods, saw palmetto and prairie grassland.

## *Section 3. Hydrology*

Figure 1-2 shows the major hydrologic features in the planning region including rivers, lakes and springs.

### 1.0 Rivers

The planning region contains all or part of seven major watersheds including the Braden, Manatee, Myakka and Peace rivers, Myakkahatchee Creek (a tributary to the Myakka River), and Horse and Shell creeks (tributaries to the Peace River). There are many smaller tributaries to these larger systems as well as several coastal watersheds drained by many small tidally influenced or intermittent streams. The Braden, Manatee and Peace rivers and Myakkahatchee and Shell creeks are utilized as public water supply sources.

*The lower Peace River in Charlotte County.*

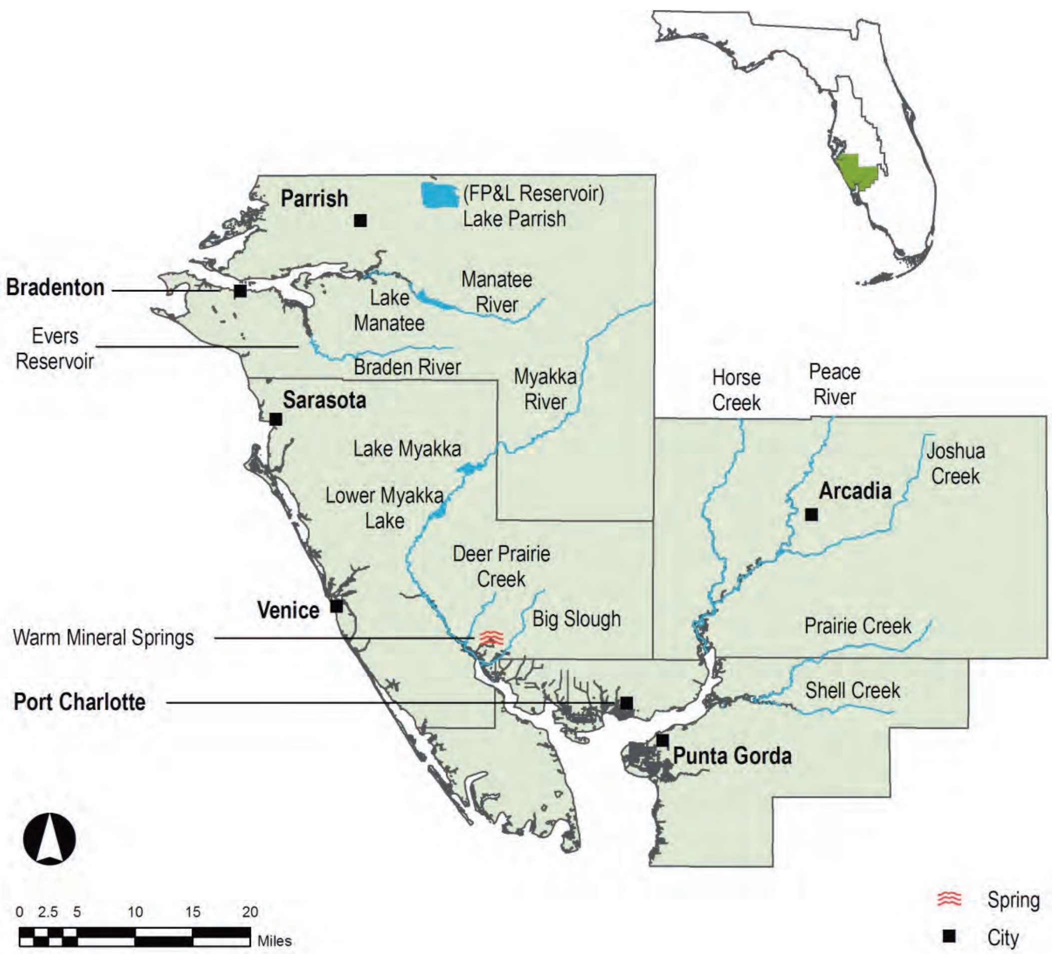



Figure 1-2. *Major hydrologic features in the Southern Planning Region*

2.0 Lakes

There are only a few named lakes in the planning region. These include Upper and Lower Myakka lakes on the Myakka River.

3.0 Springs

There are no first-magnitude springs (discharge exceeds 100 cubic feet per second [cfs]) and only one second-magnitude spring (discharge between 10 and 100 cfs) located within the planning region. Warm Mineral Springs is located near the City of North Port in Sarasota County. Periodic measurements indicate that average discharge is approximately 10 cfs (Roseneau et al., 1977). The warm temperature of the spring water indicates that the source of the water is probably much deeper in the aquifer than springs further to the north, which tend to have shallow flow systems.

4.0 Wetlands

Prior to significant development, approximately 54 percent of Florida was covered by wetlands. However, due to drainage and development, only about 30 percent of the state currently remains covered by wetlands. Wetlands can be grouped into saltwater and freshwater types. Saltwater wetlands are found bordering estuaries, which are coastal wetlands influenced by the mixing of freshwater and seawater. Saltmarsh grasses and mangroves are common estuarine plants. Charlotte Harbor, Sarasota Bay and the southernmost portion of Tampa Bay are estuaries of national significance in the planning region that have been included in the National Estuary Program.

Freshwater wetlands are common in inland areas of Florida. Hardwood-cypress swamps and marshes are two major freshwater wetland systems. Both systems are found either bordering lakes and rivers or standing alone as isolated wetlands. The hardwood-cypress swamps are forested systems with water at or above land surface for a considerable portion of the year. Marshes are typically shallower systems vegetated by herbaceous plants rather than trees. Wet prairies, also present in interior Florida, are vegetated with a range of mesic, herbaceous species and hardwood shrubs and are inundated during the wettest times of the year. Extensive hardwood swamps and wet prairies occur within the Myakka River watershed. Other less extensive swamps, as well as isolated wetlands, occur throughout the planning region.

## *Section 4. Geology/Hydrogeology*

Three principal aquifer systems, the surficial, intermediate and Upper Floridan, are present throughout the planning region and are used as water supply sources. Figure 1-3 is a generalized north-south cross section showing the hydrogeology of the District. As seen in the figure, the Southern West-Central Florida Groundwater Basin (SWCFGWB) encompasses the southern portion of the District where the intermediate aquifer system and its associated clay confining units separate the surficial aquifer from the Upper Floridan aquifer and confine the Upper Floridan aquifer across the entire planning region. The surficial aquifer system is contained within near-surface deposits that mainly consist of undifferentiated sands, clayey sand, silt, shell and marl of Quaternary age. The aquifer produces relatively small quantities of water, which are generally used for low-volume irrigation or domestic water supply. Surficial deposits range in thickness from 10 feet in coastal areas to greater than 100 feet further inland (SWFWMD, 1993). Underlying the surficial aquifer system is the confined intermediate aquifer system with its associated confining units. This aquifer consists predominantly of discontinuous sand, gravel, shell, limestone and dolomite beds of the Hawthorn Group and contains up to three confined or semi-confined production zones throughout much of the planning region (Wolansky, 1983). The production zones are separated by low-permeability sandy clays, clays and marls. These confining beds restrict vertical movement of groundwater between individual water-bearing zones in the intermediate aquifer and the overlying surficial and underlying Upper Floridan aquifers. In general, the thickness of the intermediate aquifer increases from north to south across the District. Thickness varies from approximately 50 feet in northern Manatee County to more than 600 feet in Charlotte County (Duerr et al., 1988). The intermediate aquifer is utilized extensively for public supply, agricultural irrigation, and recreational, domestic and industrial water uses, especially in the southern coastal portions of the planning region. The Upper Floridan aquifer system, by far the most important source of groundwater in the planning region, is composed of a thick, stratified sequence of limestone and dolomite units that include (in order of increasing geologic age and depth) the Suwannee Limestone, Ocala Limestone

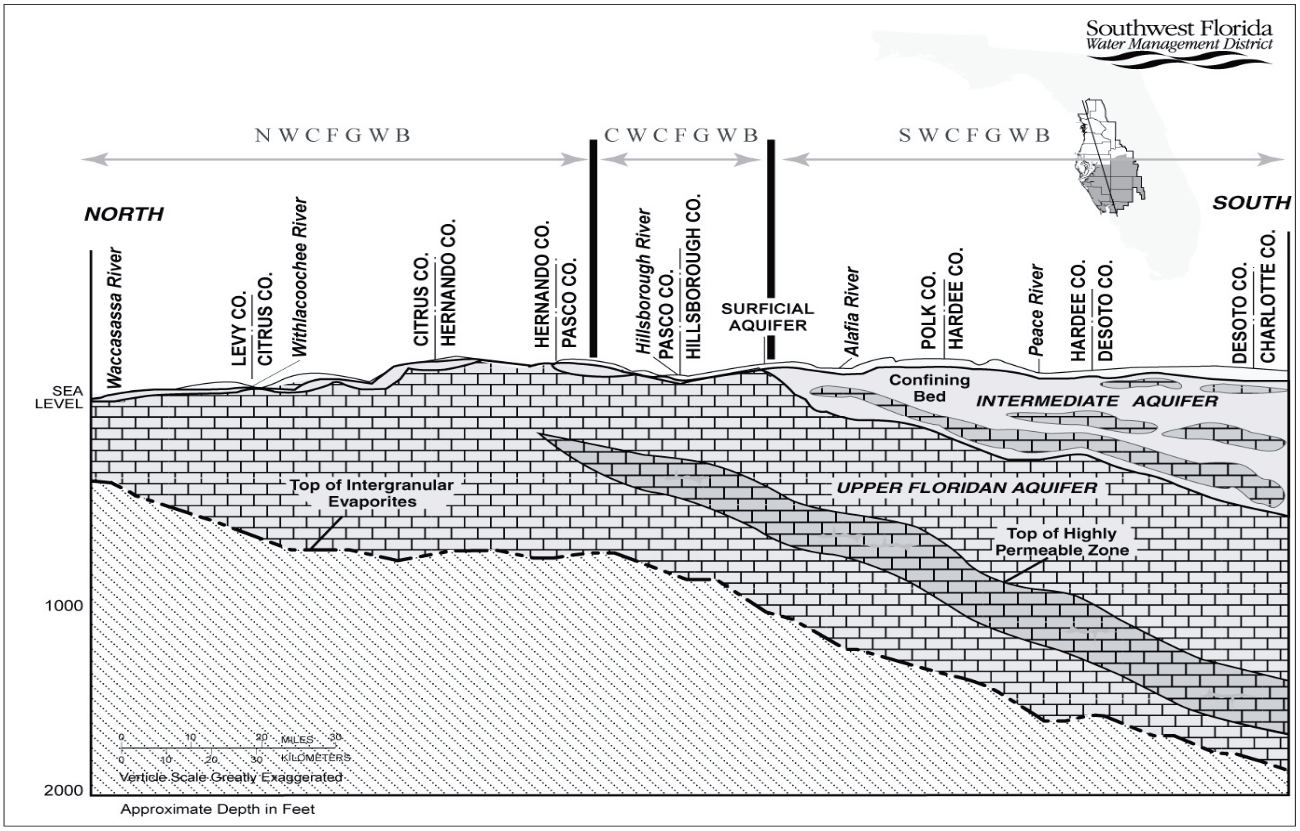



Figure 1-3. *Generalized north-south geologic cross section through the District*

and Avon Park Formation. The aquifer is confined throughout the planning region by the low-permeability sediments of the overlying intermediate aquifer. The Upper Floridan aquifer can be separated into upper and lower flow zones. The Suwannee Limestone forms the upper flow zone and the lower zone is composed of the highly transmissive portion of the Avon Park Formation. The two zones are separated by the lower permeability Ocala Limestone, which acts as a semi-confining layer. The two flow zones are locally connected, through the Ocala, by diffuse leakage, vertical solution openings along fractures, or other zones of preferential flow (Menke et al., 1961). The middle confining unit of the Floridan aquifer lies near the base of the Avon Park Formation. It is composed of evaporite minerals such as gypsum and anhydrite, which occur as thin beds or as nodules within dolomitic limestone that overall has very low permeability. The middle confining unit is generally considered to be the base of the freshwater production zone of the aquifer except in coastal areas of Manatee and Sarasota counties and within southern DeSoto and Charlotte counties In this area, water quality within the Avon Park Formation is brackish or saline with chloride concentrations exceeding 1,000 mg/L.

There is generally no recharge to the Upper Floridan aquifer along the coast because the area is a zone of discharge. Further inland, recharge to the aquifer system increases from zero to a few inches per year (Sepulveda, 2002). This low recharge rate is due to the clay confining layers within the intermediate aquifer that overlie the Upper Floridan aquifer and restrict the vertical exchange of water between the surficial and Upper Floridan aquifers across most of the planning region (SWFWMD, 1993). Groundwater is highly mineralized throughout much of the aquifer in the southern portions of the planning region. In these areas, groundwater from the shallower intermediate aquifer is used extensively for water supply.

## Part D. Previous Technical Investigations

The 2010 RWSP builds on a series of cornerstone technical investigations that were undertaken by the District and the USGS beginning in the 1970s. These investigations have provided District staff with an understanding of the complex relationships between human activities (i.e., surface and groundwater usage and large-scale land-use alterations), climatic cycles, aquifer and surface water interactions, aquifer and surface hydrology, and water quality. Investigations conducted in the Southern Planning Region and in areas adjacent to it are listed by categories and briefly outlined below.

### *Section 1. Water Resource Investigations*


During the past 30 years, various water resource investigations have been initiated by the District to collect critical information about the condition of water resources and the impacts of human activities on them. Following the Florida Water Resources Act of 1972, the District began to invest in enhancing its understanding of the effects of water use, drainage and development on the water resources and ecology of west-central Florida. A major result of this investment was the creation of the District's Regional Observation and Monitor-well Program (ROMP) which involved the construction of monitor wells and aquifer testing to better characterize groundwater resources and surface water and groundwater interactions. About a dozen wells were drilled annually and in the 1980s, data collected from these wells began to be used in a number of hydrologic assessments that clearly identified regional resource concerns.

In 1978, the Peace River Basin Board directed that a hydrologic investigation be performed to assess causes of lake level declines along the Lake Wales Ridge in Polk and Highlands counties that had been occurring since the 1960s. The investigation (referred to as Ridge I) was completed in 1980 and concluded that the declines were due to below-normal rainfall and groundwater withdrawals. In 1987, the District initiated the Ridge II study to implement the data collection that was recommended in the previous study and further assess lake level declines. The Ridge II investigation also concluded that lake level declines were a result of below-average rainfall and aquifer withdrawals. It was recognized in that study that groundwater withdrawals throughout the groundwater basin contributed to declines within the Ridge area. Additionally, it was concluded that in some cases alterations to surface drainage were significant and affected lake level fluctuations.

During the 1980s, hydrologic and biologic monitoring from the District's expanded data collection networks began to reveal water resource impacts in other areas. In the late 1980s, the District initiated water resource assessment projects (WRAPs) for the Eastern Tampa Bay (ETB) and Northern Tampa Bay (NTB) areas to determine causes of water level declines and to address water supply availability. Resource concerns in these areas included lowered lake and wetland levels in the NTB area and saltwater intrusion in the Floridan aquifer in the ETB area.

In 1989, based on the findings of the Ridge II and WRAP studies and continued concern about water resource impacts, the District established the Ridge area, ETB and NTB WUCAs and implemented a strategy to address the resource concerns, which included comprehensive studies to determine long-term water supply availability. From May 1989 through March 1990, there were extensive public work group meetings to develop management plans for the ETB, NTB and Ridge area WUCAs. These meetings are summarized in the Highlands Ridge Work Group Report (SWFWMD, 1989) and Management Plan (SWFWMD, 1990a), Eastern Tampa Bay Work Group Report (SWFWMD, 1990b) and Management Plan (SWFWMD, 1990c), and Northern Tampa Bay Work Group Report (SWFWMD, 1990d) and Management Plan (SWFWMD, 1990e). These deliberations led to major revisions of the District's water use permitting rules as special conditions were added that were specific to each WUCA. It was also during these deliberations that the original concept of the SWUCA emerged. The ETB work group had lengthy discussions on the connectivity of the groundwater basin and how withdrawals throughout the basin were contributing to saltwater intrusion and impacts to lakes in the Ridge area. A significant finding of both the Ridge II study and the ETB WRAP was that the lowering of the potentiometric surface within those areas was due to groundwater withdrawals from beyond as well as within those areas. Additionally, the ETB WRAP concluded that there was a need for a basinwide approach to the management of the water resources. Based on results of these studies and work group discussions, in October 1992, the District established the SWUCA to encompass both the ETB and Ridge area WUCAs and the remainder of the groundwater basin.

### *Section 2. USGS Hydrologic Investigations*

The District has a long-term cooperative program with the USGS to conduct hydrogeologic investigations that are intended to supplement work conducted by District staff. The projects are focused on improving the understanding of cause-and-effect relationships and developing analytical tools for resource evaluations. Funding for this program is generally on a 50/50 cost-share basis with the USGS. However, this varies based on whether other cooperators are involved in the project and if requests for non-routine data collection or special project assignments are implemented. The District's cooperative investigations with the USGS have typically focused on regional hydrogeology, water quality and data collection. Over the years, several groundwater and surface water cooperative projects have been completed in and around the planning region. In addition, a number of projects and data collection activities are in progress. Completed and ongoing cooperative District/USGS investigations and data collection activities are listed in Table 1-2.

### *Section 3. Water Supply Investigations*

As part of the U.S. Army Corps of Engineers' Four River Basins Area project, an assessment of water resources in the region was prepared to determine ways in which excess surface or groundwater could be utilized to help solve regional water supply problems. Objectives of the study were to evaluate current and anticipated water resource problems in the study area, determine sites suitable for alleviating the identified problems and describe preliminary design elements and costs associated with developing these sites. The study projected where problem areas were anticipated through the year 2035 and identified possible solutions to those problems.

Table 1-2. *District/USGS cooperative hydrologic investigations and data collection activities applicable to the Southern Planning Region*

| Investigation Type | Description |
|---|---|
| **Completed Investigations** | |
| Groundwater | Regional Groundwater Flow System Models of the SWFWMD, Highlands Ridge WUCA, and Hardee and DeSoto Counties |
| | Hydrogeologic Characterization of the Intermediate Aquifer System |
| Surface Water | Hydrologic Assessment of the Peace and Alafia Rivers |
| Groundwater and Surface Water | Effects of Using Groundwater for Supplemental Hydration of Lakes and Wetlands |
| **Ongoing Investigations/Data Collection Activities** | |
| Groundwater | Hydrogeology and Quality of Groundwater in Highlands County |
| Surface Water | Primer of Hydrogeology and Ecology of Freshwater Wetlands in Central Florida |
| | Charlie Creek Watershed Hydrologic Characterization |
| | Methods to Define Storm Flow and Base Flow Components of Total Stream Flow in Florida Watersheds |
| Data Collection | Minimum Flows and Levels Data Collection |
| | Surface Water Flow, Level and Water Quality Data Collection |

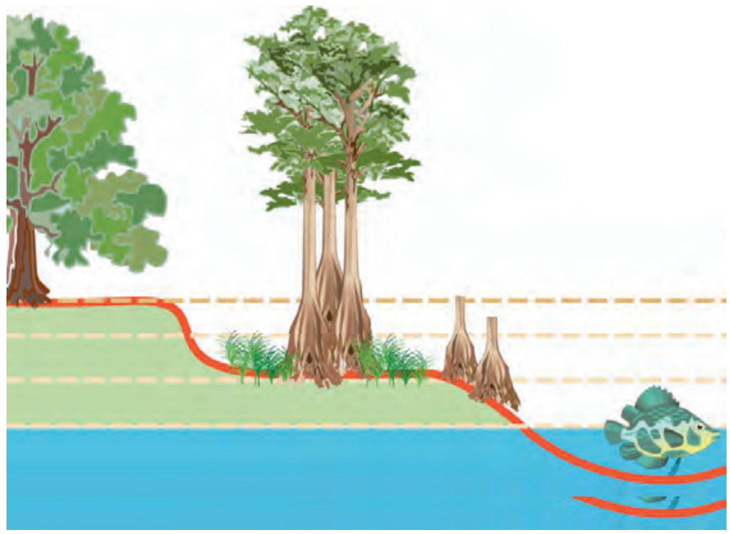
Since the 1970s, the District has conducted numerous hydrologic assessments designed to assess the effects of groundwater withdrawals and determine the availability of groundwater in the region. In the late 1980s, the Florida Legislature directed the WMDs to conduct a Groundwater Basin Resource Availability Inventory covering areas deemed appropriate by the WMD's Governing Boards. The District completed inventory reports for 13 of the 16 counties within its jurisdiction. The three remaining counties, which were only partially contained within the District's boundaries, were to be completed by adjacent WMDs. These reports described the groundwater resources of the individual counties and respective groundwater basins.

Based on the District's hydrologic and biologic monitoring programs and results of the hydrologic assessments, the District established three WUCAs in the late 1980s because of observed impacts of groundwater withdrawals. Recognizing that the future supply of groundwater was limited in some areas, the District prepared the *Water Supply Needs & Sources: 1990–2020 study* (SWFWMD, 1992a). One of the objectives of the study was to provide a foundation from which the District could provide appropriate water resource management in the future. Key to the management approach was to optimize resources to provide for all reasonable-and-beneficial uses without causing unacceptable impacts to water resources, natural systems and existing legal users. The document assessed future water demands and sources through the year 2020. Major recommendations of the study included the need for users to rely on local sources to the greatest extent practicable to meet their needs before pursuing more distant sources, requiring users to increase their water use efficiency, and pursuing a regional approach to water supply planning and development.

In response to legislation in 1997 that clarified the role of WMDs in water supply planning, the District completed a water supply assessment in 1998 (SWFWMD, 1998). The assessment quantified water supply needs through the year 2020 and identified areas where future demand could not be met with traditional groundwater sources. As required by the legislation and based on the outcome of the water supply assessment, the District initiated preparation of an RWSP for its southern 10 counties. This area encompassed the NTBWUCA and the SWUCA. In 2001, the District published its first RWSP, which quantified water supply demands through the year 2020 and identified water supply options for developing alternative sources (sources other than fresh groundwater). The RWSP was updated in 2006 for a planning period that extended through 2025. The 2006 RWSP (SWFWMD, 2006) concluded that fresh groundwater from the

Upper Floridan aquifer would be available to meet future demands on a limited basis only and that sufficient alternative sources existed in the 10-county planning region to meet projected demands through 2025. It also concluded that a regional approach to meeting future water demands was required because some areas had limited access to alternative water supplies.

### Section 4. Minimum Flows and Levels Investigations



In addition to the actual measurement of water levels and flows, extensive field data is often required in support of MFL development. Studies done in support of MFL development are both ecologic and hydrologic in nature and include basic biologic assessments such as the determination of the frequency, abundance and distribution of plant and animal species and their habitats. Ultimately this ecologic information is related to hydrology based on relationships to elevation or flow. Ecologic and hydrologic relationships are developed using either statistical or mechanistic models or a combination of the two. In estuaries, for example, two- or three-dimensional salinity models may be developed to assess how changes in flow affect the spatial and temporal distribution of various salinity zones. In certain circumstances, depending on the resources of concern, thermal or water quality models might be required as well. Elevation data is also collected for generating bathymetric maps or coverage used for modeling purposes to determine when important features such as roads, floor slabs and docks become inundated or when flows or levels drop sufficiently to affect recreation and aesthetics.

### Section 5. Modeling Investigations

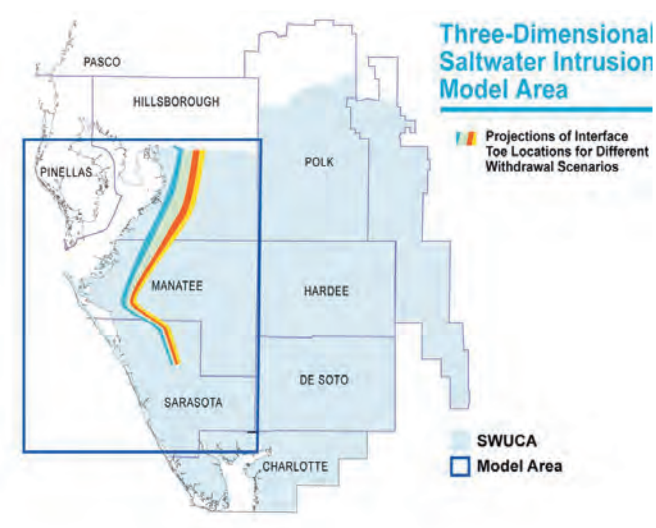
Since the 1970s, the District has developed numerous computer models to support resource evaluations and water supply investigations. These models have been subdivided into groundwater flow models for general resource assessments and solute transport models to assess past and future saltwater intrusion. In recent years, the District has begun to support the use of integrated hydrologic models that simulate the entire hydrologic cycle and include information on both the surface water and groundwater flow systems. These models are being used to address issues where the interaction between groundwater and surface water is significant. Many of the early groundwater flow models were developed by the USGS through the cooperative studies program with the District. Over time, as more data were collected and computers became more sophisticated, models developed by the District included more detail about the hydrologic system. The end result of the modeling process is a tool that can be used to assess effects of current and future withdrawals and better understand hydrologic relationships.

1.0 Groundwater Flow Models

The early groundwater models developed for the SWUCA were completed by the USGS. In the early 1990s, the District developed the Eastern Tampa Bay model (Barcelo and Basso, 1993), which simulated flow within the Southern West-Central Florida Groundwater Basin (SWCFGWB). Though this model was originally designed to evaluate groundwater withdrawals for the ETB WRAP, it has been used to evaluate effects of various proposed and existing withdrawals across the SWUCA in the SWCFGWB. Results of the modeling effort have confirmed the regional nature of the groundwater basin in the SWUCA. Following completion of the Eastern Tampa Bay model, the USGS was contracted to develop a model of the Lake Wales Ridge area (Yobbi, 1996), which has been used to provide assessments of the effects of regional groundwater withdrawals on surficial aquifer water levels in the Ridge area.

The Southern District Model Version 1.0 simulates groundwater flow in the entire District south of Hernando County (Beach and Chan, 2003). However, the model is primarily designed to simulate conditions throughout the District south of the Hillsborough River and Green Swamp. The Southern District Model Version 1.0 has replaced the Eastern Tampa Bay model as the principal tool for resource assessment and resource management. The model was updated as Southern District Model Version 2.0 (Beach, 2006).

2.0 Saltwater Intrusion Models




*Graphical representation of modeled projections of the distance saltwater will move inland in the Upper Floridan aquifer in the Southern Water Use Caution Area over the next 50 years under various pumping scenarios.*

There have been three major models developed to simulate historical and future saltwater intrusion in the SWUCA. The first of these models was a series of three, two-dimensional, cross-section models capable of simulating density-dependent flow known as the Eastern Tampa Bay Cross-Section Models (HydroGeoLogic, Inc., 1994). Each model was designed as a geologic cross section located along flow paths to the Gulf of Mexico or Tampa Bay and were used to make the initial estimates of movement of the saltwater-freshwater interface in the ETBWUCA. To address the three-dimensional nature of the interface, a sharp interface code, SIMLAS, was developed by HydroGeoLogic, Inc. (1993) for the District. The code was applied to the Eastern Tampa Bay area, creating a sharp interface model of saltwater intrusion. Subsequent to this, the cross-sectional models were refined (HydroGeoLogic, Inc., 1994b) and the results were compared to those of the sharp interface model (HydroGeoLogic, Inc., 1994a). The cross-sectional models compared well with the sharp interface model.

In support of establishing a minimum aquifer level to protect against saltwater intrusion in the most impacted area of the SWUCA, a fully three-dimensional, solute transport model of the ETB area was developed by HydroGeoLogic, Inc in 2002 (HydroGeoLogic, Inc., 2002). The model encompassed all of Manatee and Sarasota counties and the southern half of Hillsborough and Pinellas counties and simulated flow and transport in the Upper Floridan aquifer. The model was calibrated from 1900 to 2000, although there is only water quality data for the period from 1990 to 2000. The model was used to derive estimates of the number of wells and amount of water supply at risk to future saltwater intrusion under different pumping scenarios.

3.0 Integrated Surface Water/Groundwater Models

The Peace River Integrated Model (PRIM) project will develop an integrated surface water/ groundwater model of the entire Peace River Basin. The model will be used to evaluate the cause of declines in flow that have occurred since the early 1960s and to evaluate resource management options. The model is being developed by HydroGeoLogic, Inc. of Herndon, Virginia, and is expected to be completed in late 2010. The model will initially be focused on simulation of recent and future conditions and will then be used to separate the effects of various land uses and climate changes on river flows.

The Myakka River Watershed Initiative is a comprehensive watershed study and planning effort to address environmental damage caused by excess water attributed to agricultural operations in the watershed. The Myakka River Watershed Water Budget Model was a component of this initiative. The objectives of the model were to estimate quantities and timing of excess flows in the upper Myakka River; investigate linkages between land use and practices and excess flows; develop time-series of flow rates sufficient for pollutant load modeling; evaluate alternative management scenarios to restore natural hydrology; and simulate hydroperiods for the Flatford Swamp under historic, existing and proposed flow conditions. The model is complete and has been calibrated and verified, but it will be updated as knowledge of the system expands.

4.0 Districtwide Regulation Model

The development and implementation of a Districtwide regulation model (DWRM) was undertaken in an effort to produce a regulatory modeling platform that is technically sound, efficient, reliable and has the capability to address cumulative impacts. The DWRM was initially developed in 2003 (Environmental Simulations, Inc., 2004). It is mainly used to evaluate whether requested groundwater quantities in water use permit applications have the potential to cause unacceptable impacts to existing legal users, off-site land uses, environmental systems, the saltwater interface and movement of documented groundwater contamination on an individual and cumulative basis. This model simulates the surficial, intermediate, Upper Floridan and Lower Floridan aquifers. It covers the entire District and an appropriate buffer area surrounding the District. The DWRM Version 2 (Environmental Simulations, Inc., 2007) incorporates Focused Telescopic Mesh Refinement (FTMR), which was initially developed to enable the regional DWRM to be used as a base model for efficient development of smaller scale sub-models (FTMR models). The FTMR uses a fine grid around a well or group of wells and increasing grid spacing out to the edge of the model. It was specifically designed to enhance water use permit analysis; however, the DWRM and the FTMR are increasingly being used for water resource evaluations.

# Chapter 2: Resource Protection Criteria

This chapter addresses the primary strategies the District employs to protect water resources, which include water use caution areas (WUCA), minimum flows and levels (MFLs), prevention and recovery strategies, and reservations.

*The lowering of water levels in the Upper Floridan aquifer due to groundwater pumping frequently causes the upper Peace River to cease flowing during the dry season.*

## Part A. Water Use Caution Areas

### Section 1. Definitions and History

Figure 2-1 depicts the location of the District's WUCAs. WUCAs are areas that require regional action to address cumulative water withdrawals that are causing or may cause adverse impacts to the water and related land resources or the public interest (Chapter 40D-2.801, F.A.C.). In order to determine whether an area should be declared a WUCA, the Governing Board must consider the following factors:

- Quantity of water available for use from groundwater sources, surface water sources, or both.
- Quality of water available for use from groundwater sources, surface water sources, or both, including impacts such as saline water intrusion, mineralized water upconing or pollution.
- Environmental systems, such as wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources.
- Lake stages or surface water rates of flow.
- Off-site land uses.
- Other resources as deemed appropriate.

In the late 1980s, the District determined that certain interim resource management initiatives could be implemented to help prevent existing problems in the water resource assessment project (WRAP) areas from getting worse prior to the completion of each WRAP. As a result, in 1989, the District established three WUCAs: Northern Tampa Bay (NTB), Eastern Tampa Bay (ETB) and Highlands Ridge (HR). For each of the initial WUCAs, a three-phased approach to water resource management was implemented, including: (1) short-term actions that could be put into place immediately, (2) mid-term actions that could be implemented concurrent with the ongoing WRAPs and (3) long-term actions that would be based upon the results of the WRAPs. In addition to the development of conservation plans, cumulative impact analysis-based permitting and requiring withdrawals from stressed lakes to cease within three years, the District developed management plans for each WUCA to stabilize and restore the water resources in each area through a combination of regulatory and non-regulatory efforts. One significant change that occurred as a result of the implementation of the management plans was the

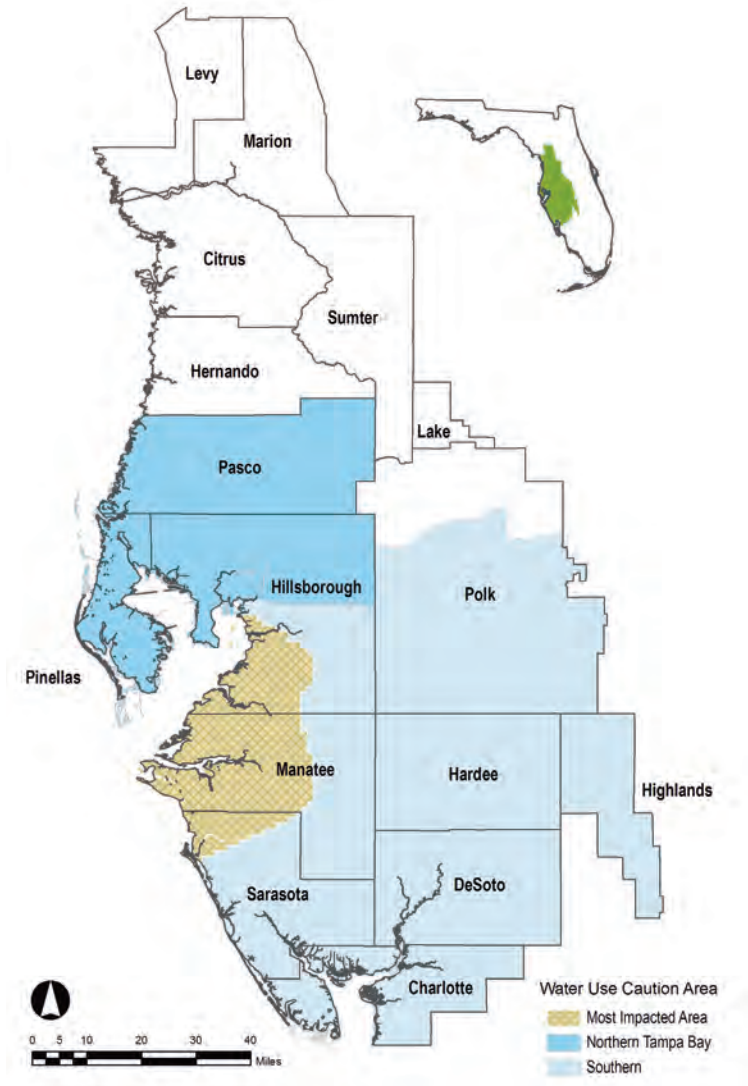



Figure 2-1. *Location of the District's water use caution areas*

designation of the most impacted area (MIA) in the ETBWUCA, where any entity proposing groundwater withdrawals that would lower the Upper Floridan aquifer potentiometric surface within the MIA would be required to implement a net benefit that mitigates the predicted withdrawal impacts.

1.0 Southern Water Use Caution Area (SWUCA)

Beginning in the 1930s, groundwater withdrawals steadily increased in the Southern West-Central Florida Groundwater Basin in response to growing demands for water from the mining and agricultural industries and later from public supply, power generation and recreational users. Before peaking in the mid 1970s, these withdrawals resulted in declines in Upper Floridan aquifer levels that exceeded 50 feet in some areas of the groundwater basin. The result of the depressed aquifer levels was saltwater intrusion in the coastal portions of the Upper Floridan aquifer, reduced flows in the upper Peace River and lowered lake levels in the Lake

Wales Ridge of Polk and Highlands counties. In response to these resource concerns, the District established the SWUCA in 1992. The SWUCA encompasses the entire southern portion of the District, including the areas previously included in the ETB and HR WUCAs. Although groundwater withdrawals have since stabilized as a result of management efforts, water resources of the area continue to be impacted by the decline in aquifer water levels.

In 1994, the District initiated rule making to modify its water use permitting rules to better manage water resources in the SWUCA. The main objectives of the rules were to (1) significantly slow saltwater intrusion into the confined Upper Floridan aquifer along the coast, (2) stabilize lake levels in Polk and Highlands counties and (3) limit regulatory impacts on the region's economy and existing legal users. The principal intent of the rules was to establish a minimum aquifer level and to allow renewal of existing permits while gradually reducing permitted quantities as a means to recover aquifer levels to the established minimum. A number of parties filed objections to parts of the rule and an administrative hearing was conducted. In March 1997, the District received a Final Order upholding the minimum aquifer level (and the science used to establish it) and the phasing in of conservation. However, the rule provisions relating to reallocation and preferential treatment of existing users were not upheld.

In 1998, the District initiated a reevaluation of the SWUCA management strategy. In March 2006, to slow the rate of saltwater intrusion, the District established minimum "low" flows for the upper Peace River and minimum levels for eight lakes along the Lake Wales Ridge in Polk and Highlands counties and the Upper Floridan aquifer in the MIA of the SWUCA. Since most, if not all of these water resources were not meeting their adopted MFLs, the District adopted a recovery strategy for the SWUCA.

## Part B. Minimum Flows and Levels

*A District scientist collecting data that was used to establish a minimum flow for the upper Peace River.*

### *Section 1. Definitions and History*

An MFL is that level or flow below which significant harm occurs to the water resources or ecology of the area. Since the early 1970s, the District has been engaged in an effort to develop MFLs for water bodies. The District implements established MFLs primarily through its water supply planning, water use permitting and environmental resource permitting programs, and funding of water resource and water supply development projects that are part of a recovery or prevention strategy. Beginning with legislative changes that were enacted to the MFL statute in 1996, the District has enhanced its program for the development of MFLs. The District's MFL program addresses all the requirements expressed in the Florida Water Resources Act and the Water Resource Implementation Rule.

1.0 Statutory and Regulatory Framework

The Florida Water Resources Act (Chapter 373, F.S.) and the Water Resource Implementation Rule (Chapter 62-40, F.A.C., formerly the State Water Policy) provide the basis for establishing MFLs and explicitly include provisions for setting them. The Water Resources Act requires the WMDs to establish minimum levels for both groundwater and surface waters and minimum flows for surface watercourses below which significant harm to the area's water resources or ecology would result. In 1996, the Florida Legislature mandated that the District submit a priority list and schedule for establishing MFLs by Oct. 1, 1997, for surface watercourses, aquifers and surface waters in the counties of Hillsborough, Pasco, and Pinellas in the NTB area (Section 373. 042[2]). Chapter 373 now requires the WMDs to update and submit for approval by the FDEP a priority list and schedule for the establishment of MFLs throughout their respective jurisdictions. The priority list and schedule is published annually in the *Florida Administrative Weekly* and is posted on the District's web site at *www.WaterMatters.org.*

## *Section 2. Priority Setting Process*

In accordance with the requirements of Section 373.042, F.S., the District has established and annually updates a list of priority groundwater and surface waters for which MFLs will be set. As part of determining the priority list and schedule, the following factors are considered:

- Importance of the water bodies to the state or region.
- Existence of or potential for significant harm to the water resources or ecology of the state or region to occur.
- Required inclusion of all first-magnitude springs and all second-magnitude springs within state or federally owned lands purchased for conservation purposes.
- Availability of historic hydrologic records (flows and/or levels) sufficient to allow statistical analysis and calibration of computer models when selecting particular water bodies in areas with many water bodies.
- Proximity of MFLs already established for nearby water bodies.
- Possibility that the water body may be developed as a potential water supply in the foreseeable future.
- Value of developing an MFL for regulatory purposes or permit evaluation.

The District's Priority List and Schedule for the Establishment of MFLs Is contained in the Chapter 2 Appendix.

## *Section 3. Technical Approach to the Establishment of MFLs*

The District's approach to establishing MFLs assumes that hydrologic regimes that differ from historic conditions exist, but those regimes will protect the structure and function of aquifers and other water resources from significant harm. For example, consider a historic condition for an unaltered river or lake system with no local groundwater or surface water withdrawal impacts. A new hydrologic regime for the system would be associated with each increase in water use, from very small withdrawals that have no measurable effect on the historic regime to very large withdrawals that could markedly alter the long-term hydrologic regime. A threshold hydrologic regime may exist that is lower than the historic regime but which protects the water resources and ecology of the system from significant harm. The threshold regime, resulting primarily from water withdrawals, would essentially preserve the natural flow regime but with changes to the amplitude in flows that reflect a general lowering across the entire flow range. The purpose of establishing MFLs is to define the threshold hydrologic regime that would allow for water withdrawals while protecting the water resources and ecology from significant harm. Thus, MFLs represent minimum acceptable rather than historic or optimal hydrologic conditions.

1.0 Ongoing Work, Reassessment and Future Development

The District continues to conduct the necessary activities to support the establishment of MFLs according to the District Priority List and Schedule. Refinement and development of new methodologies is also ongoing. In accordance with state law, MFLs are established based upon the best available information. The District plans to conduct periodic reassessment of the adopted MFLs based on consideration of the significance of particular MFLs in water supply planning and the relevance of new data that may become available.

2.0 Scientific Peer Review

Section 373.042(4), F.S., permits affected parties to request independent scientific peer review of the scientific and technical data and methodologies used to determine MFLs. As part of the adopted MFL rules, the District has committed to pursuing independent scientific peer review as part of future efforts. The District voluntarily seeks independent scientific peer review of MFL methodologies that are developed for all priority water resources. Since the RWSP was last updated in 2006, the District has sought and obtained the review of methodologies for the following water resources in the planning region: (1) upper Braden River, (2) Dona Bay/Shakett Creek below Cow Pen Slough, (3) lower Peace River and Shell Creek, and proposed methodological revisions for methods used to establish minimum lake levels.

3.0 Methodology

The District's methodology for establishing MFLs for lakes, wetlands, rivers, aquifers and springs is explained in detail in the Chapter 2 Appendix.

## *Section 4. MFLs Established to Date*

Figure 2-2 depicts MFL priority water resources in the Southern Planning Region. A complete list of water resources with established MFLs throughout the District is provided in the Chapter 2 Appendix. Priority water resources with established MFLs in the planning region include the following:

- Saltwater intrusion minimum aquifer level for the MIA of the SWUCA
- Middle Peace and upper Myakka rivers (located partially in the Heartland Planning Region) and the freshwater segment of the Braden River

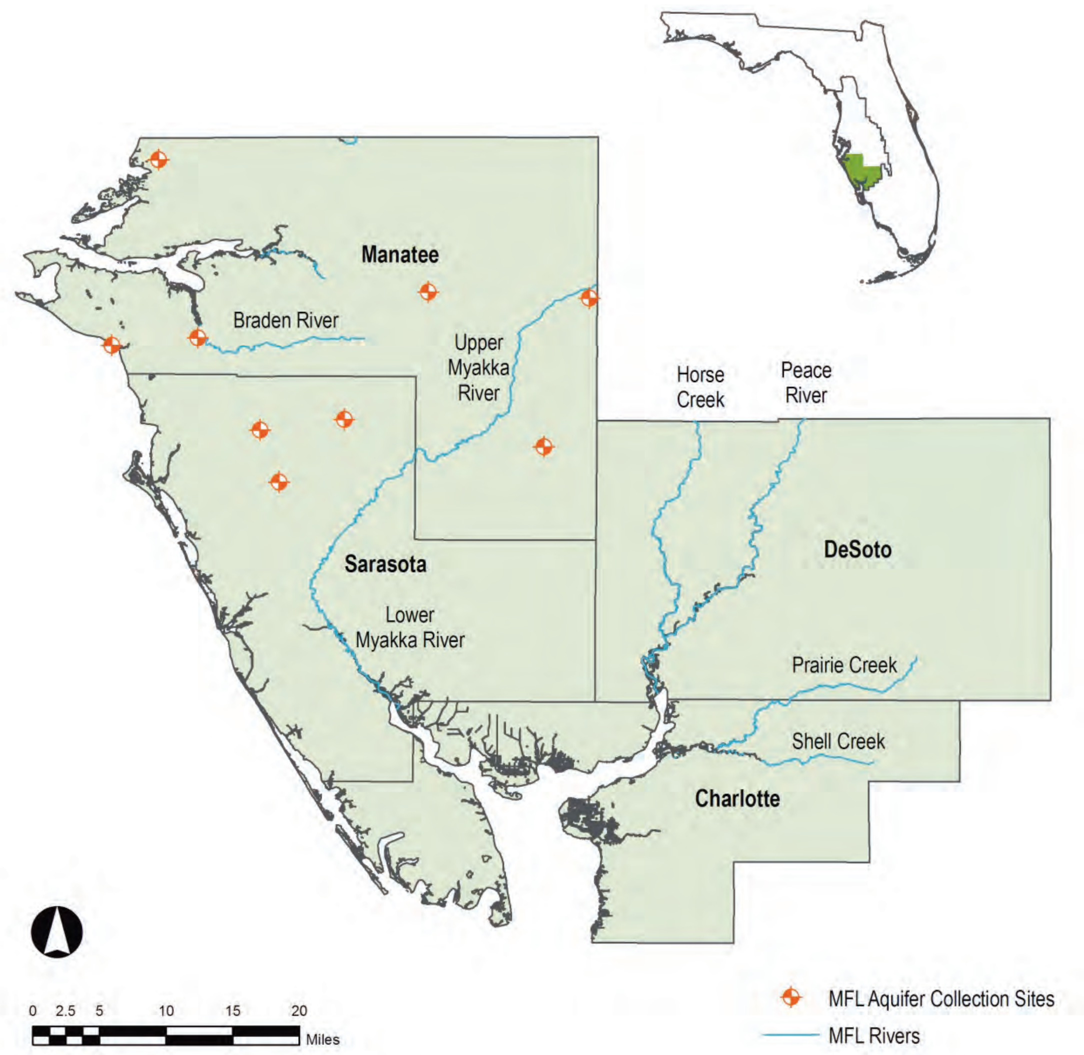


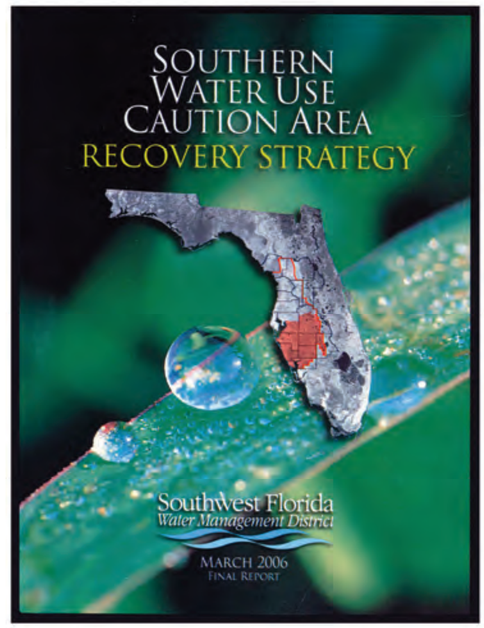

Figure 2-2. *MFL priority water resources in the Southern Planning Region*

Priority water resources that are located at least partially within the planning region for which MFLs have not yet been established include:

- Lower Peace Estuary (including Shell Creek)
- Dona Bay (Cow Pen Slough/Canal)
- Little Manatee River
- Lower Myakka River System (Myakkahatchee Creek, Deer Prairie Creek and Blackburn Canal)
- Manatee River System
- Horse Creek
- Prairie Creek
- Shell Creek (freshwater segment)
- SWUCA Phase II

## Part C. Prevention and Recovery Strategies

### Section 1. Prevention Activities




A three-point prevention strategy has been developed to address MFLs: (1) monitoring water levels and flows for water resources/sites with established MFLs to evaluate the need for prevention strategies; (2) assessment of potential water supply/resource problems as part of the regional water supply planning process; and (3) implementation of the water use permitting program, which ensures that water use does not cause violation of established MFLs.

In addition to water supply planning activities initiated by the District, other entities in the planning region are also involved in planning efforts in cooperation with those of the District. The goal is to ensure that future water supply demands will be met without adversely impacting proposed or established MFLs. An example of such a planning activity is discussed below.

1.0 Punta Gorda Water Supply Master Plan

In 2006, the City of Punta Gorda prepared a Water Supply Master Plan to address their water supply needs through 2050. This plan reviewed several water supply scenarios and recommended a new off-stream reservoir and the expansion of the city's Shell Creek Water Treatment Plant. Several changes since the completion of the plan, including a draft proposal for a minimum flow for Shell Creek and the city's interconnection with the Peace River Manasota Regional Water Supply Authority's (PRMRWSA) distribution system, have required the city to update their plan. The 2009 plan update provides a more incremental approach to future water supply development, based on current policies, regulations and financial conditions. The plan update proposes a variety of alternative supply scenarios that use a brackish groundwater reverse osmosis system, an expanded surface water system and/or an off-stream reservoir with various sizing and cost estimates. Future phases may be chosen from the 2009 plan update based on the city's changing needs and the availability of both surface water and brackish groundwater.

### Section 2. Recovery Strategies

Section 373. 0421(2), F.S., requires that a recovery strategy be developed if the existing flow or level in a water resource is below, or within 20 years is projected to fall below, established MFLs. The District establishes recovery strategies by rule in Chapter 40D-80, F.A.C. When MFLs for a water resource are not being met, or as part of a recovery strategy are not expected to be met for some time in the future, the District will first examine the established MFLs in light of any newly obtained scientific data or other relevant information to determine whether the MFL should be reassessed. If no reassessment is necessary, the management tools listed below are available to restore the water resource to meet its MFL.

- Developing additional supplies
- Implementing structural controls and/or augmentation systems to raise levels or increase flows in water bodies
- Reducing water use permitting allocations
- Requiring the use of alternative water supply sources

The following is a description of the District's SWUCA recovery strategy — the only recovery strategy adopted in the planning region to date.

1.0 SWUCA

The purpose of the SWUCA recovery strategy is to provide a plan for reducing the rate of saltwater intrusion and restore low flows to the upper Peace River and lake levels by 2025, while ensuring sufficient water supplies and protecting the investments of existing water use permittees. The strategy has six basic components: conservation, alternative water supply development, resource recovery projects, land-use transitions, permitting and monitoring and reporting. Promoting conservation and alternative supply development is a continuation of long-standing District programs that, along with the District's permitting program, have contributed to a stabilization of groundwater withdrawals in the region over the past 30 years. Resource recovery projects, such as the project to raise the levels of Lake Hancock for release to the upper Peace River during the dry season, are actively being pursued. Whereas coastal areas will generally meet their future demands through development of alternative supplies, some new uses in inland areas can be met with groundwater from the Upper Floridan aquifer that will use groundwater quantities from displaced non-residential uses (i.e., land-use transitions) as mitigation for the impacts of the new groundwater withdrawals.

The success of the recovery strategy will be determined through continued monitoring of the resource. The District uses an extensive monitoring network to assess trends in water levels, flows and saltwater intrusion. Additionally, the District conducts an assessment of the cumulative impacts of the factors affecting recovery. Information developed as part of this monitoring effort is provided to the Governing Board on an annual basis. The water resource and water supply development components of the strategy simply require "staying the course," which is how the District has addressed these issues for the past decade.

Regarding the financial component of the recovery strategy, the District has developed a funding strategy that outlines how the alternative water supplies and demand management measures needed to meet demand in the SWUCA and the remainder of the District during the planning period can be funded. The funding strategy also includes water resource restoration projects in areas such as the upper Peace River. An overview of the strategy is included in Chapter 8, Overview of Funding Mechanisms.

The management approaches outlined in the recovery strategy will be reevaluated and updated over time. The five-year updates to the RWSP include revisiting demand projections as well as reevaluation of potential sources, using the best available information. In addition, monitoring of recovery in terms of both resource trends and trends in permitted and used quantities of water is an essential component of the strategy. The monitoring will provide the information necessary to determine progress in achieving recovery and protection goals and will enable the District to take an adaptive management approach to the resource concerns in the SWUCA to ensure the goals and objectives are ultimately achieved.

## Part D. Reservations

Subsection 373.223(4), F. S., authorizes reservations of water by providing as follows: "The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety…" The District will consider establishing a reservation of water when a District water resource development project will produce water needed to achieve compliance with adopted MFLs. Reservations of water will be established by rule. The rule-making process allows for public input to the Governing Board in its deliberations about establishing a reservation, including, among other matters, the amount of water to be reserved and the time of year the reservation would be effective. For example, in the upper Peace River, actual flows are below the minimum flow established by the District. The District is implementing MFL projects as described in the SWUCA recovery strategy. The District is currently undertaking a project to raise water levels on Lake Hancock to provide a significant portion of the additional flows needed to meet the minimum low flows in the upper Peace River. Following implementation of the Lake Hancock project, the District will monitor flows and determine if additional projects are needed to achieve the minimum low-flow for the upper Peace River. The District initiated rule making in May 2009 with the intent of reserving from permitting the quantity of water that will provide the flow necessary to meet the minimum low flows in the upper Peace River. When a reservation is established and incorporated into Rule 40D-2.302, F.A.C., only those water use withdrawals that do not reduce the reserved quantity can be evaluated for permitting.

## Part E. Climate Change

### *Section 1. Overview*

Climate change has been a growing global concern for several decades. According to the United States Environmental Protection Agency (EPA), a global warming trend of about 1.0°F to 1.7°F has occurred from 1906–2005. This warming trend is believed to be the result of increased levels of greenhouse gases (GHG) such as carbon dioxide ($CO_2$) in the earth's atmosphere. Climate change is a global issue that will require international coordination and planning, but local, regional and statewide strategies will be extremely important in alleviating the potential impacts.

In the state of Florida, regional and statewide models indicate the potential for increased rates of sea level rise, precipitation fluctuations, flooding of low-lying areas, erosion of beaches, loss of coastal wetlands, intrusion of salt water into water supplies and increased vulnerability of coastal areas to storms and hurricanes. As a result, Governor Crist has acknowledged the need to reduce statewide GHG emissions and develop recommendations for long-term policies that address the potential impacts of climate change. The Governor has issued Executive Orders that lay out a set of immediate actions to address climate change issues, and he has convened two Florida Summits on Global Climate Change. In response, the Florida Legislature has reorganized Florida's Energy Office Program and created a new Energy and Climate Commission.

Florida now has partnership agreements with Germany and the United Kingdom outlining climate policies and mutual economic benefits, a State Climate Change web site and an Action Team on Energy and Climate Change, which was established to identify the policy areas likely to require adaptive management. One of the primary policy areas identified was water resource management, including several goals relating to the effect of climate change on water supply planning efforts. In addition, the Century Commission's 2008 Water Congress recommended support for Florida-specific research on climate change and water management interrelationships to better understand the state's water vulnerabilities and adaptation potential. The Water Congress recommended this research include the following: protection of drinking water and wastewater infrastructure against the threat of rising sea level; increased water use efficiencies to reduce carbon footprints; and consideration of energy and greenhouse emission consequences of water supply activities (Century Commission 2009). These research needs and potential risks associated with climate change mandate that they be addressed in water supply planning.

Climate change is one water supply challenge among many such as drought, deterioration in groundwater and surface water quality, and limitations on the availability of water sources. This section of the RWSP will address the potential issues of concern for water supply planning as a result of climate change, identify current management strategies in place to address these concerns, and consider future strategies necessary to adaptively manage water supply resources in the face of a changing climate.

Sources of climate change information include the US Global Change Research Program (*www.globalchange.gov/*), the EPA's climate change web site, and the Florida State University, Beaches and Shores Resource Center and the Center for Economic Forecasting and Analysis' report on sea level rise in Florida (based on the work of the Intergovernmental Panel on Climate Change).

### *Section 2. Possible Effects*

Although the nature, magnitude and timing of the effects of climate change are not well understood, current data suggest that water supply planning may be affected in three primary ways: sea level rise, air temperature rise and changes in precipitation regimes.

1.0 Sea Level Rise

According to the EPA's climate change web site, sea levels along the mid-Atlantic and gulf coasts have already risen 5 to 6 inches more than the global average in the last century due to the subsidence of coastal lands in this region. In late 2008, the Florida State University Beaches and Shores Resource Center and the Center for Economic Forecasting and Analysis published a report on sea level rise in Florida. The report presented low-end and high-end scenarios based on the work of the Intergovernmental Panel on Climate Change (IPCC) and the center's own analysis of trends. They estimated that by 2080, sea level will rise between 0.82 feet and 2.13 feet (Harrington et al. 2008). Such changes would stress southwest Florida's water resources in a variety of ways. Rising sea levels would cause salt water to encroach further up coastal rivers into freshwater intakes of water treatment plants. Saltwater intrusion would also threaten coastal aquifers that supply urban, agricultural and industrial water users. Most of Florida's population, and the water infrastructure to serve them, reside within 50 miles of the coast, and population is projected to increase in these areas. New and existing water supply infrastructure that will be needed to serve this population would be impacted by higher storm surges. The cost of constructing, repairing and retrofitting infrastructure to meet the threat of sea level rise and higher storm surges will be very high.

2.0 Air Temperature Rise

The IPCC predicts that by 2100 the average temperature at the earth's surface could increase anywhere from 2.5 to 10.4°F (IPCC 2007). Evaporation is likely to increase with a warmer climate, which could result in lower river flows, lower lake levels and greater challenges balancing the needs of humans with the needs of the environment during drier periods. Increased evaporation is likely to have an impact upon runoff, soil moisture and groundwater recharge, in addition to adversely affecting water supply availability from surface water sources and reservoirs (IPCC 2008). Additionally, higher air temperatures may cause declines in water quality that could raise the cost of treatment to meet potable water-quality standards. This uncertainty may significantly decrease the reliability and increase the cost of surface water supply sources.

3.0 Precipitation Regimes and Storm Frequency

Current models suggest that overall precipitation will generally decrease in sub-tropical areas (IPCC 2008). However, due to warming sea surface temperatures, tropical storms and hurricanes are likely to become more intense, produce stronger peak winds and increased rainfall over some areas. Studies show that in humid regions, higher summer temperatures are related to an increased probability of severe convective weather and the frequency of heavy and very heavy rain events, resulting in higher peak flows and increased flooding in some areas (Groisman, et al. 2005). In addition, very heavy rain events have increased over most of the contiguous United States and evidence is growing that the observed historical trend of increased very heavy rain events is linked to climate change (Groisman).

### *Section 3. Current Management Strategies*

The District has taken several steps to address the management of water resources in light of a changing climate. First, the District's data collection and monitoring activities are likely to provide information critical to monitoring and responding to local climate change. Long-established networks of rainfall and streamflow gage stations, many with real-time electronic reporting, provide continuous streams of data that will enable the District to monitor changes in local hydrology. In addition to monitoring rivers, lakes, springs and wetlands to ensure adequate water to sustain natural systems and provide for human use, the District has an extensive network of coastal and inland surface and groundwater monitoring sites to collect and analyze water quality data, including information about saltwater intrusion. In those places where water quantity and quality issues become evident, the District implements programs, projects and regulations to address them. The District also participates in local, state and national discussions on these issues in order to accommodate timely and effective responses to climate changes as they become evident.

The District also encourages maximizing the use of diverse water supply sources and establishing system redundancies to ensure a resilient water supply. For example, the District promotes water conservation across all use sectors, from agriculture and industrial to residential and commercial uses, which not only saves supplies for the future but also reduces chemical and energy use. The District continues to increase the availability and use of reclaimed water through partnerships, the development of wet-weather storage facilities and requirements for efficiency enhancements. Additionally, the District supports and co-funds projects to interconnect water supply systems, either potable or nonpotable, to ensure adequate supplies from dispersed sources and redundancy for emergencies. The District also emphasizes the need for diversified water supply sources and helps to fund environmentally sustainable and drought-resistant water supply options such as reclaimed water, stormwater reuse, brackish groundwater, surface water reservoirs, aquifer storage and recovery and the country's largest seawater desalination plant.

Efforts like these are possible by leveraging partnerships through programs such as the District's Cooperative Funding Initiative (CFI). The CFI is an important cost-share program that can be used to accomplish a variety of objectives relating to water supply and climate change. For example, through cooperative funding, the District can improve water use efficiency and demand management, both of which are effective options to cope with climate change (Bates et al. 2008). Collectively, these efforts will be very important in ensuring an adequate and resilient water supply in the face of various water supply challenges and will play an important role in meeting demands in a changing climate. Through these and other measures, the District is well positioned to address and adapt to changes that may result from the alteration of historic climate regimes.

### *Section 4. Future Adaptive Management Strategies*

Meeting the new challenges to water supply planning posed by climate change will require new tools. More region-specific modeling and forecasts are needed to better understand the nature of these changes. While many District efforts provide ongoing and critical information and allow the flexibility to accommodate future changes, effective adaptation to climate change will require an estimate of the likely magnitude and timing of change. Any such projections will have some uncertainty and the planning response must recognize that uncertainty. An important means of reducing uncertainty is assessing the most plausible scenarios for climate variability and change in Florida. Florida's Energy and Climate Change Action Plan (2008) points out the need to identify and quantify the potential effects of differing scenarios on the vulnerabilities and reliability of existing water supplies. The development of risk assessments can help determine adaptation needs and potential program changes in a variety of areas.

While GHGs are generally recognized as the primary source of human-induced climate changes, the National Center for Atmospheric Research in Boulder, Colorado, notes changes in historical land cover may also play an important role. Over the past 100 years, a large percentage of Florida's wetlands have been drained and converted for other uses. This large-scale transformation has potentially modified the regional climate, making the days warmer in summer and the nights colder in winter, as well as causing decreased inland rainfall. By comparing differences in rainfall between 1993 and pre-1900, average state precipitation may have been reduced as much as 12 percent (Lindsey 2005). Regardless of the reason for hydrologic changes, planning and acting sooner rather than later can significantly lessen impacts and reduce the costs needed to adapt to these changes as they occur. The District has a statutory responsibility to review land-use changes and provide technical assistance to local governments, such as quantifiable conservation data and strategies, to protect current water sources and limit demands. As other adaptive strategies are developed, it will be the District's role to promote their adoption by the 98 local governments within its boundaries through planning, communication and regulatory activities.

Climate change may have significant potential to affect water supply sources and should be factored into evaluations of the adequacy of supplies to meet future demand. It also has potential to dramatically change patterns of demand and could, therefore, be an important consideration in demand projections. Changes in the nature of supply and demand would necessitate infrastructure adaptation. High cost and relative uncertainty can make these adaptations problematic; however, as related information is generated, existing and proposed water sources and projects will be evaluated to determine their feasibility and desirability in light of a changing environment. For these reasons, the District is maintaining a “monitor and adapt” approach toward climate change. The District will actively monitor research projects, both locally and nationally, interpret the results, and initiate appropriate actions necessary to protect the water resources in the region as the effects of climate change become evident.

Changes to the environment may ultimately result from climate change. At present, Florida’s water managers do not have a clear understanding of what those changes will be. The WMDs are important players in maintaining Florida’s unique quality of life, water resources, environmental sustainability and economic vitality. The District will play an influential role in quantifying, proactively planning for and implementing actions that address the uncertainties and risks associated with climate change in the region.

# Chapter 3: Demand Estimates and Projections

This chapter is an analysis of the demand for water for all use categories in the planning region for the 2005 to 2030 planning period. The chapter includes the District's methods and assumptions used in projecting water demand for each county, the demand projections in five-year increments and an analysis and discussion of important trends in the data. Water demand has been projected for the: public supply, agricultural, industrial commercial, mining dewatering, power generation and recreational and aesthetic water use categories for each county in the planning region. An additional water use category, environmental restoration, comprises quantities of water that need to be developed and/or retired to meet established minimum flows and levels (MFLs). The environmental restoration demand could increase during the planning period based on the recovery requirements of MFLs established in future years. The methodologies used to project demand for each category are briefly summarized in this chapter and presented in greater detail in the Chapter 3 Appendix.

*Water for golf course irrigation and other recreational and aesthetic uses accounts for nearly 14 percent of the projected water demand for the planning period.*

The demand projections represent those reasonable and beneficial uses of water that are anticipated to occur through the year 2030. Five-in-10 (average condition) and 1-in-10 (drought condition) demands have been determined for each five-year increment from 2005 to 2030 for each category. The demand projections for Charlotte County, located partially in the South Florida Water Management District, reflect only the anticipated demands in the portion of the county located within the District's boundaries. Decreases in demand are reductions in the use of groundwater for the agricultural and industrial/commercial, mining/dewatering and power generation use categories. Decreases in demand are not subtracted from increases in demand but are tracked in separate tables. This is because increases in demand may be met with alternative sources and/or conservation and the retired groundwater quantities may be reallocated for mitigation of new groundwater permits for other use categories and/or permanently retired to help meet environmental restoration goals.

General reporting conventions for the RWSP were guided by the document developed by the Water Planning Coordination Group: *Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process* (WPCG, 2005). This document was produced by the Water Demand Projection Subcommittee of the Water Planning Coordination Group, a subcommittee consisting of representatives from the WMDs and the FDEP, formed in 1997 as a means to reach consensus on the methods and parameters used in developing the RWSPs. Some of the key guidance parameters include:

- Establishment of a base year: The year 2005 was agreed upon as a base year for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group. The data for the base year consists of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands.
- Water use reporting thresholds: Minimum thresholds of water use within each water use category were agreed upon as the basis for projection.
- 5-in-10 versus 1-in-10: For reporting demand in average versus drought conditions, specific parameters were prescribed for at least a portion of the demand related to all water supply categories except industrial/commercial, mining/dewatering and power generation. In general, demand is reported for a 5-in-10 average annual effective rainfall condition and a 1-in-10 drought year condition (an increase in water demand having a 10 percent probability of occurring during any given year).

The projected demand represents the total amount of water required to meet reasonable and beneficial water needs through 2030. Total demand does not account for reductions that could be achieved by additional demand management measures. Water conservation and other sources are accounted for separately in Chapter 4 as a means by which demand can be met.

## Part A. Water Demand Projections

The following is a summary of the methods used to project water demand. Demand projections were developed for five categories: (1) public supply, (2) agriculture, (3) industrial/commercial, mining/dewatering and power generation (I/C,M/D,PG), (4) recreational/aesthetic and (5) environmental restoration. The categorization provides for the projection of demand for similar water uses under similar assumptions, methods and reporting conditions.

### *Section 1. Public Supply*

*The washing of laundry accounts for 15 to 40 percent of the overall water consumption in a typical household of four persons.*

1.0 Definition of the Public Supply Water Use Category

The public supply category is composed of four subcategories: (1) large utilities (permitted for 0.1 mgd or greater), (2) small utilities (permitted for less than 0.1 mgd), (3) domestic self-supply (individual private homes or businesses that are not utility customers that receive their water from small wells that do not require a water use permit and (4) additional irrigation demand (water from domestic wells that do not require a water use permit and used for irrigation by residences that rely on a utility for indoor and other non-irrigation water needs).

## 2.0 Population Projections

### 2.1 Base Year Population

All WMDs agreed that 2005 would be the base year from which projections would be determined. The 2005 base year population for each county was derived from the *Estimated Water Use Report* (SWFWMD, 2005a). Population and per capita water use was obtained from historical data previously collected and analyzed by the District or from data provided as part of the District's water supply planning process.

### 2.2 Methodology for Projecting Population

The population projections developed by the Bureau of Economic and Business Research (BEBR) are generally accepted as the standard throughout Florida. However, these projections are made at the county level only and accurate projections of future water demand require more spatially precise data. The District achieved this by developing a model that projects future permanent population growth at the census block level, distributes that growth to parcels within each block and normalizes those projections to BEBR county projections. The model is comprehensively described in the Chapter 3 Appendix.

## 3.0 2005 Base Year Water Use and Per Capita Rate

### 3.1 Base Year Water Use

The 2005 public supply base year water use for each large utility is derived by multiplying the average 2003–2007 unadjusted gross per capita rate by the 2005 estimated population for each individual utility. Base year water use for small utilities is derived by multiplying the average 2003–2007 unadjusted gross countywide per capita rate by the 2005 estimated population for the additional estimated population associated with those non-reporting utilities, contained in Table 1 of the *Estimated Water Use Report* (SWFWMD, 2005a).

## 4.0 Water Demand Projection Methodology

### 4.1 Public Supply

Water demand is projected in five-year increments from 2010 to 2030. To develop the projections, the District used the 2003–2007 average per capita rate multiplied by the projected population for that increment. An additional component of public water supply demand is water derived from domestic wells for irrigation. These wells have a diameter of less than 6", do not require a water use permit and are used for irrigation at residences that receive potable water for indoor use from a utility. These wells are addressed in a separate report entitled *Southwest Florida Water Management District Irrigation Well Inventory* (D.L. Smith and Associates, 2004). This report provides the estimated number of domestic irrigation wells within the District and their associated water demand. The District estimates that approximately 300 gpd are used for each well.

4.2 Domestic Self-Supply

Domestic self-supply population is categorized as any current and future functional population parcel projections developed using the District's GIS population projection model (GIS Associates, Inc., 2008 and GIS Associates, Inc., 2009) that are not within a water utility retail service area.

5.0 Water Demand Projections

Table 3-1 shows the projected public supply demand for the planning period. The table shows that demand will increase by 45 mgd for the 5-in-10 condition. The projections are generally consistent with those of the District's 2006 RWSP (SWFWMD, 2006). However, there are significant differences, some of which can be attributed to utilities that submitted alternative projections as part of the water use permit renewal process that were justifiable, based on historical regression data and long-term trends, and supported by complete documentation. Other differences in the projections from those in the 2006 RWSP can be attributed to changes in methodology for the per capita rate used, the change in methodology and threshold for the large utility category and the general trend of decreases in per capita water use reported by permittees.

6.0 Stakeholder Review

Population and water demand projection methodologies, results and analyses were provided to the District's water use regulation staff and public water use stakeholders for review. Changes suggested by stakeholders were incorporated only if they were based on historical regression data and long-term trends and supported by complete documentation.

*Residential landscaping can be designed to greatly reduce the need for supplemental irrigation.*

Table 3-1. *Projected increase in public supply demand including public supply, domestic self-supply and private irrigation wells in the Southern Planning Region (5-in-10 and 1-in-10) (mgd)*

| County | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Increase | | % Increase | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 |
| Charlotte | **18.2** | **19.3** | 1.8 | 1.9 | 1.4 | 1.5 | 1.4 | 1.4 | 1.3 | 1.4 | 1.1 | 1.2 | **7.0** | **7.4** | **38.4%** | **38.3%** |
| DeSoto | **3.1** | **3.3** | 0.6 | 0.7 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | **1.4** | **1.5** | **45.1%** | **45.4%** |
| Manatee | **40.8** | **43.2** | 7.4 | 7.9 | 3.8 | 4.0 | 3.5 | 3.8 | 3.4 | 3.5 | 3.1 | 3.4 | **21.2** | **22.6** | **51.9%** | **52.3%** |
| Sarasota | **38.1** | **40.4** | 3.1 | 3.3 | 3.6 | 3.8 | 3.1 | 3.3 | 3.0 | 3.2 | 2.6 | 2.7 | **15.4** | **16.3** | **40.4%** | **40.3%** |
| **Incremental Increase** | **n/a** | **n/a** | **12.9** | **13.8** | **9.1** | **9.6** | **8.2** | **8.6** | **7.8** | **8.3** | **7.0** | **7.5** | **45.0** | **47.8** | **44.9%** | **45.0%** |

***Water used for landscape irrigation in the planning region is a large component of current public supply use and future demand.***

### Section 2. Agriculture

1.0 Description of the Agricultural Water Use Category

Agriculture represents the second largest category of water use in the District. Included in this category are irrigated crops and other miscellaneous water uses associated with agricultural commodity production. Irrigated acreage was determined for the following commodities: (1) citrus, (2) vegetables, melons and berries (cucumbers, melons, potatoes, strawberries, tomatoes, other vegetables and row crops), (3) field crops, (4) greenhouse/nursery, (5) sod and (6) pasture. Projected water demand associated with aquaculture, dairy, poultry, swine, etc., are reported as "miscellaneous."

*Large industrial farming operations in Manatee County use large quantities of groundwater to grow crops such as tomatoes and cucumbers.*

2.0 Water Demand Projection Methodology

Demand projections for irrigated commodities were determined by multiplying projected irrigated acreage by the irrigation requirements of each commodity. Acreage projections were formulated based on a cumulative review of the information through GIS/permitting analysis, analysis of historical Florida Agricultural Statistics Service (FASS) data, and other sources using a base year of 2005. The District's GIS resources were used to compare the agricultural water use permitting information and land use/land cover property appraiser parcel data for each county and to record the future land use for each parcel and permitted area. The acreage increases were limited by the total available remaining land and total permitted quantity of water. This method attempted to account for land-use transition between agriculture and residential, commercial or industrial use, and a land-use conversion trend was determined. Aerial photography provided another layer of information for land use/land cover analysis and commodity category determination.

3.0 Water Demand Projections

Trends indicate that agricultural activities are expected to remain at or near their current levels Districtwide during the planning period. These trends include declining or stable land costs, a reduced pace of urban development and enhanced focus by the agricultural industry on solutions to destructive insect and disease outbreaks.

In 2010, 123.9 mgd will be utilized to irrigate 136,600 acres of agricultural commodities. During the planning period, irrigated acreage is expected to increase slightly by approximately two percent, or 2,600 acres. Citrus will remain the predominant crop category and will increase by 3,700 acres. The majority of citrus acreage in the planning region, 73,000 acres, is located in DeSoto County. Other major commodities in the region include tomatoes, sod and other vegetables/row crops.

Table 3-2a is the projected increase in agricultural irrigation demand for the 5-in-10 and 2-in-10 conditions for the planning period. For the 5-in-10 condition, demand is projected to increase from 117.8 in 2005 to 125.1 mgd in 2030, an increase of 7.3 mgd, or 6.2 percent. Table 3-2b is the projected decrease in agricultural irrigation demand for the 5-in-10 and 2-in-10 conditions for the planning period. For the 5-in-10 condition, a decrease in demand of 3.7 mgd is projected. This reduction in demand represents a reduction in the use of groundwater, which is tracked separately and not subtracted from the increase in demand. This is because increases in agricultural demand may be met with alternative sources or conservation. The retired groundwater quantities may be reallocated for mitigation of new groundwater permits for other use categories and/or permanently retired to help meet environmental restoration goals.

4.0 Stakeholder Review

The agricultural water demand projection methodology, results and analyses were provided to the District's water use regulation staff and agricultural stakeholders for review. Changes suggested by stakeholders were incorporated only if they were based on historical regression data and long-term trends and supported by complete documentation. Review of the commodity acreages by agricultural experts was varied. Some believed that for some commodities in some counties the projections were too high; others, too low. The District reviewed these comments, compared them to the methods used to produce the irrigated acreage projections for the 2006 RWSP, and made revisions where appropriate. The general consensus after public comment was that citrus acreage projections were unrealistically low and should be revisited. As a result, the citrus projections were revised based on a combination of historical FASS data and knowledge of emerging trends.

*The efficiency of agricultural irrigation has greatly increased through the use of water-saving technologies such as microjet irrigation.*

Table 3-2a. *Projected increase in agricultural irrigation demand in the Southern Planning Region (5-in-10 and 2-in-10) (mgd)*

| County | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Increase | | % Increase | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 |
| **Charlotte** | **11.2** | **14.5** | 1.8 | 2.8 | 0.1 | 0.2 | 0.04 | 0.1 | 0.04 | 0.1 | 0.04 | 0.1 | **2.0** | **3.3** | **18.0%** | **22.0%** |
| **DeSoto** | **60.2** | **89.7** | 3.9 | 5.6 | - | - | - | - | - | - | - | - | **3.9** | **5.6** | **6.4%** | **6.2%** |
| **Manatee** | **40.1** | **54.4** | 0.5 | 0.7 | - | - | - | - | - | - | 1.0 | - | **1.5** | **0.7** | **3.5%** | **1.3%** |
| **Sarasota** | **6.2** | **8.8** | - | - | - | - | - | - | - | - | - | - | **0.0** | **0.0** | **0.0%** | **0.0%** |
| **Incremental Increase** | **n/a** | **n/a** | **6.2** | **9.1** | **0.1** | **0.2** | **0.04** | **0.1** | **0.04** | **0.1** | **1.0** | **0.1** | **7.4** | **9.6** | **6.2%** | **5.6%** |

Table 3-2b. *Projected decrease in agricultural irrigation demand in the Southern Planning Region (5-in-10 and 2-in-10) (mgd)*

| County | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Decrease | | % Decrease | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 | 5-10 | 2-10 |
| **Charlotte** | **11.2** | **14.5** | - | - | - | - | - | - | - | - | - | - | **0.0** | **0.0** | **0.0%** | **0.0%** |
| **DeSoto** | **60.2** | **89.7** | - | - | -0.3 | -0.5 | -0.3 | -0.4 | -0.1 | -0.1 | -0.02 | -0.03 | **-0.7** | **-1.0** | **1.1%** | **1.2%** |
| **Manatee** | **40.1** | **54.4** | - | - | -0.7 | -1.0 | -1.2 | -1.7 | -0.7 | -1.1 | - | -0.05 | **-2.6** | **-3.8** | **6.6%** | **7.0%** |
| **Sarasota** | **6.2** | **8.8** | -0.2 | - | -0.05 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.05 | - | **-0.4** | **-0.2** | **6.1%** | **2.5%** |
| **Incremental Decrease** | **n/a** | **n/a** | **-0.2** | **-** | **-1.0** | **-1.6** | **-1.6** | **-2.2** | **-0.9** | **-1.3** | **-0.1** | **-0.1** | **-3.7** | **-5.1** | **3.1%** | **3.1%** |

### Section 3. Industrial/Commercial, Mining/Dewatering and Power Generation (I/C,M/D,PG)

*A dragline mining phosphate ore in the southern portion of the District.*

1.0 Description of the I/C,M/D,PG Water Use Category

I/C,M/D,PG uses within the District include chemical manufacturing, food processing and miscellaneous industrial and commercial uses. Much of the water used in food processing is for citrus and other agricultural commodities. Chemical manufacturing is associated with phosphate mining and consists mainly of phosphate processing. Water for thermoelectric power generation is used for cooling or other purposes associated with the generation of electricity. M/D water use is associated with a number of products mined in the District, including phosphate, limestone, sand and shell.

2.0 Demand Projection Methodology

Demand projections were developed by multiplying the amount of water permitted to each I/C,M/D,PG facility by the percentage of permitted quantities historically used in the category in each county. The permitted quantity for each facility was the value contained in the District's Water Management Information System (WMIS) in October 2008 (SWFWMD, 2008a). The percentage of the permitted quantity historically used in each county was calculated by dividing total estimated county use by the county's permitted quantity in each category for the years 2001 through 2006, using data from the District's estimated water use reports. During this six-year period, 38.2 percent of M/D permitted quantities and 42.1 percent of I/C permitted quantities were actually reported as used Districtwide. However, the percentage of permitted quantity actually used in the I/C and M/D categories varies significantly from county to county. When data was available, the percentage of the permitted quantity actually used by each PG water use permittee was used to project water demand on a permit-by-permit basis. When individual power plant data was not available, the Districtwide average use for PG was used.

When the 2001 RWSP was completed, it was noted that the District had experienced a tremendous amount of volatility in the number of I/C and M/D water use permits in a short period of time. A comparison of currently existing water use permits with those that existed when the demand projections were compiled for the 2006 RWSP indicates that permit volatility remains a significant factor. There were 426 I/C and M/D water use permits as of October 2008. This number includes 90 newly issued permits not in existence in 2005, 63 that were not captured in 2005 and 90 that existed in 2005 but have since been deleted. This equates to a net change of 57 percent in total permits since data for the 2006 RWSP was compiled. Therefore, permit volatility must be considered when attempting to project water demand over a 20-year period. Because of permit volatility, it is conceivable, even probable, that new permits have been issued and others have been deleted or expired since October 2008. Thus, the 2010 projections are based on a “snapshot in time.”

## 3.0 Water Demand Projections

Table 3-3a is the projected increase in I/C,M/D,PG water demand for the planning period. Demand is projected to increase from 6.4 mgd in 2005 to 8.7 mgd in 2030, an increase of 2.3 mgd, or 35.9 percent. As higher-quality phosphate reserves are mined out in the Heartland Planning Region, the mining industry will expand operations in the Southern Planning Region, which will result in an increase in demand. Due to the projection method used, the quantity permitted is a key factor in calculating future demand. For several years, the permitted quantity in the I/C and M/D sectors has been declining. Much of this reduction is due to revisions in the way permitted quantities for M/D are allocated by the District's Water Use Permitting Department. Non-consumptive dewatering uses are no longer included in permitted quantities. For the 2006 RWSP, demand was calculated based on a Districtwide permitted quantity of 396.8 mgd, while demand for the 2010 RWSP was calculated based on a Districtwide permitted quantity of 273.2 mgd, a reduction of 123.6 mgd, or 31 percent. As a result, projected demand in the 2010 RWSP is lower than was projected in the 2006 RWSP, even though the 2010 projections include all 16 counties. The 2005 projections only included the 10 southern counties. Additionally, mining quantities permitted for product entrainment were not included in the 2010 demand projections because the District considers such quantities incidental to the mining process and not part of the actual water demand, i.e., the quantities necessary to conduct the mining operation. Eliminating entrainment quantities reduced projected demand through the planning period by approximately 1.4 mgd Districtwide.

Table 3-3a. *Projected increase in industrial/commercial, mining/dewatering, power generation demand in the Southern Planning Region (5-in-10)[1] (mgd)*

| County | 2005 Base | 2005–2010 | 2010–2015 | 2015–2020 | 2020–2025 | 2025–2030 | Total Increase | % Increase |
|---|---|---|---|---|---|---|---|---|
| **Charlotte** | **0.8** | - | - | - | - | - | **0.0** | **0.0%** |
| **DeSoto** | **0.2** | - | - | - | - | - | **0.0** | **0.0%** |
| **Manatee** | **4.3** | 1.6 | 0.2 | 0.1 | 0.2 | 0.2 | **2.3** | **53%** |
| **Sarasota** | **1.1** | - | - | - | - | - | **0.0** | **0.0%** |
| **Incremental Increase** | **n/a** | **1.6** | **0.2** | **0.1** | **0.2** | **0.2** | **2.3** | **35.9%** |

[1]For the I/C,M/D,PG category, water use for the 5-in-10 and 1-in-10 condition is the same.

Table 3-3b, the projected decrease in I/C,M/D,PG demand for the planning period, shows a decrease of 1.5 mgd. This is a reduction in the use of groundwater, which is tracked separately and not subtracted from the increase in demand. This is because increases in I/C,M/D,PG demand may be met with alternative sources or conservation. The retired groundwater quantities may be reallocated for mitigation of new groundwater permits for other use categories and/or permanently retired to help meet environmental restoration goals.

## 4.0 Stakeholder Review

The demand projection methodology, results and analyses were provided to the District's water use permitting staff and I/C,M/D,PG sector stakeholders for review and comment. The

3-3b. *Projected decrease in industrial/commercial, mining/dewatering, power generation demand for the Southern Planning Region (5-in-10)[1] (mgd)*

| County | 2005 Base | 2005 2010 | 2010 2015 | 2015 2020 | 2020 2025 | 2025 2030 | Total Decrease | % Decrease |
|---|---|---|---|---|---|---|---|---|
| **Charlotte** | **0.8** | -0.6 | - | - | - | - | **-0.6** | **75%** |
| **DeSoto** | **0.2** | - | - | - | - | - | **0.0** | **0.0%** |
| **Manatee** | **4.3** | - | - | - | - | - | **0.0** | **0.0%** |
| **Sarasota** | **1.1** | -09 | - | - | - | - | **-0.9** | **81.8%** |
| **Incremental Decrease** | **n/a** | **-1.5** | **-** | **-** | **-** | **-** | **-1.5** | **23.8%** |

[1]For the I/C,M/D,PG category, water use for the 5-in-10 and 1-in-10 condition is the same.

projections were reviewed by the District's Industrial Advisory Committee, which concurred with the projection methodologies and outcome. Upon receiving stakeholder comments, the District reviewed suggested changes and, if appropriate, included updates. Suggested changes were only taken into consideration if they were based on historical regression data and long-term trends and supported by complete documentation.

## *Section 4. Recreational /Aesthetic*

1.0 Description of the Recreational Aesthetic Water Use Category

The recreational/aesthetic category includes the self-supplied water use associated with the irrigation of golf courses, cemeteries, parks, medians, attractions and other large self-supplied green areas. Golf courses are the major users within this category. Recreational/aesthetic water use projections are based largely on historical trends.

***The demand for water for recreation/aesthetic purposes in the Southern Planning Region is expected to increase by nearly 12 mgd during the planning period.***

2.0 Demand Projection Methodology

2.1 Golf Courses

Golf course demands are based on the average water use per hole by county and a projection of golf course growth. The average golf course water use from 2003 through 2007 for permitted golf courses in the District was used to calculate the average gallons per day per hole. Growth in golf course holes was projected for each county from 2005 to 2030 using a linear extrapolation from a linear regression. The number of golf course holes for each county was statistically significant at over a 90 percent confidence level when compared to a straight-line trend to 2030. That confidence level, together with the historical trend, provided the basis for the assumption that the trend could continue through 2030. The average annual water use per hole by county was multiplied by the future growth in golf course holes to project demand.

### 2.2 Landscapes

Landscape water use includes irrigation for parks, medians, attractions, cemeteries and other large self-supplied green areas. For each county, per capita water use, expressed in gallons per day per person, was obtained from a five-year average (2003 through 2007) of the published estimated landscape water use from the District's *Estimated Water Use Report*. Estimates of population growth from 2005 to 2030 were obtained from the District's public supply demand projections. The population projections were multiplied by the per capita landscape water use to estimate aesthetic demand by county. The District's average per capita water use for green space irrigation is 6.7 gallons per day per person.

## 3.0 Water Demand Projections

Table 3-4 is the projected increase in recreational/aesthetic demand for the planning period. The table shows an increase in demand of 11.6 mgd for the 5-in-10 condition. It is apparent that current economic conditions are having an effect on golf course growth because the growth rate has decreased compared to what was documented in the 2006 RWSP. Reclaimed water has made a definite impact on golf course water use and this should continue into the future. Most recreational/aesthetic water use occurs near major population centers in the coastal counties where large quantities of reclaimed water can be used to offset the use of potable water for this category. Reclaimed water use for recreational/aesthetic irrigation in these counties is more than 14 mgd, with an offset of more than 10 mgd of potable-quality water supply.

Charlotte, Sarasota and Manatee counties have more than 2,100 golf course holes. The slowing of growth in these counties as a result of the current economic downturn will reduce future demand for water for the recreational/aesthetic water use category. DeSoto County has only 54 golf course holes and is not anticipated to be a significant user of water for golf course irrigation during the planning period. Aesthetic water demand in the region ranges from 5.2 to 11.5 gallons per person per day. The wide variation in use for aesthetic irrigation is probably due to weather, soils and conservation efforts that include the use of reclaimed water.

## 4.0 Stakeholder Review

The demand projection methodology, results and analyses were provided to the District's water use permitting staff and recreational/aesthetic use sector stakeholders for review and comment. Comments and suggested changes were only taken into consideration if they were based on historical regression data and long-term trends and supported by complete documentation.

Table 3-4. *Projected increase in recreational/aesthetic demand in the Southern Planning Region (5-in-10 and 1-in-10) (mgd)*

| County | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Increase | | % Increase | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 |
| Charlotte | **4.6** | **5.9** | 0.3 | 0.4 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.8 | 0.6 | 0.8 | **2.7** | **3.4** | **58.7%** | **56.0%** |
| DeSoto | **0.6** | **0.8** | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | **0.2** | **0.3** | **33.3%** | **50.0%** |
| Manatee | **9.1** | **11.7** | 1.0 | 1.2 | 0.8 | 1.1 | 0.9 | 1.0 | 0.8 | 1.1 | 0.8 | 1.0 | **4.3** | **5.4** | **47.3%** | **46.2%** |
| Sarasota | **13.1** | **16.9** | 0.4 | 0.5 | 1.0 | 1.3 | 1.0 | 1.3 | 1.0 | 1.3 | 1.0 | 1.2 | **4.4** | **5.6** | **33.6%** | **33.1%** |
| **Incremental Increase** | **n/a** | **n/a** | **1.8** | **2.2** | **2.4** | **3.1** | **2.6** | **3.1** | **2.4** | **3.2** | **2.4** | **3.1** | **11.6** | **14.7** | **42.3%** | **41.6%** |

***Water used for irrigation of common areas in residential subdivisions is included in the recreational/aesthetic water use category.***

## Section 5. Environmental Restoration

*A component of environmental restoration water demand is the quantity of water needed to restore minimum flows to impacted rivers such as the Peace River in Polk County.*

### 1.0 Description of the Environmental Restoration Water Use Category

Environmental restoration comprises quantities of water that may need to be developed and/or existing quantities that need to be retired to facilitate recovery of natural systems to meet their established MFLs. Table 3-5 summarizes environmental restoration quantities that will be required for the Southern Planning Region through 2030.

### 2.0 Water Resources to Be Recovered

#### 2.1 SWUCA Saltwater Intrusion Minimum Aquifer Level (SWIMAL)

One of the requirements of the District's SWUCA recovery strategy is a 50-mgd reduction in groundwater withdrawals that is expected to result in achievement of the SWIMAL in the Upper Floridan aquifer. It is anticipated that this demand will be met between 2005 and 2025, primarily by a gradual

Table 3-5. *Projected increase in environmental restoration demand for the Southern Planning Region (mgd)*

| Water Resource to be Recovered | 2005 2010 | 2010–2015 | 2015–2020 | 2020–2025 | 2025–2030 | Total Increase |
|---|---|---|---|---|---|---|
| **SWIMAL (SWUCA)[1]** | 5.9 | 4.0 | 4.0 | 4.0 | - | **17.9** |
| **Shell Creek** | TBD | TBD | TBD | TBD | - | **TBD** |
| **Incremental Increase** | **5.9** | **4.0** | **4.0** | **4.0** | **-** | **17.9 +** |

[1]Of the 50-mgd demand anticipated to be needed for recovery, a reduction of 13.7 mgd was accomplished by the end of 2008. Additional demand should be achieved by the end of 2010 and is included in the 2010 column. The remainder of the demand was divided over five-year increments, starting in 2015 and ending in 2025.

reduction in agricultural groundwater use resulting from water conservation efforts and as agricultural lands are replaced by urban land uses that will be supplied by alternative sources. If reductions in groundwater withdrawals are optimally distributed throughout the SWUCA, the SWIMAL may be achieved with less than 50 mgd in reductions. The 50-mgd SWIMAL demand was allocated to the planning regions based on the percentage of estimated groundwater use in the SWUCA in each region from 2000 to 2007. The required reduction in groundwater withdrawals for the portion of the SWUCA in the Southern Planning Region is 17.9 mgd. It is estimated that a reduction of 5.9 mgd will have occurred in the region by 2010, leaving a reduction of 12.0 mgd to be achieved between 2010 and 2025. Since this reduction is likely to occur gradually, it is divided into increments of 4.0 mgd in each five-year time increment from 2010 to 2025.

2.2 Shell Creek

Shell Creek, located in Charlotte County in the SWUCA, was impounded in the mid-1960s to create a reservoir to supply drinking water to the City of Punta. Preliminary studies undertaken in support of minimum flow development indicate that actual flows in Shell Creek are below proposed minimums during portions of the dry season. Therefore, a recovery strategy will be required. The quantity of water needed for restoration will be determined once minimum flow studies for Shell Creek have been completed.

### *Section 6. Summary of Projected Increases and Decreases in Demand*

Tables 3-6a and 3-6b summarize the projected increases and decreases in demand respectively for the 5-in-10 and 1-in-10 conditions for use categories in the planning region. Increases and decreases in demand are tracked separately. Decreases in demand represent a reduction in the use of groundwater, which can be available for mitigation of new groundwater permits and/or permanently retired to help meet environmental restoration goals.

Table 3-7 summarizes the projected increases in demand for each county in the planning region for the 5-in-10 condition. Table 3-6a shows that 84.1 mgd of additional water supply will need to be developed and/or existing use retired to meet demand in the planning region through 2030 for the 5-in-10 condition. Public supply water use will increase by 45.0 mgd during the planning period, which accounts for 53 percent of the projected increase. Environmental restoration is next at 17.9 mgd, or 21 percent of the projected increase. Table 3-6b shows a decrease of approximately 5.3 mgd in agricultural and I/C,M/D,PG water use for the 5-in-10 condition, most of which is groundwater. The 17.9 mgd reduction in groundwater withdrawals necessary to meet the SWIMAL in the SWUCA could be partially offset by the projected 5.3 mgd decrease in groundwater use.

### *Section 7. Comparison of Demands Between the 2006 RWSP and the 2010 RWSP*

The largest difference between the 2006 and 2010 RWSP demand projections is in the agricultural water use category. The 2006 RWSP projected a decline of nearly 64 mgd for the 2000–2025 planning period, while the 2010 projections showed a small net increase for the 2005–2030 planning period. The largest difference was in DeSoto County where the 2006 RWSP projected a decline of 35.3 mgd while the 2010 RWSP projected a small net increase. The 2006 RWSP also projected a large decline in Manatee County for the planning period of approximately 23 mgd, which was attributed to a 49 percent decrease in citrus acreage. The 2010 RWSP projected a small net decrease for the planning period. Because the 2006 RWSP was developed during the peak of the residential housing boom, the difference is probably due to the over-projection in the 2006 RWSP of the amount of agricultural land that would be replaced by residential and commercial uses in the county. The next largest difference is in the public supply water use category. The 2006 RWSP projected an increase of more than 57 mgd for the 2000–2025 planning period while the 2010 projections showed an increase of 45 mgd from 2005–2030. The explanation for the difference is also related to the fact that the 2006 RWSP was developed during the peak of the residential housing boom. The economic downturn that followed in subsequent years resulted in significantly lower population growth projections, which directly translates to a decline in projected water demand. The 2006 and 2010 RWSP demand projections for the I/C,M/D,PG and recreational/aesthetic categories are relatively similar.

Table 3-6a. *Summary of the projected increase in demand in the Southern Planning Region (5-in-10 and 1-in-10)[1] (mgd)*

| Water Use Category | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Increase | | % Increase | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 |
| Public Supply | 100.2 | 106.2 | 12.9 | 13.8 | 9.1 | 9.6 | 8.2 | 8.6 | 7.8 | 8.3 | 7.0 | 7.5 | 45.0 | 47.8 | 44.9% | 35.6% |
| Agriculture | 117.8 | 167.4 | 6.1 | 9.1 | 0.1 | 0.2 | 0.04 | 0.06 | 0.04 | 0.06 | 1.0 | 0.08 | 7.3 | 9.5 | 6.2% | 5.6% |
| I/C,M/D,PG | 6.3 | 6.3 | 1.6 | 1.6 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 2.3 | 2.3 | 36.5% | 36.5% |
| Recreation | 27.4 | 35.3 | 1.8 | 2.2 | 2.4 | 3.1 | 2.6 | 3.1 | 2.4 | 3.2 | 2.4 | 3.1 | 11.6 | 14.7 | 42.3% | 42.0% |
| Restoration | n/a | n/a | 5.9 | 5.9 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 0.0 | 0.0 | 17.9 | 17.9 | n/a | n/a |
| Incremental Increase | n/a | n/a | 28.3 | 32.6 | 15.8 | 17.1 | 14.9 | 15.9 | 14.4 | 15.8 | 10.6 | 10.9 | 84.1 | 92.3 | n/a | n/a |
| Cumulative Increase | 251.7 | 315.2 | 280.0 | 347.8 | 295.8 | 364.9 | 310.7 | 380.8 | 325.1 | 396.6 | 335.7 | 407.5 | 84.1 | 92.3 | 33.5% | 29.2% |

[1]Agriculture quantities in the 1-in-10 column are actually 2-in-10.

Table 3-6b. *Summary of the projected decrease in demand in the Southern Planning Region (5-in-10 and 1-in-10)[1] (mgd)*

| Water use Category | 2005 Base | | 2005–2010 | | 2010–2015 | | 2015–2020 | | 2020–2025 | | 2025–2030 | | Total Decrease | | % Decrease | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 | 5-10 | 1-10 |
| Public Supply | 100.2 | 106.2 | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 | 0.0% | 0.0% |
| Agriculture | 117.8 | 167.4 | -0.16 | - | -1.1 | -1.6 | -1.5 | -2.2 | -0.9 | -1.2 | -0.07 | -0.08 | -3.7 | -5.1 | 3.1% | 3.0% |
| I/C,M/D,PG | 6.3 | 6.3 | -1.5 | -1.5 | - | - | - | - | - | - | - | - | -1.5 | -1.5 | 23.8% | 23.8% |
| Recreation | 27.4 | 35.3 | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 | 0.0% | 0.0% |
| Restoration | n/a | n/a | - | - | - | - | - | - | - | - | - | - | 0.0 | 0.0 | n/a | n/a |
| Incremental Decrease | n/a | n/a | -1.7 | -1.5 | -1.1 | -1.6 | -1.5 | -2.2 | -0.9 | -1.2 | -0.07 | -0.08 | -5.3 | -6.6 | 2.1% | 2.1% |

[1]Agriculture quantities in the 1-in-10 column are actually 2-in-10.

Table 3-7. *Summary of the projected increase in demand for counties in the Southern Planning Region (5-in-10) (mgd)*

| Water Use Category | Planning Period | | | | | | Total Increase | |
|---|---|---|---|---|---|---|---|---|
| | 2005 Base | 2005–2010 | 2010–2015 | 2015–2020 | 2020–2025 | 2025–2030 | mgd | % Increase |
| **Charlotte** | | | | | | | | |
| **Agriculture** | 11.2 | 1.78 | 0.12 | 0.04 | 0.04 | 0.04 | **2.02** | **18.0%** |
| **I/C,M/D,PG** | 0.8 | - | - | - | - | - | **-** | **-** |
| **Public Supply** | 18.2 | 1.8 | 1.4 | 1.4 | 1.3 | 1.1 | **7.0** | **38.5%** |
| **Rec/Aesthetic** | 4.6 | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 | **2.7** | **58.7%** |
| **Environmental Restoration[1]** | n/a | TBD | TBD | TBD | TBD | - | **TBD** | **n/a** |
| **Incremental Increase** | **n/a** | **3.9** | **2.1** | **2.0** | **1.9** | **1.7** | **11.6** | **n/a** |
| **Cumulative Increase** | **34.8** | **38.7** | **40.8** | **42.8** | **44.7** | **46.4** | **11.6** | **33.3%** |
| **DeSoto** | | | | | | | | |
| **Agriculture** | 60.21 | 3.9 | - | - | - | - | **3.9** | **6.5%** |
| **I/C,M/D,PG** | 0.2 | - | - | - | - | - | **-** | **-** |
| **Public Supply** | 3.1 | 0.6 | 0.3 | 0.2 | 0.1 | 0.2 | **1.4** | **45.2%** |
| **Rec/Aesthetic** | 0.6 | 0.1 | - | 0.1 | - | - | **0.2** | **33.3%** |
| **Environmental Restoration[1]** | n/a | TBD | TBD | TBD | TBD | - | **TBD** | **n/a** |
| **Incremental Increase** | **n/a** | **4.6** | **0.3** | **0.3** | **0.1** | **0.2** | **5.5** | **n/a** |
| **Cumulative Increase** | **64.1** | **68.7** | **69.0** | **69.3** | **69.4** | **69.6** | **5.5** | **8.6%** |
| **Manatee** | | | | | | | | |
| **Agriculture** | 40.15 | 0.45 | - | - | - | 0.95 | **1.4** | **3.5%** |
| **I/C,M/D,PG** | 4.3 | 1.6 | 0.2 | 0.1 | 0.2 | 0.2 | **2.3** | **53.5%** |
| **Public Supply** | 40.8 | 7.4 | 3.8 | 3.5 | 3.4 | 3.1 | **21.2** | **52.0%** |
| **Rec/Aesthetic** | 9.1 | 1.0 | 0.8 | 0.9 | 0.8 | 0.8 | **4.3** | **47.2%** |
| **Environmental Restoration[1]** | n/a | TBD | TBD | TBD | TBD | - | **TBD** | **n/a** |
| **Incremental Increase** | **n/a** | **10.4** | **4.8** | **4.5** | **4.4** | **5.1** | **29.2** | **n/a** |
| **Cumulative Increase** | **94.3** | **104.7** | **109.5** | **114.0** | **118.4** | **123.5** | **29.2** | **30.1%** |
| **Sarasota** | | | | | | | | |
| **Agriculture** | 6.25 | - | - | - | - | - | **0.0** | **-** |
| **I/C,M/D,PG** | 1.1 | - | - | - | - | - | **-** | **-** |
| **Public Supply** | 38.1 | 3.1 | 3.6 | 3.1 | 3.0 | 2.6 | **15.4** | **40.4%** |
| **Rec/Aesthetic** | 13.1 | 0.4 | 1.0 | 1.0 | 1.0 | 1.0 | **4.4** | **33.6%** |
| **Environmental Restoration[1]** | n/a | TBD | TBD | TBD | TBD | - | **TBD** | **n/a** |
| **Incremental Increase** | **n/a** | **3.5** | **4.6** | **4.1** | **4.0** | **3.6** | **19.8** | **n/a** |
| **Cumulative Increase** | **58.5** | **62.0** | **66.6** | **70.7** | **74.7** | **78.3** | **19.8** | **33.8%** |

[1]The environmental restoration quantity in the planning region for the SWIMAL is 17.9 mgd. This quantity has not been proportioned by county and, therefore, it has not been included in the table. Additional restoration quantities may be required for the restoration of Shell Creek.

# Chapter 4: Evaluation of Water Sources

This chapter presents the results of the District's investigations to quantify the amount of water that is potentially available from all sources of water within the planning region to meet demands through 2030. Sources of water that were evaluated include surface water, stormwater, reclaimed water, seawater desalination, brackish groundwater desalination, fresh groundwater and conservation. Aquifer storage and recovery (ASR) is also discussed as a storage option with great potential to maximize the utilization of surface water and reclaimed water. The amount of water that is potentially available from these sources is compared to the demand projections for the planning region presented in Chapter 3, and a determination is made as to the sufficiency of the sources to meet demand through 2030.


*Desalinated brackish groundwater is a significant water supply source for a number of municipalities in the Southern Planning Region.*

## Part A. Evaluation of Water Sources

In 2006, approximately 78 percent (239 mgd) of the 307 mgd of water used in the planning region was from groundwater sources. For the 2010 Regional Water Supply Plan (RWSP), as was the case for the 2006 and 2001 RWSPs, it is assumed that the majority of new water supply needed to meet projected demands during the planning period will come from sources other than fresh groundwater. This assumption is based largely on the impacts of groundwater withdrawals on water resources in the Southern Water Use Caution Area (SWUCA), discussed in Chapter 2, and previous direction from the Governing Board. Limited additional fresh groundwater supplies will be available from the surficial and intermediate aquifers and possibly from the Upper Floridan aquifer, subject to a rigorous, case-by-case permitting review.

Water users throughout the region are increasingly implementing conservation measures to reduce their water demands. Such conservation measures will enable water supply systems to support more users with the same quantity of water and hydrologic stress. However, the region's continued growth will require the development of additional alternative sources such as reclaimed water, brackish groundwater, seawater and surface water with off-stream reservoirs or ASR systems for storage. To facilitate the development of these projects, the District encourages partnerships between neighboring municipalities and counties. The following discussion summarizes the status of the evaluation and development of various water supply sources and the potential for those sources to be used to meet the projected water demand in the planning region.

## Section 1. Surface Water/Stormwater

*The dam on the Manatee River has created a reservoir that is a major water-supply source for Manatee County.*

The major river/creek systems in the planning region include the Braden, Manatee, Myakka and Peace rivers, Myakkahatchee, Shell, Owen, Horse, Prairie and Joshua creeks, and Cow Pen Slough. Major public supply utilities use the Braden, Manatee and Peace rivers and Myakkahatchee and Shell creeks. The Braden and Manatee rivers and Shell Creek have in-stream dams that form reservoirs for storage. The potential yield for all rivers will ultimately be constrained by their minimum flows once they are established; however, yields associated with rivers that have in-stream impoundments also depend on the degree of structural alteration that has occurred and the habitat that is supported by the flows. The City of Bradenton utilizes the Evers Reservoir on the Braden River for public supply and diverted an average of 5.8 mgd per year for the period 2003–2007. Manatee County withdrew an average of 30.0 mgd from 2003 to 2007 from Lake Manatee, which is an in-stream impoundment on the Manatee River. The City of Punta Gorda's average withdrawal from the Shell Creek reservoir from 2003 to 2007 was 4.6 mgd.

### 1.0 Criteria for Determining Potential Water Availability

The available yield for each river was calculated using its established minimum flow and/or hydrodynamic modeling (if available) and its current permitted allocation. If the minimum flow for a river was not yet established or a hydrodynamic model was not available, planning-level minimum flow criteria were utilized. A five-step process was used to estimate potential surface water availability that included: (1) estimation of unimpacted flow, (2) selection of the period used to quantify available yield, (3) application of minimum flow or planning level criteria, (4) consideration of existing legal users and (5) application of engineering limitations. The amount of water that can be developed in the future will depend on adopted minimum flows and the permitting process. A more detailed explanation of the methodology is contained in the Chapter 4 Appendix.

### 2.0 Overview of River/Creek Systems

#### 2.1 Manatee River

The Manatee River watershed is located almost completely within Manatee County and encompasses nearly 330 square miles, including 83 square miles of the Braden River system. The river originates in northeast Manatee County and flows 45 miles to its mouth at the southern end of Tampa Bay. A dam was constructed on the river in 1966, impounding about six miles of the river's middle reach, forming Lake Manatee. Withdrawals from the reservoir began soon after construction. Since tidal influences reach approximately 20 miles upstream from the mouth of the river nearly to the dam, no stream-gauging stations are in place downstream of the dam. Lake Manatee is operated as a public water supply reservoir by the Manatee County Utility Department. The adjusted annual average flow for the period from 1982–2003 is 117 mgd (182 cfs). However, this value might not be completely reliable. The utility holds water in the reservoir during the dry season and releases large quantities during the wet season due to the limited storage capacity of the reservoir. This skews the flow distribution and affects the calculated potential withdrawal amounts. The utility is permitted for average annual withdrawals of 34.9 mgd. A citrus grove is permitted to withdraw 0.06 mgd from the East Fork of the Manatee River. Total average annual diversions from 2003 to 2007 were 30 mgd. Based on existing withdrawals and the planning level minimum flow criteria, an additional 2.2 mgd is potentially available from the river.

### 2.2 Braden River

The Braden River discharges to the tidal reaches of the Manatee River about eight miles south of Tampa Bay. From its confluence with the Manatee River, the river extends seven miles southeasterly and then about 12 miles easterly to its headwaters. The upper reaches consist of channelized tributaries in central Manatee County. No gauging stations exist on the Braden River. A water supply reservoir, Ward Lake (38 acres), was created in 1938 by damming the river just south of State Road 70. The reservoir was enlarged in 1985 and renamed the Bill Evers Reservoir (230 acres). The river is tidally influenced below the dam. The adjusted average annual discharge from 1993 to 2003 at the Braden River was 68.7 mgd (107 cfs). Bradenton Utilities is permitted to withdraw an average of 6.95 mgd. Average annual withdrawals from 2003 to 2007 were 5.8 mgd. Based on existing withdrawals and planning level minimum flow criteria, an additional 1.6 mgd is potentially available from the river.

### 2.3 Cow Pen Slough

The Cow Pen Slough watershed encompasses approximately 63 square miles in Sarasota County and 9.5 square miles in Manatee County. Land use in the upper part of the watershed is primarily agricultural and primarily urban in the lower part. Runoff from the watershed is conveyed through 14 miles of improved channel and outfalls into Dona Bay. Historically, a large portion of the upper watershed discharged into the Myakka River. In the 1960s, the slough was channelized to improve conditions for agricultural development. This alteration resulted in the diversion of flows from the Myakka River and has contributed to excess freshwater flows entering Dona Bay, which has disrupted the natural freshwater/saltwater regime in the estuary. Two flood-control structures are located on Cow Pen Slough, one just north of Laurel Road and the other just south of State Road 72. Minimum flows have been adopted for Cow Pen Slough.

It is anticipated that future environmental restoration efforts in the watershed will focus on preventing the excess freshwater flows from entering Dona Bay. Through the diversion and capture of these excess flows, opportunities for water supply development will be created, which will help to advance environmental restoration efforts. There is limited flow data available on Cow Pen Slough. As part of the District's efforts to establish MFLs, flow measurements on the Slough were initiated in 2003. Flows from 1985 to 2005 were estimated to average 32.9 mgd (50.9 cfs) and were based on a model calibrated to the flows in the Myakka River. No permitted withdrawals exist on Cow Pen Slough. The peer review panel for the Cow Pen Slough MFL recommended against direct withdrawals from the Dona Bay/Shakett Creek System until such time that additional studies can be conducted in the small tributaries (Salt Creek and Fox Creek), which provide the majority of flow to the original 16-square-mile watershed below Cow Pen Slough Canal. Accordingly, the established minimum flow prohibits withdrawals from Dona Bay/Shakett Creek below CPS-2 but allows for diversion of the channelized flows from Cow Pen Slough above CPS-2. Based on the established MFL, 32.9 mgd of water supply is potentially available; however, available quantities could be reduced if excess flows are redirected during future environmental restoration efforts.

2.4 Myakka River

*A kayaker paddles the largely pristine upper Myakka River.*

The Myakka River extends 69 miles from its mouth at Charlotte Harbor, northeast to its origins in northeast Manatee County, and it has a watershed of approximately 598 square miles. Major tributaries are Myakkahatchee Creek (Big Slough Canal), Deer Prairie Slough/Creek and Owen Creek. Two lakes of significant size, Upper and Lower Myakka lakes, are located along the Myakka River and have a combined surface area of 1,380 acres. A portion of the river has been designated an Outstanding Florida Water and the segment through Sarasota County was designated a Florida Wild and Scenic River. The Myakka River watershed has undergone extensive hydrologic alteration. Over the past few decades, inflows from irrigation water applied to agricultural lands are believed to have contributed to excess water entering Flatford Swamp and other areas of the river. Along the middle portion of the river, small dams were constructed on the Upper and Lower Myakka lakes. Other flow alterations, including those at Tatum Sawgrass, Vanderipe Slough, Clay Gully, Cow Pen Slough and the Blackburn Canal, have shifted the timing of flows, drastically reduced storage areas and diverted large quantities of water out of the watershed. Seventy-three percent of the river's annual flow occurs during the wet season, and the river has a broad, seasonally inundated floodplain. Historically, during the drier periods of the year, there was no flow in the upper river. However, in the last several decades, inflows from irrigated agricultural lands have significantly increased the dry-season flow of the river and it no longer ceases flowing in the dry season. The adjusted annual average flow from 1965 to 2003 at the Myakka River near Sarasota is 163.5 mgd (253.2 cfs). This includes up to 14.5 to 17.0 mgd (22.5 to 26 cfs) of excess dry-season flow that has been estimated to occur during eight months of the year (Kelly et al., 2005) as a result of irrigation of agricultural lands. As part of efforts to restore environmentally impacted areas in the upper watershed, it will be necessary to prevent excess surface water flows from entering Flatford Swamp. Through the diversion and capture of these excess flows, opportunities for water supply development will be created, which will help to advance environmental restoration efforts. There are currently no permitted withdrawals from the river. Based on the proposed, preliminary minimum flow, an additional 41.7 mgd of water supply is potentially available from the river; however, implementation of agricultural best management practices or use of the river as a water source could reduce future surface water flows.

2.5 Myakkahatchee Creek (Big Slough Canal)

The Myakkahatchee Creek (Big Slough Canal) is a tributary to the lower Myakka River. The watershed covers approximately 195 square miles, with the largest segments in Manatee and Sarasota counties. Smaller portions of the watershed are also located in DeSoto and Charlotte counties. A tributary of the Myakka River, Myakkahatchee Creek is a channelized drainway for more than 20 miles, with the lower portion of the watershed situated in the City of North Port. In the upper reaches, land use is predominantly pasture. Near the outlet, land use is urban and residential and the many canals draining the urban areas are fitted with control structures. The annual average flow in Myakkahatchee Creek from 1981 to 2003, as measured at the structure near the withdrawal point upstream of the US 41 crossing, is 43.6 mgd (67.5 cfs). The City of North Port is permitted to withdraw an annual average of 4.4 mgd from Myakkahatchee Creek, and Charlotte Golf Partners, L.P., is permitted to withdraw an annual average of 0.8 mgd from the Cocoplum Waterway tributary. Total average annual withdrawals from 2003 to 2007 were 1.3 mgd. Pending the establishment of minimum flows and any possible withdrawals from the Myakka River, potential new withdrawals could occur from Myakkahatchee Creek, but they would have to comply with minimum flows for the Lower Myakka River. The potential yield from Myakka River listed can be considered to include any new withdrawals from Myakkahatchee Creek.

2.6 Peace River

*The lower Peace River in Charlotte County.*

The Peace River begins in the Green Swamp and flows south to Charlotte Harbor. The Peace River watershed encompasses 1,800 square miles. There are two main tributaries in the upper watershed. Peace Creek drains approximately 225 square miles in the northeast part of the watershed, serving as an outlet for several lakes near the towns of Lake Alfred and Haines City. Saddle Creek Canal drains 144 square miles in the north-west portion of the watershed in Polk County, where the dominant drainage feature is Lake Hancock. Numerous lakes are present in the area north of Bartow, ranging in size from a few to about 4,600 acres. In this area surface water drainage is ill-defined. South of Bartow to about Fort Meade, the land surface has been considerably altered by phosphate mining activities. Major tributaries south of Fort Meade include Horse, Joshua and Charlie creeks.

The major withdrawal from the Peace River is for public supply by the Peace River Manasota Regional Water Supply Authority (PRMRWSA). The PRMRWSA operates a regional water supply facility in southwest DeSoto County. Prior to its recent expansion, the facility consisted of an 85-acre off-stream reservoir, with a capacity of 625 million gallons, and 20 ASR wells. Consistent with minimum flow methodology, annual flow was calculated by summing flow at the Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee for the reference period 1985 through 2004. Adjusted annual flow was 813 mgd (1,264 cfs). The PRMRWSA is permitted to supply an annual average of 32.7 mgd from the river. In order to maximize storage in its reservoir and ASR system, the PRMRWSA is permitted to withdraw 10 percent of the total flow of the river up to a maximum of 90 mgd when the flow, as measured the previous day at the Arcadia stream gage, is above 84 mgd (130 cfs). In 2009, a new reservoir with a capacity of 6 billion gallons was completed and the capacity of the water treatment plant was expanded from 24 mgd to 48 mgd, which will enable the PRMRWSA to utilize its entire permitted quantity of 32.7 mgd. Average annual withdrawals by the PRMRWSA during the period 2003 to 2007 were 14.9 mgd and in recent years have been 20.0 mgd. In addition to the permitted PRMRWSA withdrawals, two additional permittees withdraw an annual average of 0.005 mgd and 0.06 mgd. Total average annual withdrawals from 2003 to 2007 were 14.9 mgd.

Although water supply availability for the Peace River was calculated for the Polk County Comprehensive Water Supply Plan Joint Study (Peace River Expansion Constant Supply Option) (Royal Consulting Services, Inc., 2008), the proposed minimum flow criteria available at the time the Royal report was produced were not ultimately adopted. Surface water availability in Table 4-1 was calculated using revised flow criteria that were eventually adopted by the District's Governing Board in 2010.

Projects are being developed to divert and store water from the upper Peace River during high-flow periods for release to meet minimum flows during low-flow periods. Reservations of water for these projects will affect future surface water availability. These projects include the proposed Lake Hancock Lake Level Modification Project and the Upper Peace River Resource Development Project. Flow assumptions used for the minimum flow reservations may be adjusted in the future as projects are finalized and could affect the calculations in Table 4-1.

All available surface water in the Peace River is allocated to the Southern Planning Region in Table 4-1 because more water is physically present and available downstream; however, future withdrawals from the river in the Heartland Planning Region are possible and likely. To maximize development of additional water supplies from the river, future withdrawals will need to be closely coordinated with the PRMRWSA and other users. Based on the minimum flow criteria, an additional 80.4 mgd of water supply is potentially available from the river.

2.7 Shell Creek

The Shell Creek/Prairie Creek watershed encompasses 400 square miles and empties into the lower Peace River near where the river enters Charlotte Harbor. It is the largest sub-basin in the Peace River watershed. In 1964 a dam was constructed on Shell Creek, which created an 835-acre in-stream reservoir used for municipal supply by the City of Punta Gorda. The adjusted annual average discharge from 1965 to 2003 at the reservoir is 225

Table 4-1. *Summary of current withdrawals and potential availability of water from rivers/creeks in the Southern Planning Region (mgd) based on planning level minimum flow criteria (P85/10 Percent) or the proposed or established minimum flow*

| Water Body | In-stream Impoundment | Adjusted Annual Average Flow[1] | Potentially Available Flow Prior to Withdrawal[2] | Permitted Average Withdrawal Limits[3] | Current Withdrawal[4] | Unpermitted Potentially Available Withdrawals[5] | Days/Year New Water Available | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Avg | Min | Max |
| Manatee River @ Dam | Yes | 117 | 11.7 | 35.0 | 30.0 | 2.2 | 27 | 1 | 56 |
| Braden River @ Dam | Yes | 68.7 | 6.87 | 7.0 | 5.8 | 1.6 | 72 | 17 | 118 |
| Cow Pen Slough @ I-75[7] | Yes | 20.5 | 32.9 | 0.0 | 0.0 | 32.9 | 286 | 132 | 366 |
| Myakka River @ Sarasota[8] | No | 163.5 | 41.7 | 0.0 | 0.0 | 41.7 | 359 | 325 | 366 |
| Myakkahatchee Creek @ Diversion | Yes | 43.6 | 4.4 | 4.5 | 1.3 | 0.0 | 106 | 22 | 207 |
| Peace River @ Treatment Plant[9] | No | 813 | 113.2 | 32.8 | 14.9 | 80.4 | 320 | 152 | 365 |
| Shell Creek @ Dam | Yes | 225 | 22.5 | 8.4 | 4.7 | 14.6 | 231 | 115 | 338 |
| **TOTAL** | | | | **87.7** | **56.7** | **173.4** | | | |

[1]Mean flow based on recorded USGS flow plus reported water use permit (WUP) withdrawals added back in when applicable. Maximum period of record used for rivers is 1965-2003. Flow records for Manatee River (1982-2003), Braden River (1993-2003), and Myakkahatchee Creek (1981-2003), and Peace River (1985-2004) are shorter. Cow Pen Slough was estimated based on flow data for watersheds of similar areas (1985-2005).
[2]Based on 10% of mean flow for all water bodies with the following exceptions: proposed minimum flow criteria were used to calculate potentially available quantities for Cow Pen Slough and Myakka River.
[3]Based on individual WUP permit conditions, which may or may not follow current 10% diversion limitation guidelines.
[4]Based on average reported withdrawals during 2003-2007.
[5]Equal to remainder of 10% of total flow after permitted uses allocated, with minimum flow cutoff for new withdrawals of P85 and maximum system diversion capacity of twice median flow (P50) with these exceptions: Myakka River and Cow Pen Slough estimated by subtracting permitted withdrawal limits from estimated available flow prior to withdrawal.
[6]Based on estimated number of days that any additional withdrawal is available considering current permitted quantities and withdrawal restrictions. The minimum and maximum are the estimated range of days that additional withdrawals would have been available in any particular year.[7]Dona Bay/Shakett Creek flows have been increased significantly through channelization (Cow Pen Slough Canal) of upland wetlands that used to flow to the Myakka into the headwaters of Shakett Creek. Adjusted average annual flow is for the channelized portion of Cow Pen Slough above the CPS-2 structure. Potentially available flow quantities allow for withdrawal of all flows above CPS-2, which would reduce unnatural discharges to the Dona Bay/Shakett Creek system. Excess flows may be redirected as part of environmental restoration efforts, which could reduce surface water flows.
[8]Myakka River flows have increased over time due to augmentation resulting from agricultural irrigation (source of 71% of the excess flows) and watershed alterations (source of 29% of excess flows). Potentially available flow prior to withdrawal equals the sum of the daily excess flows (capped at 130 cfs) and ten percent of the remaining daily flows at the Myakka River near Sarasota gage from June 21 to the end of February. From March 1 through June 20, withdrawals from the river are limited to the excess flows capped at 130 cfs. Implementation of agricultural best management practices or use of river as a water source could reduce future surface water flows.
[9]All available surface water is shown in Southern Planning Region, because calculation was based on flows at furthest downstream gage; however, future withdrawals in the Heartland Planning Region are possible and likely.

mgd (354 cfs). Punta Gorda Utilities is permitted for average annual withdrawals of approximately 8.0 mgd. Three withdrawals for agricultural irrigation are permitted on Shell Creek for a total annual average withdrawal of 0.26 mgd. Average annual diversions from 2003 to 2007 were 4.7 mgd. Minimum flows have been recommended and peer-reviewed; however, a recovery strategy to address low-flow periods is required and is expected to be completed by the end of 2010. Based on existing withdrawals and planning level minimum flow criteria, an additional 14.6 mgd of water is potentially available from the river.

3.0 Potential for Water Supply From Surface Water

Table 4-1 summarizes potential availability of water from rivers in the planning region. The estimated additional surface water that could potentially be obtained from rivers in the planning region ranges from approximately 31.0 mgd to 204.4 mgd. The lower end of the range is the amount of surface water that has been permitted but is currently unused (87.7 mgd minus 56.7 mgd) and the upper end includes permitted but unused quantities (31.0 mgd) plus the estimated remaining unpermitted available surface water (173.4 mgd). The estimated available flow may be significantly reduced if current excess flows in Cow Pen Slough and the Myakka River are diverted to restore natural flow conditions. Additional factors that could affect the quantities of water that are ultimately developed for water supply include the future establishment of minimum flows, the ability to develop sufficient storage capacity, variation in discharges to the river from outside sources, and the ultimate success of adopted recovery plans. Although Table 4-1 depicts available water quantities at the more downstream gages, it is possible and likely that some of the water will be developed in upstream portions of the watersheds.

### *Section 2. Reclaimed Water*

Reclaimed water is defined by the Florida Department of Environmental Protection (FDEP) as water that is beneficially reused after being treated to at least secondary wastewater treatment standards by a wastewater treatment plant (WWTP). Reclaimed water can be used in a number of ways, including decreasing reliance on potable water supplies, increasing groundwater recharge and restoring natural systems. Manatee County has developed one of the largest reclaimed water system in the planning region. As of 2005, reuse customers served by Manatee County utilized an average daily flow of more than 15 mgd of reclaimed water for agricultural, residential, golf course and other public access irrigation use. Since 1987, the District has provided nearly $46 million in cost-share funding in the planning region for 71 reclaimed water projects.

*A reclaimed water pump station.*

The benefit that can be obtained from the use of reclaimed water is governed by the concepts of utilization and offset. Utilization is the percent of treated wastewater from a WWTP that is utilized in a reclaimed water system. The utilization rate of a reclaimed water system varies by utility. Typically, only 50 to 70 percent of treated wastewater flows go to reclaimed water customers. The highest utilization rates occur in utilities in urban areas where large industries and numerous residential customers can be supplied. Utilization is also limited by seasonal supply and storage. A utility cannot expand its reuse system beyond peak flow demand, which occurs during dry periods when demand is highest, without experiencing shortages. For example, a reclaimed water system with a 1.0 mgd average annual flow normally is limited to supplying 0.5 mgd (50 percent utilization) on an annual basis. This is because during the dry season, demand for reclaimed water for irrigation can more than double.

The four main options to increase utilization beyond 50 percent include seasonal storage, system interconnects, an interruptible customer base and supplementing reclaimed water supplies with other sources. Seasonal storage is the storage of excess reclaimed water in surface reservoirs or ASR systems during the wet season when demand is low. This stored reclaimed water can be used to augment daily reclaimed water flows to meet peak demand in the dry season. System interconnects involve the transfer of reclaimed water from areas of excess supply to areas of high demand. This transferred reclaimed water can be used to augment daily reclaimed water flows to meet peak demand in the dry season. An interruptible customer base is where a utility has golf course, recreational, commercial, agricultural, industrial and other bulk customers that have multiple sources of irrigation or process water. Reclaimed water is supplied to these customers during certain times of the day and during certain seasons, but they may be requested to go “off line” and switch to backup sources during peak demand times or seasons. This enables a utility to develop a much larger customer base and maximize the utilization of reclaimed water, while avoiding the negative consequences of running out of reclaimed water during peak irrigation times/seasons. Supplementing reclaimed water supplies with other water sources such as stormwater and groundwater for short periods to meet peak demand enables systems to serve a larger customer base.

Offset is the amount of potable-quality groundwater or surface water that is replaced by reclaimed water usage. Customers tend to use more reclaimed water than potable water because reclaimed water is generally less expensive and not as restricted as potable water. For example, a single-family residence with an inground irrigation system connected to potable water uses about 300 gpd for irrigation. However, if the same single-family residence converts to an unmetered, flat rate, reclaimed water irrigation supply without day-of-week restrictions, it will use approximately two and one-half times (804 gpd) that amount. In this example, the offset rate would be 37 percent (300 gpd offset for 804 gpd reclaimed water utilization). Different types of reclaimed water uses have different offset potentials. For example, a power plant or industry using 1.0 mgd of potable water for cooling or process water will, after converting to reclaimed water, normally use about the same quantity. In this example, the offset rate would be 100 percent. Most reclaimed water utilities provide service to a wide variety of customers and, as a result, the average reclaimed water offset is approximately 65 percent. The District is actively cooperating with utilities to identify ways to increase reclaimed water utilization and offset. For example, efficiency can be further enhanced with practices such as individual metering coupled with water-conserving rates, efficient irrigation design and irrigation restrictions.

The District’s goal is to achieve a 75 percent utilization rate of all WWTP flows and offset efficiency of all reclaimed water used of 75 percent by the year 2030. This goal is intended to reduce the overuse of reclaimed water and increase potable and groundwater offsets. Opportunities may exist for utilization and offset to be even greater in some cases by utilizing methods such as customer base selection (i.e., large industrial), project type selection (i.e., recharge) and implementation of developing technologies.

1.0 Potential for Water Supply From Reclaimed Water

Table 4-2 provides information on the current and future availability of reclaimed water in the planning region and the potential to achieve potable-quality water offsets through 2030. In 2005, there were 31 WWTPs in Manatee, Sarasota, Charlotte and DeSoto counties that collectively produced 69.2 mgd of wastewater. Of that quantity, 30.1 mgd was beneficially used to offset 19.6 mgd (65 percent efficiency) of potable-quality water sources. Therefore, only 44 percent of the available reclaimed water produced in the planning region was provided to customers. By 2030, it is expected that more than 75 percent of reclaimed water available in the planning region will be utilized and that efficiency by the end user will increase from 65 percent to 75 percent through a combination of measures such as metering, volume-based rates and education. As a result, by 2030 it is estimated that 82.6 mgd (more than 75 percent) of the 97.7 mgd of reclaimed water that will be produced in the planning region will be beneficially used and 62.0 mgd (75 percent) of traditional water supplies will be offset.

The quantity of reclaimed water that will be available in 2030 that was not allocated to projects as of 2005 is 67.6 mgd. Based on an overall 75 percent utilization and offset, 52.5 mgd will be utilized and 39.4 mgd of potable-quality water supplies will be offset by this quantity from 2005 to 2030. Utilization and offset could potentially be greater than 75 percent because of industrial operations that use large quantities of water and achieve virtually 100 percent offset rates.

Table 4-2. *2005 actual versus 2030 potential reclaimed water availability, utilization and offset (mgd) in the Southern Planning Region*

| County | 2005 Availability, Utilization and Offset[1] | | | | 2005–2030 Potential Availability, Utilization and Offset[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of WWTPs in 2005 | WWTP Flow in 2005 | Utilization in 2005 | Potable-Quality Water Offset (65%) | 2030 Total WWTP Flow | 2030 Availability (Increase in WWTP Flow 2005–2030 Plus Unused 2005 WWTP Flow) | Utilization (75%)[3] | Potable-Quality Water Offset (75%)[4] |
| **Manatee** | 5 | 30.19 | 16.42 | 10.67 | 42.48 | 26.06 | 23.25 | 17.44 |
| **Sarasota** | 14 | 27.43 | 11.70 | 7.60 | 39.32 | 27.62 | 19.32 | 14.49 |
| **Charlotte** | 8 | 9.46 | 1.69 | 1.10 | 13.25 | 11.56 | 8.27 | 6.20 |
| **DeSoto** | 4 | 2.13 | 0.28 | 0.18 | 2.64 | 2.36 | 1.70 | 1.28 |
| **Total** | **31** | **69.21** | **30.09** | **19.56** | **97.69** | **67.60** | **52.54** | **39.41** |

[1]Estimated at 65% Districtwide average.
[2]See Table 4-1 in Appendix 4.
[3] Equals total 2030 WWTP flow@75% utilization minus 2005 actual utilization, unless otherwise noted.
[4]Unless otherwise noted.

### Section 3. Seawater Desalination

*Desalinated seawater has great potential to meet future water supply demand in the Southern Planning Region.*

Seawater is defined as water in any sea, gulf, bay, or ocean having a total dissolved solids concentration greater than or equal to 35,000 mg/L (SWFWMD, 2001). Seawater can provide a stable, drought proof water supply that is increasingly attractive as the availability of traditional supplies diminishes and advances in reverse osmosis (RO) membrane technology and turbine efficiency continue to reduce costs. Seawater desalination using RO is a process in which fresh water is produced as pressurized seawater is passed through a semi-permeable membrane. The process results in fresh product water (permeate) and a mineralized concentrate byproduct. There are five principal elements to a RO desalination system that require extensive design consideration: (1) an intake structure to acquire the source water, (2) pretreatment to remove organic matter and suspended solids, (3) desalination to remove dissolved minerals and other constituents, (4) post-treatment to stabilize product water and prepare it for transmission, and (5) concentrate management (National Research Council, 2008). Each of these elements is briefly discussed below.

The intake structure is utilized to withdraw large amounts of source water for the treatment process. The intake design and operation must address environmental impacts because much of the District's near-shore areas have been designated as either Outstanding Florida Waters (OFW) or aquatic preserves. Ecological concerns include the risk of impingement and entrainment of aquatic life at the intake, entrainment of sediments and perturbation to seagrasses and hard-bottom communities. The pretreatment of source water is imperative to protect RO membranes from fouling prematurely, and this may be the most critical design element in an RO system treating seawater. A pretreatment system may require coagulation and/or microfiltration technology similar to the treatment of fresh surface water. Extensive pilot testing is recommended to determine the most appropriate pretreatment system.

There are a variety of methods to desalinate water. However, RO is the most accepted and rapidly advancing technology. The RO system pressurizes saline water above the osmotic pressure of the solutes and passes the water through a network of semi-permeable membranes. Fresh water passes through the membranes, while a constant flow of raw water prevents dissolved minerals from fouling the membrane's surface. The membranes are susceptible to fouling or damage from dissolved organic matter and other fine suspended particles, which is why an effective pretreatment method is necessary. The pressurization step can be energy-intensive, although the latest membrane technology has reduced the required pressure levels. Technical advancements have also been made with energy recovery systems, which use the high-pressure concentrate flow exiting the RO membranes to drive turbines. In return, the turbines direct energy back to the pumps feeding the source water. Research indicates that energy recovery rates between 30 and 40 percent are possible. Energy recovery systems reduce electrical demands of the facility, alleviate redundant pumping capacities and lower operational costs. The post-treatment element is necessary to protect the facility's infrastructure and distribution piping. The RO product water has a very low hardness and alkalinity, which can cause corrosion to piping and addition of unwanted metals into the water. Chemical post-treatment such as lime or caustic soda addition is often used for buffering and pH adjustment. A settling system may be necessary to reduce turbidity generated by chemical treatment. A degassing system may also be necessary, as dissolved gasses such as hydrogen sulfide can pass through RO membranes and create a noticeable odor in the finished water.

Nearly all seawater desalination facilities worldwide dispose of RO concentrate by surface water discharge, which entails significant environmental considerations. The salinity of the concentrate can be 50 percent higher than that of the source water and the increased density of the concentrate may cause it to sink and impact benthic communities (National Research Council, 2008). A National Pollution Discharge Elimination System (NPDES) permit from the Environmental Protection Agency (EPA) and other local permits may be required to discharge the concentrate into surface waters. To obtain the NPDES permit, a variety of factors must be demonstrated to not impose harm to aquatic organisms. There are several technological approaches to alleviating these issues including diffusion of the discharge using widely dispersed multiple outlets and pumping large volumes of additional water to dilute the concentrate to safe levels prior to discharge.

An additional consideration in the development of desalination facilities that can significantly enhance their financial feasibility is co-location with electric power stations. Co-location produces cost and environmental compliance benefits by blending waste concentrate with the power station's high-volume cooling water discharge. The complex infrastructure for the intake and outflow is already in place and source water heated by the power station's boilers can be more efficiently desalinated.

Additional information on seawater desalination can be found in a recent FDEP report entitled *Desalination in Florida: Technology, Implementation, and Environmental Issues* (*www.dep.state.fl.us/water*).

1.0 The Tampa Bay Seawater Desalination Facility

This discussion is included as a case study that illustrates the challenges inherent in developing such a facility in the region. Tampa Bay Water's (TBW) desalination facility is the only existing seawater desalination facility in the District and is currently the largest operating seawater desalination facility in North America. The facility is co-located with Tampa Electric Company's Big Bend Power Plant on Tampa Bay and has a capacity of 25 mgd. Plans to expand the facility to 35 mgd are included in Chapter 5 as a project option. The West Coast Regional Water Supply Authority first requested proposals for the desalination

*Tampa Bay Water's facility on Tampa Bay is the largest desalination facility currently in operation in North America.*

facility in 1997, and a development contract was awarded in 1999. The project was an ambitious endeavor at the time and two developers went bankrupt as they attempted to meet the contractual goals of the project. TBW took ownership of the facility in 2002 to continue its development. Upon initial completion in 2003, it was determined that the pre-treatment system could not adequately remove organic and other particulate matter in the source water, which resulted in rapid fouling of the RO membranes. Over the next two years, a more robust pretreatment system was designed and built and the plant was declared fully operational in December 2007. During its first year of operation, the plant produced an average of 20 mgd that helped offset fresh groundwater withdrawals from TBW's wellfields. During the extensive pilot testing and refinements to the pretreatment system, there was ample time to monitor the ecological effects of the concentrate disposal. The facility dilutes the concentrate in the same discharge pipe and discharge canal that returns the cooling water from the power plant to the bay. The concentrated seawater is diluted at a 70-to-1 ratio with up to 1.4 billion gallons per day of power plant cooling water. The discharge water is diluted to within 1.5 percent of the ambient bay water quality, which is less than natural seasonal salinity fluctuations. Monitoring during the plant's first year of operation showed no measurable changes in salinity in the bay, even when the plant was operating at maximum capacity.

The District allocated $85 million to the desalination facility's capital cost, which has reached $157.5 million. The operation and maintenance costs for producing potable water has averaged $3.54/1,000 gallons. Desalinated water can now contribute up to 10 percent of the required supply for TBW's regional system. While the development of this project has faced numerous challenges, the facility is now considered a prototype for other treatment facilities.

2.0 Potential for Water Supply from Seawater Desalination

Two options for large-scale seawater desalination facilities in the planning region have been developed as part of the planning efforts of the District and the PRMRWSA. The options would be located at Port Manatee and the City of Venice and would each have capacities of 20 mgd based on economies of scale identified during the procurement of TBW's facility on Tampa Bay. Additional information on these options is presented in Chapter 5. The total potential quantity of water supply from seawater desalination in the planning region is 40 mgd.

### *Section 4. Brackish Groundwater Desalination*

Brackish groundwater in the planning region is found in coastal areas in the Upper Floridan and intermediate aquifers as a depth-variable transition between fresh and saline waters. Figure 4-1 depicts the generalized location of the freshwater/saltwater interface (as defined by the 1,000 mg/L isochlor) in the high production zone of the Upper Floridan aquifer. Generally, water quality declines to the south and west in the District in both the Upper Floridan aquifer and lower portion of the intermediate aquifer. Brackish groundwater is also found in the Lower Floridan aquifer.

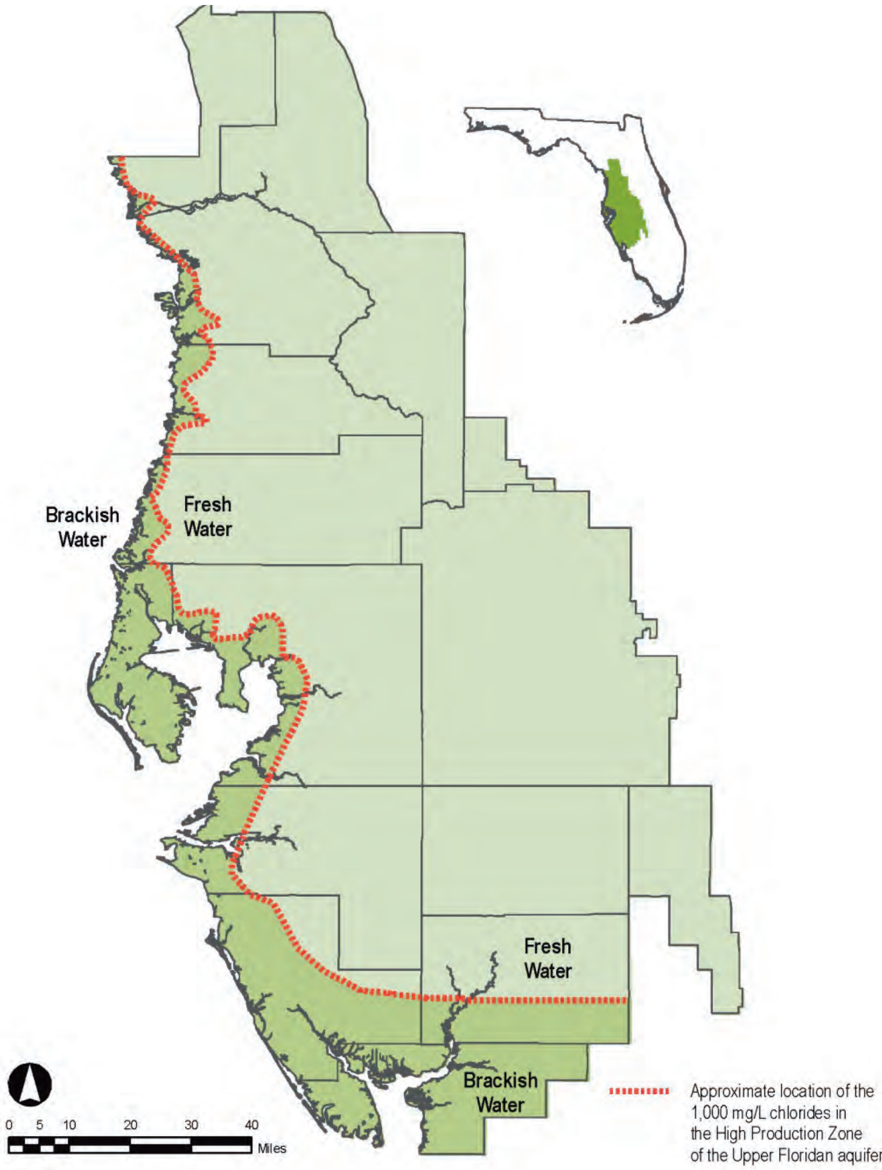



Figure 4-1. *Generalized location of the freshwater/saltwater interface*

Preliminary data collected by the District's exploratory well drilling program indicates that brackish groundwater from the Lower Floridan aquifer could be a viable water supply for inland counties. Additional data collection is planned by the District to assess the water supply potential of the Lower Floridan aquifer in greater detail.

Brackish groundwater is defined as groundwater having impurity concentrations greater than drinking water standards (TDS concentrations greater than 500 mg/L) but less than seawater (TDS) equal to or greater than 35,000 mg/L (SWFWMD, 2001). Utilities that utilize brackish groundwater for water supply typically use source water that slightly or moderately exceeds potable-water standards. Water with TDS values greater than 10,000 mg/L is more expensive to treat due to increased energy and membrane costs. Brackish groundwater desalination has been a more expensive source of water than traditional sources, and utilities and industries have used brackish groundwater only when less expensive sources are unavailable. However, improvements in technology have substantially reduced operating costs for newer systems. The predominant treatment technology for brackish groundwater is medium- or low-pressure RO membranes. TDS concentrations greater than 10,000 mg/L typically require high-pressure RO membranes. This water quality threshold generally distinguishes the upper limit of brackish groundwater source feasibility. As membrane efficiencies have increased, the operating pressures and energy needed to drive the process have declined, thus significantly reducing costs. Additionally, most treatment facilities reduce operating costs by blending RO permeate with lower-quality raw water. Some utilities may supplement their conventional treatment with a smaller portion of high-quality RO treated water to reduce the TDS levels of finished water. Having the option to blend RO permeate with other existing sources improves the overall quality and reliability of the facility. Depending on the TDS concentration of raw water, 15 to 50 percent of the water used in the RO process becomes a concentrate byproduct that must be disposed of through methods that include surface water discharge, deep-well injection or dilution at a WWTP. Surface water discharge has been the preferable disposal method due to its lower cost. Surface water discharges require a NPDES permit, and may be restrained by total maximum daily loads (TMDL) limitations. In some cases, RO facilities have been required to run below their potential efficiencies to reduce the strength of the concentrate. Because of these environmental considerations, deep-well injection and dilution at municipal WWTPs are becoming more prevalent. The use of deep-well injection may not be permittable in some areas, due to unsuitable geologic conditions. An additional disposal option that may be viable in the future is zero liquid discharge (ZLD). ZLD is the treatment of concentrate for a second round of high-recovery desalination then crystallization, or dehydration, of the remaining brine. The resulting solid may have economic value since there is potential to use it in various industrial processes. This technology addresses the issue of concentrate disposal for situations where traditional methods are not feasible. The District is participating in research to apply this technology in Florida.

Technological advancements continue to be made in the areas of energy recovery. Energy recovery systems use the high-pressure concentrate flow exiting the RO membranes to drive turbines. Energy produced from the turbines helps feed raw water into the membrane system. Energy efficiency may be increased by 30 to 40 percent, which can reduce overall operating costs. Energy recovery systems may not be viable at facilities where concentrate is disposed of through deep-well injection because it may be more desirable to maintain system pressure of the concentrate stream for the injection process. An advantage of the electrodialysis reversal (EDR) membrane process is that it requires less energy than RO. (Florida Department of Environmental Protection, 2010). Alternately charged layers of membranes pull salt ions from the source water. Sarasota County has effectively applied this technology at the T. Mabry Carlton, Jr. Water Treatment Plant.

Though the Florida Legislature declared brackish groundwater an alternative water source in 2005 (Senate Bill 444), it remains a groundwater withdrawal and must occur in a manner that is consistent with applicable rules and water use management strategies for the areas in which the withdrawals will occur. Factors affecting the development of supplies include the hydraulic properties and water quality of the aquifer, rates of groundwater withdrawal and well configurations. The District revised its Cooperative Funding Initiative policy in December 2007, which previously restricted any funding for the construction of projects that develop groundwater. Prior to the revision, the District only funded the feasibility of developing brackish groundwater sources. The construction of brackish groundwater production facilities will only be considered for funding where advanced membrane treatment is required. Brackish groundwater withdrawals that are treated by blending with fresh groundwater to reduce TDS are categorized as traditional groundwater in the RWSP.

1.0 Potential For Water Supply from Brackish Groundwater

Because brackish groundwater withdrawals from the Upper Floridan aquifer in the SWUCA have the potential to exacerbate saltwater intrusion, requests for brackish groundwater will be evaluated similarly to requests for fresh groundwater withdrawals. Proposed withdrawals, either fresh or brackish, cannot impact Upper Floridan aquifer water levels in the most impacted area (MIA) of the SWUCA. Groundwater withdrawals have been evaluated by this criterion since the early 1990s and since that time, there has been no net increase in quantities of water permitted from the Upper Floridan aquifer in the MIA. Requests for new withdrawals outside the MIA will be granted only if it is demonstrated that the withdrawals have no effect on groundwater levels in the Upper Floridan aquifer in the MIA. As discussed in the SWUCA recovery strategy, if a proposed withdrawal impacts groundwater levels in the MIA or impacts other MFL water bodies, it may be possible to receive a permit for the requested quantity if a net benefit can be achieved. A net benefit is an action an applicant can take to offset the projected effects of the withdrawal by an amount equal to the effect plus a 10 percent improvement. A net benefit can be achieved through means such as retiring existing groundwater withdrawals. Until recovery is achieved and any need for additional recovery is determined, entities seeking additional water in coastal areas should consider brackish groundwater from the Upper Floridan aquifer as an option only after all other sources of water, including conservation, have been fully explored and implemented.

One of the most important benefits of using brackish groundwater in the planning region, especially as part of a regional system, is the potential to use it conjunctively with existing surface water sources. During normal or excess rainfall years, the region would make use of its abundance of surface water from the Peace, Manatee and Braden rivers and Shell Creek. Production from brackish groundwater wellfields would be reduced during these periods to minimize environmental impacts and water supply costs for the region due to the lower cost of surface water treatment. During severe drought periods when river flows are below minimums and reservoir and ASR storage facilities are depleted, production from brackish groundwater wellfields would be maximized to ensure demands for the region would be met.

There are 23 brackish groundwater desalination facilities of varied capacities operating in the planning region. Additional small-scale private units may exist that operate below the permitting threshold. The combined withdrawal of these facilities is approximately 25 mgd from the lower permeable zone of the intermediate aquifer and the upper portion of the Upper Floridan aquifer. These withdrawals have little impact on regional saltwater intrusion because of their shallow source and relatively small magnitude. The largest withdrawals of brackish groundwater occur at the Carlton Wellfield in Sarasota County, where the county is permitted to withdraw an average of 7.3 mgd, and an additional 5.0 mgd is co-permitted for use by the PRMRWSA. The District has recently completed a study to better assess the geology of the intermediate aquifer and to determine whether new wells would distribute capacity and allow increased withdrawals (PBS&J, 2009.) The study will be applied to determine whether additional supply is available for use by water suppliers in the region.

Concentrate disposal challenges have limited brackish groundwater production at some locations. DeSoto County has a 0.5-mgd capacity RO facility at the Department of Juvenile Justice facility that is partially restricted in operation due to the lack of a concentrate disposal method. The RO facility at the City of Venice is limited to 50 percent treatment efficiency due to the allowable discharge concentrations into the Intracoastal Waterway. Treatment efficiency could be increased to provide additional supply if an alternate disposal method such as a deep-well injection is employed or if additional raw water is used to blend concentrate down to acceptable levels. Utilities in the region have investigated the use of RO treated water at a number of surface water treatment facilities for blending with treated surface water during seasonal periods when source water quality is poor. This approach can increase the production of the facilities beyond the quantities of the RO system alone and improve the seasonal reliability of the treatment plant. The R.V. Griffin Reserve, adjacent to the PRMRWSA's Peace River facility, has been evaluated as a potential brackish groundwater source to increase capacity of the facility. The City of Punta Gorda is developing a 3-mgd brackish groundwater supply to augment surface water treatment at their 10-mgd Shell Creek facility. When completed, the reduced TDS levels achieved by blending RO permeate may increase the quality and seasonal reliability of water produced by the facility and contribute to a recovery strategy for proposed MFLs on Shell Creek. The City of North Port is close to permitting a 2-mgd brackish groundwater RO facility to meet the city's future water demands. The city is also evaluating a 1.5-mgd RO facility that utilizes riverbank filtration (RBF) as a pretreatment method. The RBF system is intended to induce recharge from the Cocoplum Waterway into the surficial aquifer via a horizontal well system located near the waterway. Some upwelling from the intermediate aquifer may occur, although the ratio of sources has not yet been determined (Chapter 6, Section 1). The location of these facilities and all other existing and proposed brackish groundwater desalination facilities in the region and District are shown in Figure 4-2.

The ultimate availability of brackish groundwater in the planning region, whether new or through expansion of existing facilities, must be determined on a case-by-case basis through the permitting process. Because of this approach, an analysis to determine the total amount of brackish groundwater available for water supply in the planning region has not been undertaken. As an alternative, the availability of brackish groundwater for planning purposes is the quantity of finished water that will be developed from the unused permitted capacities of existing facilities plus the finished water capacities of facilities that are planned or actively being developed. Regarding existing facilities, there are 23 brackish groundwater desalination facilities operating in the planning region, 16 have water use permits and the remaining 7 known small-scale RO facilities operate below the permitting threshold. The total permitted capacity of the active facilities is 42.2 mgd. In 2008, these facilities withdrew 25.4 mgd of brackish groundwater and produced 18.4 mgd of potable water. Assuming 70 percent treatment efficiency unless otherwise identified, the available supply of finished water from the permitted/unused brackish groundwater quantities is 11.6 mgd. Regarding facilities that are under development, the cities of Punta Gorda and North Port are developing facilities that will produce a total of 4.5 mgd of finished water. Adding the finished water quantities from existing facilities to the projected quantities from the cities of Punta Gorda and North Port, results in a total additional supply of brackish groundwater in the planning region of 16.1 mgd. Table 4-3 provides information on the existing and planned brackish desalination facilities in the planning region.

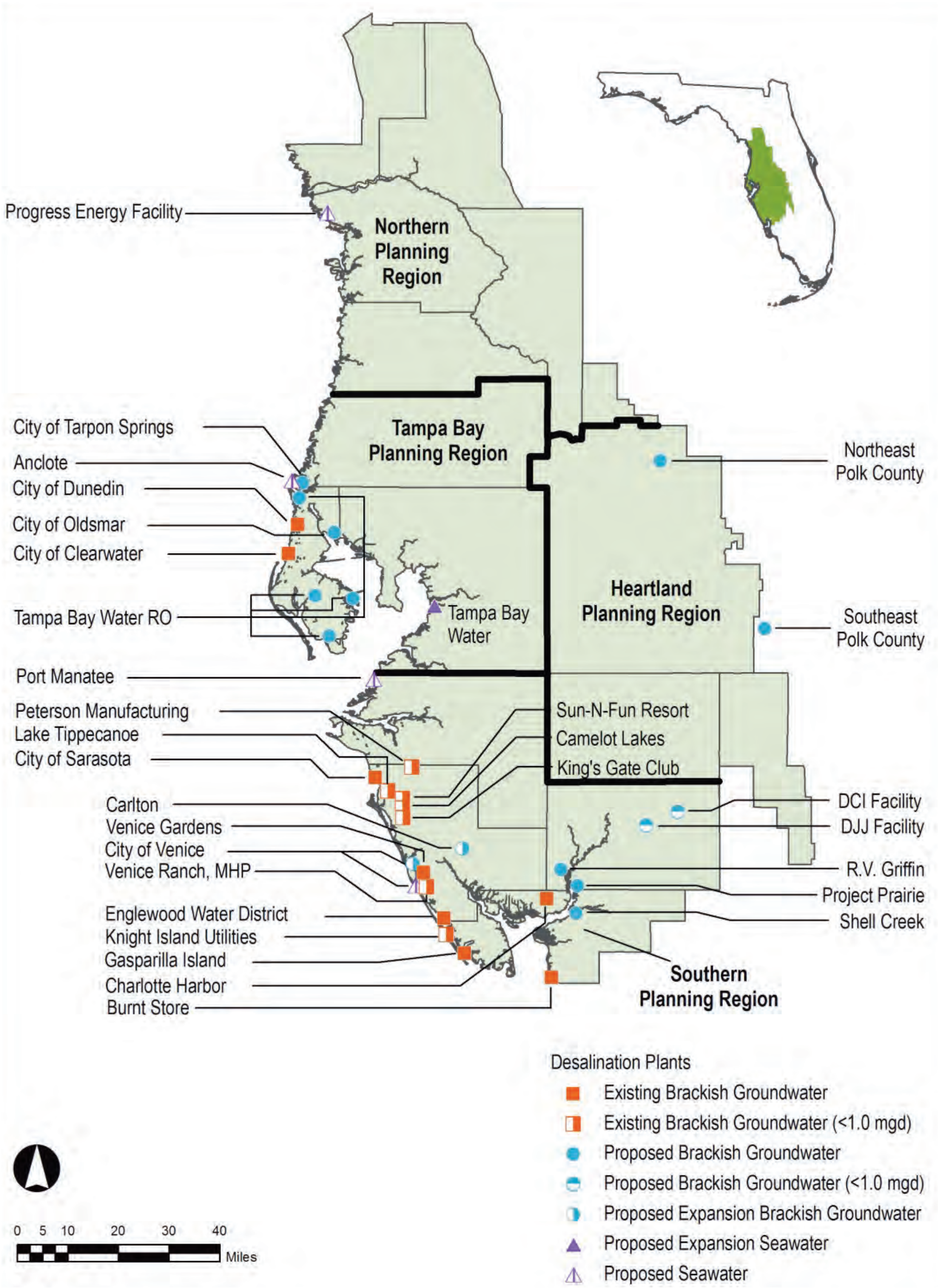



Figure 4-2. *Location of existing and potential seawater and brackish groundwater desalination facilities in the District*

Table 4-3. *Existing and potential brackish groundwater desalination facilities that are existing and under development in the Southern Planning Region (mgd)*

| Name of Utility | County | Treatment Capacity (mgd) | Annual Average Permitted Withdrawal | 2008 Average Withdrawals | 2008 Finished Supply | Available Supply[1] | Source Aquifer | Raw Water Quality TDS (mg/L) | Concentrate Discharge Type[2] |
|---|---|---|---|---|---|---|---|---|---|
| **Existing Facilities** | | | | | | | | | |
| Carlton, Sara. Co.[3 4] | Sarasota | 12.0 | 12.30 | 9.39 | 7.51 | 2.30 | Int./UFA | 1,100 - 2,300 | Deep Well |
| City of Venice | Sarasota | 4.5 | 6.82 | 4.12 | 2.06 | 1.35 | Int. | 960 – 4,700 | Surface |
| City of Sarasota | Sarasota | 6.5 | 6.00 | 5.82 | 4.4 | 0.13 | Int./UFA | 700 – 3,500 | Surface |
| Englewood Water Dist. | Sarasota | 3.0 | 5.36 | 2.87 | 2.15 | 1.87 | Int. | 3,100 - 11,000 | Deep Well |
| Venice Gardens Sara. Co.[4] | Sarasota | 2.75 | 4.43 | 0.42 | 0.29 | 2.80 | Int./UFA | 600 – 5,300 | Deep Well |
| CCU/Burnt Store | Charlotte | 1.1 | 3.17 | 0.56 | 0.39 | 1.80 | Int. | 1,700 - 3,900 | Surface |
| Gasparilla Island | Charlotte | 1.1 | 1.54 | 0.91 | 0.63 | 0.44 | Int. | 400 – 9,000 | Deep Well |
| Charlotte Harbor | Charlotte | 0.75 | 0.71 | 0.43 | 0.30 | 0.20 | Int. | 1,400 - 1,700 | Surface |
| DeSoto Correctional Institution | DeSoto | 0.33 | 0.82 | 0.38 | 0.32 | 0.37 | Int/UFA | 400-800 | WWTP |
| Camelot Lakes | Sarasota | 0.2 | 0.39 | 0.14 | 0.11 | 0.18 | Int. | 760 – 950 | SWP |
| Sun-n-Fun Resort, Inc. | Sarasota | 0.195 | 0.24 | 0.09 | 0.074 | 0.10 | Int. | 100 – 600 | Surface |
| Kings Gate Club | Sarasota | 0.06 | 0.15 | 0.13 | 0.014 | 0.01 | Int. | 300 – 740 | SWP |
| Knight Island Utilities | Charlotte | 0.03 | 0.14 | 0.08 | 0.053 | 0.04 | Int. | < 2,000 | SWP |
| Venice Ranch MHP[5] | Sarasota | 0.035 | 0.06 | 0.02 | 0.016 | 0.03 | Int. | 1200 | SWP |
| Lake Tippecanoe[5] | Sarasota | 0.06 | 0.05 | 0.04 | 0.027 | 0.01 | Int. | < 2,000 | SWP |
| Peterson Manufacturing (ind)[5] | Sarasota | 0.017 | 0.006 | 0.003 | 0.002 | 0.00 | Int/UFA | n/a | Deep Well |
| **Facilities Under Development** | | | | | | | | | |
| City of Punta Gorda | Charlotte | 3.0 | TBD | N/A | N/A | 3.0 | UFA | n/a | Deep Well |
| City of North Port | Sarasota | | TBD | N/A | N/A | 1.5 | | n/a | Deep Well |
| Total | | 35.7 | 42.2 | 25.4 | 18.4 | 16.1 | | | |

[1]Available supply represents the sum of difference between annual average permitted withdrawal and 2008 average withdrawal, multiplied by the efficiency of desalination. Efficiency of 70% was used except City of Venice (50%), Sarasota (75%), Englewood (75%), Carlton (80%), and DeSoto (85%).
[2]WWTP: wastewater treatment plant, SWP: surface/stormwater pond.
[3]Sarasota County is permitted to withdraw 7. 3 mgd average at Carlton wellfield. PRMRWSA is permitted to withdraw an additional 5. 0 mgd average for regional use.
[4]Sarasota County has a consolidated WUP for Venice Gardens, Carlton and University wellfields.
[5]Withdrawals based on finished water reported to DOH, with treatment efficiency estimated at 70%.

## Section 5. Fresh Groundwater


*A technician checks the flow and quality of groundwater from a naturally flowing well in southern Sarasota County.*

Fresh groundwater from the Upper Floridan aquifer is the principal source of water supply for all use categories in the planning region. In 2006, approximately 78 percent (239 mgd) of the 307 mgd of water used in the planning region was from groundwater sources. Approximately 22 percent (54 mgd) of the fresh groundwater used was for public supply. Fresh groundwater is also withdrawn from the surficial and intermediate aquifers for water supply, but in much smaller quantities. The following is an assessment of the availability of fresh groundwater in the surficial, intermediate and Upper Floridan aquifers in the planning region.

### 1.0 Surficial Aquifer

The surficial aquifer is mostly composed of fine-grained sand that is generally less than 50 feet thick. While small-diameter wells that yield quantities of water can be constructed in the surficial aquifer almost anywhere, there clearly are more favorable areas for development. In general, the surficial aquifer is most productive in areas where it is greater than 100 feet thick or where it includes a significant shell bed, as is the case in the southwest portion of the planning region in Charlotte, southern DeSoto and Sarasota counties. Permitted surficial aquifer withdrawals are for public supply and agricultural uses. The Gasparilla Island Water Association in Charlotte County has maintained a surficial aquifer wellfield near Placida for public supply use over the last 25 years. The average depth of each well is 25 feet. Withdrawals from wells with water use permits in the surficial aquifer occur in Charlotte County and were 0.1 mgd in 2006. Small, unpermitted quantities are also withdrawn from domestic wells for lawn watering or household use. The quantity of water estimated for this use totaled 0.1 mgd for Charlotte, DeSoto, Manatee and Sarasota counties in 2006.

It is difficult to quantify the potential availability of water from the surficial aquifer on a regional basis due to the uncertainty in hydraulic capacity of the aquifer, local variations in geology and existing water use that may limit supply. For this reason, estimates of available quantities from the surficial aquifer were combined with estimates of available quantities from the intermediate aquifer. These estimates were largely based on identifying the types of uses that could reasonably be supplied by these aquifers. These uses include residential turf and landscape irrigation and golf course and common area landscape irrigation. Agriculture may also be a significant user in Charlotte, southern DeSoto and southern Sarasota counties, where significant shell beds have been identified in the surficial aquifer. In Charlotte County, a four-acre pit excavated into a shell bed is utilized for citrus irrigation. At least four other citrus operations in eastern Charlotte County are planning to irrigate with water from shell pits. In most cases, these withdrawals will supplement or replace withdrawals of poor-quality water from the Upper Floridan aquifer. It is possible that up to five mgd of water could be obtained from these shell beds in the southwest part of the planning region. Additional exploratory drilling and testing would greatly expand knowledge of the ultimate water-producing potential of these beds.

2.0 Intermediate Aquifer

The intermediate aquifer lies between the surficial aquifer and the Upper Floridan aquifer. It exists over much of the planning region and is most productive in Charlotte, DeSoto and Sarasota counties. Use of the aquifer increases in the southern portion of the region where the water-bearing zones increase in permeability and water quality of the Upper Floridan aquifer is poor. The upper portion of the intermediate aquifer is characterized by low permeability and is of limited extent. Water in this part of the aquifer is generally of sufficient quality and quantity for domestic self-supply indoor water use/outdoor irrigation and recreational uses. Annual average water use from permitted withdrawals within the intermediate aquifer in 2006 was 34.8 mgd, with 44 percent (15.3 mgd) occurring in Sarasota County, 30 percent (10.6 mgd) in Charlotte County, 19 percent (6.6 mgd) in DeSoto County and 7 percent (2.3 mgd) in Manatee County. Small, unpermitted quantities are also withdrawn from the aquifer for lawn watering or individual household use. The quantity of water for these uses is estimated to be a total of 5.1 mgd in Sarasota, Charlotte, DeSoto and Manatee counties in 2006. The estimated availability of water from the surficial and intermediate aquifers to meet demand in the planning region is 17.4 mgd, with 11.3 mgd allocated to recreational use, 5.1 mgd to domestic self-supply and household irrigation use, and 1.0 mgd to agricultural irrigation (Table 4-4).

Table 4-4. *Estimated water demand to be met by fresh groundwater from the surficial and intermediate aquifers during the planning period in the Southern Planning Region*

| County | Domestic Self-Supply/Irrigation | Recreation | Agriculture[1] | Total |
|---|---|---|---|---|
| **Charlotte** | 2.1 | 2.6 | 3[1] | 4.7 |
| **DeSoto** | 0.6 | 0.2 | 1 | 1.8 |
| **Manatee** | 0.7 | 4.2 | 0 | 4.9 |
| **Sarasota** | 1.7 | 4.3 | 0 | 6.0 |
| **Total** | **5.1** | **11.3** | **4.0** | **17.4** |

[1] Replacement of existing Upper Floridan aquifer withdrawals.

3.0 Upper Floridan Aquifer

In the 2006 RWSP, it was stated that in order for the Upper Floridan aquifer potentiometric surface in the MIA to consistently fluctuate above the proposed saltwater intrusion minimum aquifer level (SWIMAL), groundwater withdrawals in the SWUCA needed to be reduced by 50 mgd. The District projects that by 2010, approximately 11.6 mgd of the required reductions will have been achieved mainly through land-use transitions and agricultural water conservation. Of the 38.4 mgd in groundwater withdrawal reductions that remain to be achieved in the SWUCA, the District has determined that 7.5 mgd must occur in the Southern Planning Region. The demand projections presented in Chapter 3 Table 3-6b, show that demand for I/C,M/D,PG and agricultural irrigation, which is primarily groundwater, will decline in the Planning Region by 1.5 mgd and 3.7 mgd respectively, for a total decline of 5.2 mgd by 2030. Additional reductions in the use of groundwater will occur as a result of the District's comprehensive agricultural water conservation initiatives and the permanent retirement of water use permits on lands purchased for conservation. These reductions could be used to partially offset the 7.5 mgd in reductions in the Planning Region necessary to meet the SWIMAL in the SWUCA and/or to mitigate impacts from new groundwater withdrawals.

3.1 Upper Floridan Aquifer Permitted/Unused Quantities

A number of public supply utilities in the planning region currently are not using their entire permitted allocation of groundwater. The District anticipates that these utilities will eventually grow into these unused quantities to meet future demand. Based on a review of the unused quantities of water associated with public supply water use permits in the planning region, approximately 3.5 mgd of additional groundwater quantities are available.

### *Section 6. Aquifer Storage and Recovery*

*One of the Peace River Manasota Regional Water Supply Authority's operational aquifer storage and recovery wells at the Peace River facility.*

Aquifer storage and recovery (ASR) is the process of storing water in an aquifer when water supplies exceed demand and subsequently withdrawing the water when supplies are low and/or demands are high. Locations of ASR projects in the District are shown in Figure 4-3. ASR may be used for potable, reclaimed or partially treated surface water. If water stored in the aquifer is for potable supply, it is disinfected when it is withdrawn from storage, retreated if necessary and pumped into the distribution system. District projects include storage projects that use the same well to inject and withdraw water and aquifer recharge and recovery projects that use one location for injection and another for withdrawal. ASR offers several significant advantages over conventional water storage methods including the ability to store large volumes of water at relatively low cost with little environmental impact and no evaporative losses. The success of an ASR project is generally measured in terms of recovery efficiency, which is the percentage of the original injected water recovered from the storage zone before water quality or impacts from the recovery phase (withdrawal) become unacceptable. Since brackish aquifers (those aquifers with high TDS) may be used for storage, mixing of the injected water with native water is generally the limiting factor on recovery efficiency.

To date, the majority of ASR projects have been limited to storage and recovery of potable water. However, the Englewood Water District in Sarasota County has a reclaimed water ASR project that is fully operational, and numerous others are under development throughout the southern half of the District.

1.0 ASR Hydrologic Considerations

Hydrologic conditions that maximize the recoverability of the injected water include a moderately permeable storage zone that is adequately confined above and below by lower permeability layers and that contains fairly good to moderate water quality. The permeability of the storage zone is important since low permeabilities would limit the quantity of water that could be injected, while a very high permeability would allow the injected water to migrate farther and mix

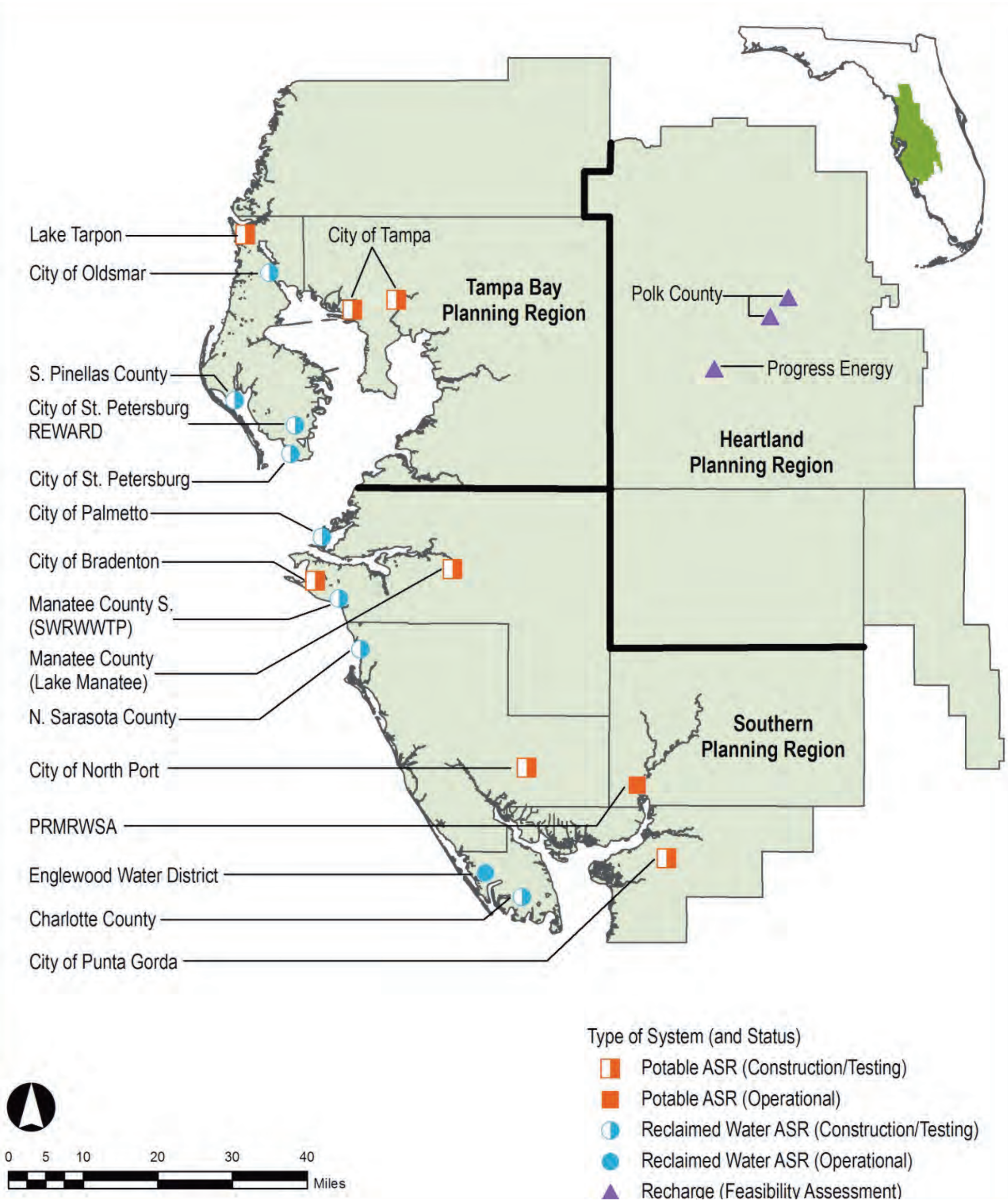



Figure 4-3. *Location of aquifer storage and recovery and aquifer recharge projects in the District that are operational or under development*

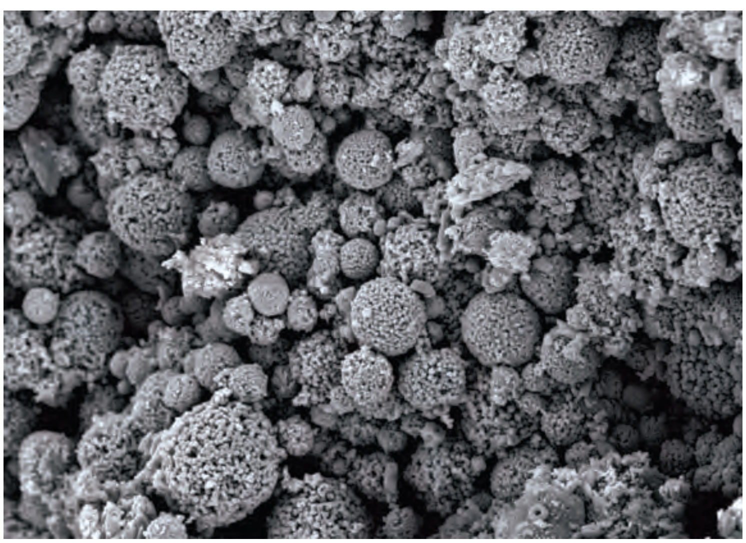
more with native water. The presence of confining layers is necessary to limit or prevent the injected water from migrating upwards (a significant issue where density differences exist between the injected water and native water). Confining layers also serve to keep poorer-quality water in adjacent zones from being captured during recovery. Poor native water quality in the storage zone will limit the percentage of usable water by degrading the injected water faster as a result of mixing processes. Additionally, the higher density of poor-quality water in the aquifer tends to cause the lower-density injected water to migrate upwards and “float” in the upper portions of the storage zone.

In the District, the recoverable percentage of injected water is typically 70 to nearly 100 percent when the TDS concentration of the native groundwater in the ASR storage zone is less than 1,000 mg/L. Recovery can be less when the TDS concentration of the native groundwater is higher. It is possible, depending on the hydrologic conditions, for the recoverable volume of water to be greater than the volume originally stored. This results when the native water quality is good to fairly good and mixing of the injected water and native water provides additional water of acceptable quality. This also forms a buffer zone between the stored water and surrounding brackish or poor quality native water to increase recovery percentage and minimize adverse geochemical reactions between waters with different chemistries. Buffer zones are considered an investment of water that improves performance and results in reserves for future recovery during extreme droughts or emergencies.

## 2.0 ASR Permitting Requirements

Permits to develop ASR systems must be obtained from the District, Florida Department of Environmental Protection (FDEP), Department of Health (DOH) and possibly the Environmental Protection Agency (EPA) if an aquifer exemption is requested. The District is responsible for the quantity and rate of recovery, including potential impacts to existing legal users (e.g., domestic wells), off-site land uses and environmental features. The FDEP is responsible for the injection and storage portion of the project, and the DOH is responsible for the quality of the water delivered to the public.

### 2.1 ASR and Arsenic



*A scanning electron microscope image of pyrite crystals in limestone of the Upper Floridan aquifer that contains minute quantities of naturally occurring arsenic.*

Regulatory requirements associated with ASR have been evolving over the past 20 years in response to new issues discovered during the operation and testing of ASR systems. One issue in particular is the mobilization of naturally occurring arsenic in the aquifer by the interaction of the injected water with the aquifer’s limestone matrix. Initially, operational ASR systems appeared capable of eventually meeting the arsenic drinking water standard of 50 micrograms/liter (µg/L) as the aquifer was flushed with water during the testing phase. However, in 2006, the arsenic drinking water standard was lowered to 10 µg/L, and many sites are now having difficulty meeting this standard.

Most ASR projects in the District are located in coastal areas where water in the Upper Floridan aquifer is brackish. In much of this area, the aquifer is not utilized for potable supply and the recovered water from ASR systems is treated to remove arsenic prior to distribution. Therefore, there has been no known exposure to arsenic above the current drinking water standard from water injected into the aquifer as a result of ASR operations. The primary issue regarding the mobilization of arsenic in the aquifer is in FDEP's interpretation of the rules related to underground injection. Currently, all drinking water standards must be met prior to water being injected into the ground, and injection of water and withdrawal of stored water cannot cause water quality in the aquifer to exceed drinking water standards.

Because the introduction of a fluid into a drinking water aquifer that causes a violation of any primary drinking water standard is prohibited, FDEP has initiated a process to allow for the continuation of ASR projects while a solution to the arsenic issue is being developed. According to FDEP rules, an Administrative Order will be issued with a permit or upon permit renewal for those facilities that were permitted or operating under a Letter of Authorization to Use prior to Jan. 26, 2006, and that exceed the current arsenic standard of 10 µg/L but have not exceeded the previous standard of 50 µg/L. A Consent Order will be issued for any facility that has exceeded the 50 µg/L concentration prior to Jan. 26, 2006, or was permitted on or after Jan. 26, 2006, and has exceeded the 10 µg/L standard.

The District has funded several research projects to evaluate and resolve the arsenic issue. The research has shown that the arsenic is being released from pyrite (which naturally occurs in the limestone and dolomite of the Upper Floridan aquifer) due to the chemical differences between the injected water and the native aquifer water (USF, 2005). A 2007 study (ASR Systems) noted that arsenic mobilization was not detected at distances greater than 200 feet in the 41 wells evaluated in the study, and arsenic concentrations decreased with each successive cycle of use. Monitor wells cooperatively funded by the District at ASR sites owned or operated by the PRMRWSA and the City of Tampa have demonstrated that arsenic mobilization is rarely detected at monitor wells 350 feet away from ASR wells (CH2M Hill, 2007). The District has also co-funded additional monitor wells to further evaluate and constrain arsenic mobilization at the City of Tampa's Rome Avenue ASR wellfield. Additional cycle testing will be needed before it can be determined whether the 10 µg/L drinking water standard for arsenic can be achieved.

Studies have also demonstrated that elevated dissolved oxygen concentrations in injection water oxidize more pyrite per cycle, which releases more arsenic into groundwater. Therefore, removing dissolved oxygen from recharge water should ameliorate high arsenic concentrations during ASR cycle testing (CH2MHill, Inc., 2007). To further evaluate the effects of removing dissolved oxygen from injection water, the District and other partners (PRMRWSA, SJRWMD, SFWMD and the City of Bradenton) have funded the construction of a degasification system at an ASR site in the City of Bradenton. The system is currently operational and performance testing is under way. The effectiveness of the degasification system will be evaluated in 2010. In addition to this process, the District is working with the FDEP and other WMDs to determine whether the current regulatory framework is appropriate for ASR systems and whether modification of the rules may be necessary.

## *Section 7. Water Conservation*

### 1.0 Non-Agricultural Water Conservation

Water conservation is defined as the beneficial reduction of water use through mandatory or voluntary actions resulting in the modification of water use practices, the reduction of water distribution system and customer losses, and/or the installation and maintenance of low-volume water use systems, processes, fixtures and devices. The implementation of a portfolio of conservation measures creates the benefits listed below.

*Easily installed faucet aerators are one of many ways to reduce indoor residential water use.*

- Infrastructure and Operating Cost. The conservation of water allows utilities to defer expensive expansions of the potable water and wastewater systems and limit operation and maintenance costs at existing treatment plants, such as the use of expensive water treatment chemicals.
- Fiscal Responsibility. Most water conservation measures have a cost-effectiveness that is much greater than that of other alternative water supply sources. The cost-effectiveness is defined as the cost of each measure compared to the amount of water expected to be conserved over the lifetime of the measure.
- Environmental Stewardship. Proper irrigation techniques, including promotion of Florida-Friendly Landscaping™ (FFL) and irrigation practices, achieved through outdoor water conservation measures can reduce unnecessary runoff from properties into water bodies. This can reduce nonpoint-source pollution, particularly from agricultural operations that use chemicals, which in turn may contribute to a local government's overall strategy of dealing with total maximum daily load restrictions within their local water bodies.

Since the 1990s, the District has provided financial and technical assistance to water users and suppliers for the implementation of local and regional water conservation efforts. Water users are encouraged to seek assistance by working with the District when implementing water-saving and water conservation education programs. Community social-based marketing, discussed later in this section, can be an important component of successful water conservation programs.

Water savings have been achieved in the planning region through a combination of regulatory, economic, incentive-based and outreach measures, as well as technical assistance. Regulatory measures include water restrictions and codes and ordinances that require water efficiency standards for new development and existing areas. For example, the National Energy Policy Act of 1992 requires that all new construction built after 1994 be equipped with low-flow plumbing fixtures. In Florida, Senate Bill 494, which took effect in July 2009, requires all automatic irrigation systems to use an automatic shutoff device. Senate Bill 2080 prohibits contractual and/or local government ordinance restrictions on the implementation of FFL. Periodically, WMDs in Florida issue water shortage orders that require short-term mandatory water conservation through best management practices (BMPs) and other practices

Economic measures, such as inclining block rate structures, provide price signals to customers of public water supply systems. Incentive programs include rebates, utility bill credits or giveaways of devices and fixtures that will replace older, less water-efficient models. Such equipment includes, but is not limited to, low-flow toilets, low-flow faucet aerators, low-flow showerheads, and irrigation controllers. Recognition programs, such as the District's Florida Water Star℠, Water CHAMP℠ and Water PRO℠ are also incentive programs that recognize homeowners and businesses for their environmental stewardship.

Education is an important element of a successful conservation program. While the actual quantity of water saved as a result of customer education is not always measurable, the effort greatly increases the success of all other facets of the conservation program by raising customer awareness and changing attitudes regarding water use. Educating the public is a necessary facet of every water conservation program, and education programs accompanied with other effective conservation measures can be an effective long-term water conservation strategy.

The District has incorporated community-based social marketing as a part of its educational strategy. Community-based social marketing is a method to change behavior at the community level. The key goals of the District's education efforts are to change the attitudes and behavior of water users regarding the need for water conservation, benefits of conserving water, consequences of not conserving water and actions needed to achieve water conservation goals. Community-based social marketing can be a useful tool to drive behavior changes in times of water shortages, such as drought or water supply interruptions.

### 1.1 Planned Conservation Measures

Based on the success of existing conservation measures, new measures, technologies, and BMPs, the District has identified the following incentive-based and outreach conservation measures that can contribute to an overall water supply management strategy. The four targeted water use categories include public supply, domestic self-supply, recreational/aesthetic, and industrial/commercial, mining, power generation (I/C,M,PG).

Regulatory, economic and community-based social marketing measures are not addressed due to the wide variance in the feasibility of implementation at the local level and the difference in costs for implementation. Three such measures which have significant potential to generate water savings but are not addressed in this document include water-conserving rate structures, water efficiency building codes/ordinances and the dissemination of conservation education materials. Water-conserving rate structures and some education programs primarily have the impact of increasing participation in conservation measures. Therefore, to include savings from these measures would likely constitute double counting of actual water savings. Other measures that have acknowledged water-savings potential and continue to be encouraged by the District include sub-metering of master-metered complexes (both multifamily and commercial) and supply-side water conservation (leak detection, system audits, etc.).

The District evaluated potential conservation measures that met established criteria for each of the four water use categories. The primary selection criterion was the cost-to-benefit ratio (cost-effectiveness). The cost-effectiveness is defined as the cost of each measure compared to the amount of water expected to be conserved over the lifetime of the measure. Water conservation measures with a cost greater than $3 per thousand gallons saved ($3/1,000 gal) are not recommended for implementation at this time (SWFWMD, 2006).

The cost of a conservation measure is made up of “variable” costs (the individual cost per measure) and “non-variable” costs (the fixed cost of implementing a program regardless of the number of measures actually implemented). For this RWSP, costs were assumed to be the same for all utilities and non-variable costs are not included. The total costs per utility, however, will vary based on size of the utility and, therefore, the number of measures implemented. The District also considered secondary criteria that included potential number of participants, potential acceptability of the measure to participants and the implementing utility, compatibility with existing programs or those that may be implemented concurrently, functional life of the measure, short-term and long-term effectiveness of a measure, level of ease with which a measure can be implemented and potential for implementation on a regional basis. After considering these criteria, the following measures were selected for further evaluation by each utility in the planning region. An asterisk indicates those measures that have not previously been implemented or financially supported by the District. A complete description of the measures, including applicable water use sectors, is provided in Chapter 5, Section 7.

Residential
- Clothes Washer Rebates*
- Plumbing Retrofit Kit
- Ultra low-flow toilet (ULFT) Rebate
- Water-Efficient Landscape and Irrigation Evaluation
- Rain Sensor Device Rebate
- Water Budgeting

Industrial/Commercial, Mining, Power Generation
- Pre-rinse Spray Valve Rebate
- Ultra Low-Flow Toilet (ULFT) Rebate
- Industrial, Commercial and Institutional (ICI) Facility Assessment
- Water-Efficient Landscape/Irrigation Evaluation (for parcels less than one acre)
- Rain Sensor Device Rebate

Recreational/Aesthetic
- Water-Efficient Landscape/Irrigation Evaluation (for parcels less than one acre)
- Large Landscape Survey (for parcels more than one acre)*
- Rain Sensor Device Rebate
- Soil Moisture Sensor Device Rebate
- Water Budgeting*

The cost of each program was calculated based on the variable cost per measure (the actual incremental cost of providing rebates, evaluations and surveys, including administrative costs). The non-variable costs (fixed program costs including promotion/educational materials, marketing, outreach, etc.) are not included. Program costs were expressed in real dollars (i.e., neither escalated for future costs nor discounted to present-day value). The cost-to-benefit ratio (or "cost-effectiveness," expressed in cost per thousand gallons saved) was discounted at a rate of 6 percent. The complete list of measures and associated costs, savings and life expectancy is provided in the Appendix for Chapter 4.

### 1.2 Planning Model for Water Conservation Measures

A spreadsheet-based planning model was developed to estimate the potential for future water savings and the cost of the identified conservation measures for all utilities and non-public supply categories, including domestic self-supply, I/C,M,PG, and recreational/aesthetic within the planning region. A complete description of the model is in the Appendix for Chapter 4.

### 1.3 Basis of Water Conservation Goals

The water savings potential stated in this RWSP is based on the implementation of the above conservation measures, provided the current and projected population, which equates to the number of accounts and estimated level of participation for the conservation programs, is accurate. Parameters considered in the conservation planning model as the basis for predicting the water savings that could be obtained from various conservation programs included (1) the number and type of accounts, (2) projected population and water demands and (3) conservation measures completed to date. These parameters are explained in greater detail as part of the description of the planning model in the Appendix for Chapter 4.

### 1.4 Potential for Non-Agricultural Water Conservation Savings

Water users are organized into four categories, based on the source and intended use of the water. The categories, as described below, include public supply, domestic self-supply, I/C,M,PG, and recreational/aesthetic.

#### 1.4.1 Public Supply

The public supply category includes all water users that receive water from public water systems and private water utilities. The public supply category may include non-residential customers such as hospitals and restaurants. Water conservation in the public supply category will continue to be the primary source of conservation program water savings in the District. Public supply systems lend themselves most easily to the administration of conservation programs since they measure each customer's water use and can focus, evaluate and adjust the program to maximize savings potential. The success of District water conservation programs for public supply systems to date is demonstrated by the 13.8 mgd in savings that has been achieved within the District since programs began in 1991 (SWFWMD, 2008b). This does not include savings from programs outside of the District's Cooperative Funding Initiative or offsets from reclaimed water.

Although some water savings in the planning region have been achieved, the potential for future public supply savings is expected to be significant. Some of the savings will occur from national and state regulations that mainly target interior plumbing fixtures and, to a limited extent, landscaping standards for single-family and multifamily residential properties. Despite savings already achieved, plumbing efficiency improvements in older (primarily pre-1995) facilities are still expected to yield considerable water savings. Spray valve retrofits for commercial hospitality establishments, waterless urinal rebates, industrial, commercial, institutional (ICI) facility assessments and large landscape surveys provide local utilities with specific conservation measures for their commercial and institutional customers. Outdoor water use and landscape irrigation, which can account for approximately 50 percent of residential public supply demand, present very significant opportunities for water savings by customers of public water suppliers.

Conservation measures were evaluated at the utility level. Therefore, the costs indicated were assumed to be incurred by the public supply utility. Based on the methodology explained previously, it is estimated that savings for the public supply category could be approximately 6.64 mgd by 2030 if all of the water conservation programs presented above are implemented (Table 4-5). The average cost-effectiveness for all planned measures is $0.51/1,000 gallons. The public supply water conservation measure that will likely have the largest impact for public supply accounts in the planning region is ICI facility assessments, which is estimated to conserve 2.0 mgd after 20 years at a cost of $2.9 million. The average amortized cost efficiency of this measure through 2030 is estimated to be $0.35/1,000 gal. The measure with the second largest impact is ultra low-flow toilet rebates, with an estimated water savings of 1.12 mgd by 2030 at a total cost of $5.6 million.

#### 1.4.1.a Domestic Self-Supply

The domestic self-supply category includes individual private homes and businesses that are not utility customers and receive their domestic water supply from a well or from surface supply for uses such as irrigation. Domestic self-supply wells do not require a District water use permit. Domestic self-supply systems are not metered and, therefore, changes in water use patterns are less measurable than those that occur in the public supply sector. Conservation programs for domestic self-supply users can still be very successful, especially when outreach for the program is done in parallel with local public supply programs. The applicable types of conservation measures that were considered to be viable in the domestic self-supply sector were the same as those for residential users of the public supply category. No commercial users were accounted for in this category, even though some commercial users are known to exist. The predicted number of measures was based on the estimated number of domestic self-supply wastewater users in the unincorporated areas.

It is estimated that savings for the domestic self-supply category could be 0.31 mgd by 2030 if all water conservation programs are implemented (Table 4-5). The average cost-effectiveness across all planned measures is $0.57/1,000 gal. The water conservation measure that will likely have the largest impact for domestic self-supply is rain sensor device rebates, which is estimated to conserve 0.12 mgd after 20 years at a cost of $95,200. The average cost-effectiveness of this measure through 2030 is estimated at $0.51/1,000 gal. The measure with the second largest impact would be water-efficient landscape and irrigation evaluations, with an estimated water savings of 0.08 mgd by 2030 at a total cost of $253,000.

1.4.2 Industrial/Commercial, Mining, Power Generation (I/C,M/D,PG)

This water use category includes those factories, mines and other industrial enterprises that obtain water directly from surface water and/or groundwater sources through a water use permit. According to a survey sent to I/C,M/D,PG permittees, water use efficiency improvements related to industrial processes have been implemented to a limited extent since 1999. Businesses try to minimize water use to lower pumping, purchasing, treatment process and disposal costs. To date, the District has focused efforts on education, indoor and outdoor surveys, and commercial applications, such as spray valves and low-flow toilets. Because of the uniqueness of the industrial processes used in this category, the opportunities for water savings are best identified through a site-specific assessment of water use at each (or a similar) facility.

*The phosphate industry has made great strides during the past decades to decrease its consumptive use of groundwater.*

It is estimated that the savings for the I/C,M/D,PG category could be 0.06 mgd by 2030 (Table 4-5). The average cost-effectiveness across all planned measures is $0.37/1,000 gal. The water conservation measure that will likely have the largest impact for I/C,M/D,PG accounts is ICI facility assessments, which is estimated to conserve 0.05 mgd after 20 years at a cost of $67,275. The average cost-effectiveness of this measure through 2030 is estimated at $0.35/1,000 gal.

1.4.3 Recreational/Aesthetic

The recreational/aesthetic water use category includes golf courses and large landscapes (e.g., cemeteries, parks and playgrounds) that obtain water directly from groundwater and surface water sources rather than from a public water supply system. It is acknowledged that some amount of water savings has been achieved in this category through the use of efficient irrigation practices and technology. As previously discussed, the potential for water savings in the recreational and aesthetic category was based on the known number of accounts and assumed participation rates.

It is estimated that the savings for the recreational/aesthetic water use category could be 0.03 mgd by 2030 (Table 4-5). The average cost-effectiveness for all planned measures is $0.39/1,000 gal. The water conservation measure that will likely have the largest impact for recreational/aesthetic accounts is large landscape surveys, which is

Table 4-5. *Potential non-agricultural water conservation savings in the Southern Planning Region*

| Use Category | Water Conserved in 2030 (mgd) | Average Cost-effectiveness ($/1,000 gal.) |
|---|---|---|
| **Public Supply** | 6.64 | 0.51 |
| **Domestic Self-Supply** | 0.31 | 0.57 |
| **IC,M,PG** | 0.06 | 0.37 |
| **Recreational/Aesthetic** | 0.03 | 0.39 |
| **Total** | 7.03 | 0.51 |

estimated to conserve 0.02 mgd after 20 years at a cost of $32,025. The average cost-effectiveness of this measure through 2030 is estimated at $1.30/1,000 gal.

### 1.5 Summary of the Potential Water Savings from Non-Agricultural Water Conservation

Through the implementation of all conservation measures listed above for the public supply, domestic self-supply, I/C,M,PG and recreational/aesthetic water use categories, it is anticipated that approximately 7.03 mgd could be saved in the planning region by 2030 at a total projected cost of $15.1 million.

## 2.0 Agricultural Water Conservation

The District uses the model farm concept to estimate the quantity of water that could potentially be saved through agricultural water conservation. The model farms concept is a tool to determine the potential for water savings for various scenarios of irrigation system conversions and/or best management practices (BMPs) that are specific to a number of different agricultural commodities and associated water use factors such as soil type, climate conditions, crop type, etc. The District also achieves agricultural water savings through the Facilitating Agricultural Resource Management Systems (FARMS) Program. The FARMS Program is categorized as water resource development and, therefore, water savings achieved through the program are assigned to water resource development quantities rather than water conservation. Additional information on the FARMS Program is located in Chapter 7.

*The District partners with state and federal agencies to provide cost-share funding and technical assistance to growers to install water-saving technology such as this tail-water recovery system for a citrus grove.*

There are 20 model farms options available with different best management/irrigation system modifications applied to the existing farms. It is recognized that the model design parameters and case study results may not be directly transferable to all operations within a given commodity category. The model farm case studies should be viewed as a standard basis for comparison of cost analyses and for estimation of water savings. An additional benefit of the model farms data is that it is used to determine whether specific elements of projects implemented as part of the FARMS Program are cost-effective. The 20 model farms options were reviewed and three that represent BMPs for irrigation of citrus, nurseries and sod were selected as being the most applicable in the planning region (HSW, 2004) (Tables 4-6a and 4-6b).

Table 4-6a. *Model farm potential water savings (5-in-10)*

| Description of Model Farm/Irrigation System/BMP Scenario | | | | Water Savings (mgd) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model Farm Scenario ID | Crop | Existing Irrigation System | Irrigation System Conversion | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | Assumptions |
| 1 | Citrus – flatwoods | Microjet | No, other BMPs only | 2.29 | 2.44 | 2.30 | 2.20 | 2.10 | 2.02 | 100% implementation, max improvement |
| 7 | Nurseries, container | Sprinkler | Line source emitter and other BMPs | 0.17 | 0.23 | 0.24 | 0.25 | 0.26 | 0.27 | 100% implementation, max improvement |
| 10 | Sod | Semi-closed seepage | Center pivot and other BMPs | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 | 100% implementation, max improvement |

Model farm potential water savings were adjusted to be consistent with latest demand projections. Model Farm Scenario 1 (Citrus–flatwoods): Existing microjet irrigation system is sufficient and no irrigation system conversion is required. Implement other BMPs only to achieve water savings. Model Farm Scenario 7 (Nurseries): Existing sprinkler to line source emitter irrigation system conversion is required. Implement other BMPs only to achieve savings. Model Farm Scenario 10 (Sod): Existing semi-closed seepage conversion to center pivot irrigation system. The data in this table can be viewed as the maximum potential savings if all growers were to install the most efficient irrigation systems and implement appropriate BMPs. The 100 percent grower participation is assumed. Source: SWFWMD (2008a), Hazen and Sawyer (2009).

Table 4-6b. *Model farm potential water savings (1-in-10)*

| Description of Model Farm/Irrigation System/BMP Scenario | | | | Water Savings (mgd) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model Farm Scenario ID | Crop | Existing Irrigation System | Irrigation System Conversion | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | Assumptions |
| 1 | Citrus – flatwoods[1] | Microjet | No, other BMPs only | 3.95 | 4.22 | 3.98 | 3.81 | 3.65 | 3.50 | 100% implementation, max improvement |
| 7 | Nurseries, container | Sprinkler | Line source emitter and other BMPs | 0.99 | 1.40 | 1.45 | 1.50 | 1.55 | 1.62 | 100% implementation, max improvement |
| 10 | Sod | Semi-closed seepage | Center pivot and other BMPs | 2.87 | 2.87 | 2.87 | 2.87 | 2.87 | 2.87 | 100% implementation, max improvement |

Model farm potential water savings were adjusted to be consistent with latest demand projections. Model Farm Scenario 1 (Citrus-flatwoods): Existing microjet irrigation system is sufficient and no irrigation system conversion is required. Implement other BMPs only to achieve water savings. Model Farm Scenario 7 (Nurseries): Existing sprinkler to line source emitter irrigation system conversion is required. Implement other BMPs only to achieve savings. Model Farm Scenario 10 (Sod): Existing semi-closed seepage conversion to center pivot irrigation system. The data in this table can be viewed as the maximum potential savings if all growers were to install the most efficient irrigation systems and implement appropriate BMPs. The 100 percent grower participation is assumed. Source: SWFWMD (2008a), Hazen and Sawyer (2009).

Sprinkler type systems are typically used for container nurseries, field crops and sod farms. Drip systems are steadily increasing in popularity, particularly for row crops grown using plastic film mulch, and are used in conjunction with a seepage system that is used for bed preparation and crop establishment. Microjet systems are the most common system used for citrus. Since supplemental irrigation for citrus exceeds all other agricultural quantities combined, more water is delivered by microjet systems than from all other systems. Surface irrigation, which includes semi-closed systems, is the most common type of irrigation for non-citrus crops in Florida.

For the three model farms chosen for the planning region, the costs per acre required to convert to a more efficient irrigation system and the cost to implement BMPs were estimated based on publicly available data and information and interviews with local irrigation system and farm management providers. The potential savings associated with each of the model farm scenarios is included in Tables 4-6a and 4-6b. The data in these tables represent the maximum potential savings if all growers were to install the most efficient irrigation system and implement appropriate BMPs for their respective commodities.

### 2.1 Potential for Agricultural Water Conservation Savings

Table 4-7 summarizes savings by commodity in 2030 for the 5-in-10 drought condition. Citrus, nurseries and sod are discussed individually and the remaining commodities are summarized together.

Table 4-7. *Summary of potential agricultural water conservation savings by commodity (5-in-10) for the Southern Planning Region through 2030*

| Commodity | Total Estimated Savings (mgd)[1] | Total Cost ($/acre)[2] |
|---|---|---|
| **Citrus** | 2.02 | $105 |
| **Nurseries** | 0.27 | $347 |
| **Sod** | 1.05 | $751 |
| **Other** | 3.19 | $100 |
| **Total** | **6.53** | **.** |

[1]Based on 100 percent participation.
[2]The total cost/acre for conversion to a more efficient system assumes the main and sub-main line installations are not included in cost estimation because it is assumed that the line would already exist in the previous system. Capital plus O&M cost, per planted acre for the first year of irrigation conversion.

## *Section 8. Summary of Potentially Available Water Supply*

Table 4-8 is a summary of the additional quantity of water that will potentially be available from all sources of water in each county in the planning region from 2010 through 2030. The table shows that the total quantity available could be as high as 334.4 mgd.

## Part B. Determination of Water Supply Deficits/Surpluses

Future water supply deficits/surpluses in the planning region were calculated as the difference between projected demands for 2030 and demands calculated for the 2005 base year (Table 3-6a). The projected additional water demand in the Southern Planning Region for the 2005–2030 planning period is approximately 84.1 mgd. It is possible that the demand for environmental restoration will be higher because preliminary studies undertaken in support of the minimum flow for Shell Creek indicate that actual flows in the creek are below proposed minimums. Therefore, a recovery strategy will be required. The quantity of water needed for restoration will be determined once minimum flow studies for Shell Creek have been completed.

As shown in Table 4-8, up to 334.4 mgd is potentially available from water sources in the planning region to meet the overall projected demand of 84.1 mgd. Based on a comparison of projected demands and available supplies, it is concluded that sufficient sources of water are available within the planning region to meet projected demands through 2030.

*Reclaimed water is often pumped from the treatment plant into ponds on golf courses where it is used to irrigate fairways and greens.*

Table 4-8. *Potential additional water availability in the Southern Planning Region through 2030 (mgd)*

| County | Surface Water[1] | | Reclaimed Water | Desalination | | Fresh Groundwater | | Water Conservation | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Permitted Unused | Available Unpermitted | Offsets | Seawater | Brackish Groundwater | Surficial and Intermediate | Upper Floridan[2] Unused/Permitted | Non-Agricultural | Agricultural | |
| **Charlotte** | 3.7 | 14.6 | 6.2 | | 5.5 | 4.7 | | 1.4 | 0.7 | **36.8** |
| **DeSoto** | 17.9 | 80.4 | 1.3 | | 0.4 | 1.8 | | 0.3 | 2.0 | **104.1** |
| **Sarasota** | 3.2 | 74.6 | 14.5 | 20.0 | 10.3 | 6.0 | 2.7 | 2.5 | 0.7 | **134.5** |
| **Manatee** | 6.2 | 3.8 | 17.4 | 20.0 | | 4.9 | 0.8 | 2.8 | 3.1 | **59.0** |
| **Total** | **31.0** | **173.4** | **39.4** | **40.0** | **16.2** | **17.4** | **3.5** | **7.0** | **6.53** | **334.4** |

[1]All available surface water from the Peace River is shown in DeSoto County, because the calculation was based on flows in DeSoto County; however, future withdrawals from the Peace River in Hardee and Polk counties are possible.
[2]Groundwater that is permitted but unused for public supply. Estimated 2009 use based on a linear trend for the period 2000–2008. Permitted quantities were current as of October 2009.

*Horse Creek is a major tributary of the Peace River.*

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*Aerial view of the Peace River Manasota Regional Water Supply Authority's recently expanded Peace River intake.*

The water supply development component of the Regional Water Supply Plan (RWSP) requires the District to identify water supply options from which water users in the planning region can choose to meet their individual needs. In addition, the District is to determine the associated costs of developing these options. As discussed in Chapter 4, the sources of water that are potentially available to meet projected water demand in the planning region include surface water and stormwater, reclaimed water, seawater desalination, brackish groundwater desalination, fresh groundwater and conservation. Investigations were conducted to identify reasonable options for developing each of the sources, to provide planning level technical and environmental feasibility analyses, and to determine costs to develop the options.

Statutory guidance on how water supply entities are to incorporate water supply development options in the District's RWSP into their water supply planning and development of their comprehensive plans is presented in the RWSP Executive Summary.

## Part A. Overview of Water Supply Development Options

Some of the options presented in this chapter were identified and evaluated as part of the 2006 RWSP. Because these options remain viable, they were updated and included in this RWSP. Where applicable, water supply options developed through the work of additional regional planning efforts such as Peace River Manasota Regional Water Supply Authority's (PRMRWSA) Regional Resource Development Feasibility Study are incorporated into this chapter. These options are not necessarily the District's preferred options but are provided as reasonable concepts that water users in the region may pursue in their water supply planning. A number of the options are of such a scale that they would likely be implemented by either a regional water supply authority or a group of users. Other options, such as those involving reclaimed water and conservation, would be implemented by individual utilities. It is anticipated that users will choose an option or combine elements of different options that best fit their needs for water supply development, provided they are consistent with the RWSP. Following a decision to pursue an option identified in the RWSP, it will be necessary for the parties involved to conduct more detailed engineering, hydrologic and biologic assessments to provide the necessary technical support for developing the option and to obtain all applicable permits.

Preliminary technical and financial feasibility analyses were conducted for the options included in this chapter. The analyses provide reasonable estimates of the quantity of water that could be developed and associated costs for development. Cost information for the options was referenced to the appropriate document or a cost index was applied to update the value from the 2006 RWSP. In the following sections, a description of several representative options for each source is included that more fully develops the concepts and refines estimates of development costs. This is followed by a table that includes the remaining options for each source.

### *Section 1. Surface Water/Stormwater*

*Aerial view of the Peace River Manasota Regional Water Supply Authority's Peace River facility showing the river intake, treatment facility and the 6-billion-gallon reservoir under construction in the background.*

As shown in Chapter 4 Table 4-8, capturing and storing water from river/creek systems during times of high flow has the greatest potential of all the water sources to meet the 2030 demand. Based on planning level criteria, approximately 204.4 mgd could be developed for water supply if all the rivers/creeks in the planning region described in Chapter 4 were developed to their full potential. A number of rivers of significant size, including the Peace, Braden, Manatee, Myakka, and Shell Creek, are located partially or in total in the planning region. With the exception of the Myakka River, all of these rivers are currently used for water supply. The Peace River is the most prominent drainage feature in the region, draining portions of Polk, Hardee, DeSoto and Charlotte counties. It has the highest flow of all the rivers in the region with a mean annual flow of 813 mgd (1,259 cfs). Though portions the Myakka River have been designated an Outstanding Florida Water and a Wild and Scenic River, the watershed has experienced numerous alterations that have affected flows. These alterations include agricultural activities, drainage projects and flood control projects. It is possible that water supply projects could be developed on the Myakka River that would help to restore the river and surrounding natural systems. Table 5-1 is a list of surface water/stormwater options developed by the District.

The PRMRWSA estimates an additional 14 mgd will be needed to meet their 2030 projected demand and system reliability. A number of surface water/stormwater options with the potential to meet this demand were identified and evaluated by the District and various studies were completed in cooperation with the PRMRWSA. The PRMRWSA conducted further evaluations as part of their Source Water Feasibility Study, completed in 2008, that provided costs for the various options.

Table 5-1. *List of surface water/stormwater options developed by the District for the Southern Planning Region*

| Option Water Body and Entity Responsible for Implementation | User Group | Avg Annual Yield (mgd) | Intake Capacity (mgd) | Capital Cost ($1,000/mgd) | Unit Cost ($/1,000 gal) | Annual O & M ($1,000) | Storage Method/Level of Treatment | Distribution Method |
|---|---|---|---|---|---|---|---|---|
| **Manatee County** | | | | | | | | |
| Braden River City of Bradenton | PS | 1.6 | 12 | 12,199 | 5.13 | 1,361 | ASR/2 | Distributed to City of Bradenton's public supply system |
| Braden River City of Bradenton | Ag | 1.6 | 12 | 12,122 | 4.48 | 992 | ASR/2 | Distributed to reclaimed water system |
| Braden River City of Bradenton | PS | 1.6 | 12 | 2,883 | 4.77 | 2,401 | ASR/1 | Distributed to City of Bradenton's public supply system |
| Frog Creek (Stormwater) Manatee County | AG, Urban Reuse | 1 | 34 | 1,148 | 4.86 | 1,679 | Off-stream reservoir, ASR/3 | Distributed to MARS system |
| Gamble Creek Manatee County | AG, Urban Reuse | 3.9 | 39 | 10,203 | 3.59 | 1,783 | Off-stream reservoir, ASR/2 | Distributed to MARS system |
| **DeSoto County** | | | | | | | | |
| Joshua Creek TBD | Ag | 3.8 | 26 | 21,517 | 8.11 | 4,401 | AR/2 | Aquifer conveyance to agricultural groundwater users |
| Joshua Creek TBD | Ag | 3.8 | 26 | 9,619 | 3.67 | 2,039 | Off-stream reservoir/3 | Piped to Joshua Water Control District |
| Joshua Creek TBD | Ag | 3.8 | 26 | 8,818 | 3.20 | 1,625 | Off-stream reservoir, AR | Aquifer conveyance to agricultural groundwater users |

1.0 Surface Water/Stormwater Options

**Surface Water/Stormwater Option #1 – Upper Myakka River Public Supply**

- Entities Responsible for Implementation: PRMRWSA, Manatee County

This project consists of diverting the excess irrigation runoff water collected in the Flatford Swamp to an off-stream reservoir as part of a comprehensive watershed initiative for the upper Myakka River Watershed and Flatford Swamp. The water would be removed from the reservoir when needed, treated at a water treatment plant and delivered to the PRMRWSA's regional distribution system. Project components include an intake structure on the Myakka River, a raw water pump station, a 6-billion-gallon impoundment structure for raw water storage, water treatment plant, and associated piping.

| Quantity Available (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | Annual O&M/1,000 gal |
|---|---|---|---|---|
| 10 | $298,000,000 | $29,830,000 | $5.94 | $1.36 |

Issues:
This project would capture excess irrigation runoff that has negatively impacted the Flatford Swamp. Capture of this water is necessary for restoration of the swamp.

**Surface Water/Stormwater Option #2 – Dona Bay/Cow Pen Slough**

- Entities Responsible for Implementation: Sarasota County, PRMRWSA

This option consists of capturing excess flow from Cow Pen Slough for storage in an off-stream reservoir and would also provide an environmental benefit by restoring the natural freshwater/saltwater regime in the Dona Bay estuary. The option will have a capacity of 15 mgd that can be developed in 5-, 10- and 15-mgd phases. The initial 5-mgd phase will include construction of a weir in the canal and transmission to the Venice Minerals borrow pit site. Additionally, the project will include construction of a reservoir at the Venice Minerals site, a pumping station at the reservoir, a raw water main to the Carlton water treatment plant and potentially a new treatment plant at the Carlton site. Some elements will be constructed to the 15-mgd ultimate capacity. The existing water treatment plant is expected to be increased to a capacity of 15 mgd.

| Quantity Available (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | Annual O&M/1,000 gal |
|---|---|---|---|---|
| 5 | $114,000,000 | $22,760,000 | $4.53 | $1.42 |

Issues:
- As Sarasota County restoration work and studies continue, more information will be available to better quantify excess flows within Cow Pen Slough, which may result in significantly higher yield estimates. Ultimately, the quantity of water supply available from Cow Pen Slough will be determined through the permitting process and the establishment of a minimum flow.

**Surface Water/Stormwater Option #3 – Shell/Prairie Creek Public Supply**

- Entities Responsible for Implementation: PRMRWSA, City of Punta Gorda, Charlotte County

This option consists of a new intake structure, raw water pumping station, new treatment facilities and associated piping, and an off-stream reservoir with a capacity of 6-billion-gallons of raw water storage. Additionally, improvements to the existing reservoir structure will be implemented to increase reliability. A 6-mile regional interconnection between the City of Punta Gorda and the Peace River facility will be constructed. The construction of the Loop Phase I interconnection is not included in the costs below. The estimated available yields for this option, 12.0 and 20.0 mgd, depend on intake location. The 20.0-mgd intake would be located near the confluence of Shell and Prairie creeks, and the 12.0 mgd would be located further upstream on Prairie Creek west of State Road 31.

| Quantity Available (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | Annual O&M/1,000 gal |
|---|---|---|---|---|
| 12 | $287,000,000 | $23,890,000 | $4.76 | $1.37 |
| 20 | $340,000,000 | $16,950,000 | $3.37 | $1.22 |

Issues:

- Additional flow data/modeling will be necessary to confirm anticipated withdrawals.
- Future phases of the reverse osmosis facility may be designed to treat surface water with high levels of TDS.

**Surface Water/Stormwater Option #4 – Conjunctive Use**

- Entities Responsible for Implementation: PRMRWSA, City of Punta Gorda, Sarasota County

The conjunctive use of surface water and groundwater to supplement water supply during dry weather was evaluated in an effort to reduce the cost of facilities and improve water quality and reliability. The three options listed above, upper Myakka River, Dona Bay/Cow Pen Slough and Shell Creek, have potential for the development of a conjunctive-use scenario. Conjunctive use of groundwater and surface water for the three options would significantly reduce the size of the required reservoirs for the same yield and reliability. Conjunctive use for Shell Creek would reduce reservoir size from 6 to 2.6 billion gallons by the addition of a 1.36-mgd groundwater supply. Conjunctive use of the upper Myakka River would reduce the reservoir size by approximately 50 percent and could provide an annual average of 1.8 mgd of groundwater with a peak of 10 mgd during drought periods. The costs and quantity for these projects developed with the conjunctive-use option are listed below.

| Option | Quantity Available (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | Annual O&M/1,000 gal |
|---|---|---|---|---|---|
| Upper Myakka River | 10 | $244,000,000 | $24,440,000 | $4.86 | $1.39 |
| Dona Bay Cow Pen Slough | 8 | $129,000,000 | $16,125,000 | $3.22 | $1.39 |
| Shell Creek | 12 | $235,000,000 | $19,583,333 | $3.90 | $1.40 |
| Shell Creek | 20 | $286,000,000 | $14,300,000 | $2.84 | $1.24 |

Issues:

- A permit for groundwater withdrawal for conjunctive use will need to demonstrate a net benefit due to the Upper Myakka watershed being located very near the most impacted area (MIA) of the SWUCA.
- Additional aquifer performance data may be required to determine total groundwater availability.

2.0 System Interconnect/Improvement Options

The system interconnect/improvement options are critical components of water supply distribution systems, which involve the construction of pipelines and booster pumping stations. Development of these options will facilitate the regionalization of potable water supply systems by providing transmission of water from areas of supply to areas of demand. The options will also increase rotational and reserve capacity and provide redundancy of water supplies during emergency conditions. The table below contains a system interconnect/improvement option identified by the Water Planning Alliance Regional System Planning and Engineering Study in cooperation with the PRMRWSA (Greeley and Hansen, 2005).

| Water Planning Alliance Project Number | Option Name and Entity Responsible for Implementation | Project Description |
|---|---|---|
| 98 | Charlotte Co/Punta Gorda Interconnect. Punta Gorda | Interconnect between Charlotte Co. and Punta Gorda Potable Water Systems |

The PRMRWSA is developing the Regional Integrated Loop System as a series of transmission pipelines to regionally transfer water from existing and future alternative supplies to demand centers within the PRMRWSA's service area. Nine phases of the loop system were evaluated in the Regional Integrated Loop System Feasibility Routing Study, completed by PBS&J in 2008. Three of the loop system phases (Phases 1A, 2, 3A) are under development and listed in Chapter 6. The PRMRWSA intends to develop six additional phases over the current or future planning horizons to transfer regional water supplies within the four-county service area. The future phases are listed below.

| Regional Integrated Loop System Phase | Project Description | Estimated Capital Cost |
|---|---|---|
| Phase 1 | 6-mile interconnect from the Shell Creek WTP to the Authority's 20-inch RTS on U.S. 17 in DeSoto County. | $11,500,000 |
| Phase 2A | 32-mile interconnect between the City of North Port and the Carlton WTP. | $37,000,000 |
| Phase 2B | 13-mile interconnect between the City of North Port and the Englewood Water District. | $27,000,000 |
| Phase 3B | 9 mile continuation of Phase 3A from the Carlton WTP to a new storage facility near I-75 in northern Sarasota County. | $55,000,000 |
| Phase 4A | 6-mile interconnect from Sarasota County storage facility to Manatee County at University Parkway. | $15,000,000 |
| Phase 4B | 16-mile interconnect from Manatee County's WTP to Sarasota County storage facility. | $42,000,000 |

### *Section 2. Reclaimed Water*

The planning region encompasses a diverse mix of rural and urban land uses that provide opportunities for urban, industrial and agricultural reclaimed water use. In addition, opportunities for storage of excess reclaimed water in brackish aquifers in coastal areas and in old mine pits in the wet season for use during drier periods are abundant in the region. Listed below are the different types of reclaimed water options that are compatible with the geology, hydrology, geography and available reclaimed water supplies in the planning region.

*Reclaimed water storage tank.*

- **Augmentation With Other Sources:** introduction of another source (stormwater, surface water, groundwater) into the reclaimed water system to expand available supply
- **Aquifer Storage and Recovery:** injection of reclaimed water into an aquifer during times of excess supply and the recovery of that same water for use during high demand
- **Distribution:** expansion of a reclaimed water system to serve more customers
- **Efficiency/Research:** the study of how utilities can maximize efficiency and offset potential of systems to conserve water (rate structures, telemetry control, watering restrictions, metering and others) and research (water quality, future uses)
- **Interconnect:** interconnection of systems to enhance supply and allow for better utilization of the resource or to enable agricultural or other water use permit exchanges
- **Natural System Restoration/Recharge:** introduction of reclaimed water to create/restore natural systems and enhance aquifer levels (indirect potable reuse)
- **Saltwater Intrusion Barrier:** injection of reclaimed water into an aquifer in coastal areas to create a salinity barrier
- **Storage:** traditional reclaimed water storage in ground storage tanks and ponds
- **Streamflow Augmentation:** introduction of reclaimed water downstream of water withdrawal points to replace flow to enable additional surface water supply
- **System Expansion:** construction of multiple components (transmission, distribution, storage) necessary to deliver reclaimed water to more customers
- **Transmission:** construction of large mains to serve more customers

The District developed 31 reclaimed water options for the planning region with input from utilities and other interested parties. The determination of the quantity of reclaimed water available for each option to utilize was based on an analysis of wastewater flows anticipated to be available in 2030 at a utilization rate of 75 percent (Chapter 4 Appendix, Table 4-1). It is recognized that the viability of some options depends on whether certain other options are developed, and not all options can be developed because some would utilize the same reclaimed water source. An expanded description is provided for 5 of the 31 options that are representative of the types of reclaimed water projects listed above. These options were subjected to a detailed analysis to more fully develop the concepts and refine cost estimates. The remaining options are listed in Table 5-2.

Flow and capital cost data for 95 reclaimed water projects originally identified as being under development (post-2005) within the District were used to develop a representative cost per 1,000 gallons supplied and capital cost for each option. The data show that for projects anticipated to come online between 2005 and 2015, the average capital cost is approximately $5.77 million for each 1.0 mgd supplied. This figure was used in cost calculations for individual reclaimed water options, unless specific cost data were available. In addition to capital costs, operation and maintenance (O&M) costs for each of the representative options were estimated. Reclaimed water flow data and O&M cost data associated with existing reclaimed water systems were collected to identify the median reclaimed water O&M cost estimate per 1,000 gallons supplied. The data show that reclaimed water O&M costs are relatively consistent across system sizes, with a median cost of $0.30 per 1,000 gallons supplied. This figure was used in cost calculations for individual reclaimed water options, unless system-specific O&M cost data were available.

**Reclaimed Water Option #1 – Bradenton Reuse Supply to Lakewood Ranch**

- Entity Responsible for Implementation: City of Bradenton Utilities

This option would provide 4 mgd of reclaimed water to offset existing withdrawals and to provide reuse to agricultural, commercial, residential and recreational customers in Lakewood Ranch (Braden River Utilities). Approximately 3 mgd of recreational, landscape and agricultural irrigation would be offset. The option would include the design and construction of 40,000 feet of 18-inch transmission main, a pump station and a 2-million-gallon storage tank. This option would expand the city's reclaimed water system and utilize all existing and future reclaimed water flows. The implementation time frame is expected to be between 2011 and 2030.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd Offset | Cost/1,000 Gallons Offset | O&M/1,000 Gallons Offset |
|---|---|---|---|---|
| 4.0 (3.0[1]) | $8,630,000 | $2,876,666 | $0.57 | $0.40 |

[1]Beneficial offset.

Issues:
- The Manatee County reclaimed water prohibition in the Braden River watershed could affect the viability of the option.
- It may be possible to upsize the option to 5.5 mgd and take all of Bradenton's reuse flows.
- The option would necessitate development of a master agreement to coordinate funding, ownership and O&M.

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Table 5-2. *List of reclaimed water options for the Southern Planning Region*

| Option and Entity Responsible for Implementation | County | Type | Supply | Offset | Capital Cost | Cost/Ben | O&M/Offset |
|---|---|---|---|---|---|---|---|
| S. Hills./MARS Intercon., Hills.Co. | Hills/Man. | Intercon. | TBD | TBD | TBD | $TBD | $0.30 |
| Bradenton WWTP Supply to Lakewood Ranch 2011–2030, City of Bradenton/Lakewood Ranch | Manatee | Intercon. | 4.00 | 3.00 | $8,630,000 | $0.57 | $0.40 |
| Manatee Co. ASR Expansion Wells 2011–2030, Manatee Co. | Manatee | ASR | 1.00 | T BD | $4,300,000 | $TBD | $TBD |
| Manatee Co. 20 MG Diurnal Storage 2011–2030, Manatee Co. | Manatee | Storage | TBD | T BD | $7,000,000 | $TBD | $TBD |
| Longboat Key/Manatee Co./Sarasota Intercon. 2011–2030, Town of Longboat Key | Manatee | Intercon. | 2.00 | 1.50 | $11,534,000 | $1.56 | $0.40 |
| Reuse Expan. In Bradenton WWTP 2011–2030, City of Bradenton | Manatee | Sys.Expan. | 4.00 | 3.00 | $23,068,000 | $1.56 | $0.40 |
| Reuse Expan in Manatee Co. Sys. 2011–2030 (w/int), Manatee Co. | Manatee | Sys.Expan. | 1.00 | 0.75 | $5,767,000 | $1.56 | $0.40 |
| Reuse Expan in Palmetto WWTP 2011–2030, City of Palmetto | Manatee | Sys.Expan. | 0.50 | 0.37 | $2,883,500 | $1.56 | $0.40 |
| Sarasota Regional ASR System 2011–2030, Sarasota Co. | Sarasota | ASR | 1.00 | TBD | $4,300,000 | $TBD | $TBD |
| Celery Fields Reuse Aug. 2011–2030, Sarasota Co. | Sarasota | Aug. | 1.00 | 0.75 | $5,767,000 | $1.56 | $0.40 |
| Sarasota Co./Siesta Key Intercon. 2011–2030, Sarasota Co. | Sarasota | Intercon. | 2.00 | 1.5 | $10,400,000 | $1.56 | $0.40 |
| Reuse Expan in Sarasota N. Co. Sys.(Atlantic/Brentwood/Bee Ridge/Central/Meadowood) 2011–2030, Sarasota Co. | Sarasota | Sys.Expan. | 2.50 | 1.88 | $14,417,500 | $1.56 | $0.40 |
| Reuse Expan in Sarasota S. Co. Sys. (Venice Eastside/Venice Gardens/Gulfgate/Southgate) 2011–2030, Sarasota Co. | Sarasota | Sys.Expan. | 5.00 | 3.75 | $28,835,000 | $1.56 | $0.40 |
| Reuse Expan in Aquasource Fruitville 2011–2030, Aqua America (to existing customer) | Sarasota | Sys.Expan. | 0.25 | 0.19 | $0 | $0 | $0.40 |
| Reuse Expan in City of Venice Sys. 2011–2030, City of Venice | Sarasota | Sys.Expan | 0.50 | 0.38 | $2,883,500 | $1.56 | $0.40 |
| Reuse Expan in Camelot Lakes 2011–2030, Camelot Lakes (to existing customers) | Sarasota | Sys.Expan. | 0.02 | 0.01 | $0 | $0 | $0.40 |
| Reuse Expan in N. Port WWTP 2013–2030, City of North Port | Sarasota | Sys.Expan | 3.00 | 2.25 | $17,301,000 | $1.56 | $0.40 |
| Reuse Expan in City of Sarasota WWTP 2011–2030, City of Sarasota | Sarasota | Sys.Expan | 3.75 | 2.81 | $21,626,250 | $1.56 | $0.40 |
| Reuse Expan in Siesta Key WWTP 2011–2030, Sarasota Co. | Sarasota | Sys.Expan | 1.00 | 0.75 | $5,767,000 | $1.56 | $0.40 |

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Table 5-2 *List of Reclaimed Water Options for the Southern Planning Region (continued)*

| Option and Entity Responsible for Implementation | County | Type | Supply | Offset | Capital Cost | Cost/Ben | O&M/Offset |
|---|---|---|---|---|---|---|---|
| Optimization and Efficiency Study in Coastal SWUCA, Various Util. | Various | Efficiency | *TBD* | *TBD* | *TBD* | *TBD* | *TBD* |
| Reuse Expan in Charlotte Co. Eastport/Westport/Rotunda WWTPs 2011–2030, Charlotte Co. | Charlotte | Sys.Expan. | *3.00* | *2.25* | *$17,301,000* | *$1.56* | *$0.40* |
| Reuse Expan in Burnt Store WWTP 2011–2030, Charlotte Co. | Charlotte | Sys.Expan | *0.25* | *0.19* | *$1,441,750* | *$1.56* | *$0.40* |
| Reuse Expan in Riverwoods WWTP 2011–2030, Riverwoods Util. | Charlotte | Sys.Expan | *0.10* | *0.08* | *$576,700* | *$1.56* | *$0.40* |
| Reuse Expan in Punta Gorda WWTP 2011–2030, City of Punta Gorda | Charlotte | Sys.Expan | *2.30* | *1.70* | *$13,264,100* | *$1.56* | *$0.40* |
| Reuse Expan in Englewood WWTP 2011–2030, Englewood Water District | Charlotte | Sys.Expan | *1.25* | *0.94* | *$7,208,750* | *$1.56* | *$0.40* |
| Englewood Manasota Beach Reuse 2011 | Charlotte | Sys.Expan | *0.30* | *0.15* | *$500,000* | *$0.65* | *$0.60* |
| Englewood Gottfried Creek Reuse 2020 | Charlotte | Sys.Expan | *0.60* | *0.30* | *$500,000* | *$0.33* | *$0.60* |
| Reuse Expan in Arcadia WWTP 2011–2030, City of Arcadia | DeSoto | Sys.Expan | *0.75* | *0.56* | *$4,325,250* | *$1.56* | *$0.40* |
| DeSoto Correctional WWTP 2011–2030, FL Dept. of Corrections | DeSoto | Sys.Expan Toilet | *0.20* | *0.20* | *$1,153,400* | *$1.14* | *$0.30* |
| Wood Memorial Hospital WWTP 2011 - 2025, G. Pierce Wood Memorial Hospital | DeSoto | Sys Expan Ind. | *0.05* | *0.05* | *$288,350* | *$1.14* | *$0.30* |
| Reuse Expan in Lake Suzy WWTP 2011–2030, Lake Suzy Utilities | DeSoto | Sys.Expan | *0.40* | *0.30* | *$2,306,800* | *$1.56* | *$0.40* |
| **Total: 31 Options** | | | ***41.72*** | ***29.61*** | ***$221,596,350*** | | |

The use of Italics denotes SWFWMD estimations.
Not all projects have estimated costs. Some options are contingent upon others. WWTPs with no available (unused) 2030 flows were not included.
Offset = (if estimated) annualized supply: 1. x 75% for Ag, & R/A/C, 2. x 100% for I/C, NSR, & PG. 3. x 75% for variety and 4. for RES is number of customers X 300 gpd.
ASR & intrusion barrier costs = (if estimated) annualized supply x 4 x $1,000,000 + $300,000.
Total Cost = (if estimated) = annualized supply x $5. 77/gallon (calc. of 96 draft under development 2005-2015 District funded reuse projects (@ $431. 4 million for 74.8-mgd reuse supply).
Preliminary cost per 1,000 gallons offset = Project cost amortized over 30 years @ a 6% interest rate.
System expansion supply 2011–2030 = Projected 2030 WWTP flow x 75% (rounded down) minus 2015 reuse (existing and planned reuse projects).
Preliminary O&M cost estimates were calculated using a median O&M cost if no specific data was available (SWFWMD, 2005b).
Preliminary O&M costs per 1,000 gallons "offset" were calculated utilizing costs per 1,000 gallons "supplied" data normalized for individual project efficiency.

**Reclaimed Water Option #2 – MARS System Diurnal Storage**

- Entity Responsible for Implementation: Manatee County Utilities

This option would provide diurnal storage for Manatee County's Manatee Agricultural Reuse System (MARS). The option would include design and construction of two 10-million-gallon storage tanks and mains to tie into the existing MARS system. The project would provide additional storage of surplus reclaimed water from the county's three facilities to serve customers in Manatee County's system. The implementation time frame is estimated to be between 2011 and 2030.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd Offset | Cost/1,000 Gallons Offset | O&M/1,000 Gallons Offset |
|---|---|---|---|---|
| .(N/A) | $7,000,000 | N/A | N/A | N/A |

Issues:
- None

**Reclaimed Water Option #3 – Celery Fields Reuse Augmentation**

- Entity Responsible for Implementation: Sarasota County Utilities

The Celery Field Regional Storage Facility (CFRSF) is a stormwater management facility adjacent to Philippi Creek in Sarasota County. The CFRSF was developed for stormwater storage for flood control, treatment, pollution control and supplemental reuse, and constructed wetlands for treatment and mitigation. The CFRSF provides capacity to impound 326 million gallons of stormwater runoff for controlled release into Philippi Creek. This option would utilize a portion of the stormwater stored in the CFRSF. Stormwater would be filtered and chlorinated prior to introduction into the county's reuse system and would be used for augmentation to meet dry-season irrigation demand. The county's reclaimed water ASR wells currently under development could be used to store stormwater during wet weather for later recovery to meet irrigation demands. The option includes design, permitting and construction of an intake structure, pumps, filtration, disinfection treatment system and 10,500 feet of 20-inch diameter pipeline to connect the county's reuse distribution system. The intake structure and pumps would be designed to supplement the reclaimed water system by up to 6.0 mgd during 60 days each year for an average of 1.0-mgd annualized supply to offset 0.75 mgd of potable water. The implementation time frame is expected to be between 2011 and 2030.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd Offset | Cost/1,000 Gallons Offset | O&M/1,000 Gallons Offset |
|---|---|---|---|---|
| 1.00 (0.75[1]) | $5,767,000 | $7,689,333 | $1.56 | $0.40 |

[1]Beneficial offset.

Issues:
- Seasonal supply of the water from the wetland system may pose quantity/quality issues and could affect the viability of the project.
- Cost of the treatment technology to treat stormwater could affect viability of the project.

**Reclaimed Water Option #4 – DeSoto Correctional Reuse Expansion (Toilet/Laundry)**

- Entity Responsible for Implementation: Florida Department of Corrections

This option is an expansion of an existing reuse disposal system that would redirect the DeSoto correctional facility's WWTP flows from spray field disposal to supply water for the facility's toilets and laundry. The concept has been used in other projects such as the Jefferson County and Charlotte County correctional institutions' toilet flushing systems. This option includes design and construction of 6-inch diameter transmission and 2-inch diameter distribution lines, a 1-million gallon storage tank, and a pumping and chlorination facility to supply up to 0.20 mgd of reclaimed water to the prison and offset 0.2 mgd of groundwater use. The implementation time frame is expected to be between 2011 and 2030.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd Offset | Cost/1,000 Gallons Offset | O&M/1,000 Gallons Offset |
|---|---|---|---|---|
| 0.20 (0.20[1]) | $1,153,400 | $5,767,000 | $1.14 | $0.30 |

[1]Beneficial offset

Issues:
- The WWTP would require upgrading to meet FDEP reclaimed water standards; however, such upgrades are anticipated to be required during the 2011–2030 time frame.

**Reclaimed Water Option #5 – Punta Gorda Reclaimed Water System**

- Entity Responsible for Implementation: City of Punta Gorda Utilities

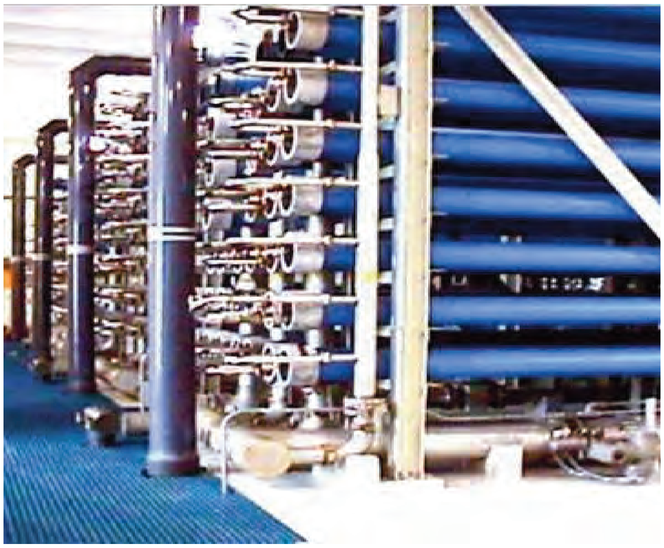
This option would redirect the effluent flows from the City of Punta Gorda's deep-well disposal site to local golf, residential, commercial and industrial water users. The option includes design and construction of a high service pumping and chlorination facility, a 10-million gallon storage tank and transmission/distribution lines from the city's WWTP to supply 2.3 mgd of reuse to a varied urban customer base and offset 1.7 mgd of potable quality water. The implementation time frame is expected to be between 2011 and 2030.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd Offset | Cost/1,000 Gallons Offset | O&M/1,000 Gallons Offset |
|---|---|---|---|---|
| 2.30 (1.7[1]) | $13,264,100 | $7,689,333 | $1.56 | $0.40 |

[1]Beneficial offset

Issues:
- The city's sewer system would require upgrading; however such upgrades are anticipated to be completed during the 2011–2030 time frame.

### *Section 3. Brackish Groundwater Desalination*



*Reverse osmosis membranes in a brackish groundwater treatment facility.*

Brackish groundwater is considered to be a viable source of water supply when it is obtained from the intermediate aquifer in the planning region. Requests for brackish groundwater withdrawals will be evaluated similarly to requests for fresh groundwater withdrawals because all withdrawals, regardless of quality, cannot impact or delay the recovery of a stressed MFL water resource. It is unlikely that options proposing to withdraw brackish groundwater from the Upper Floridan aquifer in most areas of the planning region would be permittable due to their potential to exacerbate existing resource problems that have resulted from groundwater withdrawals. The identification of brackish groundwater desalination options was based on a review of currently planned or proposed projects and an assessment of potential brackish groundwater resources in the region.

**Brackish Groundwater Option #1 – Carlton Memorial Reserve**

- Entities Responsible for Implementation: Sarasota County, PRMRWSA

Sarasota County is planning to refurbish their 12-mgd EDR treatment process at the T. Mabry Carlton, Jr. Water Treatment Plant. In addition, the county is expanding their wellfield with intermediate and/or Upper Floridan wells and installing a deep-injection well concentrate disposal system. The county is also considering the addition of a 2.5-mgd RO treatment system. The county is currently connected directly to Manatee County and the PRMRWSA's regional water supply system. Costs were obtained from the county's feasibility study and include costs for the installation of the RO system and separate alternatives for using the existing building (Configuration 1) or construction of a new building (Configuration 2).

Configuration 1

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 2.5 | $20,344,600 | $8,137,840 | $1.62 | $1.51 |

Configuration 2

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 2.5 | $27,332,600 | $10,933,040 | $2.18 | $1.51 |

**Brackish Groundwater Option #2 – RV Griffin Reserve**

- Entity Responsible for Implementation: PRMRWSA

Data from intermediate aquifer test and monitor wells at the RV Griffin Reserve indicate that water quality and production of groundwater is expected to be sufficient for the development of a wellfield. The RV Griffin Reserve option includes six intermediate aquifer wells that will each produce 700 gpm for a total production of 5 mgd. This will be accomplished by blending 3 mgd of RO permeate with 2 mgd of raw water. The PRMRWSA's water supply facility is directly interconnected to the regional system that is currently being expanded. Costs were obtained from the PRMRWSA source feasibility study.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 5.0 | $47,427,200 | $9,485,440 | $1.89 | $0.99[1] |

[1]Operation and Maintenance for 3 mgd of RO for 5-mgd total capacity.

**Brackish Groundwater Option #3 – City of Venice**

- Entities Responsible for Implementation: City of Venice, PRMRWSA

The City of Venice operates a RO facility that was originally designed to produce 4.5 mgd of finished water. Currently, the facility operates at 50 percent recovery, producing an actual finished yield of 2.1 mgd in 2008. This option includes two potential configurations to expand the city's treatment capacity and supply source. Configuration 1 includes the construction of a new water treatment facility to replace the existing facility. The new facility will have the capacity to produce 7.0 mgd of finished water with a recovery efficiency to 80 percent. The option includes five additional intermediate aquifer supply wells, two deep-injection wells for RO concentrate disposal, and associated transmission pipelines. Costs were obtained from the PRMRWSA's source feasibility study.

Configuration 1

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 7.0 | $61,600,000 | $8,800,000 | $1.75 | $1.37 |

Configuration 2 includes construction of a smaller RO facility that would have a finished water capacity of 2.5 mgd with a recovery efficiency of 80 percent. The existing system would remain in service and continue to operate with a 50 percent recovery efficiency. Both systems would use the current disposal method of surface water discharge. The option only includes the construction of the new facility and five additional source wells. Costs were obtained from the PRMRWSA source feasibility study.

Configuration 2

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 2.5 | $32,970,000 | $13,180,000 | $2.62 | $1.37 |

**Brackish Groundwater Option #4 – DeSoto County**

- Entity Responsible for Implementation: PRMRWSA

DeSoto County owns two wellfields and RO systems located at the DeSoto Correctional Institution (DCI) and Florida Department of Juvenile Justice (DJJ) facilities. The DCI facility's RO system has a treatment capacity of 0.33 mgd. Water produced from the facility is blended with additional raw water to provide a total of 0.7 mgd for local supply. The DJJ facility's RO system has a treatment capacity of 0.50 mgd, but is currently offline due to concentrate disposal issues. This option includes facility upgrades and expansion, additional Upper Floridan aquifer wells, a deep-injection well for RO concentrate disposal, and an interconnection for both facilities to provide a combined additional 3.0 mgd to the regional system. Costs were obtained from the PRMRWSA source feasibility study.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 3.0 | $49,317,200 | $16, 439,000 | $3.27 | $1.64 |

**Brackish Groundwater Option #5 – Project Prairie**

- Entity Responsible for Implementation: PRMRWSA

This option involves the reactivation of an RO treatment facility at the Project Prairie site. The option would be used to augment existing water supply sources, which may include development of a new brackish groundwater source to augment surface water supply. The facility has one existing well permitted to withdraw 432,000 gpd. The original RO membrane skid has been removed, but the facility is still equipped with a 0.5-million-gallon capacity ground storage tank, raw water piping, bypass piping, a pretreatment system and a post-treatment system. Concentrate generated by the RO process could be discharged to a lift station and eventually discharged at the former G. Pierce Wood Wastewater Treatment Plant. A summary of budgetary opinion of probable cost conducted in August 2008 indicated that the cost of re-activating the RO facility would be $144,000. The O&M cost for the system is expected to range between $15,000 and $25,000 per month.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 gallons | O&M Cost/1,000 gallons |
|---|---|---|---|---|
| 0.25 | $144,000 | $576,000 | $3.40 | $3.29 |

Southwest Florida Water Management District

### *Section 4. Seawater Desalination*

The development of seawater desalination options included identifying industrial dischargers for co-location with future desalination plants. Much of the near-shore area in the planning region has been designated as either Outstanding Florida Water (OFW) or aquatic preserves. For this reason, it was important to locate sites that would not discharge into waters with either of these designations. Other criteria for identifying potential sites were access to existing public supply infrastructure and the magnitude of the nearby water demand. A desalination facility developed at any of the sites would be required to address the two major environmental permitting issues: the intake of water directly from the gulf or a bay, which usually results in loss of marine species as a result of impingement and entrainment, and the disposal of waste concentrate.

*An interior view of the Tampa Bay Seawater Desalination Facility.*

There are currently no seawater desalination plants operating or planned for the area. The evaluation of seawater desalination as a source for the region focused on locating suitable areas that (1) would be compatible with adjacent land uses, (2) would be near existing potable water transmission infrastructure and (3) could be permitted for disposal of the concentrate. Two sites were identified that meet these criteria: the Port Manatee site in Manatee County and a site in an industrial area near the Venice airport in Sarasota County. Each option was conceptualized as having a production capacity of 20 mgd. These projects were previously included in the 2006 RWSP. A cost index was applied to update funding estimates to 2009 costs.

**Seawater Desalination Option #1 – Port Manatee**

- Entity Responsible for Implementation: PRMRWSA

This option is for the development of a desalination facility at Port Manatee in northwestern Manatee County, on Tampa Bay. The site was chosen because of its industrial nature, proximity to a deep-water channel that could accommodate intake and discharge facilities, and potential to obtain a permit to discharge concentrate. An additional advantage of the site is that it is located approximately 0.5 miles from a point of connection to two potable water lines that are part of Manatee County's water system. The facility would be designed to withdraw up to 440 mgd of seawater, of which 40 mgd would be feed water for the desalination process. Twenty mgd of finished water would be produced and 20 mgd of concentrate would be diluted with up to 400 mgd of seawater (20 to 1 ratio) and discharged to the gulf. Because the concentrate would be discharged in Class III waters outside aquatic preserves or areas designated as Outstanding Florida Waters, the potential for obtaining a permit for the discharge would be improved. The proximity of this site to the mouth of Tampa Bay may be advantageous with respect to concentrate disposal because the large volumes of water entering and leaving the bay during a normal tidal cycle would provide the volume of water necessary for dilution.

As part of the Water Planning Alliance Regional System Planning and Engineering Study, the Port Manatee site was evaluated for seawater desalination facility options with capacities of 5 and 10 mgd. Financial information for these options is presented in the table, along with the 20-mgd option.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | O&M/1,000 Gallons |
|---|---|---|---|---|
| 5 | $66,827,000 | $15,437,037 | $3.58 | $1.90 |
| 10 | $130,287,465 | $13,028,747 | $3.02 | $1.66 |
| 20 | $196,600,000 | $9,830,000 | $2.28 | $3.22 |

Issues:
- The facility, as evaluated, does not include co-location with an existing industrial discharger.
- Potential impacts requiring evaluation include the effects of a large-scale intake of seawater and discharge of waste concentrate to the bay. Although the waters receiving the waste concentrate are Class III, Outstanding Florida Waters and an aquatic preserve are nearby.

**<u>Seawater Desalination Option #2 – Venice</u>**

- Entity Responsible for Implementation: PRMRWSA

This option is for a desalination facility located in the general vicinity of the Venice airport. The site was chosen because it is in close proximity to areas of high water demand, has access to potential intake and discharge sites in the Intracoastal Waterway and Gulf of Mexico, and is near a permitted surface water discharge site. The site is also located near a water treatment plant that is interconnected to the Sarasota County Water System, which could serve as the point of distribution for the product water. The intake would be located in the Intracoastal Waterway, which would increase circulation in a portion of the waterway that has exhibited poor water quality. The concentrate would be sent through a pipeline to discharge in the Gulf of Mexico. To properly manage the disposal of concentrate from the desalination facility, the intake would be designed to withdraw up to 440 mgd from the Intracoastal Waterway, of which 40 mgd would be feed water for the desalination process. The process would result in 20 mgd of concentrate that would be diluted with up to 400 mgd of seawater (20 to 1 ratio) and discharged to the gulf. As part of the Water Planning Alliance Regional System Planning and Engineering Study, the Venice site was evaluated for seawater desalination facility options with capacities of 5 mgd and 10 mgd. Financial information for these options is presented in the table below, along with a 20-mgd option.

| Quantity Produced (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | O&M/ 1,000 Gallons |
|---|---|---|---|---|
| 5 | $73,235,085 | $14,647,017 | $3.39 | $1.89 |
| 10 | $119,964,299 | $11,996,430 | $2.77 | $1.65 |
| 20 | $195,226,185 | $9,761,309 | $2.26 | $1.45 |

Issues:

- The facility, as evaluated, does not include co-location with an existing industrial discharger.
- Potential impacts requiring evaluation include the effects of a large-scale intake of seawater from the Intracoastal Waterway and concentrate discharge to the Gulf of Mexico. Although the waters receiving the waste concentrate are Class III, Outstanding Florida Waters and an aquatic preserve are nearby.

### *Section 5. Fresh Groundwater*

*Construction of a groundwater production well.*

The development of additional fresh groundwater from the Upper Floridan aquifer in the planning region will be limited as a result of environmental impacts from excessive withdrawals and planned reductions in withdrawals that are part of the SWUCA recovery strategy. Future requests for groundwater from the Upper Floridan aquifer will be evaluated based on the projected impacts of the withdrawals on existing legal users and water resources, including those with established MFLs. In particular, groundwater withdrawals cannot impact water levels in the MIA of the SWUCA. Priority will be given to reducing groundwater withdrawals when possible in order to contribute to water level recovery in the area. Requests for withdrawals of groundwater from the Upper Floridan aquifer for new uses will be considered only if the requested use is reasonable and beneficial, incorporates maximum use of conservation and there are no available alternative sources of water. If all these conditions are met and the withdrawals are projected to impact water levels in the MIA, it will be necessary for those impacts to be offset prior to issuance of a water use permit. Though the use of groundwater from the Upper Floridan aquifer to meet future demands will be limited, it will be possible to obtain groundwater from the surficial and intermediate aquifers under certain conditions. The following option evaluates the use of horizontal wells to develop groundwater from the surficial aquifer.

**Fresh Groundwater Option #1 – Surficial Aquifer Horizontal Well Systems**

- Entities Responsible for Implementation: water supply utilities

Horizontal well systems have been used to augment reuse, to irrigate cemeteries and golf courses, and for fire suppression systems. Horizontal wells are typically used in conjunction with a pond or other storage system (aquifer storage and recovery well, tank, retrofitted parking lot). These systems are advantageous in areas where the surficial aquifer is productive and where withdrawals from deeper aquifers are restricted. This option is modeled after a horizontal well system and storage pond that was constructed for the Department of Veterans Affairs at Bay Pines Cemetery in Pinellas County. The horizontal well system includes six horizontal wells, a 1.4-million-gallon storage pond, piping and a pump station. The system had clogging issues and is being reevaluated for use.

| Potential Quantity Available (mgd) | Capital Cost | Cost/mgd | Cost/1,000 Gallons | O & M/ 1,000 gallons |
|---|---|---|---|---|
| 0.10 | $808,500 | $8,808,500 | $2.33 | $0.47 |

## *Section 6. Water Conservation*

*The District assists utilities with the development of incentive programs that encourage their customers to install water-saving fixtures such as low-flow showerheads.*

1.0 Non-Agricultural Conservation

The District identified a series of conservation measures that are appropriate for implementation by the public supply, domestic self-supply, recreational/aesthetic, and I/C,M/D,PG water use sectors. A complete description of the criteria used in selecting these measures and the methodology for determining the water savings potential for each measure within each non-agricultural water use category is described in detail in Chapter 4. Some readily applicable conservation options were not addressed due to the wide variance in implementation costs and the site-specific nature of their implementation. Two such measures in particular, which have savings potential but were not addressed as part of the 2010 RWSP, are water-conserving rate structures and local codes/ordinances, which require water conservation. The District strongly encourages these measures and when designed properly, they can be effective at conserving water. In addition, permittees are required to address these measures in their water conservation plan, which is part of the package provided by permittees during the water use permit application or renewal period. The following is a description of each non-agricultural water conservation option. Data source references for costs and savings and detailed data tables for all of the measures are located in the Chapter 5 Appendix.

**Non-Agricultural Water Conservation Option #1 – Clothes Washer Rebates**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

This option is for rebates for installation of water-efficient clothes washers in single-family homes, multifamily housing and commercial establishments. Laundry washing is a large water user in the average home, accounting for 15 percent to 40 percent of the overall water consumption inside a typical household of four persons. A family of four using a standard clothes washer may generate more than 300 loads per year, consuming 12,000 gallons of water annually. High-efficiency clothes washers can reduce this water use by more than 6,000 gallons per year. Additional benefits include using less laundry detergent, less energy and more effective cleaning. Most high-efficiency washers use only 15 to 30 gallons of water to wash the same amount of clothes as traditional washers (29 to 45 gallons per load).

The variable cost per rebate is approximately $160. The variable cost refers to the actual direct costs of each individual measure, in this case the value of the rebate and some administrative costs. The potential for water savings varies, depending on how often the washer is used, but is estimated at 16.3 gpd. For the purposes of this RWSP, the measure was evaluated based on the current variable costs and for single-family uses only. Higher savings and lower costs could be achieved in multifamily or commercial laundry facilities.

| Sector | Water Savings Rate in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 0.08 | $2.31 | $816,000 |
| **Domestic Self-Supply Total** | **0.08** | **$2.31** | **$816,000** |

**Non-Agricultural Water Conservation Option #2 – Plumbing Retrofit Kits (residential users)**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

Plumbing retrofit kits conserve water through the distribution of plumbing fixtures to retrofit high-flow plumbing fixtures with low-flow equivalents. This option is appropriate for implementation in the domestic self-supply category and multifamily and single-family residential uses in the public supply category. Typically, retrofit kits contain easy-to-install low-flow showerheads, faucet aerators and toilet leak detection tablets. Plumbing retrofit programs can be designed as a giveaway or exchange program and require outreach and marketing efforts to promote the program. Purchasing higher-quality kit contents would be a tradeoff between higher retention rates and higher program costs. The average cost per kit (including program administration and purchasing price) is approximately $12. The water savings is estimated at 12.0 gpd. Additional savings could be achieved by providing EPA WaterSense-certified low-flow showerheads.

| Sector | Water Savings Rate in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 0.64 | $0.24 | $638,766 |
| **Domestic Self-Supply** | 0.03 | $0.24 | $30,000 |
| **Total** | **0.67** | **$0.24** | **$668,766** |

**<u>Non-Agricultural Water Conservation Option #3 – Ultra Low-Flow Toilet (ULFT) Rebates (residential and commercial users)</u>**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

ULFT programs offer rebates as an incentive for replacement of high-flow toilets with water-efficient models. ULFTs use 1.6 gallons per flush (gpf) as opposed to older, less-efficient models that use 3.5 to 7.0 gpf, depending on the age of the fixture. Other fixtures such as high-efficiency toilets (HET) and dual-flush toilets (DFT) use even less water, but they can be rebated for the same amount, resulting in even higher savings than those presented here. HETs use about 1.28 gpf, while DFTs have the option to use 0.8 gallons of water for liquid removal or 1.6 gallons for full-flush solid removal. Additional savings could be achieved by providing only rebates for EPA WaterSense-certified HETs, which use 1.28 gpf or less. A DFT rebate program may be used in conjunction with a ULFT or HET toilet rebate program; however, over-estimating the potential for future water savings by “double-dipping” from both toilet types should be avoided. Since these two conservation measures are mutually exclusive, only the more conservative savings from ULFTs are presented below. ULFT programs should be accompanied by customer education regarding proper flapper selection and replacement to sustain water savings over the lifetime of the fixture. The variable cost per measure can range from $135 to $210, depending on the program. The water savings is estimated at 27 gpd.

| Sector | Water Savings in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 1.12 | $1.18 | $5,609,925 |
| **Domestic Self-Supply** | 0.07 | $1.18 | $357,750 |
| **I/C,M/D,PG** | 0.002 | $1.18 | $7,898 |
| **Total** | **1.20** | **$1.18** | **$5,975,573** |

**<u>Non-Agricultural Water Conservation Option #4 – Landscape and Irrigation Evaluations and Large Landscape Surveys (all users)</u>**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

Water-efficient landscape and irrigation evaluations (evaluations) and large landscape surveys (surveys) obtain water savings by evaluating individual irrigation systems, providing expert tips on opportunities to increase water efficiency, and offering targeted rebates or incentives based on those recommendations. Evaluations are applicable to all accounts that use inground sprinkler systems for landscape irrigation, and surveys are for accounts that have irrigated landscapes larger than one acre in size. Surveys apply only to the non-residential sub-category of the public supply category and the I/C,M/D,PG and recreational/aesthetic categories. The cost-effectiveness is greatest for these large accounts. The cost of the option increases with the area surveyed. The variable cost of each evaluation (smaller accounts) is $460 and the variable cost for each survey (large accounts) is $875. The average water savings rate is 140 gpd for evaluations and 428 gpd for surveys. On-site follow-up evaluations are recommended to verify water savings. Since these measures depend on behavior modifications and equipment that typically has a five-year life, the "life span" of the water savings is limited to five years.

| Water-Efficient Landscape and Irrigation Evaluation & Rebate | | | |
|---|---|---|---|
| **Sector** | **Water Savings in 2030 (mgd)** | **Cost-effectiveness ($/1,000 gal)** | **Total Cost** |
| **Public Supply** | 0.82 | $2.09 | $2,708,940 |
| **Domestic Self-Supply** | 0.08 | $2.09 | $253,000 |
| **I/C,M/D,PG** | 0.003 | $2.09 | $8,970 |
| **Recreational/Aesthetic** | 0.01 | $2.09 | $16,836 |
| **Total** | **0.91** | **$2.09** | **$2,987,746** |

| Large Landscape Survey | | | |
|---|---|---|---|
| **Sector** | **Water Savings in 2030 (mgd)** | **Cost-effectiveness ($/1,000 gal)** | **Cumulative 20-Year Cost** |
| **Public Supply** | 0.16 | $1.30 | $332,063 |
| **Recreational/Aesthetic** | 0.02 | $1.30 | $32,025 |
| **Total** | **0.18** | **$1.30** | **$364,088** |

**Non-Agricultural Water Conservation Option #5 – Rain Sensor Device Rebates (all users)**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

Rain sensor devices reduce water used by automatic irrigation systems by shutting down irrigation controllers or shutting irrigation control valves during rain events. This measure can be effective for any water user that has an automatic irrigation system because Florida law requires all systems to use an automatic shutoff device. In Florida, Senate Bill 494, which took effect in July 2009, requires all automatic irrigation systems to use an automatic shutoff device. The rain sensor program would provide rebates for the purchase and installation of rain sensors. The variable cost of each measure is $80, most of which is driven by the actual value of the rebate. The average water savings per device is estimated to be 100 gpd. Since the devices typically have a five-year life, the "life span" of the water savings is limited to five years. Other weather-based control devices for irrigation systems, such as soil moisture sensor devices, have shown in certain circumstances to be capable of saving even more water in residential settings. Similar to rain sensor devices, these measures can be effective for any water user that has an automatic irrigation system and could potentially save greater quantities than those presented below.

| Sector | Water Savings in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 1.11 | $0.51 | $890,000 |
| **Domestic Self-Supply** | 0.12 | $0.51 | $95,200 |
| **I/C,M/D,PG** | 0.002 | $0.51 | $1,560 |
| **Recreational/Aesthetic** | 0.01 | $0.51 | $5,856 |
| **Total** | **1.24** | **$0.51** | **$992,616** |

**Non-Agricultural Water Conservation Option #6 – Industrial Commercial Pre-Rinse Spray Valve Replacement Rebates (industrial and commercial users)**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

This measure offers rebates to hospitality facilities to replace high water-volume spray valves with water-conserving low-volume spray valves. The measure could apply to non-residential customers of the public supply sector or any other applicable customers within the I/C,M/D,PG sector. A traditional spray valve uses 2 to 5 gallons per minute, while high-efficiency spray valves use no more than 1.6 gpm. High-efficiency valves are also more effective at removing food from dishware. As with other rebate programs, the customer would first apply for a rebate, install or replace the spray valve(s) and provide documentation of purchase with a request for rebate payment. The variable cost of each spray valve measure is estimated at $92, most of which includes the actual value of the rebate. The average water savings is estimated at 200 gpd per device.

| Sector | Water Savings in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 0.52 | $0.11 | $238,234 |
| **I/C,M,PG** | 0.004 | $0.11 | $1,794 |
| **Total** | **0.52** | **$0.11** | **$240,028** |

**Non-Agricultural Water Conservation Option #7 – Industrial, Commercial, Institutional Water Use Facility Assessments (industrial, commercial, institutional users)**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

The objective of industrial, commercial, institutional (ICI) facility assessments is to reduce water consumption by conducting assessments of water use at non-residential facilities to identify the potential for improved efficiency. ICI facilities can use water for a variety of purposes including cooling, dissolving, energy storage, pressure source, raw material or for more traditional domestic uses. Surveys typically include a site visit, characterization of existing water uses and a review of operational practices, followed by recommended measures to improve water use efficiency. The cost of the measures (minus the value of rebates and incentives) is weighed against a payback period through reduced water and sewer bills and any associated energy savings. While the average survey will have a variable cost of $3,450, the average savings rate is 2,308 gpd. On-site follow-up surveys are recommended to verify water savings. The savings related to the surveys result from the implementation of recommendations. Offering rebates along with the surveys will enhance the likelihood that recommended measures get implemented but will also increase the program costs. It should also be noted that many performance contractors are also available to conduct ICI surveys, and they will normally invest in the efficiency improvements for an agreed upon percentage of the financial savings achieved through the water, sewer and energy savings.

| Sector | Water Savings in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 2.01 | $0.35 | $2,999,555 |
| **I/C,M,PG** | 0.045 | $0.35 | $67,275 |
| **Total** | **2.05** | **$0.35** | **$3,066,830** |

**Non-Agricultural Water Conservation Option #8 – Landscape Water Budgeting (all users)**

- Entities Responsible for Implementation: utilities, municipalities, counties and industrial organizations

A water budget is a calculation of an adequate amount of water for a landscaped area based on the actual needs of the associated flora. A water budget requires site-specific information regarding the size of the landscaped area, the composition of plants, crop coefficient values, soil conditions and weather data, including precipitation and temperature. This measure targets water users that have inground irrigation systems and is based on reducing the number of irrigation events per year. Each account would be given a tailored water budget and would be required to remain within that budget. Program participants would be required to follow the local water restrictions. Utilities (or counties) would track each account's metered use to monitor and enforce the budgets. This option represents the only enforceable measure not required by local plumbing codes being evaluated in this RWSP. One common way to encourage adherence to a water budget, without strictly requiring adherence, is by tying the water allocations from the water budget to a tiered rate structure. When accounts surpass different levels of water consumption relative to their water budget, they are required to pay more per unit of water. Since this measure is an ongoing program that targets all accounts, the variable cost is $11 per account per year, regardless of the participation rate. This is based on standard monitoring and enforcement of water budgets, which is ideally automated through the billing system. The average savings for this option is estimated at 78 gpd. The savings benchmark is based on the annual average use of residential irrigation systems and the amount that would be used if those systems were following a water budget.

| Sector | Water Savings in 2030 (mgd) | Cost-effectiveness ($/1,000 gal) | Total Cost |
|---|---|---|---|
| **Public Supply** | 0.17 | $0.09 | $24,035 |
| **Domestic Self-Supply** | 0.008 | $0.09 | $1,100 |
| **Recreation/Aesthetic** | 0.006 | $0.09 | $805 |
| **Total** | **0.18** | **$0.09** | **$25,940** |

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## 2.0 Agricultural Water Conservation

*The FARMS Program is a partnership with state and federal agencies that provides cost-share funding for growers to install water-saving technologies.*

Nearly 40 percent of irrigated agricultural acreage and 30 percent of agricultural water use in the District occurs in the Southern Planning Region. As the largest consumer of water in the region, there is great potential to increase the efficiency of agricultural water use. In 2010, it is anticipated that approximately 136,000 acres of agricultural lands will be irrigated by 124 mgd of water that will mostly be obtained from the Upper Floridan aquifer. The District has a comprehensive strategy to reduce agricultural groundwater use over the next 20 years. A key component of this strategy is the cooperative programs the District has established with other agencies to provide the agricultural community with a wide array of technical and financial assistance programs to facilitate increases in water use efficiency. For nearly 30 years, the District has administered programs that have provided millions of dollars to fund more than 100 projects that have helped farmers increase the efficiency of their water use and improve water quality. Water conservation options for which the District will provide assistance as part of FARMS and other programs are described below. For some of the programs, examples of options that could be implemented by growers are included with basic technical specifications and costs.

### 2.1 Facilitating Agricultural Resource Management Systems (FARMS)

The District, in cooperation with the Florida Department of Agriculture and Consumer Services (FDACS), initiated the FARMS Program in 2003. FARMS provides cost-share reimbursement for the implementation of agricultural best management practices (BMPs) that involve both water quantity and water quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help farmers become more efficient in their water use, improve water quality, and restore and augment natural systems. FARMS is a public/private partnership between the District and FDACS and private agriculturalists. Reimbursement cost-share rates for agriculturalists are based on the degree to which they implement both water quantity and water quality BMPs. The goal for the FARMS Program is to offset 40 mgd of groundwater use for agriculture by 2025. Because the District classifies FARMS projects as water resource development, additional information pertaining to the program, status of project implementation and water savings achieved to date is provided in Chapter 7.

### 2.2 Well Back-Plugging Program

The well back-plugging program provides funding assistance for property owners to partially back-plug wells with poor water quality. Back-plugging involves plugging the lower portion of deep wells with cement to isolate the geological formation where poor-quality groundwater originates. Back-plugged wells show a dramatic reduction in concentrations of chloride and sulfate, which are the constituents that typically exceed standards in the region. Because the District classifies the well back-plugging program as water resource development, additional information pertaining to the program, status of project implementation and water savings achieved to date is provided in Chapter 7.

### 2.3 Institute of Food and Agricultural Sciences (IFAS) Research and Education Projects

The District provides funding for IFAS to investigate a variety of agriculture issues that involve water conservation. These include development of tailwater recovery technology, determination of crop water use requirements, field irrigation scheduling, frost/freeze protection, etc. IFAS conducts the research and then promotes the results to the agricultural community.

### 2.4 Mobile Irrigation Laboratory

The mobile irrigation lab program is a cooperative initiative between the District and the Natural Resources Conservation Service (NRCS). The NRCS conducts efficiency and conservation evaluations of agricultural irrigation systems. Since 1986, the mobile irrigation lab service has evaluated irrigation systems at more than 900 sites in the District and recommended management strategies and/or irrigation system adjustments.

### 2.5 Model Farms

The model farms concept is a tool to determine the potential for water savings for various scenarios of irrigation system conversions and/or BMPs for a number of different agricultural commodities. There are 20 model farms available with different best management/irrigation system modifications applied to the existing farms. Currently, there are 32 model farms projects that are either in operation or planned for implementation in the planning region.

### 2.6 Best Management Practices

BMPs are innovative, dynamic and improved water management approaches applied to agricultural irrigation practices and crop production to help promote surface and groundwater resource sustainability. BMPs help protect water resources and water quality, manage natural resources and promote water conservation. Some BMPs are as simple as preparing a schedule for irrigation to help reduce water consumption in a rainy season, while others involve cutting-edge technologies such as soil moisture monitors, customized weather stations and computer programs for localized irrigation systems. The following are BMP options that the District, its cooperators and the agricultural community have successfully implemented in the planning region.

**BMP Option #1 – Tailwater Recovery System**

Tailwater recovery has proven to achieve both water-quality improvements and groundwater conservation. Tailwater ponds are typically excavated below ground level at the low end of a farm to collect excess irrigation water and stormwater runoff. To utilize the pond as a source of irrigation water, pumps, filters and other appurtenances are needed to connect the pond to the existing irrigation system. The use of these ponds for irrigation offsets a portion of the groundwater used to irrigate the commodity and can improve water quality of the downstream watershed by reducing the concentration of mineralized groundwater applied to fields. An example of a tailwater recovery project is the JDI Farms project in Charlotte County. The farm is permitted to withdraw up to 0.30 mgd of groundwater to irrigate tomatoes and melons. The goal of the project is to reduce groundwater withdrawals through the use of two tailwater recovery/surface water collection reservoirs. The project includes two surface water pump stations, filtration and infrastructure necessary to operate and connect the reservoirs to a new, more efficient drip irrigation system. The projected reduction in groundwater withdrawals is 35 percent, or 0.11 mgd of its permitted quantities.

| Option | Potential Savings (mgd)[1] | Capital Cost Per Acre[2] | O&M Cost/Acre 3 | Cost/1,000 Gallons |
|---|---|---|---|---|
| Tailwater Recovery System | 3 | $530 | $1.51 | $0.34 |

[1]if implemented in year 2010 on all acreage.
[2]Costs estimated in 2008 and included depreciation, insurance, taxes and repairs (for a 300-acre farm).
[3]BMP cost update using 2008 construction costs (Hazen and Sawyer, 2009).

**BMP Option #2 – Precision Irrigation Systems**

Precision irrigation systems allow for the automatic remote control of irrigation pumps based upon information derived from soil moisture sensors that measure and monitor discrete sub-surface moisture levels. The system enables the grower to maintain soil moisture within optimized ranges, which reduces the potential for overwatering and prevents underwatering to avoid reduction in crop yields. A second system that increases irrigation efficiencies involves the use of automatic valves and on-off timers. These devices can be programmed to start and stop irrigation pumps to achieve maximum efficient irrigation durations. Without automatic valves and timers, the pumps must be manually turned off, which may not occur at the most optimum time. Several different types of electronic systems that increase irrigation system efficiency have been implemented through the FARMS Program.

*The District partners with state and federal agencies to provide cost-share funding for growers to install weather stations that help decrease the quantity of water used for freeze protection.*

**BMP Option #3 – Farm-Sited Weather Stations**

Regional weather information is often generalized and cannot account for the wide spatial variation of rainfall and temperature. The use of basic weather monitoring stations on individual farms can provide the grower with an effective tool to decide when to initiate a daily irrigation event or turn pumps on or off during a frost/freeze event. Using water for cold protection has long been an accepted practice for a variety of crops in Florida but it must be properly applied to avoid damage. During frost/freeze events, the weather stations can notify the grower when conditions are likely for damage to occur or when the danger of frost/freeze has passed.

Turning pumps on too early before damaging conditions occur will waste water and fuel, while turning the pumps off too early could cause damage to crops through evaporative cooling. The use of a farm-sited weather station can reduce water consumption and improve surface water quality in areas where poor quality groundwater is used for cold protection.

2.7 Development of Alternative Water Sources for Agricultural Irrigation

The District has identified three alternative water sources that could be used for irrigation of row crops and citrus. These include (1) rainwater harvesting, (2) substituting reclaimed water for groundwater and (3) use of the surficial aquifer. Although these sources are not applicable to every site and are not necessarily the most cost-effective, they are examples of practical alternatives that could reduce the use of groundwater from the Upper Floridan aquifer.

**Agricultural Alternative Water Source Option #1 – Rainwater Harvesting**

A farm-scale prototype rainwater harvesting plan was developed to generate planning estimates of potential water savings and costs. The site would be typical of many row crop farms in the planning region. The crops would be fall and spring tomatoes and strawberries grown on 1,000 acres with only a third of the acreage in production at any one time. This scenario could be permitted for an annual average of approximately 1.5 mgd of irrigation quantities. Components of the system would include a surface water withdrawal pump station, 30-acre reservoir, pump station and distribution system, and a surface water runoff interception/diversion ditch. A 500-foot intake ditch would convey water from an intermittent stream to a sump where it would be withdrawn by a 3,000-gpm pump and conveyed via a 6,000-foot, 16-inch diameter pipe to a 30-acre irrigation reservoir. Water from the reservoir would be distributed to the fields using two 2,500-gpm pumps and 25,000 feet of irrigation main. A 6,100-foot interception ditch would divert runoff to an existing wetland perimeter ditch that would discharge into the sump. Control structures would be installed on the interception ditch to maintain base flow downstream and allow large storm events to bypass the ditch.

The amount of rainwater that could be harvested is conservatively estimated to be 0.53 mgd, which is 35 percent of the annual average water use allocation and 76 percent of the fall allocation. Assuming the grower participated in incentive programs such as FARMS and the NRCS Environmental Quality Incentives Program, the cost to the grower could be significantly less than the $2,980,000 capital cost. The water savings that could be achieved by implementing similar rainwater harvesting systems in the planning region is conservatively estimated to be 12.4 mgd.

| Option | Potential Savings (mgd)[1] | Capital Cost[2] | O&M Cost | Cost/1,000 Gallons[3] |
|---|---|---|---|---|
| Rainwater Harvesting | 12.4 | $2,980,000 | $98.90/Acre | $2.16 |

[1]If implemented in year 2010 on all acreage, but does not include nurseries.
[2]Costs estimated in 2004 and included depreciation, insurance, taxes and repairs.
[3]HSW, 2004.

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**Agricultural Alternative Source Option #2 – Reclaimed Water**

Reclaimed water has safely been used for more than 40 years for agricultural irrigation in Florida, and currently more than 9,000 acres of edible crops within the District are irrigated with reclaimed water (FDEP 2008 Reuse Inventory, 2010). The feasibility of using reclaimed water for agriculture depends on the location of reclaimed water infrastructure and type of crop requiring irrigation. In accordance with F.A.C. 62-610.475, edible crops irrigated with reclaimed water are required to be peeled, skinned, cooked or thermally processed before consumption. Indirect application methods are also allowable, such as ridge and furrow irrigation, drip irrigation or sub-surface distribution systems for use on crops such as tomatoes, strawberries and vegetables. Chapter 4, Section 2 contains a discussion of reclaimed water availability, and Chapter 5, Section 2 contains a list of identified reclaimed water options, including agricultural supply.

**Agricultural Alternative Source Option #3 – Surface Water Sources**

This option involves the capture and storage of surface water for agricultural irrigation. An example of this type of project is the Falkner-Classie Farms Surface Water Withdrawal Project located in Manatee County. The project involves the capture of irrigation water runoff from creeks prior to their entry into the Flatford Swamp and reuse of the water for bed preparation and crop establishment on 1,186 acres of row crops. In addition to helping to restore the natural hydroperiod of the swamp, the project also offsets groundwater withdrawals. Project components include four pumping stations, piping, valves and other components necessary to connect two reservoirs into the existing irrigation system. The quantity of surface water captured and used on an annual average basis is estimated to be 0.76-mgd annual average, which reduces groundwater withdrawals by approximately 2.2 mgd.

| Option | Potential Savings (mgd) | Capital Cost | O&M Cost | Cost/1,000 Gallons |
|---|---|---|---|---|
| Classie Farms Surface Water Exchange Project | 2.2 | $3,140,000 | Unknown | $0.43 |

Construction of an early phase of the Peace River Manasota Regional Water Supply Authority's water treatment plant at the Peace River facility in DeSoto County.

This chapter is an overview of water supply projects that are under development in the Southern Planning Region. Projects under development are those the District is co-funding that have either been (1) completed since the year 2005 — the base year for the 2010 Regional Water Supply Plan (RWSP), (2) are in the planning, design or construction phase or (3) are not yet in the planning phase but have been at least partially funded through the 2010 fiscal year. The demand projections presented in Chapter 3 show that approximately 84.1 mgd of new water supply will need to be developed during the 2005–2030 planning period to meet demand for all use sectors and to restore minimum flows and levels (MFLs) for impacted natural systems in the planning region. As of 2010, it is estimated that at least 66 percent of that demand (54 mgd) has either been met or will be met by projects that meet the District's definition of being "under development." In addition, it is probable that additional water supplies are being developed by various entities in the planning region outside of the District's funding programs.

## Part A. Projects Under Development

Projects under development in the planning region include major expansions of the Peace River Manasota Regional Water Supply Authority (PRMRWSA) system, Bradenton reservoir expansion project, City of Punta Gorda brackish groundwater project, the Myakkahatchee Creek river bank filtration/reverse osmosis project, development and expansion of reclaimed water systems and ASR systems for potable and reclaimed water, and conservation projects for public supply and agriculture.

### *Section 1. Surface Water/Stormwater*

1.0 Surface Water/Stormwater Projects

**Surface Water/Stormwater Project #1 – PRMRWSA Regional Expansion Project**

This project, completed in 2009, has expanded existing water supply facilities to enable the PRMRWSA to deliver its total permitted allocation of 32.7 mgd from the Peace River to their customers. The project included a new reservoir, increased water treatment plant capacity, and an extension of the regional transmission system to serve portions of DeSoto County. The new facilities will be used in conjunction with the authority's existing reservoir and ASR wellfield system to maximize the use of surface water.

Reservoir Expansion

The recently completed reservoir provides 6 billion gallons of storage, in addition to the 0.6 billion gallons of storage provided by the old reservoir. This storage volume is required to provide a sustainable supply to meet the PRMRWSA's demands during dry periods when withdrawals from the Peace River are limited to maintain minimum flows. Total cost for this project was $82.5 million. The reservoir was completed in 2009 and filling of the reservoir began in July 2009.

Water Treatment Plant Expansion

The capacity of the treatment plant was expanded from 24 to 48 mgd and included raw water pumping (river and reservoir); flocculation and sedimentation basins;, chlorine contact basins; chemical feed systems; storage tanks; high service pumping; backwash recovery basins; residual thickening and mechanical dewatering system; instrumentation and controls; and an operations center. The additional treatment components have been incorporated into the existing treatment scheme and SCADA system. The total estimated cost for the expansion was $93.5 million.

DeSoto County Regional Transmission System Extension

The DeSoto County Regional Transmission System (RTS) extension was completed in September 2005 and provides for transmission of potable water from the Peace River facility to portions of DeSoto County. The extension consisted of 5 miles of 20-inch diameter pipeline and provides future opportunities to interconnect with other neighboring utilities within DeSoto and Charlotte counties. Further interconnection of utility systems would enhance regional supply management and provide the opportunity to rotate and rest sources of supply. The total estimated cost for the extension was $3,632,000.

| Quantity Produced (mgd) | Capital Cost | Capital Cost (District's Share) | Cost/mgd | Cost/1,000 gallons |
|---|---|---|---|---|
| 15.7 | $179,600,000 | $82,660,000 | $11,400,000 | $2.90 |

**Surface Water/Stormwater Project #2 – City of North Port Myakkahatchee Creek/Cocoplum Waterway River Bank Filtration/Reverse Osmosis Water Treatment Project**

The City of North Port's Myakkahatchee Creek Surface Water Treatment Plant exhibits considerable seasonal variability in flow and water quality from its source, which has prevented year-round operation, and full production at the plant's design capacity of 4.4 mgd. This project consists of a 1.5-mgd-capacity RO facility, which will provide a high-quality blending source to help meet water quality standards. The RO system will be supplied by an innovative riverbank filtration system consisting of horizontal wells located parallel to the Cocoplum Waterway. This project will improve the reliability of the city's water system, help the city meet its future demands and increase the use of surface water within the Southern Water Use Caution Area (SWUCA).

| Quantity Produced (mgd) | Capital Cost | Capital Cost (District's Share) | Cost/mgd | Cost/1,000 gallons |
|---|---|---|---|---|
| 1.5 | $13,100,000 | $1,400,000 | $8,733,333 | 3.06 |

**Surface Water/Stormwater Project #3 – City of Bradenton Reservoir Expansion**

This project will increase the storage capacity of the Bill Evers Reservoir, which will enable the capture of additional flow from the Braden River during high-flow periods. The projected raw water supply capacity will increase to 2.62 mgd. The project includes a raw water intake at the existing reservoir and pumping and piping for filling the new storage facility. The system will provide turnover and prevent stratification and stagnation of water in the new storage facility. Additionally, the project will include equipment and piping for withdrawing water from the new storage facility.

| Quantity Produced (mgd) | Capital Cost | Capital Cost (District's Share) | Cost/mgd | Cost/1,000 gallons |
|---|---|---|---|---|
| 2.62 | $17,372,000 | $4,433,000 | $6,600,000 | 1.49 |

**Surface Water/Stormwater Project #4 – Punta Gorda Shell Creek WTP Expansion to 10 mgd**

The City of Punta Gorda completed the expansion of their Shell Creek Water Treatment Plant (WTP) from 8 mgd to 10 mgd in March 2009. The intent of this project was to make water available to address a potential water supply shortfall that may have occurred while the Peace River Manasota Regional Water Supply Authority completed its facility expansion in March 2010. The project enabled the authority to have rotational capacity and the ability to rest sources, and it provided reserve capacity for emergency transfers. The project elements included rehabilitating existing filters and improving the facility's chemical mixing and disinfection processes.

| Quantity Produced (mgd) | Capital Cost | Capital Cost (District's Share) | Cost/mgd | Cost/1,000 gallons |
|---|---|---|---|---|
| 2 | $2,769,307 | $1,384,654 | $1,384,654 | $2.13 |

2.0 System Interconnect/Improvement Projects

**System Interconnect/Improvement Projects #1 – Regional Integrated Loop System**

The regional integrated loop system project is a series of transmission pipelines that will be developed to regionally transfer and deliver water from existing and future alternative supplies to demand centers within the PRMRWSA's four-county service area. The system will also provide reserve capacity for emergency transfers and maximize the use of surface water in the SWUCA. Information on the phases of the system that are under development are listed in the table below.


*Construction of a potable water transmission pipeline funded in part by District matching funds.*

| PRMRWSA Integrated Loop System Phase | Capital Cost | Description |
|---|---|---|
| PRMRWSA Regional Integrated Loop System Phase 1A Interconnect – Charlotte County | $19,015,000 | Connects supply systems of PRMRWSA, Charlotte County and Punta Gorda. Eight miles of 24" main with 1.4 mile subaqueous crossing of the Peace River, including a high service pumping station and groundwater storage tank on U.S. 17. Contractor selected. Begin construction summer 2010. Scheduled completion 2012. |
| PRMRWSA Regional Integrated Loop System Phase 2 Interconnect – City of North Port | $18,500,000 | Provides transmission capacity between PRMRWSA system and North Port. Approximately 7 miles of 42-inch diameter transmission pipeline paralleling the existing 36-inch diameter transmission pipeline. In final design. Scheduled for completion late 2012. |
| PRMRWSA Regional Integrated Loop System Phase 3A – Sarasota County | $31,879,240 | Pumping, storage and pipeline from Sarasota County's Carlton WTF, north across Myakka River to a county utility main. Interconnect will extend to WTF in Manatee County once future phases have been completed. Under construction; November 2011 completion. |

**System Interconnect/Improvement Project #2 – Emergency Backup Interconnect–Longboat Key**

The purpose of this project was to enable the Town of Longboat Key to receive a reliable supply of potable water in the event supplies are not available from Manatee County. The project included the design and construction of 2,400 feet of 16-inch diameter potable water pipeline that would connect the town's water supply system with that of the City of Sarasota. The project was completed in 2009.

| Project Name | Capital Cost | Project Description |
|---|---|---|
| Emergency backup potable water supply interconnect – Longboat Key | $4,200,000 | 16-inch interconnect pipeline with City of Sarasota |

**System Interconnect/Improvement Project #3 – Arcadia DeSoto Interconnect–City of Arcadia**

This interconnect provides the City of Arcadia an alternative source of water while conserving approximately 0.2 mgd of treated water that is flushed to maintain satisfactory chlorine residual in DeSoto County's existing regional transmission line from the PRMRWSA. The project consists of 50 feet of transmission main, meter, flow control valve, telemetry and other fittings necessary to interconnect the DeSoto County regional water main near the City of Arcadia's groundwater treatment facility. The interconnect will allow DeSoto County to send water to the City of Arcadia where it can be utilized to offset water withdrawn from the intermediate aquifer.

| Project Name | Capital Cost | Project Description |
|---|---|---|
| Arcadia–DeSoto Interconnect | $150,000 | 12-inch interconnect pipeline with City of Arcadia |

## *Section 2. Reclaimed Water*

Table 6-1 is a list, description and summary of the benefits and costs that have been or will be realized by reclaimed water projects currently under development. It is anticipated that these projects will be online by 2015. Descriptions of three of the projects in the table that are representative of the types of projects under development are provided below.

1.0 Reclaimed Water Projects Transmission, Storage Feasibility

**Reclaimed Water Project #1 – Charlotte County–Regional Reclaimed Water Expansion Phase 2**

The project consists of design, permitting and construction of reclaimed water mains, pump station, 5-million-gallon storage pond, instrumentation, controls and related appurtenances. The District has agreed to fund 50 percent of the $2.8 million project cost. The project will be completed in 2012.

**Reclaimed Water Project #2 – Aqua Utilities Reuse Transmission–Eastern Lakewood Ranch**

The project consists of design, permitting and construction of a transmission main and pump station to provide reclaimed water to the residential and agricultural areas in the eastern part of Lakewood Ranch. The transmission main will interconnect the Lakewood Ranch Phase VII-D Lake with new residential developments and existing agricultural areas. The District is funding 50 percent of the $3,274,000 project cost. When completed in 2010, the project will provide 1.15 mgd of public access quality reclaimed water to offset up to 1.15 mgd of residential and agricultural irrigation demands. At build-out, the project will provide 1.5 mgd of public access quality reclaimed water to meet the irrigation demand in the eastern area of Lakewood Ranch. The projected offset at 100 percent efficiency is 1.5 mgd.

**Reclaimed Water Project #3 – Manatee County Agricultural Reuse Project (MARS)**

The project consists of design, permitting and construction of transmission main, three pump stations and a 2-million-gallon storage tank to provide reclaimed water primarily to agricultural areas of Manatee County. The transmission mains also interconnected the county's three regional WWTPs into one unified regional system. The District funded nearly $12 million of the $37 million project cost. The project was completed in 2007 and now provides up to 20 mgd of public access quality reclaimed water to beneficially offset up to 12 mgd of agricultural and residential irrigation demands.

2.0 Reclaimed Water Projects – Research, Monitoring and Education

In addition to funding reclaimed water projects, the District also supports reclaimed water research and monitoring, which is central to maximizing reclaimed water use and increasing benefits. The District assists utilities in exploring opportunities for increased utilization of

Table 6-1. *Reclaimed water projects under development in the Southern Planning Region*

| Cooperator | General Project Description | Reuse (mgd) | | | Customer (#) | | Costs | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Produced | Offset | Stored | Type | Total | Total | District[2] | $/Kg[1] |
| **Charlotte County** | | | | | | | | | |
| Charlotte County | Trans/Pump/Store H027 | 1.27 | 0.95 | 1.0 | Rec,Com,GC | 18 | $7,250,000 | $4,043,175 | $1.50 |
| | Trans/Pump/Store H055 | N/A | N/A | 5.0 | | | | | |
| | ASR Conversion L215 | N/A | N/A | 100 | N/A | N/A | $3,000,000 | $1,585,450 | N/A |
| City of Punta Gorda | Feasibility Study L640 | N/A | N/A | N/A | N/A | N/A | $250,000 | $125,000 | N/A |
| **DeSoto County** | | | | | | | | | |
| City of Arcadia | Trans/Pump K889 | 0.40 | 0.30 | | Rec,Res,Ag | | $600,000 | $300,000 | $0.39 |
| DeSoto County | Feasibility Study L491 | N/A | N/A | N/A | N/A | N/A | $41,000 | $30,825 | N/A |
| **Manatee County** | | | | | | | | | |
| Manatee County | ASR F007 | N/A | N/A | 90.0 | N/A | N/A | $650,000 | $325,000 | N/A |
| | Trans/Pump/Storage F014 | 20.00 | 12.00 | 2.0 | Variety | TBD | $37,670,000 | $11,980,970 | $0.62 |
| | Transmission L201 | 0.11 | 0.05 | | Res | 175 | $173,846 | $86,923 | $0.65 |
| | Feasibility Study L006 | N/A | N/A | N/A | N/A | N/A | $400,000 | $200,000 | N/A |
| City of Palmetto | ASR L608 | 0.00 | 0.00 | 108 | N/A | N/A | $2,340,000 | $1,238,000 | N/A |
| City of Bradenton | Feasibility Study L515 | N/A | N/A | N/A | N/A | N/A | $60,000 | $30,000 | N/A |
| **Sarasota County** | | | | | | | | | |
| City of Venice | Trans/Pump FB24 | 1.32 | 0.70 | 0.00 | Res,Rec | 587 | $1,111,710 | $585,855 | $0.31 |
| Sarasota County | ASR K269 | 0.00 | 0.00 | 108.00 | N/A | N/A | $6,443,546 | $3,316,637 | N/A |
| Venice Golf and Country Club | Stormwater Reuse L213 | 0.35 | 0.35 | 0.00 | GC | 1 | $162,490 | $81,245 | N/A |
| City of Sarasota | Transmission L500 | 0.10 | 0.10 | 0.00 | Rec | 1 | $625,000 | $255,633 | $1.23 |
| Bradenton/Palmetto/Manatee Co. | Feasibility Study L854 | N/A | N/A | N/A | N/A | N/A | $120,000 | $40,000 | N/A |
| City of North Port | Feasibility Study L629 | N/A | N/A | N/A | N/A | N/A | $95,000 | $47,500 | N/A |
| | Store/Pump N084 | 0.00 | 0.00 | 2.50 | N/A | N/A | $2,101,500 | $1,051,250 | N/A |
| Englewood Water District | Transmission L028 | 0.11 | 0.08 | 0.00 | Rec | 2 | $254,480 | $127,240 | $0.63 |
| | Transmission L652 | 0.10 | 0.05 | 0.00 | Res | 251 | $271,582 | $157,789 | $1.04 |
| | Transmission L869 | 0.04 | 0.02 | 0.00 | Res | 73 | $240,000 | $122,500 | $2.16 |
| | Supplemental Supply N218 | 0.08 | 0.06 | 0.00 | GC | 7 | $260,000 | $130,000 | $0.84 |
| Aqua Utilities | Trans, Pump L522 | 0.57 | 0.57 | 0.00 | Rec | TBD | $364,300 | $209,472 | $0.13 |
| | Trans/Pump L874 (From Sarasota) | 1.50 | 1.50 | 0.00 | Res,Ag | TBD | $3,274,000 | $1,637,000 | $0.43 |
| **Total** | **25 Projects** | **25.95** | **16.73** | **416.50** | | **1,115** | **$67,758,454** | **$27,707,464** | **$0.83** |

[1]Cost per 1,000-gallon offset calculated at 6% interest amortized over a 30-year project life. [2]Costs include all revenue sources budgeted by the District.

reclaimed water and supports applied research projects, which not only include innovative treatment and novel uses of reclaimed water but also nutrient and constituent monitoring. Table 6-2 includes general descriptions and a summary of nine research projects for which the District has provided more than $985,000 in funding. The District has also committed to developing a comprehensive reclaimed water education strategy. All reclaimed water construction projects funded by the District require education programs that stress the value and benefits of efficient and effective water use regardless of the water source. To provide reclaimed water information to a broader audience, the District has developed a web page that is one of the top Internet sources of reuse information. The District also produces reclaimed water publications that are offered to residents, utilities, engineering firms, environmental agencies and other parties interested in developing and expanding reclaimed water systems.

Table 6-2. *Descriptions and summary of reclaimed water research projects in the District*

| Cooperator | General Project Description | Costs[1] | |
|---|---|---|---|
| | | Total | District[2] |
| WateReuse Foundation | Water Treatment Study L112 | $500,000 | $275,000 |
| WateReuse Foundation | Water Quality Study P872 | $520,000 | $282,722 |
| WateReuse Foundation | Pathogen Study P173 | $216,000 | $34,023 |
| WateReuse Foundation | Research Cost Study P174 | $200,000 | $70,875 |
| WateReuse Foundation | Research Study ASR P175 | $393,000 | $72,410 |
| WateReuse Foundation | Storage Study P694 | $300,000 | $100,000 |
| WateReuse Foundation | Soil Aquifer Treatment P695 | $200,000 | $66,667 |
| WateReuse Foundation | Wetlands Study P696 | $200,000 | $66,667 |
| WateReuse Foundation | Nutrient Study P698 | $305,100 | $16,700 |
| **TOTALS** | **9 Projects** | **$2,834,100** | **$985,064** |

[1]Cost per 1,000-gallon benefits not applicable to research studies.
[2]Costs include all revenue sources budgeted by the District.

### *Section 3. Brackish Groundwater Desalination*

**Brackish Groundwater Desalination Project #1- City of Punta Gorda Reverse Osmosis Facility**

*The pre-filtration system of a brackish groundwater desalination facility.*

This project is for a brackish groundwater wellfield and RO treatment facility that will produce 3.0 mgd of finished water. The water will be blended with water from Shell Creek, which historically has had high total dissolved solids concentrations during the dry season. Additionally, development of potable water quantities from brackish water could be part of a future recovery strategy for proposed minimum flows on Shell Creek. The project, which is currently in the permitting stage, could potentially provide water to the region through the PRMRWSA's Phase 1A Interconnect. The RO facility will be co-located with the City of Punta Gorda's existing 10-mgd water treatment facility. Costs are based on the city's Water Treatment Cost Analysis Report (Tetra Tech, 2010).

| Quantity Produced (mgd) | Capital Cost | Capital Cost (District's Share) | Cost/mgd | Cost/1,000 gallons |
|---|---|---|---|---|
| 3.0 | $29,388,000 | $14,694,000 | $9,796,000 | $3.35 |

Issues:
- Additional flow data/modeling will be necessary to confirm anticipated withdrawals.
- Additional aquifer performance data will be required to determine groundwater availability.
- Future phases of the RO facility may be designed to treat surface water with high TDS.

### *Section 4. ASR Projects*

There are two potable ASR projects under development in the planning region that are being designed to provide up to 3 mgd of new water supply during the dry season. Table 6-3 provides project information including stage of development, project yield, number of wells and costs. Figure 4-3 shows ASR project locations in the District. Reclaimed water ASR projects are listed in Table 6-1.

### *Section 5. Water Conservation*

1.0 Non-Agricultural Water Conservation Projects

1.1 Indoor Water Conservation Projects

Water conservation planning and implementation, relatively new in the planning region, is an area with opportunities for partnerships through the Cooperative Funding Initiative. Since 1999, the District has assisted local utilities with the distribution of 2,696 ultra low-flow or high-efficiency toilets, and 8,000 plumbing retrofit kits. These programs have cost the District and cooperating local governments $230,956 and have yielded a potable water savings of 385,810 gallons per day. In July 2008, the PRMRWSA completed a strategic plan for 2025 that describes their commitment to provide a better match between supply and demand through various initiatives, including water conservation. This will be accomplished initially by requiring their customers to adopt a water conservation plan specific to their demographics that includes various demand management measures based on BMPs and standards, and that is consistent with or more stringent than policies supported by the District. To support this effort, the District offers technical assistance to each local entity to develop conservation programs and routinely participates in research to ensure the latest conservation information is available to stakeholders. Table 6-4 provides information on indoor water conservation projects under development.

Table 6-3. *List of ASR projects under development in the Southern Planning Region*

| Project Site | Status[1] | Test Well Annual Stored Vol. Goal (mg) | Final System Goal | | | Approximate Project Costs (District share Is half) |
|---|---|---|---|---|---|---|
| | | | Annual Stored Volume (mg) | 100 Day Dry Season Yield (mgd) | Total Number of Wells | |
| **Potable Water ASR Projects** | | | | | | |
| City of Bradenton High Service Pump Station Site | Construct/testing. Construction permit issued. ASR/surface water facility complete, 7 cycle tests performed. Degas system to remove dissolved oxygen and dechlorination system constructed. Was used on cycle test 8 in 06/09. | 160 | 160 | 1.5 | 1 | ASR and 4 monitor wells = $1,291,300<br>Degas system pilot = $700,000 |
| North Port | Construct/testing. Delayed. Awaiting results from Bradenton degas system test. If degas reduces arsenic, degas system to be installed. | 90 | 180 | 2.0 | 1 | Future Degas system and water quality monitoring = $2,000,000 |

[1]Construction/testing generally includes demand projections, water quality assessment, construction permitting, site selection, well design, geologic testing, cycle testing and final report.

*An aquifer storage and recovery well.*

Table 6-4. *List of indoor water conservation projects under development in the Southern Planning Region*

| Cooperator | Project Number | General Description | Savings (gpd) | Devices Rebates | Total Cost[1] | District Cost | $/1,000 gal Saved |
|---|---|---|---|---|---|---|---|
| Charlotte Co. | L856 | Toilet Rebate | 18,480 | 770 | $100,100 | $50,050 | $1.28 |
| City of North Port | L506 | Retrofit and Toilet Rebate Residential | 5,180 | 560 | $48,990 | $24,495 | $1.96 |
| Manatee Co. | L601 | Retrofit and Toilet Rebate Universal | 16,800 | 1,200 | $85,650 | $42,825 | $1.20 |
| Manatee Co. | L627 | Retrofit and Toilet Rebate Residential | 15,244 | 1,648 | $117,000 | $58,500 | $1.81 |
| Manatee Co. | L949 | Retrofit and Toilet Rebate Universal | 17,250 | 1,800 | $126,144 | $63,072 | $1.72 |
| Manatee Co. | N115 | Retrofit and Toilet Rebate Universal | 25,565 | 1,800 | $126,144 | $63,072 | $1.16 |
| Charlotte Co. | N113 | Toilet Rebate | 32,164 | 1,500 | $114,020 | $57,010 | $1.02 |
| Manatee Co. | N231 | Toilet Rebate | 21,425 | 900 | $126,144 | $63,072 | $1.62 |
| **Totals** | | | **152,108** | **10,178** | **$844,192** | **$422,096** | **$1.37[2]** |

[1]The total project cost may include variable project specific costs including marketing, education and administration.
[2]Total cost efficiency is weighted by each project's percent share of total savings in relation to the cost.

## 1.2 Outdoor Water Conservation Projects

*Use of a drip system to irrigate residential landscaping can help to reduce outdoor water use.*

Outdoor water use and water savings associated with outdoor water conservation projects can be difficult to measure since the plant materials, soils, irrigation systems and size of all irrigated areas are not the same. Outdoor water use can be a significant portion of a water supply utility's total demand, accounting for as much as 50 percent of each residential account's metered use. Since a large portion of this use can be attributed to a lack of education, operational experience and preventative maintenance, the District emphasizes BMPs and current technologies that address the reduction of outdoor water use. These include Florida-Friendly Landscaping™ (FFL) and Florida Yards & Neighborhoods, outdoor water audits, retrofit programs for rain and soil moisture sensor shutoff systems, and irrigation system efficiency analyses. The District provides leak detection surveys for utility systems to reduce unaccounted for water use associated with distribution system leaks and inaccurate metering. The District also promotes public information and education, social-based marketing campaigns, cooperative funding of demonstration projects, research, the use of FFL on District properties, development of model landscape ordinances and assistance with the local adoption of recently passed state legislation promoting the use of FFL. Since 1998, the District has assisted local utilities within the planning region with 862 rain sensor rebates for a potable water savings of 109,180 gallons per day. Table 6-5 provides information on outdoor conservation projects under development.

Table 6-5. *List of outdoor water conservation projects under development in the Southern Planning Region*

| Cooperator | Project Number | General Description | Savings (gpd) | Sensors/ Audits | Total Cost[1] | District Cost | $/1,000 gal Saved |
|---|---|---|---|---|---|---|---|
| Manatee Co. | L509 | Retrofit/Rebate Rain Sensor | 25,000 | 250 | $12,500 | $6,250 | $.32 |
| Braden River Utilities | N107 | Soil Moisture Sensor Rebate | 80,000 | 400 | $200,000 | $100,000 | $1.67 |
| Manatee County | L512 | Shallow Well Rebate | 56,888 | 51 | $25,500 | $12,750 | $0.11 |
| **Totals:** | | | **161,888** | **701** | **$238,000** | **$119,000** | **$1.46[2]** |

[1]The total project cost may include variable project-specific costs including marketing, education and administration.
[2]Total cost efficiency is weighted by each project's percent share of total savings in relation to the cost.

## 2.0 Agricultural Water Conservation Projects


***Installation of a water control structure as part of a tail-water system that will capture and reuse agricultural irrigation water.***

The following is a summary of the District's agricultural water conservation projects that are under development in the planning region. The District's largest agricultural water conservation initiative, the Facilitating Agricultural Resource Management Systems (FARMS) Program and the Well Back-Plugging Program, are not included in this section because the District classifies the programs as water resource development. Details of the programs, including projects under development, are contained in Chapter 7.

### 2.1 Institute of Food and Agricultural Sciences (IFAS) Research and Education Projects

The District provides funding for IFAS to investigate a variety of agriculture issues that involve water conservation. These include development of tailwater recovery technology, determination of crop water use requirements, field irrigation scheduling, frost/freeze protection, etc. IFAS conducts the research then promotes the results to the agricultural community. Table 6-6 is a list of agricultural water conservation research projects that are under development in the planning region.

Table 6-6. *Agricultural conservation research projects under development in the Southern Planning Region*

| Project | Total Project Cost + District Cooperator | Total Project and Land Cost | Funding Source | Planning Region(s)[1] |
|---|---|---|---|---|
| Study of Water Requirements for Transplant Establishment of Plastic Mulched Vegetable Crops Grown on Flatwood | $60,000 | $60,000 | District | Southern |
| Enhancing Irrigation and Nutrient BMPs for Seepage-Irrigated Vegetable Production | $110,000 | $110,000 | District | Southern |
| Impact of Organic Amendments on Soil Water Retention and Water Conservation | $175,000 | $175,000 | District | Southern |
| Determining Water Use During the Production of Select Tropical Foliage Plants | $60,000 | $60,000 | District | Southern |
| Tailwater Recovery | $135,000 | $135,000 | District | Southern |
| Evaluation of Soil Moisture-Based On-Demand Irrigation Controllers | $143,000 | $143,000 | District | Southern |
| Mote Aquaculture Park | $300,000 | $300,000 | District | Southern |
| **Total** | **$983,000** | **$983,000** | | |

[1]Selected projects affecting Southern Planning Region. The outcome of research projects can benefit other planning regions. Projects may include several planning regions.

Southwest Florida Water Management District

This chapter addresses the legislatively required water resource development projects identified through the water supply planning process. The numerous water-related projects receiving District funding assistance are categorized as either water supply development or water resource development. The District has chosen to place most of the proposed project options (Chapter 5) and projects under development (Chapter 6) in the water supply development category. This chapter contains a much smaller number of projects that the District has categorized as water resource development, as defined below.

*The Lake Hancock Lake Level Modification Project is a major District-funded water resource development project designed to restore minimum flows to the upper Peace River.*

The intent of water resource development projects is to enhance the amount of water available for water supply development. Chapter 373, F.S., defines water resource development as "the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities" (Subsection 373.019[22], F.S.).

## Part A. Overview of Water Resource Development Projects

The District classifies water resource development projects into two broad categories. The first category encompasses data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities and others. These activities are included in Section 1. The second category includes projects that meet the more narrow definition of water resource development, i.e., "regional projects designed to create from traditional or alternative sources, an identifiable, quantifiable supply of water for existing and/or future reasonable beneficial uses." These projects are included in Section 2.

### Section 1. Data Collection and Analysis Activities

The District has budgeted significant funds in FY2010 to implement the water resource development component of the RWSP. The activities summarized in Table 7-1 are mainly data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities and others. The table indicates that approximately $31 million will be allocated annually toward these activities Districtwide between FY2010 and FY2014 for a total of approximately $154 million. Because budgets for the years beyond

FY2010 have not yet been developed, funds for FY2011 through FY2014 were set equal to FY2010 funding. This is a practical approach, because even though funding for each activity is expected to vary somewhat each year, the total cost of data collection and analysis activities for each fiscal year is expected to remain relatively constant through 2014. Funding for these activities is from the District's Governing Board and Basin Boards, which is matched by water supply authorities, local governments and the United States Geological Survey (USGS). Each of the activities included in Table 7-1 is described in greater detail below.

1.0 Hydrologic Data Collection

The District has a comprehensive hydrologic conditions monitoring program, which includes data collected by District staff and permittees as well as data collected as part of the District's cooperative program with the USGS. Data collected from this program allows the District to gage changes in the health of water resources, monitor trends in conditions, identify and analyze existing or potential resource problems, and develop programs to correct existing problems and prevent future problems from occurring. The primary hydrologic conditions that are monitored include rainfall, evapotranspiration, lake levels, discharge and stage height of major streams and rivers, groundwater levels, various water quality parameters of both surface and groundwater (including springs), and water use. In addition, the District monitors ecological conditions as they relate to both potential water use impacts and changes in hydrologic conditions. The District also monitors data submitted by water use permit holders to ensure compliance with permit conditions and to assist in monitoring hydrologic conditions.

2.0 Regional Observation and Monitor-well Program (ROMP)

This purpose of ROMP is to develop a regional groundwater monitoring network through well construction and an understanding of the hydrogeologic framework of the District through aquifer testing. Data from these monitoring sites is used to evaluate seasonal and long-term changes in groundwater levels and quality, and the interaction and connectivity between groundwater and surface water bodies. Geophysical logging is also conducted on existing wells to provide data on well construction and water quality, most of which is incorporated into the District's geographic information system (GIS) database. Impacts resulting from increased groundwater withdrawals over nearly four decades have been documented and assessed through analysis of data collected from the ROMP well network. These impacts directly affect the District's planning, regulatory policies and programs. For example, ROMP data is used during the permitting process to model potential impacts of new uses and to monitor existing permittees to prevent impacts to natural systems and existing legal users. During construction of new monitor wells, valuable hydrogeologic information such as cores, aquifer hydrologic characteristics, water quality data and potentiometric levels are collected. From these data, aquifers and confining units are delineated, location of the freshwater/saltwater interface is determined and water quality within aquifers is characterized. The installation of long-term groundwater monitoring sites for the next few years will continue to target the District's water use caution areas (WUCAs) as well as the Northern Planning Region where additional data is needed to support the evaluation of water resources. This will provide additional data for the water resource assessment projects (WRAPs) and aquifer characteristics inventory, along with well performance data for wellhead protection projects.

Table 7-1. *Water resource development data collection and analysis activities in the District*

| Project | FY2010 Costs | FY2011 Costs | FY2012 Costs | FY2013 Costs | FY2014 Costs | Total Costs | Funding Source |
|---|---|---|---|---|---|---|---|
| **(1) Hydrologic Data Collection** | $4,137,158 | $4,137,158 | $4,137,158 | $4,137,158 | $4,137,158 | $20,685,790 | District, USGS |
| **(2) Regional Observation and Monitor-well Program** | $3,022,052 | $3,022,052 | $3,022,052 | $3,022,052 | $3,022,052 | $15,110,260 | District, Local Partnerships |
| **(3) Quality of Water Improvement Program** | $699,341 | $699,341 | $699,341 | $699,341 | $699,341 | $3,496,705 | District |
| **(4) Flood Control Projects:** | | | | | | | |
| (a) Data Collection | Included in Hydrologic Data Collection | Included in Hydrologic Data Collection | Included in Hydrologic Data Collection | Included in Hydrologic Data Collection | Included in Hydrologic Data Collection | Included in Hydrologic Data Collection | District, USGS |
| (b) Remediating Existing Problems | $17,450,106 | $17,450,106 | $17,450,106 | $17,450,106 | $17,450,106 | $87,250,530 | District, Local Government Cooperators |
| (c) Lake Levels/MFLs Program | $3,837,712 | $3,837,712 | $3,837,712 | $3,837,712 | $3,837,712 | $19,188,560 | District |
| **(5) Hydrologic Investigations:** | | | | | | | |
| (a) USGS Hydrologic Studies | $439,250 | $439,250 | $439,250 | $439,250 | $439,250 | $2,196,250 | District/USGS Local Government Cooperators |
| (b) Water Resource Assessment Projects | $1,116,987 | $1,116,987 | $1,116,987 | $1,116,987 | $1,116,987 | $5,584,935 | District/USGS Local Government Cooperators |
| **Totals** | **$30,702,606** | **$30,702,606** | **$30,702,606** | **$30,702,606** | **$30,702,606** | **$153,513,030** | |

3.0 Quality of Water Improvement Program (QWIP)

District technicians work to plug an abandoned free-flowing well.

The QWIP was established in 1974 through Chapter 373, F.S., to restore groundwater conditions altered by well drilling activities. The QWIP's primary goal is to preserve groundwater and surface water resources through proper well abandonment. Plugging abandoned artesian wells eliminates the waste of water at the surface and the degradation of groundwater from inter-aquifer contamination. Thousands of wells constructed prior to current well construction standards were often deficient in casing, which interconnected aquifers and enabled poor-quality mineralized water from deeper aquifers to migrate into shallower aquifers that contain potable-quality water. These wells also allow mineralized water to flow to the surface and contaminate surface water.

Plugging wells involves filling the abandoned well with cement. Isolation of the aquifers is reestablished and the mixing of varying water qualities and free flow is stopped. Prior to plugging an abandoned well, geophysical logging is performed to determine the proper plugging method and to provide groundwater quality and geologic data for inclusion in the District's database. The emphasis of the QWIP is primarily in coastal portions of the Southern Water Use Caution Area (SWUCA) where the Upper Floridan aquifer is confined and flowing wells can exist. Historically, the QWIP has proven to be a cost-effective method to prevent waste and contamination of potable groundwater and surface waters. In January 1994, the District increased QWIP funding as an incentive for property owners to comply with well plugging requirements contained in the Florida Statutes.

4.0 Flood Control Projects

The District undertakes a number of flood protection activities. These activities include data collection, remediation of existing flooding problems, the watershed management program (WMP), and the lake levels program. Each of these flood protection efforts is described below:

4.1 Data Collection

Data collection related to flood protection includes the regular assembly of information on such key indicators as rainfall, water levels

During 2004, several hurricanes passed through the District causing severe flooding along the Peace Creek Canal in the headwaters of the Peace River.

and stream flows. The District's capability to assist in flood control has continued to improve during the past several years with the expansion of the District's Supervisory Control and Data Acquisition (SCADA) system. This computerized data collection system comprises the cornerstone of the District's flood data collection through a Districtwide network of more than 254 continuous water level and rainfall data collection stations. These stations are considered "near-real time," meaning the data is available to District staff within minutes of being measured. These data are augmented by 66 remote data loggers that record continuous water level and rainfall data until the data are manually downloaded to a computer in the field by a technician.

The SCADA system provides an early warning mechanism that allows flood problems to be anticipated by observing water level and rainfall trends. This information, which is automatically transmitted to District headquarters by radio, allows the District to operate its structures much more effectively during rainfall events and provides limited capability to remotely operate gates at water-control structures. The system was designed with several fail-safe components to keep it operational during major storm events, when traditional communication lines may be inoperable.

The amount and detail of rainfall and stream level data now available for use by modelers has expanded significantly in recent years. In addition to the 138 rainfall sites on SCADA, the District operates 46 other recording rainfall gages without telemetry. These instruments record rainfall accumulations every 15 minutes, transmitting data hourly or daily. More recording rain gages are being installed to develop a dense, Districtwide network of precipitation data.

The USGS has monitored flow on all major rivers and streams in west-central Florida during the past few years, mostly through a cooperatively funded program with the District. The USGS has instrumented 130 surface water sites on these rivers and streams with data collection instruments that have the capability to relay data in near-real time by satellite. These data are posted on the USGS' web site, increasing accessibility for the many entities that use this information.

4.2 Watershed Management Program (WMP)

While much of the District's focus is on flood prevention, existing problem areas can be addressed in numerous ways. An example is the WMP, which is being implemented by the District in cooperation with local governments. The WMP evaluates the capacity of a watershed to protect, enhance and restore water quality and natural systems, while achieving flood protection. It identifies ways to effectively coordinate and implement watershed management strategies and has five elements: (1) collecting topographic information to delineate surface features and understand the boundaries of each watershed, (2) developing a watershed evaluation using the topographic information, (3) determining whether a watershed can provide adequate water for water supply and the environment and provide flood protection and good water quality, (4) implementation of BMPs to improve a watershed when its level of service is below targets assigned by local governments and (5) maintenance of watershed Information to account for changes to watershed features produced by new growth, land alteration and other natural or anthropogenic events. Local governments and the District combine their resources and exchange watershed data to implement the WMP. The District will create coordination documents for each county government (and city government as requested) to address coordination and enhance cooperation. Local governments' capital improvement plans and the District's Cooperative Funding Initiative will provide funding for local elements of the WMP. Additionally, flood hazard information generated by watershed evaluations is used by the Federal Emergency Management Agency (FEMA) to revise the Flood Insurance Rate Maps. Since the WMP may change based on growth and shifting priorities, decision-makers will have opportunities throughout the program to determine when and where funds are needed.

### 4.3 Lake Levels Program

The District's lake levels program, established in the 1970s, has provided the adopted management levels for more than 400 lakes throughout the District. Flood stage information from this program is used by many local governments in regulating development adjacent to lakes, as well as by the District in public flood protection education efforts. Information relative to flood protection from the lake levels program is contained in the District publication, *Flood-Stage Frequency Relations for Selected Lakes* (SWFWMD, 1992b). This report, a compilation of flood level information for all lakes for which it is available, has been distributed to numerous local governments and is available from the District upon request. The lake levels program merged with the District's minimum flows and levels (MFLs) program in an effort to expand and enhance the management and protection of surface and groundwater resources.

## 5.0 Hydrologic Investigations

Hydrologic investigations include USGS hydrologic studies and District WRAP studies, each of which is described below:

### 5.1 USGS Hydrologic Studies

The District has a long-term cooperative funding program with the USGS to collect hydrologic data and conduct regional hydrogeologic investigations. The goals of this program are to monitor for changes in the hydrologic system and improve the understanding of cause-and-effect relationships. Funding for this program is generally on a 50/50 cost-share basis; however, this varies based on whether other cooperators are involved in the project and whether requests for non-routine data collection or special project assignments are implemented. Hydrologic data collection is a large part of the cooperative funding program and is closely coordinated with the District's Hydrologic Data Section. The USGS provides ongoing monitoring of 135 surface water sites within the entire District.

Regional investigations of the hydrogeology of the District are an important aspect of the cooperative program. These investigations are intended to augment work conducted by the District and are focused on improving the understanding of cause-and-effect relationships and developing analytical tools to be used in resource evaluations. These investigations have included: (1) development of computer models of the regional groundwater flow systems for the District; Highlands Ridge WUCA; Hardee and DeSoto counties; Cypress Creek, Cross Bar and Morris Bridge wellfields; and the St. Petersburg aquifer storage and recovery (ASR) site; (2) detailed analysis of the hydrologic budgets for two benchmark lakes (Lucerne and Starr); (3) hydrogeologic characterization of the Intermediate aquifer; (4) hydrologic assessments of the Peace and Alafia rivers; and (5) investigation of the hydrology of the upper Hillsborough River Basin. In recent years, this program has included projects to determine the effects of using groundwater to augment stressed lakes and investigation of factors influencing coastal spring flows. Ongoing projects include: evaluation of the effects of using groundwater for supplemental hydration of wetlands; assessing the lake/aquifer interaction in a spring-fed lake by using isotopes in groundwater to estimate lake seepage; statistical characterization of lake level fluctuations; and a pilot study that will compare the hydrologic effects, including water supply demand, of converting land from agricultural to urban/suburban use-types on similar size tracts of land in the SWUCA.

5.2 Water Resource Assessment Projects (WRAPs)

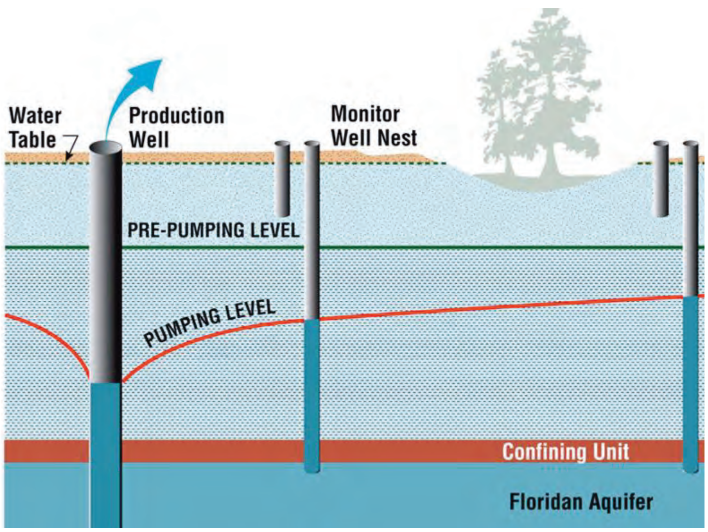


*Diagram of an aquifer performance test. Data collected from these tests is an important component of a water resource assessment project.*

In the late 1980s, the District initiated a program to conduct WRAPs to assess water availability in several regions and to support the development and establishment of MFLs. These projects are detailed assessments of regional water resources and include intensive data collection and monitoring to characterize hydrologic conditions and determine effects of water withdrawals. There are five areas in the District for which WRAPs have been initiated. The first three WRAPs were initiated in the late 1980s and early 1990s for the Northern Tampa Bay (NTB), Eastern Tampa Bay (ETB) and Highlands Ridge (HR) areas. These projects were initiated in response to declining lake and wetland water levels and the increased inland movement of the freshwater/saltwater interface. In the mid-1990s, a fourth WRAP was initiated that encompassed the southern portion of the District, including the ETB and HR WRAPs. A fifth WRAP is being conducted for the northern portion of the District, primarily focusing on areas north of Pasco County. The data collection element for the Northern District WRAP was initiated in 1998 to determine baseline hydrologic conditions. The ETB WRAP was completed in 1993 and the NTB WRAP was completed in 1996. The Southern District WRAP is ongoing but a groundwater flow model is complete. The Northern District WRAP program is also ongoing, but the groundwater model was completed in May 2008. As these projects progress they provide the foundation for determining water availability and can assist in the establishment of MFLs. Once the studies are completed, water resource management programs established in these areas can be modified as necessary.

In 1999, the District initiated the NTB Phase II investigation as a follow-up to the NTB WRAP. Through a series of projects, this study will continue assessments of the biologic and hydrologic systems in NTB to support the ongoing development of MFLs, water resources recovery, water use permitting and environmental resource permitting. Projects will include the further development of MFLs' methodologies, assessments of various techniques for restoring water levels in surface water features, and expanded biologic and hydrologic data collection. These studies will continue through 2010. A key component of the NTB Phase II study is the extensive network of hydrologic and biologic data collection sites. The significant data collection network currently maintained by the District, TBW and local governments will be reassessed, updated and expanded as part of the study. Impacts to surface water features are generally the most limiting factor to water supply development in the NTB area. Because the data from monitoring sites in surface water features will form the basis of decisions concerning key water management issues, it is critical that data in the NTB area be collected for various types of systems throughout the study area. Specific target areas for expansion and upgrade include hydrologic and biologic data collection in a wider variety of wetland types, increased spatial coverage of wetland and nested aquifer monitor wells and staff gages, and data collection in areas of minimal hydrologic impacts for control purposes. Upon completion, the District and TBW's combined network is projected to include more than 600 wetland and more than 500 aquifer monitoring sites.

## Section 2. Water Resource Development Projects

The District currently has 20 projects that meet the definition of water resource development "projects," as defined by the Executive Office of the Governor, i.e., "regional projects designed to create from traditional or alternative sources, an identifiable, quantifiable supply of water for existing and/or future reasonable-beneficial uses." Districtwide, the total cost of these projects is approximately $197 million and a minimum of 55 mgd of additional water supply will be produced or conserved. Thirteen of the District's 20 projects are located in or will benefit the Southern Planning Region and are summarized in Table 7-2. These projects are pilot/research projects, agricultural/environmental restoration projects and restoration of flows to the upper Peace River. District funding for a number of these projects is matched to varying degrees by local cooperators, including local governments, regional water supply authorities and others. In addition, a number of projects have received state and federal funding. District funds for these projects are being generated through a number of different mechanisms described in the RWSP Executive Summary. Each of the projects included in Table 7-2 is described in detail below.

*Rehydration of wetlands with reclaimed water is an example of a water resource development project that could help impacted wetlands remain hydrated.*

1.0 Alternative Water Supply Research, Restoration and Pilot Projects

Alternative water supply research, restoration and pilot projects are designed to further the development of innovative technologies that will produce water from alternative sources and restore levels and flow to water resources. Included in these projects is research to improve the water quality of ASR systems, and an initiative to restore the Flatford Swamp in the upper Myakka watershed.

Southwest Florida Water Management District

Table 7-2. *Project costs and district funding for water resource development projects that benefit the Southern Planning Region*

| Project | Total Prior District Funding | FY2010 District Cost | Total Cost District + Cooperator | Funding Source[1] | Quantity Developed Or Conserved (mgd) |
|---|---|---|---|---|---|
| **(1) Alternative Water Supply Research, Restoration, and Pilot Projects** | | | | | |
| (a) ASR Pretreatment Investigation | $304,666 | $32,185 | $736,851 | District, PRMRWSA, Bradenton, Other WMD's | N/A |
| (b) Flatford Swamp Hydrologic Restoration/ Implementation | $957,281 | $2,000,000 | $40,957,281 | District | |
| **(2) Agricultural Water Supply/Environmental Restoration Projects** | | | | | |
| (a) Irrigation Well Back-Plugging Program | $1,486,436 | $90,595 | $1,547,031 | District | TBD |
| (b) FARMS Program[2] | $17,075,018 | $1,698,720 | $21,859,752 | FDACS, District, State of FL | 40 |
| (c) Mini-FARMS Program | $75,000 | $0 | $75,000 | FDACS, District | 2 |
| (d) Commercial Hydroponic Conversion Project | $0 | $50,000 | $853,500 | District, Central Florida Hydroponics | TBD |
| **(3) Restoration of Minimum Flows to the Upper Peace River[3]** | | | | | |
| a) L. Hancock Lake Level Modification | $6,416,746 | $3,103,648 | $13,420,394 | District, State of FL | TBD |
| b) L. Hancock Outfall Structure P-11 Mod. | $5,000,000 | $4,948 | $5,004,948 | District | N/A |
| c) L. Hancock Outfall Wetland Treatment System | $18,009,327 | $2,428,580 | $28,437,907 | District, State of FL, Federal | N/A |
| d) Upper Peace River Res. Development Project | $2,740,343 | $263,416 | $3,754,759 | District, State of FL | TBD |
| e) Peace Creek Canal Watershed | $4,488,743 | $484,469 | $7,448,212 | FEMA, Polk County, District, State of FL | TBD |
| f) Upper Peace Karst Berms | $170,472 | $67,583 | $238,055 | District | TBD |
| **Total** | **$56,724,032** | **$10,224,144** | **$124,333,690** | | **TBD** |

[1]Acronyms: FDACS – Florida Department of Agriculture and Consumer Services; FEMA – Federal Emergency Management Agency. Funding from the Water Protection and Sustainability Trust Fund is indicated as state of Florida.
[2]FARMS budget represents the Districtwide project cost. Individual components of the FARMS Program specific to the Southern Planning Region are included in Table 7-3.
[3]Many of the projects included under restoration of minimum flows to the upper Peace River will require substantial land acquisition. Expenditures for land purchases have totaled approximately $120 million, with final costs possibly exceeding $200 million.

**(a) ASR Pretreatment Investigation.** The purpose of this project is to investigate methods to suppress the mobilization of arsenic that often occurs during ASR activities. The project consists of 3 sub-projects: (1) evaluation of arsenic mobilization processes occurring during ASR activities, which is being pursued by two independent consultant teams, (2) bench-scale leaching studies on storage zone cores and (3) development of a degasification system to remove dissolved oxygen (DO) from source water prior to injection. This project is being co-funded by the Peace River Manasota Regional Water

Supply Authority (PRMRWSA), the South Florida and St. Johns River water management districts and the City of Bradenton. The third component of the project consists of design, permitting and construction of a DO removal system at the City of Bradenton's ASR site. The degasification system will be capable of processing water at 450 gpm at 99.98 percent DO removal but is capable of flow rates as high as 750 gpm with lower DO removal efficiency. A technical advisory committee is designing the testing program to demonstrate the effectiveness of DO reduction in the control of arsenic mobilization. A final report documenting the effectiveness of DO removal will be prepared at the end of cycle testing in 2010.

The City of Bradenton received an underground injection control (UIC) permit renewal and consent order in October 2008. Installation of the degasification system was completed in September 2008 and the performance test was completed in September and October. In October, the city continued recovery of water from the ASR well to remove any remaining arsenic mobilized by earlier cycle tests. Injection of the first de-oxygenated water into the aquifer began in December 2008 at a rate of 1. 0 mgd. Due to dry conditions, the city did not have sufficient water to inject and cycle testing was postponed until the wet season began in June 2009. Recovery of 6 million gallons of degassed water stored in December began in May 2009. Recovery was completed by the end of May 2009. The full-scale cycle test for storing 140 million gallons began in June 2009. By the end of August 2010, the effectiveness of controlling arsenic mobilization through degasification should be known. Design and permitting of the degasification system and cycle testing of water quality parameters will continue. If the project is successful, the city may expand the system to a flow rate of 1.5 mgd.

(b) **Flatford Swamp Hydrologic Restoration and Implementation.** This project is the implementation phase of the Flatford Swamp hydrologic restoration alternative of the Myakka River watershed initiative. The initiative is a comprehensive effort to determine the effects of land-use conversions and alterations on the watershed and evaluate BMPs for restoration. The objective is to restore water quality, natural systems and floodplain impacts in the watershed in ways that will also enhance water supplies in the SWUCA. The goal of the Flatford Swamp hydrologic restoration alternative is to reestablish historic hydroperiods by removing excess flows from the swamp and surrounding areas. The project will include design/permitting and construction.

Work continues on the Myakka River watershed initiative to refine preferred alternatives for hydrologic restoration prior to moving these options into preliminary design. In 2010, the District plans to initiate design/permitting of the preferred Flatford Swamp alternative for hydrologic restoration and perform an initial evaluation of natural systems restoration opportunities. The restoration alternatives matrix of Flatford Swamp options is expected to be completed in 2010, when the next phase will be more defined.

### 2.0 Agricultural Water Supply/Environmental Restoration Projects

These projects utilize many of the agricultural water conservation strategies described in Chapter 5, Section 7 to reduce groundwater withdrawals by increasing the water use efficiency of agricultural operations. The projects have the added benefit of reducing agricultural impacts to surface water features. The projects are public/private partnerships where the District provides financial incentives to farmers to increase the water use efficiency of their operations.

(a) **Irrigation Well Back-Plugging Program.** In the coastal and southern portions of SWUCA, groundwater quality in the deep, high-production zone of the Upper Floridan aquifer is generally marginal to poor. Investigations conducted by the District have determined that agricultural pumping from this zone can cause localized upward movement of highly mineralized groundwater into irrigation wells. The use of mineralized groundwater for irrigation reduces crop yield, corrodes pumping equipment and degrades the quality of surface waters. Surface water quality impacts have been documented in the Shell Creek, Prairie Creek and Joshua Creek (SPJC) watersheds located in DeSoto and Charlotte counties. As a result, these watersheds are a priority area for the back-plugging program. Back-plugging is already an important management tool in other areas of the SWUCA where irrigation wells exhibit poor water quality. Back-plugging of these wells to a recommended depth is helping to improve surface water quality, maintain groundwater resources and improve crop yields.

A total of 63 wells have been back-plugged in the SWUCA; 46 are located in the SPJC priority watersheds. Results from analysis of water samples collected from these wells show a reduction in TDS and chloride levels of 47 percent and 63 percent respectively, with a reduction in pumping yields of only 23 percent. For the 17 wells in the SWUCA outside of the SPJC area, seven were back-plugged in the Peace River watershed, six in the Alafia River watershed, two in the Manatee River watershed, one in the Myakka River watershed and one in the Horse Creek watershed. Water quality results for all back-plugged wells combined in the SWUCA showed reductions in TDS and chloride levels of 46 and 60 percent, respectively, with a combined reduction in pumping yields of only 24 percent. Routine monitoring results of selected back-plugged wells continue to show improvements in the quality of groundwater used for irrigation purposes. Staff will continue to identify wells for back-plugging.

(b) **Facilitating Agricultural Resource Management Systems (FARMS) Program**

The purpose of the FARMS initiative is to provide an incentive to the agricultural community to implement agricultural best management practices (BMPs). The resource benefits of these BMPs include water-quality improvements; reduced groundwater withdrawals; and conservation, restoration, or augmentation of the water resources and ecology. The program is a public/private partnership developed by the District and the Florida Department of Agriculture and Consumer Services (FDACS). The goal of the program is to offset 40 mgd of groundwater use in the SWUCA. The performance of each FARMS project is tracked to determine its effectiveness.

*The FARMS program provides funding for growers to install water saving technologies such as this solar powered, remotely operated value on an irrigation system. The District classifies FARMS as water resource development.*

The FARMS Program also funds non-project-related outreach activities and data collection efforts such as the Institute of Food and Agricultural Sciences (IFAS) Flatwood

Citrus BMP Implementation and the Upper Myakka Surface-Water Quality Monitoring Network, which enhances the District's understanding of agricultural impacts on the Flatford Swamp and the effectiveness of FARMS projects.

The FARMS Program has 83 active projects in six of the District's eight Basins. Projected offset from these projects is 13.8 mgd. To date, the cost of the groundwater offset achieved is $1.40 per 1,000 gallons. Table 7-3 is a summary of 55 active FARMS projects in the planning region. Each of the projects reduces withdrawals from the Upper Floridan or intermediate aquifers through a combination of improved irrigation efficiency, surface water storage and use and/or tailwater capture and reuse. Several of the projects have the additional benefit of improving surface water quality by reducing runoff of mineralized groundwater. Many cooperators are finding that implementation of FARMS' BMPs has the additional benefit of improving crop yields. Thirty-five of the projects are operational and are being monitored for groundwater use offset, seven are under construction, and 35 are awaiting contractual approval. Collectively, these projects are expected to offset approximately 11 mgd of groundwater withdrawals. FARMS is also providing partial funding for two regional projects that are being coordinated through the FDACS. One will help implement BMPs for citrus growers and row crop farmers, and the other is the Mini-FARMS program described below. The priority for the development of future projects is in the upper Myakka and SPJC watersheds.

(c) **Mini-FARMS Program.** In 2005, the FDACS and the District agreed to co-fund the Mini-FARMS Program, which assists small acreage growers (less than 100 acres) in establishing BMPs for water resources improvements within the District. Mini-FARMS is administered by the FDACS and participating soil and water conservation districts and authorizes maximum reimbursements of $8,000 per project, or 85 percent of program-eligible costs. It is estimated that the Mini-FARMS Program can offset up to 2 mgd of groundwater use by 2025, primarily through increased irrigation efficiencies and updated technologies. In 2007, the District co-funded FDACS with $75,000 toward implementation of this program. The FDACS is the primary funding source for the program. The District has previously funded this program, although no funding is budgeted in 2010. It is estimated that the projects budgeted through 2010 will result in a savings of 83,850 gpd. Future projects are a priority with the FDACS and the District in the upper Myakka and SPJC watersheds.

(d) **Commercial Hydroponic Conversion Project.** The purpose of this project is to develop a commercially viable alternative to conventional raised bed farming. The site is located on a farm in northeastern Hillsborough County and will consist of 2 acres of hydroponically grown strawberries using a vertical stacking system enclosed in greenhouses to reduce pesticide use and overhead watering for frost/freeze protection. Where conventionally grown strawberries consist of 17,400 plants per acre, this system will have 100,000 plants per acre, or the equivalent of 11.5 traditionally grown acres. The vertical stacking system with irrigation water and fertilizer supplied by drip tubing will receive approximately 1 quart of water per stack four times daily. The use of a covered growing area will also allow the project operator to experiment with extended growing seasons and year-round production. The site will be open for educational tours, and the applicant is establishing a growers' cooperative for the dissemination of hydroponic production

Table 7-3. *Active FARMS projects in the Southern Planning Region*

| Project Name/Location | Project Description | Offset (GPD) | Project Cost | District Funding |
|---|---|---|---|---|
| 4 Star Tomato - Long Creek Farm, Manatee County | Improves conditions in Upper Myakka River watershed through retention of irrigation and stormwater and seepage interception system along farm boundary adjacent to Long Creek. Culverts with risers to retain water in six storage areas, drain pipe, pump station, and pressure pipe to convey seepage water. | 100,000 | $250,000 | $187,500 |
| Bermont Properties, LLC | Improves Myrtle Slough/Shell Creek water quality through reduction in runoff. Increases efficiency of irrigation for 1,500 acres of citrus. Hydraulically controlled valves, irrigation control stations with rain sensors, and piping to connect valves to existing irrigation systems. | 146,000 | $255,000 | $191,250 |
| Bethel Farms, LTD, DeSoto County | Reduces groundwater withdrawals using solar-powered field sensors and radio telemetry to monitor soil parameters and climate conditions at 2,150-acre citrus/sod operation. | 57,885 | $40,628 | $20,314 |
| Bishop Citrus, Charlotte Co. | Uses reservoir to irrigate 160-acre block of 320-acre citrus operation located within the Shell Creek watershed in Charlotte County. | 80,000 | $253,350 | $190,000 |
| CFI USA, Inc. Venus II Grove, Manatee Co. | Five-acre reservoir to recover tailwater and surface water. One irrigation pump station, filtration and piping to connect to existing irrigation system for 245 acres of citrus. | 70,500 | $347,000 | $135,000 |
| Charles Parsley, DeSoto Co. | Reuse of tailwater/surface water in reservoir for portion of 33-acre strawberry farm. Irrigation pump station, filtration and piping to connect to existing irrigation system. | 55,000 | $150,000 | $110,000 |
| Citrus Creek Grove, Charlotte Co. | Reduces withdrawals of groundwater for 688 acres of citrus. Network of solar-powered sensors and radio telemetry linked to Internet to monitor soil moisture and climate conditions, enabling optimized irrigation scheduling, preventing overwatering and improving crop yields. | 27,170 | $17,869 | $8,936 |
| Citrus Creek Grove, (Phase 2), Charlotte Co. | Reduces withdrawals of mineralized groundwater using large reservoir to irrigate 668-acre citrus grove. | 181,210 | $850,000 | $637,500 |
| Down South Blues Corp, DeSoto Co. | Reservoir, irrigation pump station , filtration and piping to connect to existing irrigation system located on 40-acre blueberry farm. | 48,600 | $250,000 | $187,500 |
| Prairie River Ranch, Phase 2, DeSoto Co. | Reduces withdrawal of marginal quality groundwater and runoff into Joshua Creek. Reservoir, irrigation pump station, filtration and piping to connect to existing irrigation system for irrigation of 1,615 acres of citrus. | 92,300 | $418,000 | $312,000 |
| Prairie River Ranch, Phase 2a, DeSoto Co. | Reduces use of groundwater using 5-acre reservoir. Reduces quantity of marginal quality groundwater entering Joshua Creek. Irrigation pump station, filtration and piping to connect to existing irrigation system. | 35,000 | $50,000 | $37,500 |
| Gemstone Grove, LLC, Manatee Co. | Solar-powered sensors and radio telemetry to monitor soil moisture and climate conditions via Internet for 225 acres of citrus in upper Myakka River watershed. | 11,350 | $16,990 | $12,740 |
| Hancock Groves Phase 2, DeSoto Co. | Uses existing 25-acre pond as irrigation source for 400 acres of citrus. Two irrigation pump stations, filtration and piping to connect reservoir system to existing irrigation system. | 76,980 | $468,968 | $234,226 |
| Hancock Groves Phase 3, DeSoto Co. | Reduction of groundwater withdrawals and runoff to Prairie Creek watershed. Surface water/tailwater reuse from existing reservoir to irrigate 470-acre block of citrus. | 348,400 | $617,550 | $375,000 |
| Island Grove – Farm #6, DeSoto Co. | Two-acre reservoir within existing stormwater/tailwater retention area. Irrigation pump station, filtration and piping to connect reservoir to existing irrigation system of 72-acre blueberry farm. | 100,000 | $356,635 | $267,476 |
| Island Grove Ag Products, DeSoto Co. | Reduces water use on three blueberry farms (totaling 72 acres) through integrated irrigation system. Two weather stations, soil moisture sensors and automated pump controls for three wells to reduce number and duration of irrigation events. | 25,000 | $96,000 | $48,000 |

Table 7-3. *Active FARMS Projects in the Southern Planning Region (continued)*

| Project Name/Location | Project Description | Offset (GPD) | Project Cost | District Funding |
|---|---|---|---|---|
| Island Grove Ag Products, DeSoto Co. | Reduces water use on three blueberry farms in DeSoto Co. through integrated irrigation systems. Two weather stations, soil moisture sensors and automated pump controls for three wells to reduce number and duration of irrigation events. | 25,000 | $96,000 | $48,000 |
| Keystone Groves, DeSoto Co. | Reduces groundwater withdrawals for 240 acres of citrus in DeSoto Co. and 173 acres of citrus in Hardee Co. Solar-powered field sensors and radio telemetry uplinked to Internet to monitor soil moisture and climate conditions | 14,395 | $28,000 | $18,800 |
| Lakeshore Knolls, LLC, Manatee Co. | Solar-powered field sensors and radio telemetry uplinked to Internet to monitor soil moisture and climate conditions for 448 acres of citrus near Lake Manatee. | 22,900 | $12,984 | $6,492 |
| Landscaping, Sod & Irrigation, DeSoto Co. | Replaces groundwater for 80-acre sod farm with water from two reservoirs and two irrigation pump stations, filtration and piping to connect to irrigation system. | 129,000 | $163,210 | $122,340 |
| Old Florida Investments, DeSoto Co. | Controls frequency/duration of irrigation events for 220-acre tomato farm. Network of three automated hydraulic irrigation valves and pumps. | 29,195 | $87,000 | $43,500 |
| Orange-Co, PL | Linear surface water reservoir, irrigation pump station, filtration and piping to connect reservoir to microjet irrigation system. | 225,100 | $173,618 | $114,886 |
| Roper Growers Cooperative, DeSoto Co. | Soil moisture sensors, hydraulic valve controls and automated pump controls to reduce groundwater use for 312 acres of citrus. | 32,000 | $50,000 | $37,500 |
| Sandy Branch Ranch, Manatee Co. | Improves irrigation efficiency by controlling frequency/duration of irrigation events for 500-acre citrus and tomato farm. Network of three automated hydraulic irrigation valves and pumps. | 33,660 | $85,000 | $63,750 |
| Schiller Investments, Charlotte Co. | Reduces surface water withdrawals for 66 acres of citrus and groundwater withdrawals on 630 acres of citrus. Solar-powered field sensors monitor soil parameters and climate conditions to optimize irrigation scheduling, prevent overwatering and improve crop yields. | 26,700 | $28,000 | $18,800 |
| T J Chastain – Neal Rd, Charlotte Co. | Increases irrigation efficiency for 430 acres of citrus. Hydraulic valves controlled by timer at irrigation zones, cut-off switch for each unit and rain sensor. Existing system uses low-volume under tree sprayers. | 47,580 | $50,000 | $25,000 |
| T J Chastain – Shell Creek | Improves quality of water leaving 40 acres of citrus. Surface water pump station, filters, piping to withdrawal water from Shell Creek. Project offsets 100 percent of groundwater irrigation use. | 55,200 | $160,000 | $120,000 |
| TRB Groves, Phase 3, Charlotte Co. | Construction/operation of irrigation reservoir, retrofitting two pump stations, irrigation controls for automated pumps via soil moisture probes and rain sensors. | 826,000 | $1,000,000 | $712,000 |
| Walters Grove, Charlotte Co. | Solar-powered field sensors/radio telemetry uplinked to Internet to monitor soil moisture/climate conditions for 15 acres of citrus. | 835 | $4,000 | $2,000 |
| WFA Land Company, Inc., Manatee Co. | Integrated irrigation system for 1,460 acres of citrus/sod. Two weather stations, soil moisture sensors and automated pump controls for five wells to reduce number/duration of irrigation events. | 180,700 | $268,223 | $134,112 |
| | **Totals** | **3,103,660** | **$6,644,025** | **$4,422,122** |

information to other strawberry farmers in the area. The project is conservatively estimated to save 23,000 gpd over conventional farming methods during a 212-day growing season. By locating the operation in greenhouses, it is estimated that an additional 136,000 gallons will be saved for every frost/freeze event. The operation also has the additional benefit of eliminating the need to use soil fumigants, which are becoming increasingly regulated and expensive to use.

3.0 Restoration of Minimum Flows to the Upper Peace River

*Portions of the upper Peace River frequently do not flow during the dry season. The District's strategy to improve conditions in the river is a $58 million effort consisting of several water resource development projects that will restore minimum flows and improve water quality.*

Since the late 1990s, the District has been working to establish minimum flows for the upper, middle and lower Peace River. Surface water drainage alterations, reduction in surface storage, variations in long-term rainfall and induced recharge due to groundwater withdrawals have all contributed to a reduction in low flows that prevents the upper river from meeting its established minimum flow. A requirement of minimum flow establishment is the development of a recovery strategy if actual flows are below or are predicted to fall below the established minimum flow. The following projects are key portions of the recovery strategy.

**(a) Lake Hancock Lake Level Modification.** The objective of this project is to store additional water in Lake Hancock by raising the control elevation of the existing outflow structure, then slowly releasing the water during the dry season to help meet the established minimum flow for the upper Peace River between Bartow and Zolfo Springs. The project is intended to increase the normal operating level of the lake from 98.7 feet to 100.0 feet by modifying the P-11 outfall structure. The project is being conducted in three phases. Phase 1 provided the preliminary evaluations and incremental probable costs for raising the normal high operating levels of the lake. Phase 2 involves generating detailed information for development and submission of a conceptual environmental resource permit (ERP) and identifying impacts to private lands for acquisition and other mitigation needs. Phase 3 is the implementation of mitigation components. The project will be coordinated with the outfall wetland treatment system, which is intended to improve the quality of water released from the lake.

A conceptual ERP was received from the FDEP in June 2007. A U.S. Army Corps of Engineers' Public Notice of Intent to permit was completed in December 2007 and approval was received in April 2008. District staff met with affected property owners in August and September 2007 to discuss the project and determine whether the District would need to acquire their property to implement the project. The District is currently negotiating with landowners and purchasing properties. The District is also working on Federal Department of Transportation (FDOT) permits for Highway 540 and the Polk Parkway and has contracted for the design, permitting and development of construction documents for mitigation required upstream of the P-11 Structure.

b) **Lake Hancock Outfall Structure P-11 Modification.** The purpose of this project is to replace the existing outfall structure with a new structure that will be capable of holding the lake level at a higher elevation. The project is directly related to the Lake Hancock Lake Level Modification Project and is contingent on the successful completion of the three phases of that project. The District's contractor has completed the 60 percent design plans and specifications and will submit them to the FDEP for an ERP to construct the new structure.

(c) **Lake Hancock Outfall Wetland Treatment System.** The goal of this project is to improve water quality discharging from Lake Hancock through Saddle Creek to the Peace River. The Saddle Creek drainage basin contributes approximately 6 percent of the total flow of the Peace River, yet contributes approximately 13 percent of the watershed's total annual nitrogen load. Nitrogen has been identified as the primary target nutrient in restoring water quality in the Peace River and preventing degradation of Charlotte Harbor. The Peace River ecosystem routinely suffers from algal blooms during periods of low flows and warm weather. These events not only affect the fish and wildlife associated directly with the river and estuary, but also affect the PRMRWSA's water supply system located on the Peace River in DeSoto County. Lake Hancock has been identified by the FDEP as impaired under the Clean Water Act, requiring that total maximum daily loads be established. Nitrogen loads were also predicted to increase significantly over the next 20 years as a result of development. Improving the quality of the water discharging from Lake Hancock is the most cost-effective means of reducing nitrogen loads into the Peace River and Charlotte Harbor. The outfall treatment project will be developed on a portion of 3,500 acres the District has acquired south of Lake Hancock. A contractor is conducting a feasibility study of treatment technologies, designing and permitting the selected alternative, and providing construction management services. The project involves five tasks: (1) research, monitoring and data acquisition, (2) feasibility study, (3) design and permitting, (4) construction and (5) system start-up and operation.

*The Lake Hancock Outfall Wetland Treatment System will be constructed on 3,500 acres the District has acquired south of Lake Hancock and will improve water quality discharging from Lake Hancock into the headwaters of the Peace River.*

In February 2006, the District adopted a 27 percent nitrogen load reduction goal and selected the constructed wetlands project as the primary treatment mechanism. The District's contractor completed 60 percent design and technical specifications in

February 2009. The ERP application will be submitted to the FDEP during the 90 percent design stage. The contractor is currently completing additional geotechnical work to locate fill needed for construction of dikes surrounding the wetland cells. A consultant submitted the habitat enhancement plan for District land west of the lake and lower Saddle Creek and is currently finalizing the report. The project may potentially be used as mitigation for a Polk County landfill, which may cause some delays.

(d) **Upper Peace River Resource Development Project (Including the Upper Peace River Minimum Flow Enhancement Feasibility Study and the Hydraulic Reconnection of Non-Mandatory Phosphate Lands Project).** This project involves identification and evaluation of potential water resource development projects in the upper Peace River watershed above Zolfo Springs. The project includes collection of topographic information, watershed evaluation and development of watershed management plan elements. Work on these tasks for the area contributing flow to the river between the confluence with the Peace Creek Canal and the Highway 640 bridge crossing in Homeland are nearing completion. Watershed evaluation tasks are being conducted for the area contributing flow to the river between the Highway 640 bridge crossing in Homeland and Zolfo Springs. These tasks include collection of hydrologic and hydraulic information for existing and future conditions reflected in approved reclamation plans. Potential surface water storage was evaluated for areas adjacent to the river.

(e) **Peace Creek Canal Watershed.** This is a multiyear project to collect topographic information, evaluate the watershed and conduct elements of the District's watershed management plan for the Peace Creek Canal watershed. The watershed covers 230 square miles in Polk County. Projects will be identified that will restore basin storage, improve water quality, provide flood protection benefits and improve natural systems. In 2005, the District assumed the responsibility to maintain and/or improve the water conveyance and storage capabilities of the Peace Creek Canal. The District continues to provide aquatic plant maintenance in the canal and implemented a permanent spraying schedule in 2007. The District also continues to remove sediments in strategic reaches of the canal. In 2007, Polk County requested funding from the District for the acquisition of 18 residential properties along the canal that repeatedly flooded. The District provided matching funds for a FEMA grant to assist in acquiring these properties. The topographic information and watershed evaluation portions of the watershed management plan and immediate maintenance have been completed. A canal maintenance evaluation report was completed in May 2005, which identified short- and long-term maintenance activities that would improve conveyance in the canal. Twelve sediment removal sites and two culvert replacements have been completed. Permits were approved in February 2009 for three additional sediment removal sites within the canal.

*The Peace Creek Canal watershed project is designed to restore channelized portions of the basin to enhance water storage, improve water quality, provide flood protection benefits and improve natural systems.*

*The karst berms project will evaluate the feasibility of constructing in-channel devices that will prevent dry season river flow from being captured by karst features but will allow recharge to occur through the features during higher-flow periods.*

(f) **Upper Peace River Karst Berms.** This project will evaluate the feasibility of constructing low-flow devices or altering stream morphology in the vicinity of select karst features in the upper Peace River to maintain dry-season flows in the river channel while allowing recharge through the karst features to occur during periods of higher river flows. Based on the results of this project, construction of some means of reducing the losses through the karst features at extreme low flows may be undertaken. If successful, this project will minimize the amount of water needed to be stored in the watershed to meet minimum flows and achieve recovery for the upper Peace River. The feasibility study was completed in April 2009 and concluded that the installation of devices to reduce losses through karst features at low flows is justified. Additional funding is provided in 2010 for the design phase of the project. As of the fall of 2009, water levels were too high to permit access to complete geophysical surveys and borings.

# Chapter 8: Overview of Funding Mechanisms

This chapter provides an overview of mechanisms available to generate the necessary funds to implement the water supply and water resource projects proposed by the District and its cooperators to meet the water supply demand projected through 2030 and restore minimum flows and levels (MFLs) to impacted natural systems. The chapter includes:

*The District has provided hundreds of millions of dollars in matching funds to local governments to develop water supply infrastructure such as this reclaimed water pump station.*

- A discussion of the District's statutory responsibilities for funding water supply and water resource development projects.
- Identification of utility, water management district, state and federal funding mechanisms.
- A discussion of public-private partnerships and private investment.
- A comparison of demand to water supply projects by state of development and funding.
- A projection of the amount of funding that is expected to be generated or available from the various funding mechanisms from 2011 through 2030.
- A comparison of the cost of proposed large-scale water supply and water resource development projects to the amount of funding to be generated or made available through 2030.

Table 8-1 shows the demand projections for each planning region for the 2005–2030 planning period. The table shows that approximately 431.0 mgd of new water supply will need to be developed in the District during the planning period to meet demand for all users and restore natural systems.

Table 8-1. *Demand projections (mgd) by planning region (2005–2030)*

| Planning Region | Projected Demand |
|---|---|
| **Southern** | 84.1 |
| **Heartland** | 129.6 |
| **Tampa Bay** | 126.9 |
| **Northern** | 90.4 |
| **Total** | **431.0** |

As of the December 2010 release date of this RWSP, it is estimated that 169 mgd, or 39 percent of the demand, has either been met or will be met by projects that are under development. Projects under development are those the District is co-funding that have either been: (1) completed since the year 2005 — the base year for the 2010 RWSP, (2) are in the planning, design or construction phase or (3) are not yet in the planning phase but have been at least partially funded through fiscal year (FY) 2010.

To begin developing an estimate of the capital cost of the projects that will be needed to meet the portion of the 2030 demand that is not yet under development, the District has compiled a list of large-scale water supply development projects (Table 8-4). The water supply produced from these large-scale water supply development projects, combined with the water supply to be produced from numerous water supply and water conservation projects currently under development, will meet more than one-half of the projected demand. The District anticipates that a large portion of the remaining half of the demand will be met through projects that users will select from the water supply options listed in Chapter 5 of this RWSP. Finally, a significant portion of this remaining demand is in the Northern Planning Region where more than half will be met with fresh groundwater from the Upper Floridan aquifer. To determine the availability of funding to cover the cost of developing projects needed to meet the portion of the 2030 demand that is not yet under development, the capital cost of the potential large-scale projects discussed in Table 8-4 is compared to the amount of funding that will be generated through 2030 by the various utility, District, state and federal funding mechanisms.

## Part A. Statutory Responsibility for Funding

Section 373.0831, F.S., describes the responsibilities of the WMDs in regard to funding water resource and water supply development projects:

> *(1)(a) The proper role of the water management districts in water supply is primarily planning and water resource development, but this does not preclude them from providing assistance with water supply development.*
>
> *(1)(b) The proper role of local government, regional water supply authorities and government-owned and privately owned water utilities in water supply is primarily water supply development, but this does not preclude them from providing assistance with water resource development.*
>
> *(2)(b) Water management districts take the lead in identifying and implementing water resource development projects, and they are responsible for securing necessary funding for regionally significant water resource development projects.*
>
> *(2)(c) Local governments, regional water supply authorities, and government-owned and privately owned utilities take the lead in securing funds for and implementing water supply development projects. Generally, direct beneficiaries of water supply development projects should pay the costs of the projects from which they benefit, and water supply development projects should continue to be paid for through local funding sources.*

Section 373.707(2)(c), F.S., describes the responsibilities of the WMDs in regard to providing funding assistance for the development of alternative water supplies:

> *(2)(c) Funding for the development of alternative water supplies shall be a shared responsibility of water suppliers and users, the state of Florida and the water management districts, with water suppliers and users having the primary responsibility and the state of Florida and the water management districts being responsible for providing funding assistance.*

In accordance with the intent of the legislation and the promotion of efficient use of water, direct beneficiaries of water supply development projects should generally bear the costs of projects from which they benefit. However, affordability and equity are also valid considerations.

Currently, the District funds both water supply and water resource development projects. In general, as discussed in Chapter 7, the District considers its water resource development activities to include resource data collection and analysis and water resource development projects. In terms of water supply development, the District has typically funded the development, storage and transmission of non-traditional sources of water, including reclaimed water and conservation. Potential sources of funding for water supply and water resource development projects are addressed below.

## Part B. Funding Mechanisms

### *Section 1. Water Utilities*

Water supply development funding has been, and will remain, the primary responsibility of water utilities. Increased demand generally results from new customers that help to finance source development through impact fees and utility bills. Water utilities draw from a number of revenue sources such as connection fees, tap fees, impact fees (system development charges), base and minimum charges, and volume charges. Connection and tap fees generally do not contribute to water supply development or treatment capital costs. Impact fees are generally devoted to the construction of source development, treatment and transmission facilities. Base charges generally contribute to fixed customer costs such as billing and meter replacement. However, a high base charge, or a minimum charge, which covers the cost of the number of gallons of water used, may also contribute to source development, treatment and transmission construction cost debt service. Volume charges contribute to both source development/treatment/transmission debt service and operation and maintenance.

Community development districts (CDDs) and special water supply and/or sewer districts may also develop non-ad valorem assessments for system improvements to be paid at the same time as property taxes. CDDs and special district utilities generally occur in developed areas not served by a government-run utility and generally serve a planned development. Regional water supply authorities, such as Tampa Bay Water, are also special water supply districts but do not have retail customers. Facilities are funded through fixed and variable charges to the utilities they supply which are, in the end, paid by the retail customers of the utilities. All the above-mentioned types of utilities and regional water supply authorities have the ability to issue secure construction bonds backed by revenues from fees, rates and charges.

A survey of water and sewer utility fees and charges in the District was conducted in October 2008 to estimate revenues that contribute to source development, treatment and transmission capital projects. The 2010 projected water use of the surveyed utilities constitutes 76 percent of 2010 projected utility-supplied water use in the District, so estimates developed from survey results should be fairly representative. Distribution system impact fees, when applicable, and connection and tap fees were excluded from the calculations (developers are typically required to supply on-site distribution lines and may be required to contribute to off-site infrastructure as well, in addition to impact fees). Impact, base and volume charges from surveyed utilities were weighted by the projected share in population growth of the utilities to form weighted average charges that were applied to the region's future customers and water use. Revenue estimates exclude projected use by domestic self-supply populations and the additional use of private wells by public supply customers. Estimated revenues are based on rates and charges in effect as of October 2008 and are expressed in 2008 dollars.

Between 2010 and 2030, new public water supply demand in the District will generate approximately $7.5 billion in one-time impact fees and recurring base and volumetric charges. Table 8-2 breaks down the projected new customer revenues into water and wastewater revenues and then into one-time impact fees, recurring base/minimum charges and recurring volume-based charges. Although wastewater revenues support sewer system development, treatment and transmission projects, these revenues may also be used to support capital expenditures on reclaimed water system development.

Table 8-2. *Cumulative projected water and wastewater revenues from new customers in the District (2010–2030)*[1]

| Revenue Source | Water (Millions) | Wastewater (Millions) |
|---|---|---|
| **New Base Charges** | $710 | $1,166 |
| **New Volume Charges** | $1,445 | $2,092 |
| **New Impact Fees** | $800 | $1,249 |
| **Total** | **$2,955** | **$4,507** |

[1]Estimated in 2008 nominal dollars using FY2009 rates and charges.

While some of these revenues will go to pay existing facility debt service, most of that service will be retired in various stages over the next 20 years and debt service for new projects added. Projects built late in the 20-year planning period will continue to generate revenues for debt service for many years after 2030, the end of the planning period.

Financing through volume-related charges, to the extent practical, is the most economically efficient means to finance new water supply development. Volume charge financing provides consumers and businesses the greatest degree of direct control over water-related costs and a direct incentive to conserve. Such financing increases utility revenue stream variability, but such variability may be reduced through the development of rate stabilization or reserve funds.

If volume charges are utilized to fund higher cost alternative water sources, the impact on rate-payers can be mitigated through existing and innovative rate structures and charges. High-usage rate blocks can be set to reflect the full marginal cost of the next source of supply. Usage by conserving customers can be set at the existing average embedded cost, as they are not driving the need for additional supply development (or below existing cost if a lifeline rate is necessary). If the rate change to implement this pricing is designed to exceed current revenue requirements, the additional revenue can be dedicated to new source development. Such pricing both encourages conservation and reduces the need for steeper increases in future rates. Additional conservation delays the need for new facilities and may reduce their required size.

The increased conservation, in combination with collecting some construction revenues in advance of construction, distributes price increases more evenly over time and smoothes out the “lumpy” nature of price increases inherent in common water-pricing practices. This allows customers to adjust water use practices and technology over time. If the change in rates were revenue-neutral, additional conservation would still occur as the difference between average price and marginal price for larger water users increases. Indexing of prices is another means of distributing price increases over time.

There are a number of additional means available to mitigate the impact of higher cost sources to customers. Many of these are addressed in the American Water Works Association publications *Avoiding Rate Shock: Making the Case for Water Rates* (AWWA, 2004) and *Thinking Outside the Bill: A Utility Manager's Guide to Assisting Low-Income Water Customers* (AWWA, 2005).

### *Section 2. Water Management District*

The District's Governing Board and the seven Basin Boards provide significant financial assistance for conservation and alternative source projects through the Cooperative Funding Initiative, which includes (1) Basin Board's cooperative funding program, (2) water supply and resource development (WSRD) program and (3) District initiatives. Financial assistance is provided primarily to governmental entities, but private entities are also eligible to participate in these programs. For example, financial assistance has been provided to private agricultural concerns such as Falkner Farms and Pacific Tomato Growers, both located in Manatee County, through the District's WSRD program. WSRD funding assistance was provided for these projects developed through the District's Facilitating Agricultural Resource Management Systems (FARMS) Program to offset groundwater withdrawals for agricultural irrigation with excess surface water from the Flatford Swamp. Financial assistance has also been provided through the FARMS Program to more than 30 private agricultural operations in the Shell Creek, Prairie Creek and Joshua Creek watersheds to offset groundwater withdrawals and enhance surface water quality by reducing pumping of highly mineralized groundwater that can run off into creeks and rivers. In total, the FARMS Program has initiated 87 projects Districtwide to expedite the implementation of production-scale agricultural BMPs that provide water resource benefits.

1.0 Cooperative Funding Initiative (CFI)

The CFI is a basin-local matching grant program. The Basin Boards jointly participate with local governments and other entities in funding water management programs and projects of mutual benefit. The goal is to ensure proper development, use and protection of the regional water resources of the District. Projects are generally funded 50 percent by the Basin Boards, with the local cooperators funding the remaining 50 percent. The CFI has been highly successful since its inception in 1988, with the Basin Boards providing project funding totaling $539 million from FY1988 through FY2010, which was matched by local cooperators.

2.0 Water Supply and Resource Development (WSRD) Program

The District's WSRD program was established in 2000 to provide funding for projects of regional significance on a matching, flexible basis to complement the District's New Water Sources Initiative (NWSI) and cooperative funding programs. The NWSI was funded from FY1994 through FY2007 and was combined with the WSRD budget with the completion of the Partnership Agreement funding obligation. Through the annual budget, the Governing and Basin Boards have jointly provided funds to develop alternative supplies and restore historic flows and levels. These funds are generally matched by a partnering entity that benefits from the projects. Projects funded to date include reclaimed water, aquifer storage and recovery (ASR), agricultural conservation, and hydrologic restoration projects. From FY1994 through FY2010, the Governing and Basin Boards have provided cumulative project funding totaling $708 million ($384 million WSRD and $324 million NWSI) for WSRD/NWSI projects that have been completed or are in the process of being completed. These funds were matched when a partnering entity was involved.

It is anticipated that the Governing and Basin Boards will collectively contribute at least $20 million annually for the WSRD program from 2011 through 2030 (Governing Board $10 million and Basin Boards $10 million). This analysis assumes that 50 percent of future annual $20 million WSRD budgets will be set aside for projects to be funded completely by the District. This is because certain projects, such as the upper Peace River water resource development projects, may not have local cooperators and may be funded entirely by the District. The remaining 50 percent will be matched on an equal cost basis.

3.0 District Initiatives

District initiatives are funded in cases where a project is of great importance or priority to a region. The Governing and Basin Boards can increase their percentage match and in some cases provide total funding for the project. Examples of these initiatives include: (1) Quality of Water Improvement Program (QWIP) — an initiative to plug deteriorated, free-flowing wells that waste water and cause inter-aquifer contamination, (2) the leak detection program — an initiative to conserve water by having District staff inspect and detect leaks in public water system pipelines, (3) data collection and analysis to support major District initiatives such as the MFLs program and (4) various agricultural research projects designed to increase the water use efficiency of agricultural operations.

## *Section 3. State Funding*

1.0 State of Florida Water Protection and Sustainability Program

The state of Florida Water Protection and Sustainability Program was created in the 2005 legislative session through Senate Bill 444. The program provides matching funds for the District's CFI and WSRD programs for alternative water supply development assistance. For 2006, the first year of funding, the Legislature allocated $100 million for alternative water supply development assistance, with $25 million allocated for the District. The District was allocated $15 million in FY2007 and $13 million in FY2008. In FY2009, the District was allocated $750,000, for two specific projects. The reduced funding was related to the state's budget constraints resulting from the economic downturn and the declining real estate industry. In FY2010, the state did not allocate funding for the program. During the 2009 legislative session, the Legislature passed Senate Bill 1740, which re-created the Water Protection and Sustainability Program Trust Fund as part of Chapter 373, F.S., indicating the state's continued support for the program. It is anticipated that the state will resume its funding for the program when economic conditions improve.

The state funds will be applied toward the maximum 20 percent of the construction costs of eligible projects. In addition, the Legislature has established a goal for each WMD to annually contribute funding equal to 100 percent of the state funding for alternative water supply development assistance, which the District has exceeded annually. If funding is continued by the Legislature, the state's Water Protection and Sustainability Program could serve as a significant source of matching funds to assist in the development of alternative water supplies.

2.0 Florida Forever Program

The Florida Forever Act, passed in 1999, was a $10 billion, 10-year, statewide program. A bill to extend the Florida Forever Program was passed by the Legislature during the 2008 legislative session, continuing the Florida Forever Program for 10 more years at $300 million annually and reducing the annual allocation to WMDs from $105 million to $90 million, with $22.5 million (25 percent) to be allocated to the District, subject to annual appropriation. For FY2010, the Legislature did not appropriate funding for the Florida Forever Program, other than for the state's debt service. For FY2011, the 2010 Legislature appropriated $15 million in total, with $1.125 million allocated to the District. Future funding for the Florida Forever Program will depend on improvement in the economy and stabilization of the documentary stamp tax funding source.

The District has expended $95 million ($81.6 million for land acquisition and $13.4 million for water body restoration) of Florida Forever funding in support of water resource development. A "water resource development project" is defined as a project eligible for funding pursuant to Section 259.105 (Florida Forever) that increases the amount of water available to meet the needs of natural systems and the citizens of the state by enhancing or restoring aquifer recharge, facilitating the capture and storage of excess flows in surface waters, or promoting reuse. Implementation of eligible projects under the Florida Forever Program includes land acquisition, land and water body restoration, ASR facilities, surface water reservoirs and other capital improvements. An example of how the funds were used for water resource development was the purchase of lands around Lake Hancock within the Peace River watershed as the first step in restoring minimum flows to the upper Peace River. In addition, the District Governing Board has allocated $79 million ($28.5 million expended to date) in ad valorem-based funding to complete the acquisition of lands associated with the Lake Hancock project, which were acquired on a voluntary basis and through eminent domain proceedings.

3.0 State Funding for the Facilitating Agricultural Resource Management Systems (FARMS) Program

Now operating under Rule 40D-26, the FARMS Program, through the District, seeks additional funding annually. Since the inception of the program, the District has received $6.4 million in state appropriations and $1.3 million from the Florida Department of Agriculture and Consumer Services (FDACS). No funding was provided for FY2010 or FY2011. Future state funding for the program will likely depend on improvement in the economy.

4.0 West-Central Florida Water Restoration Action Plan (WRAP)

The WRAP is an implementation plan for components of the Southern Water Use Caution Area (SWUCA) recovery strategy adopted by the District. The document outlines the District's strategy for ensuring that adequate water supplies are available to meet growing demands, while at the same time protecting and restoring the water and related natural resources of the area. The WRAP prescribes measures to implement the recovery strategy and quantifies the funds necessary, making it easier for the District to seek funding for the initiative from state and federal sources. In 2009, the Legislature officially recognized the WRAP through Senate Bill 2080, creating Section 373.0363, F.S., as the District's regional environmental restoration and water resource sustainability program for the SWUCA. In FY2009, the District received $15 million in funding for the WRAP. Again, due to economic conditions, no new funding was provided for FY2010 or FY2011. It is anticipated that the state will again provide funding for the WRAP as the economy stabilizes.

### *Section 4. Federal Funding*

In 1994, the District began an initiative to seek federal matching funds for water projects. Since that time, the Office of the Governor, the FDEP, other WMDs and local government, and regional water supply authority sponsors have joined with the District to secure federal funding. Through a cooperative effort with members of Florida's Congressional Delegation, the federal initiative has grown substantially. In 1999, the effort was expanded to seek funding for the development of alternative source projects and in 2001, the state of Florida and the WMDs expanded a list of projects in order to seek all available resources to develop an environmentally sustainable water supply strategy that would meet the demands of growth throughout the state. The projects include the use of alternative water supply technologies as well as stormwater retention and filtering and wastewater treatment. Each WMD certifies that the projects submitted for funding are regional in scope and that matching funds are available either from the district's budget or from a local government sponsor.

A total of $95.5 million has been received by local cooperators. Federal matching funds from this initiative helped fund the construction of TBW's C. W. Bill Young Regional Reservoir and the Peace River Manasota Regional Water Supply Authority's (PRMRWSA) reservoir and plant expansion. Further, authorization through the Water Resources and Development Act aids in the efforts to secure funding for the Peace River and Myakka River watersheds restoration initiative. District staff considers funding for water supply projects to be a top priority and continues to work with the Office of the Governor, the Florida Department of Environmental Protection (FDEP) and the members of the Florida Congressional Delegation to secure federal funding.

1.0 U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) Environmental Quality Incentive Program (EQIP)

The EQIP provides technical, educational and financial assistance to eligible farmers and ranchers to address soil, water and related natural resource concerns on their lands. The program provides assistance to farmers and ranchers to comply with federal, state of Florida, and tribal environmental laws that encourage environmental enhancement. The purpose of the program is achieved through the implementation of a conservation plan, which includes structural, vegetative and land management practices. The program is carried out primarily in priority areas that may be watersheds, regions and/or multistate areas where significant resource concerns exist. Water supply and nutrient management through detention/retention or tailwater recovery ponds can be pursued through this program.

*The FARMS Program provides funding from the District, FDACS and the federal EQIP program to help farmers increase the efficiency of their water use and reduce impacts to natural systems.*

The District's FARMS Program works cooperatively with the NRCS EQIP program on both financial and technical levels. In this effort, FARMS staff has coordinated dual cost-share projects whenever possible. By an agreement between the District, FDACS and the NRCS, the maximum funding for using both FARMS and EQIP is 75 percent of total project cost. To date, 12 FARMS projects have involved some level of dual cost-share with EQIP, with several additional cooperative projects expected in the near future. On a technical level, agency interaction includes using the NRCS mobile irrigation lab to investigate using FARMS cost-share for improvements to overall irrigation system efficiency, using NRCS engineering designs for regulatory agricultural exemptions whenever possible, and coordinating cost-share on specific project-related infrastructure. As an example, FARMS may assist with an alternative source of irrigation water and EQIP assists with an upgrade to an irrigation delivery system. The relationship is mutually beneficial, extends cost-share dollars and provides more technical assistance to participants in both programs.

In addition to EQIP, the FARMS Program is partnering with NRCS in 2010, through the Agriculture Water Enhancement Program (AWEP), to bring additional NRCS cost-share funding to the SWUCA. The AWEP was created by the 2008 Farm Bill with similar goals as EQIP, including conserving and/or improving the quality of groundwater and surface water. By entering into a partnership agreement, the District and NRCS can leverage existing cost-share funds toward mutual water conservation goals and provide project funding to more producers in the SWUCA.

### Section 5. Public-Private Partnerships and Private Investment

As lower-cost, traditional water sources become scarce, more expensive alternative sources that involve more technical expertise and financial risk must be developed. This expertise and risk may be beyond the level of expertise and risk tolerance of many utilities and water supply authorities. A range of public/private partnership and risk options is available to provide this expertise and shift risk. These options range from all-public ownership, design, construction and operation to all-private ownership, design, construction and operation. Aside from financial risk reduction, competition among private firms desiring to fund, build or operate water supply development projects could act to reduce project costs, potentially resulting in lower customer charges.

In addition to investor-owned public supply utilities, private risk sharing could be undertaken by three distinct forms of water supply entities: (1) government-owned utilities, the District or regional water supply authorities contracting with private entities to design, build or operate facilities (public-private partnerships), (2) cooperative institutions such as irrigation districts contracting with private entities and (3) private entities, which could identify a customer base and become water supplier to one or more water use types.

1.0 Public-Private Utility Partnerships

The two major advantages of this type of arrangement are that (1) competition and economies of scale enjoyed by regional or national construction/operation firms may reduce costs and (2) some of the risk may be shifted to the private firms providing goods and services. As an example, TBW undertook a public-private partnership with Veolia Water, formerly USFilter, to design, build and operate its surface water treatment plant that has been in operation since 2002. Veolia assumed all risks for cost, schedule and facility performance, building the plant, construction management, equipment supply and startup services, and operating and maintaining the facility. The cost savings over the life cycle of the contract is expected to be significant.

Public-private partnerships are becoming more common because the water environment is becoming increasingly complex (see *www.ncppp.org* for case studies). Increasing numbers of regulated pollutants and new higher-risk technologies drive privatization of some public water supply responsibilities. Partnerships work best where risks are beyond public sector tolerance, a project is new and stand-alone, construction and long-term operation are combined, there are clearly defined performance specifications and there are clearly defined payment obligations (Kulakowski, 2005).

Other government-owned utilities and the District could enter into such public-private arrangements. A significant issue is that small utilities may not have the resources or project sizes sufficient to attract private interest. This could, however, be remedied through multi-utility agreements or participation in a regional water supply authority. A significant benefit of cooperation in larger projects is the economies of scale common in the water supply industry.

2.0 Cooperatives

Under this second type of arrangement, multiple self-supplied water users pool their resources to construct water facilities that they could not technically or economically undertake on their own. They also share the risks. Such private or public/private cooperative institutions are more common where water is not typically available at the user’s site, such as in the western U.S. The most familiar forms are irrigation or water districts that use surface water as a source. Water is usually obtained from a supplier at a cost and then distributed among members by the district. Members cooperatively fund the construction of transmission and distribution facilities from the purchase point and pay for the purchased water. If groundwater sources become limited in a given area and, in particular if the groundwater cannot be moved to where it is needed, the same type of economic forces that created irrigation and water districts in the west could develop in the District and the rest of Florida. They also could shift risk by entering into design, build and operate arrangements with contractors. Various forms of cooperative institutions in Florida, such as drainage districts and grower cooperatives, are addressed in a publication of the Office of Program Policy Analysis and Governmental Accountability (OPPAGA) of the Florida Legislature (OPPAGA, 1999).

3.0 Private Supply Investment (Aside from Investor-Owned Public Supply)

The third type of water supply entity is where investors identify an unserved customer base and develop water resource/supply facilities to meet those needs. Many look to this type of investment as a means to facilitate the development of alternative water supplies. Such private investment will not likely occur unless regulatory measures to protect water resources and related environmental features place firm limits on further development of traditional, lower-cost sources. The financial risks are too high if low-cost sources are still available. Although the purpose of the regulatory measures is resource protection, they indirectly create a customer base for alternative source developers. The cost of the alternative sources developed and the extent of public participation and funding will determine the likely customers of such an enterprise. To date, it appears that this form of pure private investment in alternative water supply development has not taken hold in Florida.

### *Section 6. Summary of Funding Mechanisms*

There are many potential institutions and sources of funding for water resource and water supply development, although many are currently limited by economic conditions. The public supply utilities and water supply authorities will likely have the least difficulty in securing funding due to their large and readily identifiable customer bases. Funding mechanisms are already established for many District water supply and resource development projects. The most difficult challenge will be identifying cost-effective and economically efficient methods of meeting the needs of self-supplied users (whose ability to pay ranges widely) when their traditional, lower-cost sources of water are no longer readily available.

## Part C. Comparison of the 2030 Projected Demand to the Amount of Funding Anticipated to Be Generated or Made Available Through District and State Funding Programs and Cooperators

### *Section 1. Projection of Potentially Available Funding*

Table 8-3 is a projection of the amount of funding that could be generated by the District and state funding programs that were discussed above. An explanation follows as to how the funding amounts in the table were calculated.

- Cooperative Funding Initiative. If the Basin Boards maintain their current levels of funding for water supply and water resource development projects, it is estimated that an additional $300 million could be generated from 2011 through 2030. If cooperators match all these funds, an additional $300 million could be leveraged. If the Basin Boards elect to increase program funding for their other areas of responsibility (i.e., flood protection, water quality and natural systems), the funding projection for water supply and water resource development could be significantly impacted.

- Water Supply and Resource Development (WSRD) Program. If the Governing and Basin Boards maintain a combined funding commitment of $20 million per year through 2030, it is estimated that $400 million could be generated from 2011 through 2030. If local cooperators match half of these funds, an additional $200 million could be leveraged.

- Water Protection and Sustainability Trust Fund (WPSTF). The amount of future state funding for the WPSTF cannot be determined at this time. As economic conditions improve and the state resumes funding for the WPSTF, any funding allocated for this District will be used as matching funds for the development of alternative water supply projects.

- Florida Forever Trust Fund. The amount of future state funding for the Florida Forever Trust Fund cannot be determined at this time. Any funding allocated for this District will be used for land acquisition, including land in support of water resource development.

Table 8-3 shows that a minimum of $1.2 billion could potentially be generated or made available to fund the water supply and water resource development projects necessary to meet the water supply demand through 2030 and to restore MFLs for impacted natural systems. This figure may be conservative since it is not possible to determine the amount of funding that may be available in the future from the federal government and state of Florida legislative appropriations.

Table 8-3. *Projection of the amount of funding that could be generated or made available by District funding programs from 2011 through 2030 (millions of $)*

| Funding Projection | |
|---|---|
| **Source** | **Amount (millions)** |
| **Basin Board Cooperative Funding Initiative (CFI)** | **$300** |
| **Funding provided assuming all Basin Board CFI water supply funds are used for projects that would be matched by a partner on an equal cost-share basis** | **$300** |
| **District WSRD program funding** | **$400** |
| **Funding provided assuming one-half of the WSRD funds are used for projects that would be matched by a partner on an equal cost-share basis.** | **$200** |
| **State of Florida, Water Protection and Sustainability Trust Fund** | **TBD** |
| **State of Florida, Florida Forever Trust Fund** | **TBD** |
| **State of Florida Legislative Appropriations** | **TBD** |
| **State of Florida Legislative Appropriations for FARMS** | **TBD** |
| **West-Central Florida Water Restoration Action Plan (WRAP)** | **TBD** |
| **Federal Funds** | **TBD** |
| **Total** | **$1,200** |

### Section 2. Evaluation of Project Costs to Meet Projected Demand

Of the 431.0 mgd of new water supply that will need to be developed during the 2005–2030 planning period to meet the demand for all users and to restore MFLs for impacted natural systems, it is estimated that 169 mgd, or 39 percent of the demand, has either been met or will be met by projects that are under development as of Dec. 30, 2010. Projects under development are those the District is co-funding that have either been (1) completed since the year 2005 — the base year for the 2010 RWSP, (2) are in the planning, design, or construction phase or (3) are not yet in the planning phase but have been at least partially funded through FY2010. The total cost for the projects currently under development is $1.02 billion. Of this amount, $889 million has been funded through FY2010, leaving $131 million to be funded beginning in FY2011. When cooperating on projects, the District typically contributes to land and capital costs.

To develop an estimate of the capital cost of projects that will need to be developed to meet the 262 mgd of demand that is not yet under development, the District compiled a list of large-scale water supply development projects that have been proposed by the PRMRWSA, Tampa Electric Company, Mosaic and Polk County that will produce an additional 36 mgd of water supply. These projects, their estimated costs and quantity of water they will produce are listed in Table 8-4. The table shows the estimated total cost of the 36 mgd of water supply that will be produced by these projects is $534 million.

Table 8-4. *Proposed large-scale water supply and water resource development projects by 2030 (millions of $)*

| Project | Entity Responsible For Implementation | Quantities (mgd) | Capital Costs | Land Costs | Potentially Eligible Land Costs | Total Costs (Capital + Land) |
|---|---|---|---|---|---|---|
| **Regional Resource Development** | PRMRWSA | 8 | $117 | $4 | - | **$121** |
| **Regional Loop System** | PRMRWSA | N/A | $104 | $3 | - | **$107** |
| **Polk County Water Supply Development** | Polk County and potentially municipalities | 10 | $143 | $7 | - | **$150** |
| **Flatford Swamp Hydrologic Restoration** | Mosaic | 12 | $82 | $4 | - | **$86** |
| **Southwest Polk County/Tampa Electric RW (Phase 2)** | Tampa Electric Co. | 6 | $70 | - | - | **$70** |
| **Subtotal Southern and Heartland Planning Regions** | | **36** | **$516** | **$18** | **-** | **$534** |
| **Total – Southern, Heartland and Tampa Bay Planning Regions** | | **36** | **$516** | **$18** | **-** | **$534** |

Of the remaining demand of 226 mgd (262 mgd minus 36 mgd), the demand in the Northern Planning Region of 89 mgd will potentially be met by 46 mgd of fresh groundwater and 43 mgd of reclaimed water and conservation projects. Because the District does not fund fresh groundwater projects, matching financial resources may only need to be generated by the District for the 43 mgd of reclaimed water and conservation projects in the Northern Planning Region. The remaining demand the District will provide co-funding for is 180 mgd (226 mgd minus 46 mgd). This demand will be met through the development of alternative water source and conservation projects chosen by users from the list of potential options in Chapter 5.

### *Section 3. Evaluation of Potential Available Funding to Assist With the Cost of Meeting Projected Demand*

The $1.2 billion in cooperator and District financial resources that will be generated through 2030 (Table 8-3) will be sufficient to fund the $534 million total cost of the projects listed in Table 8-4 and the $131 million portion of the cost of the projects under development that has not yet been funded. The remaining $535 million will be available to assist with the cost of alternative water source projects and water conservation measures that will be required to meet the remaining demand of 180 mgd that is not under development or will not be met by fresh groundwater. It may also serve as a reserve for the development of projects to replace water supplies that may be reduced as the result of the establishment or revision of MFLs. If current economic conditions worsen, resulting in District ad valorem tax revenue continuing to decline and federal and state funding continuing to be unavailable, the funding plan levels and timelines will need to be adjusted through 2030.

Southwest Florida Water Management District

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