2010
Regional Water Supply Plan
Heartland Planning Region

Southwest Florida
Water Management District

The 2010 Update of the

Regional Water Supply Plan

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

For further information regarding this plan, please contact the Planning Department at:

2379 Broad Street
Brooksville, FL 34604-6899
(352) 796-7211 or
(800) 423-1476 (Florida only)
planning@watermatters.org

This plan is also available on the District's website at: www.WaterMatters.org

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These appendices are located on the District's web site: *www.WaterMatters.org*

Abbreviations

AMO	Atlantic Multidecadal 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
CFCA	Central Florida Coordination Area
CFI	Cooperative Funding Initiative
CFRSF	Celery Field Regional Storage Facility
CFS	Cubic Feet per Second
CWCFGWB	Central West-Central Florida Groundwater Basin
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
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GPDPH	Gallons per Day per Hole
GPF	Gallons per Flush
GPM	Gallons per Minute
GIS	Geographic Information System
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 Flow and Level
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
NTB	Northern Tampa Bay
NRCS	Natural Resources Conservation Service
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

PRMRWSA	Peace River Manasota Regional Water Supply Authority
PG	Power Generation
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 Creeks
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
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

Lake Hancock, South Saddle Creek and the P-11 Structure in the creek, which maintains the lake level.

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 Heartland Planning Region, which includes Hardee County and the portions of Polk and Highlands counties within the District. This document is the 2010 RWSP update for the Heartland Planning Region.

In 2001 and 2006, the District completed RWSPs that included the Heartland Planning Region. The purpose of the RWSP is to provide a framework for future water management decisions in the District. The RWSP for the Heartland 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

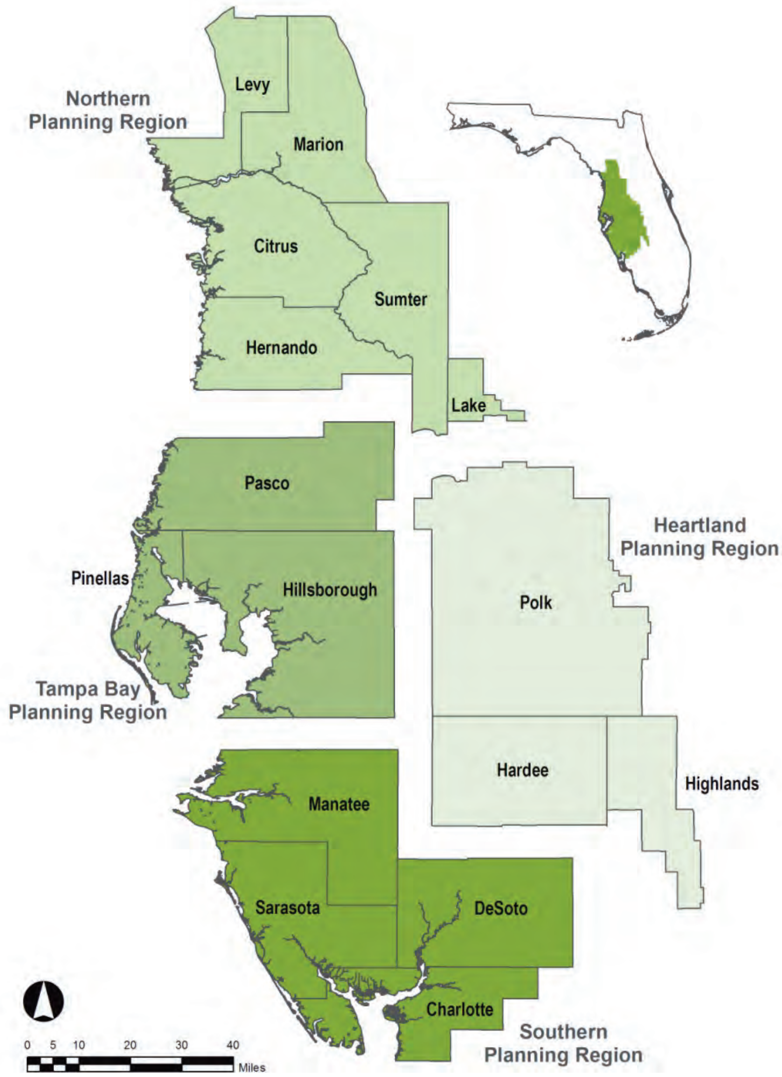


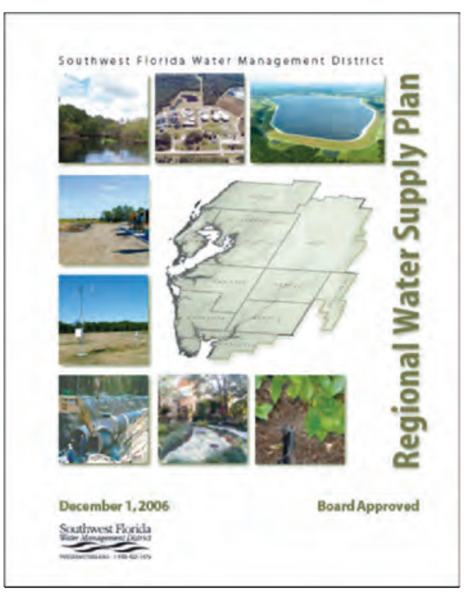
Figure 1-1. *Location of the District's four water supply planning regions*

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 was 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 Heartland Planning Region RWSP

The following describes the content of the Heartland 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 that the District has implemented or is considering implementing, including water use caution areas (WUCAs) and the District's 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 in the planning region. Chapter 5 is the water supply development component, which presents a list of alternative and traditional water supply development options for local governments and utilities, including surface water and stormwater, reclaimed water, water conservation, and fresh and brackish groundwater. 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, Overview of 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



The 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 in December 2006.

Section 1. Alternative Water Supply Development, Conservation and Reuse

1.0 Alternative Water Supply

The District partnered with Polk County in 2006 to construct an exploratory/test well into the Lower Floridan aquifer in the northeast part of the county. The project was completed in 2009 and the county is hopeful that the well could provide an alternative water source for a high-growth area of the county that lacks other readily available supplies. The District is now helping to fund reclaimed water storage infrastructure and an additional monitor well, which are necessary to conduct an aquifer performance test to better define the potential of the Lower Floridan aquifer as a source in this area.

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 million gallons per day (mgd) Districtwide as of Oct. 1, 2009. Since 2006, District-funded conservation projects have been undertaken with Polk and Highlands counties and the cities of Lakeland and Winter Haven.

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.

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. In the planning region since 2006, reclaimed water projects have been jointly undertaken with Polk County and the cities of Auburndale, Dundee, Haines City and Winter Haven. An additional project, the Southwest Polk County/Tampa Electric Reclaimed Water Project, involves the transport of reclaimed water to a power station in Polk County to support expansion of that facility. The sources of reclaimed water currently include the City of Lakeland and Polk County, but may be broadened in the future to include additional partners and reclaimed water from other sources.

The District recently completed a research study to examine new options for maximizing beneficial reuse of reclaimed water. The study evaluated the potential to recharge the Upper Floridan aquifer with reclaimed water, either in coastal areas or farther inland, to provide opportunities for additional groundwater withdrawals in areas where they might not otherwise be permittable. In addition, site-specific research is being considered in cooperation with Tampa Bay Water, the City of Clearwater and Polk County to refine the concept and determine whether specific projects can be included in water supply planning.

Section 2. Support for Water Supply Planning

The South Florida Water Management District (SFWMD), the District, and Polk County entered into a cooperative funding agreement in 2008 to develop the Polk County Comprehensive Water Supply Plan. The emphasis of the plan was on identifying and quantifying viable water supply sources, particularly alternatives to fresh groundwater, for the next 20 years. The results of this planning effort have been incorporated into this RWSP, and the District has budgeted funds to cooperatively fund implementation of water supply projects identified in the plan.

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 Establishment

1.0 Established MFLs

MFLs established in the planning region since 2006 include minimum levels in 2007 for eight lakes in Polk County, including Crooked Lake, and five lakes in Highlands County, including Lake Placid. In 2008, minimum levels were established for Lake Anoka in Highlands County. In 2010, MFLs to be established include minimum flows for the upper Withlacoochee River, minimum levels for wetlands in the Green Swamp and minimum levels for two lakes in Polk County.

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

2.0 Minimum Flows and Levels Recovery Initiatives

The District's Southern Water Use Caution Area (SWUCA) recovery strategy was approved in 2006. The strategy relies on a wide range of activities that, 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 or 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. 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

In 2006, the District worked with the St. Johns River Water Management District (SJRWMD) and the SFWMD to develop an action plan for the Central Florida Coordination Area (CFCA). The CFCA includes all or part of five counties in central Florida, including Polk County. The CFCA was established due to concerns that the development of groundwater supplies to meet growing demands in the area was causing regional impacts that were crossing WMD boundaries. Key components of the action plan that have been implemented or are ongoing include a comprehensive study of wetland impacts in the region, development of compatible groundwater modeling tools, adoption of interim rules to protect the resource, and identification of alternative water sources to supplement or replace limited groundwater supplies. The interim rules, adopted by all three WMDs in 2008, expire at the end of 2012. It is anticipated the WMDs at that time will have the necessary data and modeling capabilities to adopt new rules and management approaches to equitably distribute remaining groundwater quantities and ensure protection of the region's environmental resources.

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 for 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 by the District to assist users (*www.WaterMatters.org/demos*).

Southwest Florida Water Management District

Part C: Description of the Heartland Planning Region

Section 1. Land Use and Population

The Heartland Planning Region is characterized by a diversity of land-use types (Table 1-1), ranging from urban built-up areas in central Polk County and Lakeland, to predominantly agricultural land uses in Hardee County. Significant phosphate mining activities, primarily in Polk and Hardee counties, also occur in the region. However, mining operations are anticipated to move southward further into Hardee and DeSoto counties as phosphate reserves at existing mines are depleted. The population of the planning region is projected to increase from approximately 619,628 in 2005 to 874,525 in 2030. This is a gain of approximately 254,897 new residents — a 41 percent increase over the base year population. The majority of this population growth will be due to net migration.

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

Land Use/Land Cover Type	Percentage	Total Acres
URBAN and BUILT-UP	14.93	245,550.30
AGRICULTURE	33.62	552,799.06
RANGELAND	4.73	77,848.45
UPLAND FOREST	8.23	135,334.73
WATER	5.29	87,025.25
WETLANDS	17.54	288,435.88
BARREN LAND	0.11	1,869.43
TRANS, COMM, and UTIL	0.91	15,041.59
INDUSTRIAL and MINING	14.62	240,393.57
Total	**100.00**	**1,644,298.26**

Based on: SWFWMD 2007 GIS LULC Layer (SWFWMD, 2007)

Section 2. Physical Characteristics

The region has a diverse physiography. In southern Polk County and Hardee County, a broad, gently sloping plain is drained by the Peace River and its tributaries. Farther north in central Polk County, a poorly drained upland area contains numerous lakes. The northernmost portion of Polk County contains a portion of the Green Swamp, which is a mosaic of uplands and wetlands that forms the headwaters of four major rivers and overlies the potentiometric high of the Upper Floridan aquifer. Finally, the eastern side of the region is defined by the Lake Wales Ridge, a northwest-southeast trending highland characterized by high elevations, deep sands and sinkhole lakes.

Section 3. Hydrology

Figure 1-2 shows the major hydrologic features in the planning region.

1.0 Rivers

The Peace River, the primary river system in the region, is a blackwater river: a river system that drains pine flatwoods and cypress swamps and has dark, tannin-stained waters from decomposing plant material. The headwaters of the river are at the junction of Saddle Creek and Peace Creek in Polk County, north of Bartow and south of Lake Hancock. From this junction, the Peace River extends 106 miles south to the Charlotte Harbor estuary, where it blends with the outflows of the Caloosahatchee and Myakka rivers. There are many tributaries to the river including Payne Creek, Charlie Creek and Horse Creek.

The upper Peace River during a low-flow period.

2.0 Lakes

Nearly 200 lakes and ponds are located along the Lake Wales Ridge in the planning region. The lakes are most likely the result of sinkholes formed by the dissolution of the underlying limestone. The lakes range in size from a few tens of acres to the more than 5,500 acres that comprise Crooked Lake in southern Polk County. Water-control structures have been constructed on many of the lakes. and several of the lakes, especially in the uplands portion of the central ridge, had not discharged water for the past 25 years due to low water levels. However, wetter than normal conditions in 2003, excessive rainfall from three hurricanes in 2004 and wet conditions again in 2005 caused the lakes to rise to levels that had not been experienced since the 1950s. During the last several years, excessively dry conditions resulting from a three-year drought have caused lake and aquifer levels in the region to drop considerably again, with some reaching historically low levels.

The Winter Haven Chain of Lakes is a priority water body of the Surface Water Improvement and Management (SWIM) Program and is composed of 19 interconnected lakes. The chain is made up of two major groups with 5 in the northern chain and 14 in the southern chain, spanning a watershed area of 32 square miles in Polk County. The lakes in the Winter Haven chain are a mixture of depressional and seepage lakes, with the latter being similar to the Lake Wales Ridge lakes. The lakes were interconnected through the construction of navigable canals to promote recreational access, which has impacted the hydrology, water quality and storage in the lakes.

3.0 Springs

There are no springs of significant magnitude in the planning region. The most prominent spring in the region, Kissengen Spring, ceased flowing in the late 1950s when large quantities of

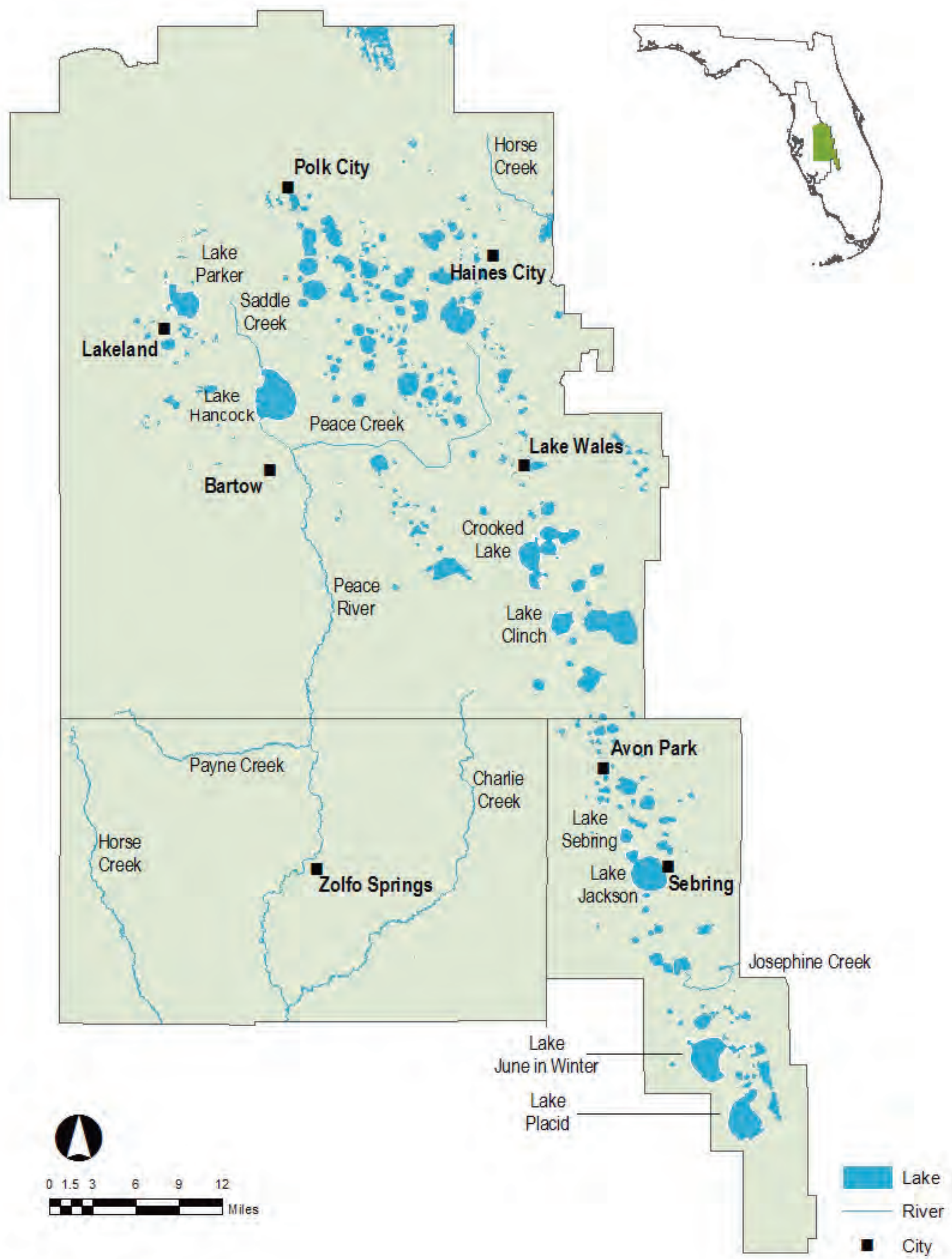


Figure 1-2. *Major hydrologic features in the Heartland Planning Region*

groundwater pumped from the Upper Floridan aquifer to supply the mining industry and other users lowered the potentiometric surface of the aquifer below the elevation of the spring vent.

4.0 Wetlands

Wetlands in the Green Swamp in northern Polk County.

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 do not exist in the planning region due to its inland location. 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. These freshwater wetlands are the predominant type of wetland in the planning region and play a significant role in the health and flow of several major river systems.

Section 4. Geology/Hydrogeology

Three principal aquifer systems, the surficial, intermediate and Upper Floridan, are present throughout much of 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 and its associated clay-confining units separate the surficial Upper Floridan aquifers and confines the Upper Floridan aquifer across much of the planning region.

The surficial aquifer system is contained within near-surface deposits that mainly consist of undifferentiated sands, clayey sand, silt, shell and marl. The aquifer produces relatively small quantities of water, which are generally used for low-volume irrigation or domestic water supply except along the Lake Wales Ridge where it is thick enough to supply large agricultural withdrawals. The aquifer ranges in thickness from 50 feet in Polk County to greater than 300 feet in southern Highlands County within the Lake Wales Ridge (Yobbi, 1996). East and west of the Lake Wales Ridge, thickness of the aquifer is generally less than 100 feet.

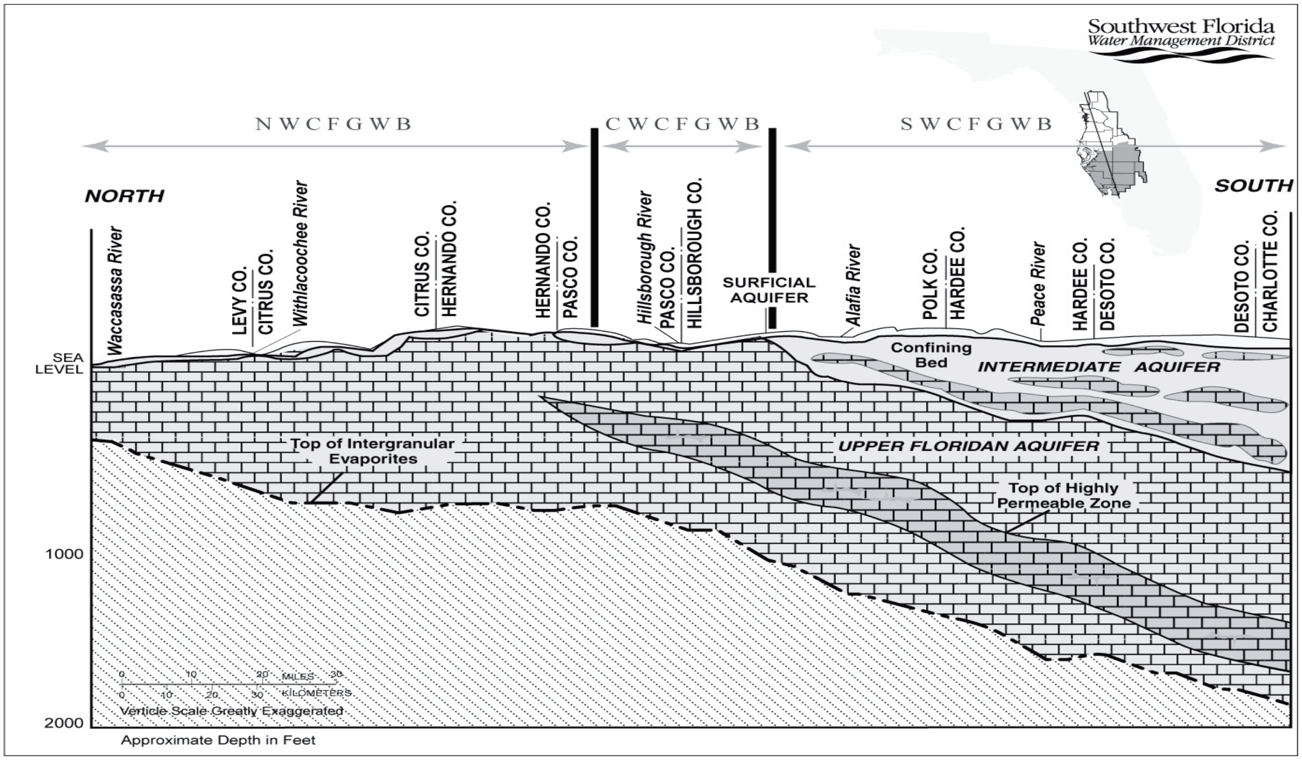


Figure 1-3. *Generalized north-south geologic cross section through the District*

Underlying the surficial aquifer system is the intermediate aquifer system. This aquifer consists predominantly of discontinuous sand, gravel, shell, limestone and dolomite beds of the Hawthorn Group. In the southern portion of the planning region, the aquifer may contain one or more distinct production zones (Wolansky, 1983). The water-bearing zones are confined or semi-confined by low-permeability sandy clays, clays and marls. From central Polk County northward, the Hawthorn Group constitutes a confining unit, as permeable zones are no longer present. In general, the thickness of the aquifer increases from north to south and varies from less than 75 feet in Polk County to more than 375 feet in Hardee County (FGS 2006). Recharge to the aquifer varies from low to moderate depending upon seasonal groundwater use in the area. Along the Lake Wales Ridge in Polk and Highlands counties, the aquifer and its confining units are extensively breached by karst features that are expressed on the surface as sinkhole lakes. In this region, the surficial and Upper Floridan aquifers are locally connected through such karst features.

The Upper Floridan aquifer system, by far the most important source of water 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 and Avon Park Formation. The aquifer can be separated into upper and lower flow zones. The Suwannee Limestone forms the upper flow zone. The lower zone is 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 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 evaporate 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 the extreme eastern portion of Polk County. In this area, the evaporites in the Avon Park middle confining unit disappear and the Lower Floridan aquifer is present, which contains fresh water. The base of the Floridan aquifer system occurs near the top of the Cedar Keys Formation where evaporate minerals form the basal confining unit (Miller, 1986).

In the western portion of the planning region, recharge to the Upper Floridan aquifer ranges from less than one inch to several inches per year (Sepulveda, 2002). This low recharge rate is due to the thick sequence of multiple clay-confining layers that overlie the aquifer. These clay layers restrict the vertical exchange of water from the surficial aquifer to the underlying Upper Floridan aquifer. Recharge to the aquifer along the Lake Wales Ridge in the northern and eastern portions of Polk and Highlands counties is much higher. In this area, the intermediate confining bed becomes thinner or dissolution of limestone has resulted in the development of karst features that are expressed on the surface as a series of sinkhole lakes. Model-estimated recharge rates in the Lake Wales Ridge range from approximately 6 to 15 in/yr (SWFWMD, 1993).

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 water and groundwater usage and large-scale land-use alterations), climactic cycles, aquifer/surface water interactions, aquifer and surface hydrology, and water quality. Investigations conducted in the Heartland 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 that had been occurring since the 1960s along the Lake Wales Ridge in Polk and Highlands counties. 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) area to determine causes of water level declines and to address water supply availability. Resource concerns in this area included saltwater intrusion in the Upper Floridan aquifer.

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 and the ETB 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 and Ridge area WUCAs. These meetings are summarized in the Highlands Ridge Work Group Report (SWFWMD, 1989) and Management Plan (SWFWMD, 1990) and Eastern Tampa Bay Work Group Report (SWFWMD, 1990) and Management Plan (SWFWMD, 1990). 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 Heartland 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.

Table 1-2. *District/USGS cooperative hydrologic investigations and data collection activities applicable to the Heartland 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
	Hydrogeology and Quality of Groundwater in Polk County
Surface Water	Hydrologic Assessment of the Peace and Alafia Rivers
	Hydrologic Budget of Benchmark Lakes Lucerne and Starr
	Statistical Characterization of Lake Level Fluctuations
	Lake Stage Statistics Assessment to Enhance Lake Minimum Level Establishment
	Pesticides and Nitrates in Lakes in the Lake Wales Ridge
Groundwater and Surface Water	Effects of Using Groundwater for Supplemental Hydration of Lakes and Wetlands
	Use of Groundwater Isotopes to Estimate Lake Seepage in the NTB and Highlands Ridge Lakes
	Effects of Recharge on Interaction Between Lakes and the Surficial Aquifer
	Relation of Geology, Hydrology and Hydrologic Changes to Sinkhole Development in the Lake Grady Basin
Ongoing Investigations/Data Collection Activities	
Groundwater	Hydrogeology and Quality of Groundwater in Highlands County
Surface Water	Primer on Hydrogeology and Ecology of Freshwater Wetlands in Central Florida
	Charlie Creek Watershed Hydrologic Characterization
	Lake Starr Long-Term Water Budget Analysis
	Methods to Define Storm Flow and Base Flow Components of Total Stream Flow in Florida Watersheds
Groundwater and Surface Water	Effects of Karst Development on Flow in the Upper Peace River
Data Collection	Minimum Flows and Levels Data Collection
	Surface Water Flow, Level and Water Quality Data Collection
	Lake Wales Ridge Nutrient and Pesticide Monitoring

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 water 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.

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 resources management in the future. Key to the management approach was to optimize resource management to provide for all reasonable and beneficial uses without causing unacceptable impacts to the water resource, 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 NTB WUCA 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 and the planning period extended to 2025 (SWFWMD, 2006). The 2006 RWSP 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 have limited access to alternative water supplies.

In 2008, the District, the SFWMD and Polk County initiated the Polk County Comprehensive Water Supply Plan. The purpose of the Plan is to identify and quantify alternative water supply sources that will be needed to meet future potable and nonpotable water demands of the public utility systems in Polk County. The Plan, which was completed in 2009, also addresses water supplies with respect to when each utility will need additional quantities, how much they will need, and what the cost of alternative water supply options will be. The Plan concludes with a menu of options and an associated strategy that each utility can implement to meet their individual water supply needs through the planning period and beyond.

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 as 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.

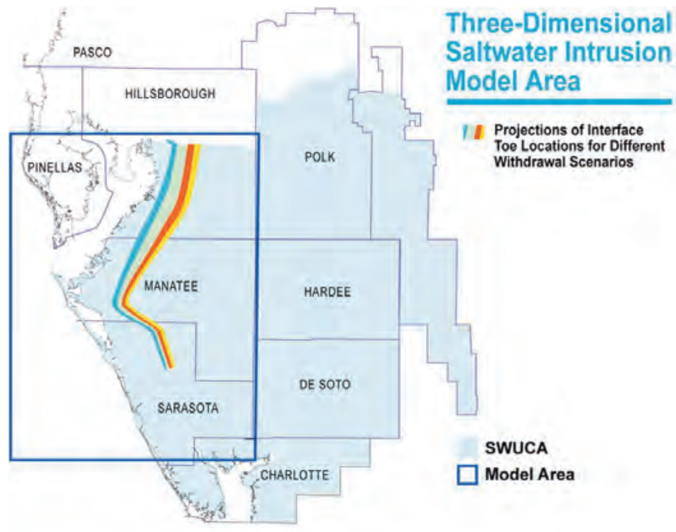
1.0 Groundwater Flow Models

The early groundwater models developed for the SWUCA were completed by the USGS. Since the early 1990s, the District developed the ETB 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 ETB 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 ETB model as the principal tool for resource assessment and resource management in the SWCFGWB. It was recalibrated using automatic calibration procedures in 2006 (Beach).

2.0 Saltwater Intrusion Models

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. Each model was designed as a geologic cross section located along flow paths to the Gulf of Mexico or Tampa Bay, and the models 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 ETB 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.



Graphical representation of modeled projections of the distance salt water will move inland in the Upper Floridan aquifer in the SWUCA over the next 50 years under various pumping scenarios.

In support of establishing a minimum aquifer level to protect against saltwater intrusion in the most impacted area (MIA) of the SWUCA, a fully three-dimensional, solute transport model of the ETB area was developed in 2002 by HydroGeoLogic, Inc. (HydroGeoLogic, Inc., 2002). The model encompassed all of Manatee, Sarasota 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 area of the District and an appropriate buffer area surrounding the boundaries of 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 (WUCAs), minimum flows and levels (MFLs), prevention and recovery strategies, and reservations.

A staff gage on a lake in the Lake Wales Ridge illustrates the problem of low lake levels that have resulted from successive droughts and groundwater pumping.

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 designation of the most impacted area (MIA) within the ETBWUCA, where any entity

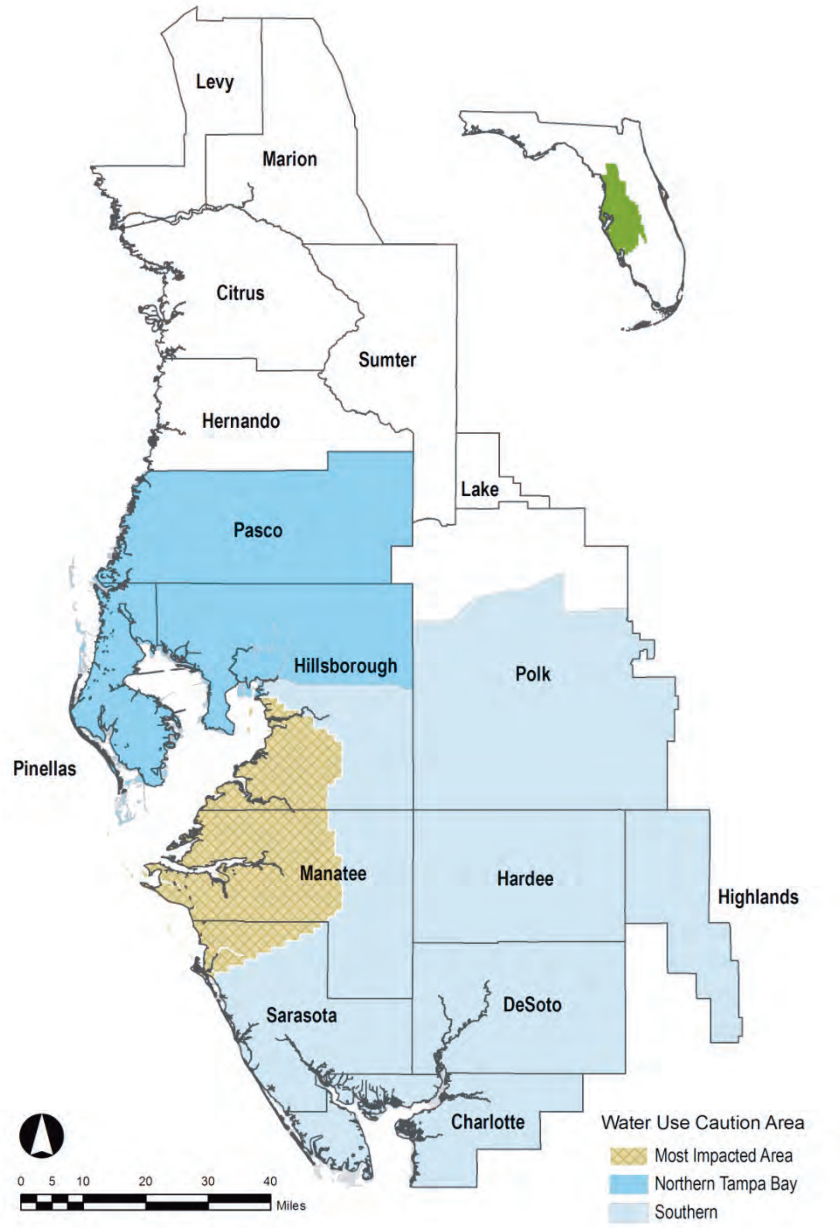


Figure 2-1. *Location of the District's water use caution areas*

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 historic 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 established 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 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 water management districts (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 *Florida Administrative Weekly* and is posted on the District's web site at 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 groundwaters 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
- 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 MFLs' 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. The District has sought and obtained the review of methodologies developed for the upper, middle and lower segments of the Peace River and the Upper Floridan aquifer in the SWUCA.

3.0 Methodology

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

Section 4. MFLs Established to Date

Figure 2-2 depicts MFL priority water resources that are located at least partially within the Heartland Planning Region. A complete list of water resources with established MFLs throughout the District is provided in the Chapter 2 Appendix. Water resources with established MFLs in the planning region include the following:

- Saltwater intrusion minimum aquifer level for the MIA of the SWUCA
- Twenty-four lakes in Highlands and Polk counties
- Upper Peace River, middle Peace River (partially located in the Southern Planning Region) and upper Myakka, upper Hillsborough and upper Alafia rivers, the headwaters of which are located in the Heartland Planning Region

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

- Crystal Lake
- Lake Hancock

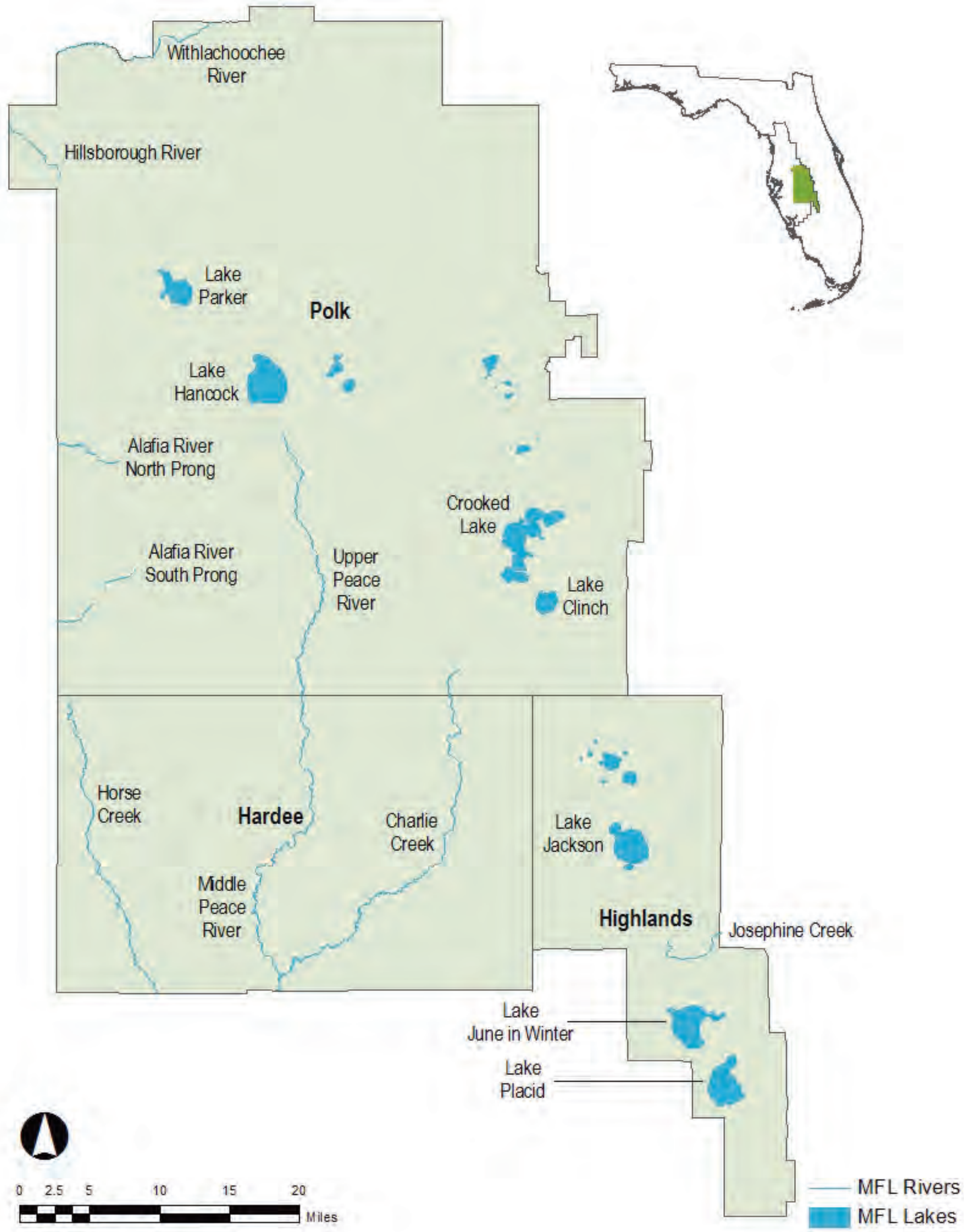


Figure 2-2. *MFL priority water resources in the Heartland Planning Region*

- Upper and middle Withlacoochee River system (Green Swamp)
- Upper Peace River "middle" and "high" minimum flows
- Charlie Creek
- Horse Creek

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 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. Additional water supply planning activities in the planning region are listed below.

1.0 Central Florida Coordination Area (CFCA)

The CFCA encompasses Orange, Osceola, Polk, Seminole and southern Lake counties (Figure 2-3). In this region, the District, the SJRWMD and the SFWMD have each concluded through detailed water supply planning and individual permit actions that the development of additional groundwater from the Upper Floridan aquifer to meet the projected growth in public water supply demand over the next 20 years would cause harm to the water resources of the region. Because the CFCA is located within three WMDs, an action plan was developed by the WMDs in the fall of 2006 to ensure a coordinated and consistent approach to managing the area's water resources. Portions of the regulatory component of the action plan were put in place through adoption of amendments to existing water use permitting rules in December 2007. Key provisions of the rules require that additional fresh groundwater withdrawals for all uses be limited to what is necessary to meet 2013 demands. Permit durations may be limited to 2013, or a longer duration permit will be limited to those fresh groundwater withdrawals documented as the applicant's demonstrated 2013 demand, unless there is a commitment to develop alternative water supplies. This first set of rules is considered to be temporary in nature and will sunset in December 2012. Development of long-term rules began in 2008 and the WMDs are continuing to implement other aspects of the action plan. As part of the plan, field investigations to assess the current status of environmental systems in the area are being conducted and analyses to determine whether existing levels of pumping are causing adverse impacts are being prepared. The WMDs are also preparing groundwater modeling assessments to determine whether projected levels of future pumping are sustainable. Results of these analyses will be used to provide the technical basis for development of a long-term water resources management plan for the CFCA. Although the entirety of Polk County is included in the CFCA for water supply planning purposes, the first set of rules only apply to the portion of the county not included within the SWUCA, in recognition that the SWUCA rules are as protective of water resources as those established for the CFCA and to avoid confusion as to which rules apply. As part of the implementation of the action plan, field investigations to assess the current status of environmental systems in the area are being conducted and analyses to determine whether existing levels of groundwater withdrawals are causing adverse impacts are being prepared. The WMDs are also preparing groundwater modeling assessments to determine whether projected levels of future withdrawals are sustainable. Results of these analyses will provide the

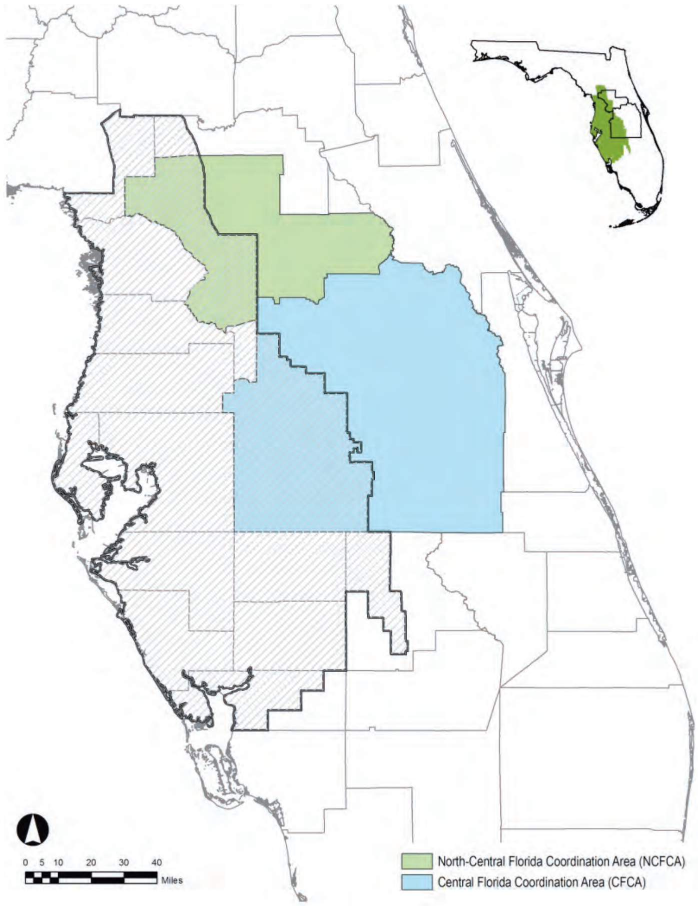


Figure 2-3. *Location of the Central Florida Coordination Area*

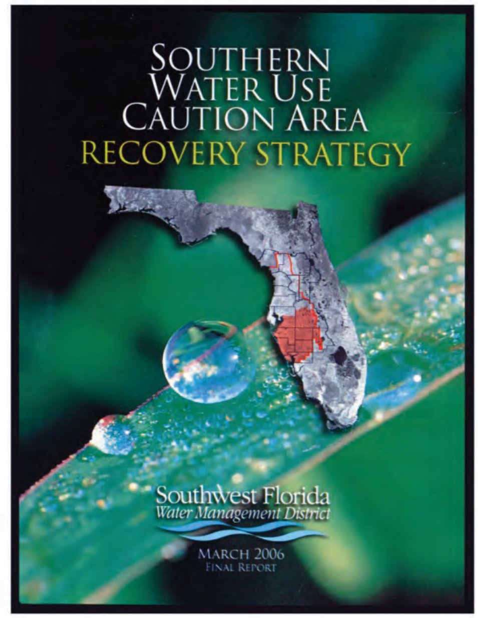
technical basis for development of a water resource management plan for the region. The three WMDs are currently collaborating on water resource assessments and water supply planning for the region.

2.0 Polk County Comprehensive Water Supply Plan

In 2008, the District, the SFWMD and Polk County initiated the Polk County Comprehensive Water Supply Plan (Plan). The purpose of the Plan is to identify and quantify alternative water supply sources that will be needed to meet future potable and nonpotable water demands of the public utility systems in Polk County. The Plan, which was completed in 2009, also addresses water supplies with respect to when each utility will need additional quantities, how much they will need and what the cost of alternative water supply options will be. The Plan concludes with a menu of options and an associated strategy that each utility can implement to meet their individual water supply needs through the planning period and beyond.

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 established 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 restoring 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 actual versus anticipated 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. 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 centers 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 (Solomon and Manning 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 (Bates et al., 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 (Bates et al., 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 et al., 2005).

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 gauge 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 a comprehensive analysis of the demand for water for all use categories in the Heartland Planning Region for the 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 aesthetic 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 existing quantities that need to be 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 is a significant component of projected water supply demand.

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 counties located partially in other water management districts (WMDs) (Highlands and Polk) reflect only the anticipated demands in those portions 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 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 consist 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).

For planning purposes, 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

Demand projections were developed for five categories: (1) public supply, (2) agriculture, (3) commercial/industrial, mining/dewatering and power generation, (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 increase in demand for public supply water use in the planning region in 2030 is projected to be larger than the increases for all other uses combined.

1.0 Definition of the Public Supply Water Use Category

The public supply category consists 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 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 any current and future functional population parcel projections developed using the District's GIS population projection model that are not within a water utility retail service area.

5.0 Water Demand Projections

Table 3-1 is the projected public supply water demand for the planning period. The table shows that public supply demand will increase by 74.5 mgd for the 5-in-10 condition and that 68.6 mgd, or 92 percent of the increase, will occur in Polk County.

The projections are generally consistent with those in the District's 2006 RWSP. However, there are differences, which can be attributed to utilities that submitted alternative projections, as part of the water use permit renewal process, Central Florida Coordination Area planning evaluations, and Polk County Comprehensive Water Supply Planning, that were justifiable, based on historical regression data and long term trends, and supported by complete documentation and methodology. Other differences in the projections from those in the 2006 RWSP can be attributed to the change 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.

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."

The demand for water for agricultural purposes in the Heartland Planning Region is projected to decrease by more than 5 mgd during the planning period.

Southwest Florida Water Management District

Table 3-1. *Projected increase in public supply demand including public supply, domestic self-supply and private irrigation wells for the Heartland 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
Hardee	2.9	3.1	0.8	0.8	0.1	0.1	-	-	0.1	0.1	-	0.1	**1.0**	**1.1**	**34.5%**	**35.5%**
Highlands	12.0	12.7	1.6	1.7	0.9	1.0	0.8	0.8	0.9	0.9	0.7	0.8	**4.9**	**5.2**	**40.8%**	**40.9%**
Polk	`	81.3	20.5	21.7	13.3	14.2	11.8	12.4	11.4	12.1	11.6	12.4	**68.6**	**72.8**	**89.4%**	**89.5%**
Incremental Increase	**n/a**	**n/a**	**22.9**	**24.2**	**14.3**	**15.3**	**12.6**	**13.2**	**12.4**	**13.1**	**12.3**	**13.3**	**74.5**	**79.1**	**81.3%**	**81.5%**

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

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. GIS resources were used to compare 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 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, 198 mgd will be used to irrigate 171,000 acres of agricultural commodities. From 2005 to 2030, irrigated acreage is expected to decrease by approximately 3 percent, or 4,800 acres. Most of the loss in acreage will be in citrus, but it will remain the predominant commodity, accounting for 89 percent of the total irrigated acreage in the planning region. The majority of citrus acreage, approximately 86,000 acres, is located in Polk County, followed by Hardee County with approximately 51,000 acres. The only notable increase in water use over the planning period is for the nursery category. 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 by only 0.2 mgd from the 2005 base year quantity of 202.3 mgd. 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 5.2 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 and/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.

Southwest Florida Water Management District

Table 3-2a. *Projected increase in agricultural irrigation demand in the Heartland 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	Avg	2-10
Hardee	**62.5**	**84.1**	-	-	-	-	-	-	0.02	0.05	-	-	**0.02**	**0.05**	**0.03%**	**0.06%**
Highlands	**50.2**	**62.4**	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0**	**0.0%**	**0.0%**
Polk	**89.6**	**122.2**	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0**	**0.0%**	**0.0%**
Incremental Increase	**n/a**	**n/a**	**-**	**-**	**-**	**-**	**-**	**-**	**0.02**	**0.05**	**-**	**-**	**0.02**	**0.05**	**0.01%**	**0.02%**

Table 3-2b. *Projected decrease in agricultural irrigation demand in the Heartland 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	Avg	2-10
Hardee	**62.5**	**84.1**	-1.0	-1.6	-0.5	-0.7	-0.04	-0.07	-	-	-0.01	-0.03	**-1.5**	**-2.4**	**2.4%**	**2.8%**
Highlands	**50.2**	**62.4**	-1.1	-1.3	-	-	-	-	-	-	-0.13	-0.2	**-1.2**	**-1.5**	**2.4%**	**2.4%**
Polk	**89.6**	**122.2**	-2.2	-1.8	-0.3	-0.5	-	-	-	-	-	-	**-2.5**	**-2.3**	**2.8%**	**1.9%**
Incremental Decrease	**n/a**	**n/a**	**-4.3**	**-4.7**	**-0.8**	**-1.2**	**-0.04**	**-0.07**	**-**	**-**	**-0.1**	**-0.2**	**-5.2**	**-6.2**	**2.6%**	**2.3%**

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

A dragline mining phosphate ore in Hardee County. Demand for water for mining and other Industrial uses is projected to increase by more than 6 mgd during the planning period in the Heartland Planning Region.

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 I/C,M/D,PG water demand for the planning period. The table shows an increase in demand for the planning period of 12.6 mgd, or 18.4 percent. 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 departments. 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 Heartland Planning Region (5-in-10)[1] (mgd)*

County	2005 Base	2005–2010	2010–2015	2015–2020	2020–2025	2025 2030	Total Increase	% Increase
Hardee	**2.2**	1.4	-	0.1	-	0.1	**1.6**	**72.7%**
Highlands	**0.5**	-	-	-	-	-	**0.0**	**0.0%**
Polk	**65.8**	4.4	-	1.8	2.3	2.5	**11.0**	**16.7%**
Incremental Increase	**n/a**	**5.8**	**-**	**1.9**	**2.3**	**2.6**	**12.6**	**18.4%**

[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 6.3 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 and/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.

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

County	2005 Base	2005–2010	2010–2015	2015–2020	2020–2025	2025–2030	Total Decrease	% Decrease
Hardee	**2.2**	-	-	-	-	-	**0.0**	**0.0%**
Highlands	**0.5**	-0.2	-	-	-	-	**-0.2**	**40.0%**
Polk	**65.8**	-	-6.1	-	-	-	**-6.1**	**9.3%**
Incremental Decrease	**n/a**	**-0.2**	**-6.1**	**-**	**-**	**-**	**-6.3**	**9.2%**

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

Approximately 38 percent of all I/C and M/D water use permits are located in the Heartland Planning Region — more than in any other region. Most of the phosphate mines and fertilizer plants in the District are located in the region, along with several thermoelectric power plants. While some of the mining operations are moving into the Southern Planning Region as areas in the Heartland Planning Region are mined out, many of the power plants are expected to expand during the planning period in order to provide electricity for anticipated increases in Florida's population.

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 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.

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

2.0 Demand Projection Methodology

2.1 Golf Courses

Golf course demands are based on the average water use per golf course 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 more than 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 water demand for the planning period. The table shows an increase in demand of 10.7 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. The irrigation need for golf courses is considerable and it will continue to compete with other users of potable and nonpotable supplies. 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, which is also where large quantities of reclaimed water are located that can be used to offset the use of potable water for this category.

The three interior counties that make up the Heartland Planning Region have two distinct land-use characteristics. Highlands, Hardee and southern Polk are largely agricultural, while northern Polk County, with the Interstate 4 corridor, is more densely populated and has numerous large developments with golf courses. Hardee County has three golf courses, while Highlands County has 16 golf courses. Neither county has used reclaimed water to meet recreational/aesthetic irrigation demands. Polk County has more than 54 golf courses and 11 use 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 Heartland Planning Region (5-in-10 and 1-in-10) (mgd)*

Heartland Planning Region																
County	2005 Base		2005–2010		2010–2015		2015–020		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
Hardee	**0.4**	**0.5**	0.1	0.2	0.1	0.1	-	-	0.1	0.1	-	0.1	**0.3**	**0.5**	**75.0%**	**100%**
Highlands	**3.8**	**4.9**	0.3	0.5	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.3	**1.4**	**1.8**	**36.8**	**36.7%**
Polk	**13.1**	**16.8**	2.5	3.2	1.7	2.2	1.6	2.0	1.6	2.0	1.5	2.0	**9.0**	**11.4**	**68.7%**	**67.8%**
Incremental Increase	**n/a**	**n/a**	**2.9**	**3.9**	**2.1**	**2.6**	**1.9**	**2.3**	**1.9**	**2.5**	**1.8**	**2.4**	**10.7**	**13.7**	**61.8%**	**61.7%**

Polk County has 54 golf courses, 11 of which are irrigated with reclaimed water.

Section 5. Environmental Restoration

The quantity of water needed to restore minimum flows to the upper Peace River and increase aquifer levels to meet the saltwater intrusion minimum aquifer level in the Heartland Planning Region's portion of the Southern Water Use Caution Area is projected to be 31.9 mgd for the planning period.

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 MFLs. Table 3-5 summarizes environmental restoration quantities that will be required for the 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

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

Water Resource to be Recovered	2005–2010	2010–2015	2015–2020	2020–2025	2025–2030	Total Increase
SWIMAL (SWUCA)[1]	3.2	7.9	7.9	7.9	-	**26.9**
Upper Peace River	-	5.0			-	**5.0**
Incremental Increase	**3.2**	**12.9**	**7.9**	**7.9**	**-**	**31.9**

[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 reductions should be achieved by the end of 2010 and are included in the 2010 column. The remainder of the demand was divided over five-year increments, starting in 2015 and ending in 2025.

that is expected to result in achievement of the SWIMAL in the Upper Floridan aquifer. It is anticipated that this demand will be met by 2025, primarily by a gradual 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 environmental restoration demand was allocated to the planning regions based on the percentage of estimated groundwater use in the SWUCA in each region over the 2000 to 2007 period. The required reduction in groundwater withdrawals for the portion of the SWUCA in the Heartland Planning Region is 26.9 mgd. By of the end of 2010, it is estimated that a reduction of 3.2 mgd will have occurred in the region, leaving a reduction of 23.7 mgd to be achieved by 2025. In Table 3-5, the demand is distributed over five-year increments, starting in 2015 and ending in 2025.

2.2 Upper Peace River

Studies undertaken in support of minimum flow development indicate that actual flow in the upper Peace River between Bartow and Zolfo Springs is often below the established minimum during the dry season when the entire flow of the river can be diverted underground through sinkholes. These studies have also determined that an annual average of 5 mgd will be needed to meet the minimum flow. The District is working to develop this quantity of water through a number of water resource development projects that will increase storage in Lake Hancock and in mined lands in the upper Peace River watershed. The stored water will be released in the dry season to help meet the minimum flow. It is estimated that the Lake Hancock Lake Level Modification Project will provide an annual average flow of 2.7 mgd by the end of 2011.

Section 6. Summary of Projected Increases and Reductions 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 all 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 129.6 mgd of additional water supply will need to be developed and/or existing use retired to meet demand in the planning region through 2030. Public supply water use will increase by 74.5 mgd over the planning period, which accounts for 57.5 percent of the projected increase. Environmental restoration is next at 31.9 mgd, or 24.6 percent of the projected increase. Approximately 3.2 mgd of this demand was met in the 2005 to 2010 time increment. The table also shows a reduction of 11.5 mgd in agricultural and I/C,M/D,PG groundwater use. The required reduction in groundwater withdrawals necessary to meet the SWIMAL in the SWUCA could potentially be partially offset by the projected 11.5 mgd decrease in groundwater use. Some or all of the groundwater reductions could be used to mitigate the impacts of new groundwater quantities to help meet demand in the inland counties where access to alternative supplies is limited.

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

There are significant differences between the 2006 and 2010 RWSP demand projections in the agricultural, public supply and I/C,M/D,PG water use categories. Regarding the agricultural projections, the 2006 RWSP projected a decline of nearly 9 mgd for the 2000–2025 planning period, while the 2010 RWSP projected a decline of 5.2 mgd for the planning period. Even though the 2006 RWSP projected an overall decline in agricultural water demand, demand was projected to increase in Hardee County by 28 mgd. The increase was attributed to the southward movement of the citrus industry and the relatively low cost and greater availability of suitable land for agriculture in the county relative to other areas. Conversely, the 2010 RWSP projected a minor decline of 1.5 mgd in Hardee County. Regarding the public supply category, the 2006 RWSP projected an increase of 44.8 mgd for the 2000–2025 planning period while the

Table 3-6a. *Summary of projected increase in demand in the Heartland 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	**91.6**	**97.1**	22.9	24.2	14.3	15.3	12.6	13.2	12.4	13.1	12.3	13.3	**74.5**	**79.1**	**81.3%**	**81.5%**
Agriculture	**202.3**	**268.7**	-	-	-	-	-	-	0.02	0.05	-	-	**0.02**	**0.05**	**0.01%**	**0.02%**
I/C,M/D,PG	**68.5**	**68.5**	5.8	5.8	-	-	1.9	1.9	2.3	2.3	2.6	2.6	**12.6**	**12.6**	**18.3%**	**18.3%**
Recreation	**17.3**	**22.2**	2.9	3.9	2.1	2.6	1.9	2.3	1.9	2.5	1.8	2.4	**10.7**	**13.7**	**61.8%**	**61.7%**
Restoration	**n/a**	**n/a**	3.2	3.2	12.9	12.9	7.9	7.9	7.9	7.9	-	-	**31.9**	**31.9**	**n/a**	**n/a**
Incremental Increase	**n/a**	**n/a**	**34.8**	**37.1**	**29.3**	**30.8**	**24.3**	**25.3**	**24.5**	**25.8**	**16.7**	**18.3**	**129.6**	**137.3**	**n/a**	**n/a**
Cumulative Increase	**379.7**	**456.5**	**414.5**	**493.6**	**443.8**	**524.4**	**468.1**	**549.7**	**492.6**	**575.5**	**509.3**	**593.8**	**509.3**	**137.3**	**34.1%**	**36.2%**

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

Table 3-6b. *Summary of projected decrease in demand in the Heartland Planning Region (mgd) (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	**91.6**	**97.1**	-	-	-	-	-	-	-	-	-	-	**0.0**	**0.0**	**0.0%**	**0.0%**
Agriculture	**202.3**	**268.7**	-4.3	-4.7	-0.8	-1.2	-0.04	-0.07	-	-	-0.1	-0.2	**-5.2**	**-6.2**	**2.6%**	**2.3%**
I/C,M/D,PG	**68.5**	**68.5**	-0.2	-0.2	-6.1	-6.1	-	-	-	-	-	-	**-6.3**	**-6.3**	**9.2%**	**9.2%**
Recreation	**17.3**	**22.2**	-	-	-	-	-	-	-	-	-	-	**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**	**-4.5**	**-4.9**	**-6.9**	**-7.3**	**-0.04**	**-0.07**	**-**	**-**	**-0.1**	**-0.2**	**-11.5**	**-12.5**	**3.0%**	**2.7%**

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

Table 3-7. *Summary of projected increases in demand for counties in the Heartland 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	%
Hardee								
Public Supply	**2.9**	0.8	0.1	-	0.1	-	**1.0**	**34.5%**
Agriculture	**62.5**	-	-	-	0.02		**0.02**	**0.03%**
I/C,M/D,PG	**2.2**	1.4	-	0.1	-	0.1	**1.6**	**72.7%**
Rec/Aesthetic	**0.4**	0.1	0.1	-	0.1	-	**0.3**	**75.0%**
Environmental Restoration	**n/a**	TBD	TBD	TBD	TBD	-	**TBD**	**n/a**
Incremental Increase	**n/a**	**2.3**	**0.2**	**0.1**	**0.2**	**0.1**	**2.9**	**n/a**
Cumulative Increase	**68.0**	**70.3**	**70.5**	**70.6**	**70.8**	**70.9**	**2.9**	**4.3%**
Highlands								
Public Supply	**12.0**	1.6	0.9	0.8	0.9	0.7	**4.9**	**40.8%**
Agriculture	**50.2**	-	-	-	-	-	**0.0**	**0.0%**
I/C,M/D,PG	**0.5**	-	-	-	-	-	**0.0**	**0.0%**
Rec/Aesthetic	**3.8**	0.3	0.3	0.3	0.2	0.3	**1.4**	**36.8%**
Environmental Restoration	**n/a**	TBD	TBD	TBD	TBD	-	**TBD**	**n/a**
Incremental Increase	**n/a**	**1.9**	**1.2**	**1.1**	**1.1**	**1.0**	**6.3**	**n/a**
Cumulative Increase	**66.5**	**68.4**	**69.6**	**70.7**	**71.8**	**72.8**	**6.3**	**9.5%**
Polk								
Public Supply	**76.7**	20.5	13.3	11.8	11.4	11.6	**68.6**	**89.4%**
Agriculture	**89.6**	-	-	-	-	-	**0.0**	**0.0%**
I/C,M/D,PG	**65.8**	4.4	-	1.8	2.3	2.5	**11.0**	**16.7%**
Rec/Aesthetic	**13.1**	2.5	1.7	1.6	1.6	1.5	**9.0**	**68.7%**
Environmental Restoration	**n/a**	TBD	5.0	TBD	TBD	-	**5.0+**	**n/a**
Incremental Increase	**n/a**	**27.4**	**20.0**	**15.2**	**15.3**	**15.6**	**93.6**	**n/a**
Cumulative Increase	**245.2**	**272.6**	**292.6**	**307.8**	**323.1**	**338.7**	**93.6**	**38.2%**

[1]The environmental restoration quantities in the planning region include 26.9 mgd for the SWIMAL and 5.0 mgd for the upper Peace River. The 5.0 mgd for the upper Peace River will be supplied from Polk County. The SWIMAL quantities have not been proportioned by county and, therefore, have not been included in this table.

2010 RWSP projected an increase of 74.5 mgd from 2005–2030. Most of the difference is due to a much higher demand projection for Polk County — 40 mgd for the 2006 RWSP versus nearly 69 for the 2010 RWSP. There is also a significant difference between the 2006 and 2010 I/C,M/D,PG demand projections. The 2006 RWSP projected a decline of 3.4 mgd for this category, while the 2010 RWSP projected a net 6.3 mgd increase. The 2006 and 2010 RWSP demand projections for the recreational/aesthetic water use category are relatively similar.

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, 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.

The headwaters of the Alafia River are located in Polk County.

Part A. Evaluation of Water Sources

Historically, a majority of the water supply in the planning region has been provided by fresh groundwater from the Upper Floridan aquifer. For the 2010 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 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 from the Upper Floridan aquifer, subject to a rigorous, case-by-case permitting review. The Lower Floridan aquifer has the potential to be a significant source of additional water in the northern portion of the planning region, and a number of studies are in progress to evaluate this potential source.

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 and surface water with off-stream reservoirs and/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 Alafia River is a potential source of water supply for Polk County.

Within the planning region, the major river/creek systems include the Peace River and Josephine Creek. In addition, a small portion of the headwaters of the Alafia River is located in Polk County. A major public supply utility uses the Peace River in DeSoto County. The potential yield for the rivers will ultimately be determined 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.

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 neither the adopted minimum flow nor the hydrodynamic model was available, planning-level minimum flow criteria were utilized. The five-step process used to estimate potential surface water availability includes (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 complete explanation of the criteria is in the Appendix for Chapter 4.

2.0 Overview of River/Creek Systems

The following are overviews of the Peace River and Josephine Creek, the two significant river/creek systems in the region.

2.1 Peace River

The Peace River begins in the Green Swamp and flows south to Charlotte Harbor. The Peace River watershed encompasses approximately 1,800 square miles. There are two major tributaries in the upper part of the watershed. Peace Creek drains approximately 230 square miles in the northeast part of the watershed, serving as an outlet for several lakes near the cities of Lake Alfred and Haines City. Saddle Creek Canal drains 144 square miles in the northwest 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 that prior to its recent expansion 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 from the Peace River 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 0.0047 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 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 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.

2.2 Josephine Creek

Josephine Creek, with a watershed of 109 square miles, conveys water from more than 30 lakes on the Lake Wales Ridge to Lake Istokpoga (McDiffett, 1981). Wolf, Josephine, Red Beach, Ruth and Charlotte lakes drain into Josephine Creek from the north and Annie, Placid, June-in-Winter and Francis lakes drain north through Jack Creek, a tributary of Josephine Creek. Approximately 11 percent of the inflow into Lake Istokpoga is contributed by Josephine Creek (SFWMD, 2005). Land uses in the watershed are about one-third urban or built up, one-third water or wetlands, and about one-third agriculture. The adjusted annual average discharge at the Josephine Creek near the DeSoto City gage is 46 mgd (71 cfs). Annual average withdrawals of 0.083 mgd and 0.064 mgd are permitted from the creek. Average annual diversions from 2003 to 2007 were 0.1 mgd. Based on the planning level minimum flow criteria, an additional 4.35 mgd of water supply is potentially available from the creek. Future use of Josephine Creek will be dependent on minimum levels for Lake Istokpoga, which is in the SFWMD. Development of this source will require coordination with the SFWMD on issues including the effect on Lake Istokpoga minimum levels and existing legal users.

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 0.05 mgd to 4.35 mgd. The lower end of the range is the amount of surface water that has been permitted but is currently unused, and the upper end includes permitted but unused quantities plus the estimated remaining unpermitted available surface water. It is important to note that although water available from the Peace and Alafia rivers is assigned to the Southern and Tampa Bay planning regions, respectively, there is potential for water supplies to be developed from these rivers in the Heartland Planning Region. 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.

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 domestic 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. Polk County has the largest reclaimed water systems in the planning region. As of 2005, customers within Polk County Utility systems utilized an average daily flow of more than 13 mgd of reclaimed water for residential, golf course and other public access irrigation use. Since 1987, the District has provided nearly $40 million in cost-share funding in the planning region for 31 reclaimed water projects.

A reclaimed water pump station.

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

Water Body	Instream 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[6]		
							Avg	Min	Max
Peace River @ Treatment Plant[7]	See Southern Planning Region								
Josephine Creek @ WMD Boundary[8]	No	46	4.6	0.15	0.10	4.35	310	149	366
TOTAL				**0.15**	**0.10**	**4.35**			

[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 in the region is 1965–2003. Flow records for Peace River (1985–2004) are shorter.
[2]Based on 10% of mean flow for all water bodies with the following exceptions: minimum flows have been established and were applied to calculate potentially available quantities for the Peace River.
[3]Based on individual WUP permit conditions, which may or may not follow the current 10% diversion limitation guidelines.
[4]Based on average reported withdrawals during the period 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 the following exceptions: Peace River, based on lower limit of the actual supply range for the constant supply option in the Polk County Comprehensive Water Supply Plan, Peace River Evaluation (Royal Consulting Services, Inc., 2008).
[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]All available surface water is allocated to the Southern Planning Region because the calculation was based on flows in the Southern Planning Region; however, future withdrawals from the River in the Heartland Planning Region are possible.
[8]Availability will be dependent on coordination with SFWMD regarding the adopted minimum level for Lake Istokpoga and existing legal users.

The benefit that can be obtained from the use of reclaimed water is governed by the concepts of utilization and offset. Utilization rate is the percent of treated wastewater from a WWTP that is beneficially used in a reclaimed water system. The utilization rate of reclaimed water systems 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 a yearly 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 also 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) this 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 one mgd of potable water for cooling or process water, after converting to reclaimed water, will 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 rate is estimated to be 65 percent. The District is actively cooperating with utilities to help 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 38 WWTPs in Polk, Hardee and Highlands counties, which collectively produced 35.2 mgd of reclaimed water. Of that quantity, 14.3 mgd was beneficially used to offset 9.3 mgd of traditional water supplies. Therefore, only about 41 percent of the reclaimed water produced in the planning region was utilized for irrigation, cooling or other beneficial purposes. By 2030,

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

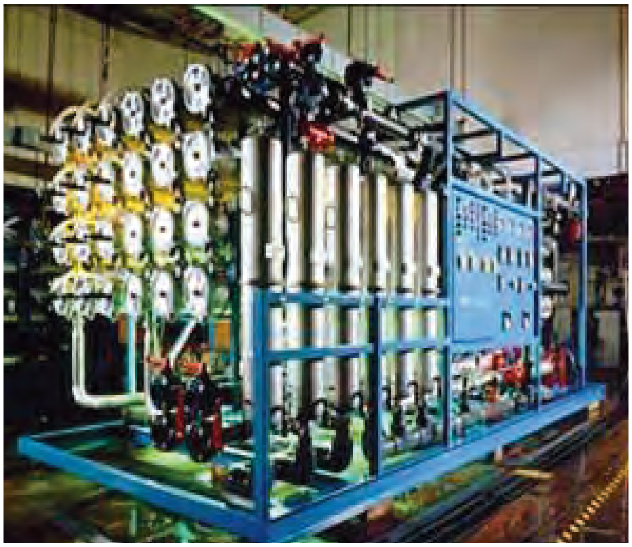
County	2005 Availability, Utilization and Offset[1]				2005–2030 Potential Availability, Utilization and Offset[2]			
	Number of WWTPs in 2005	WWTP Flow in 2005	Utilization in 2005	Potable-Quality Water Offset (65%)	2030 Total WWTP Flow	2030 Availability (Increase in WWTP Flow from 2005–2030 Plus Unused 2005 WWTP Flow)	Utilization (75%)[3]	Potable-Quality Water Offset (75%)[4]
Polk	30	31.78	13.08	8.50	71.25	58.17	47.10	39.77
Hardee	4	1.48	1.19	0.77	1.84	0.65	0.57	0.51
Highlands	5	1.99	0.00	0.00	4.02	4.02	3.01	2.26
Total	**39**	**35.25**	**14.27**	**9.27**	**77.11**	**62.84**	**50.68**	**42.54**

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

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 66.5 mgd (more than 75 percent) of the 77.1 mgd of reclaimed water produced will be beneficially used and 48.7 mgd of traditional sources will be offset (75 percent efficiency).

The quantity of reclaimed water that will be available from 2005 to 2030 that was not allocated to projects as of 2005 is 62.8 mgd. Based on an overall 75 percent utilization and offset, 50.7 mgd will be used and 42.5 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.

Section 3. Brackish Groundwater Desalination



A reverse osmosis system for desalination of brackish groundwater.

Brackish groundwater is defined as groundwater having impurity concentrations greater than drinking water standards (total dissolved solids [TDS] concentration 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 reverse osmosis (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. Figure 4-1 depicts the locations of brackish groundwater desalination facilities and potential sites for future facilities in the District.

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 National Pollution Discharge Elimination System (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 a research study to apply this technology to water quality and climatic conditions found 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 by 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 (alternately charged layers of membranes pull salt ions from the source water) is that it requires less energy than RO (Florida Department of Environmental Protection, 2010). Sarasota County has effectively applied this technology at the 12-mgd 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 update, 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.

1.0 Potential for Water Supply from Brackish Groundwater

Brackish groundwater from the Lower Floridan aquifer is a potential water supply source that has not been utilized in the planning region. The Floridan aquifer in central Florida is typically divided into Upper and Lower permeable units (Miller, 1986), separated by one or more confining units. The Lower Floridan aquifer is very productive in central Florida based on assessments performed in the area. Water quality is also generally very good but degrades to the west of Orlando. In the central portion of the SJRWMD, approximately 20 percent of the water withdrawn from the Floridan aquifer, or about 110 mgd, is derived from the Lower Floridan aquifer (McGurk and Presley, 2002). Most of this water is withdrawn by public supply utilities. Within the planning region, groundwater has not been produced from the Lower Floridan aquifer because water quality has generally been considered too brackish to justify its development. In 2003, the District initiated exploratory drilling into the Lower Floridan aquifer at ROMP well 74X, located two miles east of Davenport on the Lake Wales Ridge in Polk County. Water quality at this site is characterized by very low chloride concentrations and high sulfate concentrations of approximately 2,000 mg/L. The site is several miles south of the area believed to possess good water quality. In 2004, Polk County and the District initiated a project to assess the water supply potential of the Lower Floridan aquifer about 10 miles north of the ROMP 74X site in northeastern Polk County. This is an area with limited options for water supply development. An

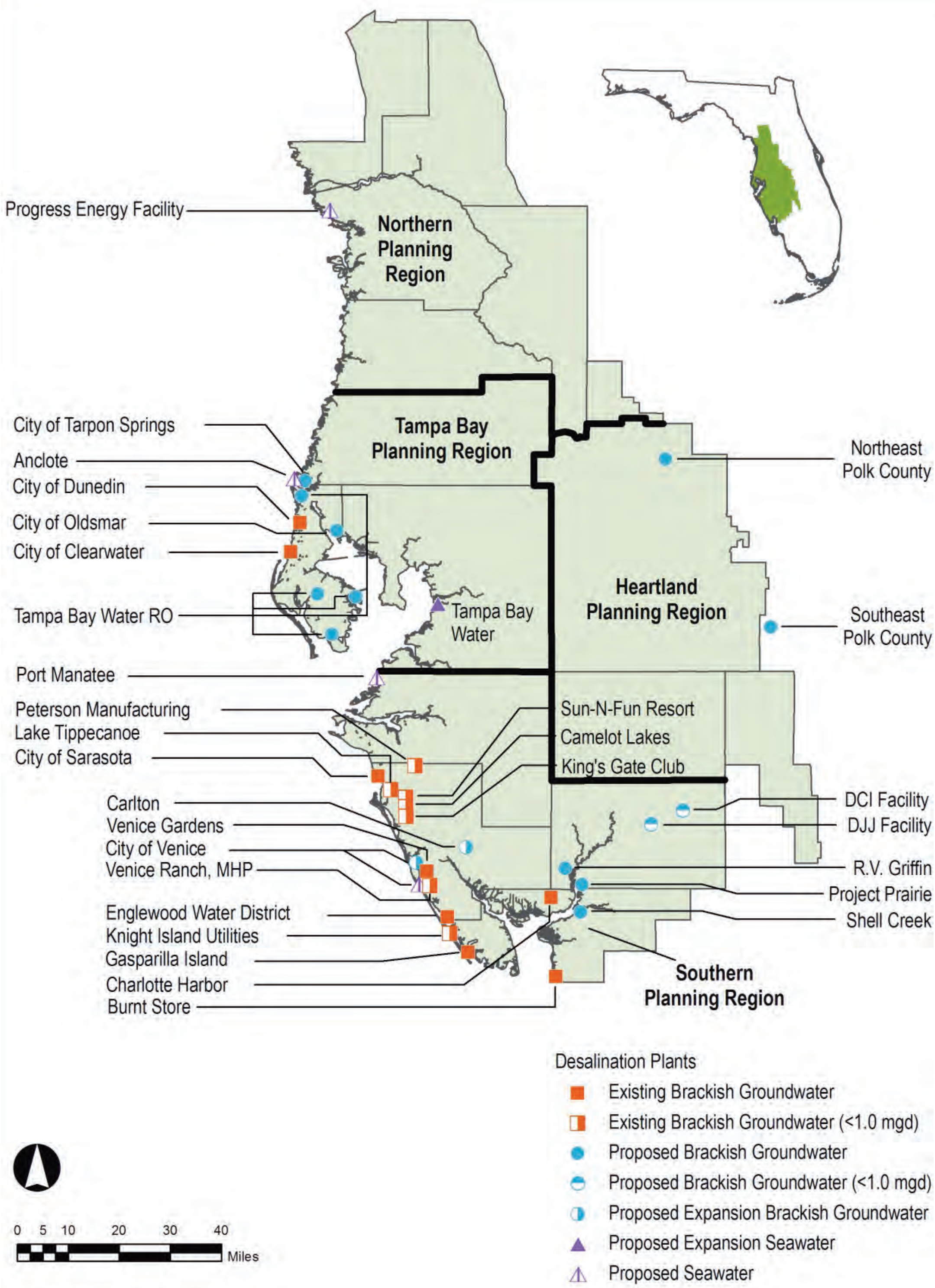


Figure 4.1. *Locations of existing and potential seawater and brackish groundwater desalination facilities in the District*

exploratory well was constructed and aquifer performance testing was initiated in 2008. Initial water quality data from the site showed better than anticipated water quality, although some degradation could occur with long-term use. Testing to determine water quality and productivity of the aquifer, as well as the characteristics of the confining units separating the Upper and Lower Floridan aquifers, is continuing. An additional Lower Floridan aquifer investigation is in progress in southeastern Polk County, within the boundaries of the SFWMD. This site could potentially contribute water to communities within the District as interconnected utility systems are developed in Polk County.

The two Lower Floridan aquifer well locations in Polk County are outside of the SWUCA but within the Central Florida Coordination Area (CFCA). Requirements for new withdrawals from the Lower Floridan aquifer in the CFCA include a justification of demand, demonstration of adequate confinement between the Upper and Lower Floridan aquifers and a determination of whether long-term water quality will meet fresh or brackish criteria. Brackish water in the CFCA is defined as groundwater in or below the Lower Floridan aquifer that has chloride concentrations at or above 1,000 mg/L or TDS concentrations at or above 1,500 mg/L. Prior to significant development of the Lower Floridan aquifer, an improved understanding of aquifer characteristics and recharge must be acquired to better manage this resource. From a treatment perspective, disposal options for concentrate generated by RO may be limited. Less costly uses of this source may be preferable, such as augmenting reclaimed water systems for outdoor irrigation or blending with existing freshwater supply from the Upper Floridan aquifer to extend the supply. Because the evaluation of the water supply characteristics of the Lower Floridan aquifer are in the early stages, it is not possible to determine the total amount of brackish groundwater available for future water supply from the aquifer in the planning region.

Section 4. Fresh Groundwater

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 96 percent (361 mgd) of the 377 mgd of water used in the planning region was from groundwater sources. Approximately 25 percent (91 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.

Construction of a groundwater production well.

1.0 Surficial Aquifer

The surficial aquifer is mostly composed of fine-grained sand that is generally less than 50 feet thick. While wells that would yield small quantities of water can be constructed in the surficial aquifer almost anywhere, there clearly are more favorable areas for development. Along the Lake Wales Ridge, highly permeable sands averaging 200 to 300 feet thick make the area favorable for development of the surficial aquifer. More than 80 percent of water use permits for surficial aquifer withdrawals are located along the Lake Wales Ridge in Highlands and Polk counties. About 90 percent of permitted withdrawals in the surficial aquifer are for agricultural irrigation. The remaining 10 percent is divided equally among public supply, recreational, and industrial/mining use. Annual average water use from permitted withdrawals in the surficial aquifer in 2006 was 11.8 mgd, with 87 percent (10.3 mgd) occurring in Highlands County, 12.7 percent (1.5 mgd) in Polk County and 1.7 percent (0.2 mgd) in Hardee County. Small, unpermitted quantities are also withdrawn from the aquifer for lawn watering or individual household use. The quantity of water for these uses was estimated to total 0.6 mgd in Hardee, Highlands and Polk 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.

2.0 Intermediate Aquifer

The intermediate aquifer is located between the surficial aquifer and the Upper Floridan aquifer. It is not present over much of the planning region, including the northern half of Polk County and the Lake Wales Ridge. Where it is present, water in the intermediate aquifer is generally of sufficient quality and quantity for domestic self-supply indoor use/outdoor irrigation and recreational uses. Annual average water use from permitted withdrawals in the intermediate aquifer in 2006 was 7.3 mgd, with 53 percent (3.9 mgd) occurring in Hardee County, 40 percent (2.9 mgd) in Polk County and 7 percent (0.5 mgd) in Highlands 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 1.3 mgd in Hardee, Highlands and Polk counties in 2006. Due to its limited extent in Polk County, about one-third of future demand for domestic self-supply indoor use/landscape irrigation and recreational water use can be met from the intermediate aquifer. Future demand supplied through withdrawals from the surficial and intermediate aquifers in the planning region is expected to total 8 mgd, with 4.6 mgd allocated to recreational use and 3.4 mgd to domestic self-supply indoor use/outdoor irrigation (Table 4-3).

3.0 Upper Floridan Aquifer

Water use in the SFWMD's portion of Polk County is governed by CFCA rules, while the portion of Polk County in the District is governed by SWUCA rules. The CFCA is discussed in Chapter 2, Part C., Section 1, Prevention Activities. Regarding the SWUCA, it was stated in the 2006

Table 4-3. *Estimated water demand to be met by groundwater from the surficial and intermediate aquifers during the planning period in the Heartland Planning Region (mgd)*

County	Domestic Self-Supply Indoor Use/Outdoor Irrigation	Recreation	Total
Hardee	0.2	0.3	0.5
Highlands	1.6	1.4	3.0
Polk	1.6[1]	2.9[1]	4.5
Total	**3.4**	**4.6**	**8.0**

[1] Reduced due to limited extent of intermediate aquifer in this county.

RWSP 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 needed to be reduced by 50 mgd. Approximately 11.6 mgd of the required reductions will have been achieved mainly through land-use transitions and agricultural water conservation by 2010. Of the 38.4 mgd of groundwater withdrawal reductions that remain to be achieved in the SWUCA, the District has determined that 23.7 mgd must occur in the Heartland 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 6.3 mgd and 5.2 mgd respectively 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 23.7 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 37.5 mgd of additional groundwater quantities are available. In addition, there is up to 3.4 mgd of permitted but unused quantities associated with power generation in the planning region.

4.0 Lower Floridan Aquifer

Projects to characterize the water supply potential of the Lower Floridan aquifer are currently being implemented. Use of the Lower Floridan aquifer for water supply will be regulated by different rules depending on whether the withdrawal is in the CFCA or the SWUCA. If the Lower Floridan aquifer in the CFCA meets brackish criteria (chloride concentrations at or above 1,000 mg/L or TDS concentrations at or above 1,500 mg/L), it is considered a supplemental water supply that can (unlike other groundwater) be permitted to meet demand beyond 2013. In the SWUCA, use of the Lower Floridan aquifer will not be permitted if it impacts the Upper Floridan aquifer. The Lower Floridan aquifer is also discussed in Section 3 of this chapter, Brackish Groundwater Desalination.

Section 5. Aquifer Storage and Recovery

A typical aquifer storage and recovery well.

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 4-2. ASR may be used for potable, reclaimed or partially treated surface water. If water stored in the aquifer is for potable supply, when it is withdrawn from storage it is disinfected, 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 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 one 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 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.

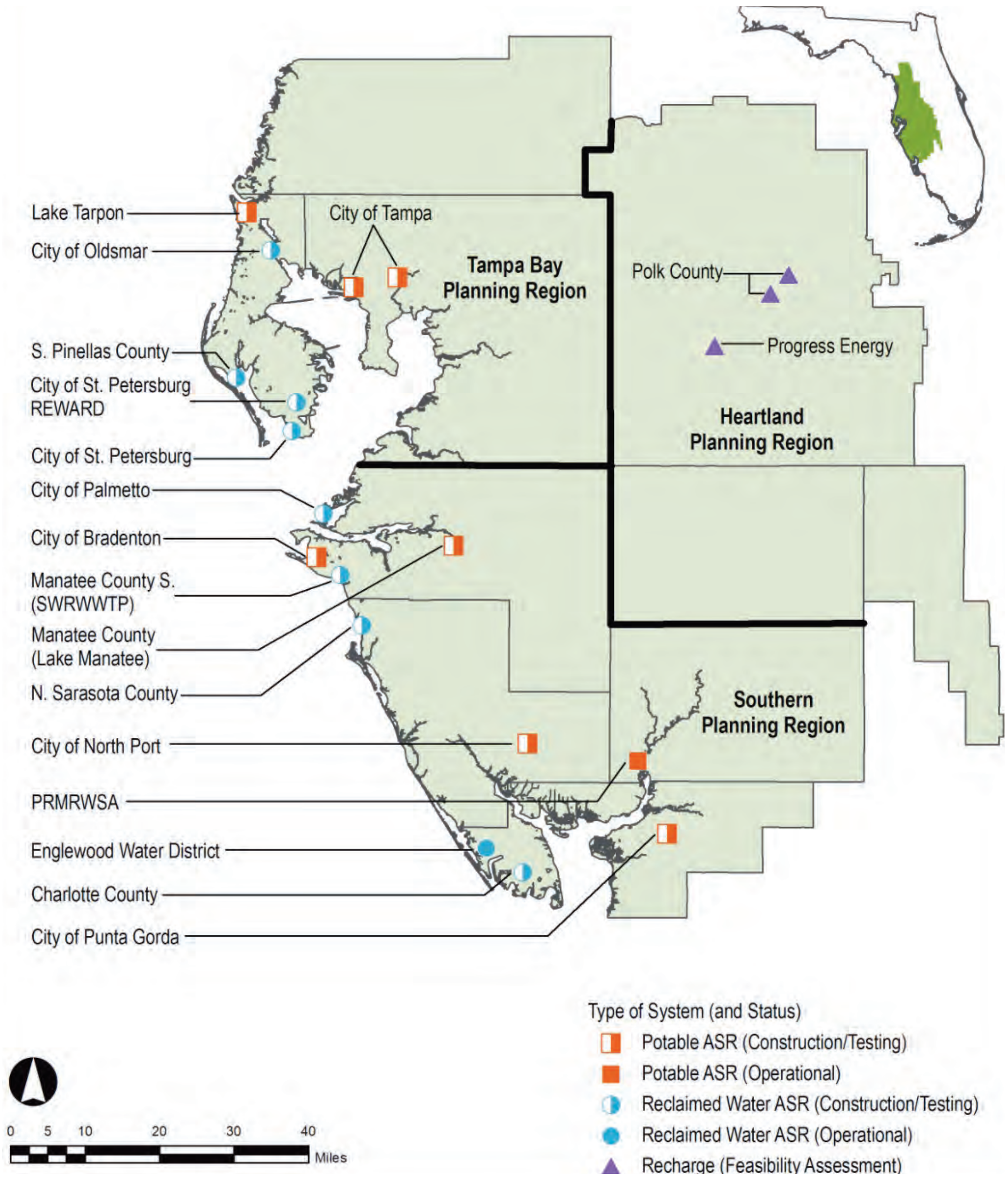


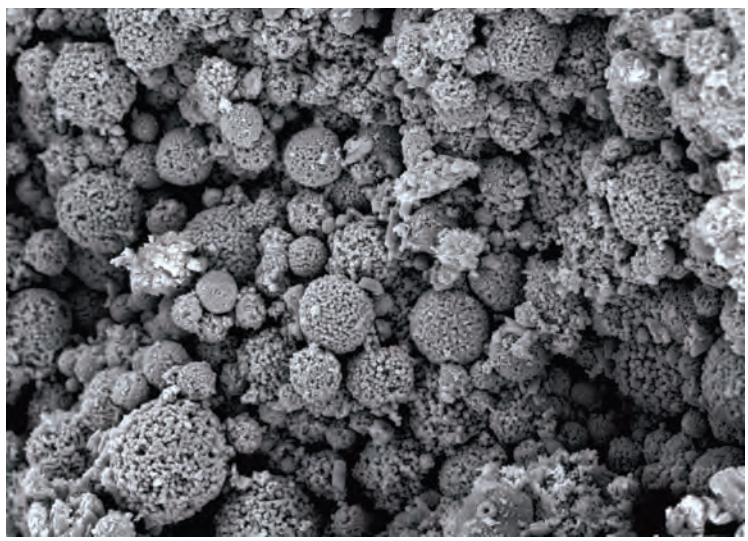
Figure 4-2. *Location of aquifer storage and recovery and aquifer recharge projects that are operational or under development in the District*

The recoverable percentage of injected water in the District is typically 70 to nearly 100 percent when the TDS concentration of native groundwater in the ASR storage zone is less than 1,000 mg/L. Recovery can be less when the TDS concentration of 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 generally 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. In some cases, it may be desirable to leave behind a portion of injected water to restore depleted groundwater reserves. 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 improve 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 contain minute quantities of naturally occurring arsenic.

The 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 the 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 Park 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 DO concentrations in injection water oxidize more pyrite per cycle, which releases more arsenic into groundwater. Therefore, removing DO from recharge water should ameliorate high arsenic concentrations during ASR cycle testing (CH2M Hill, Inc., 2007). To further evaluate the effects of removing DO from injection water, the District has 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 6. 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.

- Infrastructure and Operating Costs. 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™, 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 TMDL restrictions within their local water bodies.

Since the 1990s, the District has provided financial and technical assistance for the implementation of local and regional water conservation efforts by water users and suppliers in the planning region. 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 all new construction after 1994 to 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 Florida-Friendly Landscaping™. 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 that 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-effectiveness 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, the 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: (1) applicable water use categories and the potential number of participants, (2) potential acceptability of the measure to participants and the implementing utility, (3) compatibility with existing programs or those that may be implemented concurrently, (4) functional life of the measure, (5) short- and long-term effectiveness of a measure, (6) ease with which a measure can be implemented and (7) the possibility of implementation on a regional basis. After considering the above criteria, the measures listed below 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 above measures, including applicable water use sectors, is provided in Chapter 5.

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 (ULF) Urinal Rebate
- ULF Toilet 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 over one acre)*
- Rain 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 Chapter 4 Appendix.

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/D,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

The planning region is organized into four distinct water use 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/D,PG, and recreational/aesthetic.

1.4.1 Public Supply

The quantity of water that could be saved through 2030 by maximizing water conservation measures for the public supply and domestic self-supply water use categories in the Heartland Planning Region is 20.6 mgd.

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 sector will continue to be the primary source of conservation program water savings in the District's four planning regions. Public supply systems lend themselves most easily to the administration of conservation programs, since they measure each water 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, 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 20.6 mgd by 2030 if all water conservation programs presented above are implemented (Table 4-4). The average cost-effectiveness for all planned measures is $0.42/1,000 gal. The public supply water conservation measure that will likely have the largest impact for public supply accounts in the planning region is rain sensor device rebates, which is estimated to conserve 11.81 mgd after 20 years at a cost of $9.4 million. The average amortized cost-effectiveness of this measure through 2030 is estimated to be $0.51/1,000 gal. The measure with the second largest impact would be water-efficient landscapes and irrigation evaluations, with an estimated water savings of 2.56 mgd by 2030 at a total cost of $8.4 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 in the public supply sector. Conservation programs for domestic self-supply users can still be successful, especially when outreach for the program is done in parallel with local public supply programs. The 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 0.12 mgd by 2030 if all water conservation programs are implemented (Table 4-4). The average cost-effectiveness for all planned measures is $0.42/1,000 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 0.08 mgd after 20 years at a cost of $62,341. The average cost effectiveness of this measure through 2030 is estimated to be $0.51/1,000 gal. The measure with the second largest impact would be water-efficient landscape and irrigation evaluations, with an estimated savings of 0.03 mgd by 2030 at a total cost of $106,076.

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

Through the development of sophisticated water recirculation systems, the mining industry has greatly reduced the quantity of water consumptively used in the mining and processing of phosphate ore.

The I/C,M/D,PG 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. It is estimated that the savings for the I/C,M/D,PG category could be 0.12 mgd by 2030 (Table 4-4). 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 is ICI facility assessments, which is estimated to conserve 0.1 mgd after 20 years at a cost of $145,935. The average cost-effectiveness of this measure through 2030 is estimated to be $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 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/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 0.02 mgd by 2030 (Table 4-4). 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 estimated to conserve 0.01 mgd after 20 years at a cost of $17,588. The average cost-effectiveness of this measure through 2030 is estimated at $1.30/1,000 gal.

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

Use Category	Water Conserved in 2030 (mgd)	Average Cost-Effectiveness ($/1,000 gal)
Public Supply	20.58	0.42
Domestic Self-Supply	0.12	0.42
I/C,M/D,PG	0.12	0.37
Recreational/Aesthetic	0.02	0.39
Total	**20.84**	**0.41**

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

Through the implementation of all conservation measures listed above for all non-agricultural water use categories, it is anticipated that 20.8 mgd could be saved in the planning region by 2030 at a total projected cost of $36.7 million.

2.0 Agricultural Water Conservation

The agricultural industry has greatly increased the efficiency of their water use through the widespread implementation of water-saving irrigation technologies.

The District uses the model farms 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 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 can be found in Chapter 7. 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 model farms options were reviewed and four that represent BMPs for irrigation of citrus, melons, nurseries and sod were selected as being the most applicable in the planning region (HSW, 2004). Information on these model farms is contained in Tables 4-5a and 4-5b.

Table 4.5a. *Model farm potential water savings (5-in-10)*

Description of Model Farm/Irrigation System/BMPs 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	5.67	5.17	4.57	4.24	3.83	3.58	100 percent implement, max improvement
8	Nurseries, container	Sprinkler	Line source emitter and other BMPs	0.48	0.55	0.55	0.55	0.55	0.57	100 percent implementation, maximum improvement
10	Sod	Semi-closed seepage	Center pivot and other BMPs	0.48	0.90	0.90	0.90	0.90	0.90	100 percent implementation, maximum improvement
15	Melons	Semi-closed seepage	Fully enclosed seepage and other BMPs	1.80	0.75	0.75	0.75	0.75	0.75	100 percent implementation, maximum 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 8 (Nurseries): Replace existing sprinkler system with line source emitter irrigation system and implement other BMPs to achieve water savings. Model Farm Scenario 10 (Sod): Replace semi-enclosed seepage with center pivot irrigation system and implement other BMPs to achieve savings. Model Farm Scenario 15 (Melons): Replace semi-closed seepage with fully enclosed seepage irrigation system. Implement other BMPs only to achieve savings. 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 4-5b. *Model farm potential water savings (1-in-10)*

Description of Model Farm/Irrigation System/BMPs 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	10.23	8.31	7.29	6.79	6.19	5.80	100 percent implementation, maximum improvement
8	Nurseries, container	Sprinkler	Line source emitter and other BMPs	2.60	2.32	2.33	2.33	2.33	2.40	100 percent implementation, maximum improvement
10	Sod	Semi-closed seepage	Center pivot and other BMPs	1.15	2.38	2.38	2.38	2.38	2.38	100 percent implementation, maximum improvement
15	Melons	Semi-closed seepage	Fully enclosed seepage and BMPs	4.04	1.12	1.12	1.12	1.12	1.12	100 percent implementation, maximum improvement

Model farm potential water savings were adjusted to be consistent with latest demand projections.
1 Model Farm Scenario (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 8 (Nurseries): Replace existing sprinkler system with line source emitter irrigation system and implement other BMPs to achieve water savings. Model Farm Scenario 9 (Sod): Replace semi-enclosed seepage with center pivot irrigation system and implement other BMPs to achieve savings. Model Farm Scenario 15 (Melons): Replace semi-closed seepage with fully enclosed seepage irrigation system. Implement other BMPs only to achieve savings. 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 used for container nurseries, field crops and sod farms. Drip systems are used for row crops on plastic mulch and with a seepage system for bed prep/crop establishment. Microjet is the most common system for citrus. Surface irrigation, including semi-closed systems, is the most common type for non-citrus crops in Florida. For the four model farms chosen for the planning region, costs/acre to convert to a more efficient system and to implement BMPs were estimated based on publicly available data and information and interviews with local irrigation system and farm management providers. The savings associated with each of the model farm scenarios is included in Tables 4-5a and 4-5b. Data in these tables represent the maximum potential savings if all growers were to install the most efficient irrigation systems and implement BMPs for their respective commodities.

2.1 Potential Agricultural Water Conservation Savings

Table 4-6 summarizes savings by commodity through 2030 for the 5-in-10 condition. Citrus, nurseries, sod, and melons are discussed individually, and the remaining commodities are summarized together.

Table 4-6. *Summary of potential agricultural water conservation savings by commodity (5-in-10) for the Heartland Planning Region through 2030*

Commodity	Total Estimated Savings (mgd)[1]	Total Cost ($/acre)[2]
Citrus	3.58	$105
Nurseries	0.57	$347
Sod	0.90	$752
Melons	0.75	$172
Other	1.11	$100
Total	**6.91**	**$1,476**

[1]Based on 100 percent participation.
[2] Total cost/acre to convert to a more efficient system assumes main and sub-main line installations are not included because they already exist. Capital plus operation and maintenance cost/acre for first year of conversion.

Section 7. Summary of Potentially Available Water Supply

Table 4-7 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 123.6 mgd.

Part B. Determination of Water Supply Deficits/Surpluses

Future water supply deficits/surpluses were calculated as the difference between projected demands for 2030 and demands for the 2005 base year (Table 3-6a). The projected additional water demand for the planning period is approximately 129.6 mgd. As shown in Table 4-7, up to 123.6 mgd is potentially available from sources in the planning region to meet this demand. As discussed above, this does not include water that could be developed from the Peace River in Polk and Hardee counties and the Alafia River in Polk County and water that could be imported from Tampa Bay Water and the Toho Water Authority from outside the planning region. An additional factor is a decline in groundwater demand of 11.5 mgd during the planning period. A portion of these reductions can be used as mitigation of impacts for new groundwater withdrawals. Based on a comparison of projected demands and available supplies, it is concluded that sufficient sources of water are available in the planning region to meet demands through 2030.

Table 4-7. *Potential water availability (mgd) in the Heartland Planning Region (2005-2030)*

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	
Polk			39.77			4.5	35.7	18.6	3.4	**101.97**
Hardee			0.51			0.5	0.8	0.47	2.5	**4.81**
Highlands	0.05	4.35	2.26			3.0	4.4	1.78	1.0	**16.86**
Total	**0.05**	**4.35**	**42.53**	**N/A**	**TBD**	**8.0**	**40.9**	**20.8**	**6.9**	**123.64**

[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 other counties may be available.
[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.

Southwest Florida Water Management District

The Peace River is a potential source of potable-water supply in Hardee and Polk counties.

The water supply development component of the 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/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 Executive Summary for the RWSP.

Part A. Water Supply Development Options

Preliminary technical and financial feasibility analyses were conducted for the options included in this chapter. The analyses are for reasonable estimates of the quantity of water that could be developed and the 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.

Water supply options developed as part of the Polk County Comprehensive Water Supply Plan are also incorporated into this chapter. The options presented in this chapter 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, could be implemented by individual utilities or a group of users. 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.

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

The need to provide enough water for fish to pass over shoals limits the amount of water that can be captured for water supply from the upper Peace River in the dry season.

Capturing and storing water from river/creek systems in the planning region during times of high flow can supply significant quantities of water. The rivers/creeks that could potentially be utilized for water supply include the Peace River in Polk and Hardee counties, Josephine Creek in Highlands County, the Alafia River in Polk County, and the Kissimmee River (located outside the planning region in the SFWMD on the eastern boundary of Polk County).

The most prominent river system in the planning region is the Peace River. Although the availability of water is greater in downstream portions of the river, developing water supply options in the upper watershed has advantages such as locating water supply options on mined lands. Mined lands are well suited to water supply projects because of the large expanses of mine cuts and clay settling areas that remain following mining activities that could be used, with modifications, as surface water reservoirs. An additional advantage of utilizing the river in the upper watershed is the reduction in distribution costs that results from locating the supply closer to demand centers. A complicating factor in developing water supply options in the upper watershed is the possibility that the availability of water may not be sufficient because of the District's efforts to capture and store excess flows to meet the upper Peace River minimum flow. Several water supply development options that have been identified for the Peace River and the other rivers listed above are discussed in this section.

The surface water/stormwater options presented in this section are based on previous work that was prepared for the District's 2001 and 2006 RWSPs and the Polk County Comprehensive Water Supply Plan completed in 2009, which further refined Polk County's options. Table 5-1 is a list of surface water/stormwater options identified in the Polk County Comprehensive Water Supply Plan. Table 5-2 is an updated list of options developed by the District.

Table 5-1. *Surface water/stormwater options for the Heartland Planning Region (*Polk County Comprehensive Water Supply Plan*)*

Option, Water Body and Entity Responsible for Implementation	User Group	Avg Annual Yield (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Polk County							
Expansion of upper Peace River storage	PS	2	10,000	0.57	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/reg. system
Surface water stormwater ponds	PS	0.8	16,375	3.93	Included in unit cost	Stormwater ponds	Stormwater would supplement reclaimed water
Peace River at Arcadia	PS	15	25,913	5.56	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Alafia River (confluence of North and South Prongs)	PS	13.2	27,098	5.81	Included in unit cost	Reservoir	Piped to WTP(s) for public supply, possibly with Tampa Bay Water
Peace River at Fort Meade	PS	4.2	48,833	7.37	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Peace River at Bartow	PS	3.1	54,161	7.45	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Payne Creek near Bowling Green	PS	4.6	33,152	7.19	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Peace River at Fort Meade and Bowlegs Creek	PS	5.1	44,019	14.41	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Saddle Creek at P-11	PS	1.2	84,166	17.60	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Bowlegs Creek near Fort Meade	PS	1.2	71,916	14.64	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Peace River near Zolfo Springs	PS	10	24,600	5.45	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
South Prong Alafia River	PS	5.8	26,793	5.90	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
North Prong Alafia River	PS	5.2	26,807	5.94	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system
Peace Creek	PS	1.1	40,818	9.02	Included in unit cost	Reservoir	Piped to WTP(s) for public supply/regional system

Table 5-2. *Surface water/stormwater options for the Heartland Planning Region (District)*

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
Highlands County								
Josephine Creek Highlands County and/or others [1]	Ag, PS, Ind	4.35	4	5,695	2.13	899	AR / 1	Aquifer conveyance to ag, public supply and indust.
Hardee County								
Charlie Creek TBD	Ag	12	66	16,798	6.33	10,872	AR / 2	Aquifer conveyance to ag.
Charlie Creek TBD	Ag	12	66	4,623	1.77	3,130	Off-stream reservoir / 3	Piped to ag.
Charlie Creek TBD	Ag	12	66	4,766	1.76	2,908	Off-stream reservoir, AR / 2	Aquifer conveyance to ag.
Upper Horse Creek TBD	Ag, PS, Ind	1.4	8.3	12,134	3.86	553	Off-stream reservoir, AR / 2	Aquifer conveyance to ag, public supply and indust.

1 Development of this source will require compliance with Lake Istokpoga MFLs set by the SFWMD and consideration of current legal water users in the permitting process.

Surface Water/Stormwater Option #1 – Kissimmee River Potable Supply

- Entities Responsible for Implementation: Polk County Utilities, SFWMD

This option consists of the development of a surface water supply facility on the Kissimmee River with a minimum capacity of 24 mgd. The 24 mgd is based on conceptual analysis and the final determination of available water will depend on ongoing studies by the SFWMD. The project would include an intake structure, treatment plant, reservoir, ASR wells, and associated pipelines and ancillary features. The facility would be located within the SFWMD near the Polk/Osceola county line in the vicinity of Lake Kissimmee and would serve high growth areas of northeastern and north-central Polk County. Water would be withdrawn from the river and distributed via pipeline interconnects to nearby municipal systems. Utilities in the District that could interconnect with this system include Polk County Utilities and the Cities of Lakeland, Lake Alfred, Auburndale, Winter Haven, Lake Hamilton, Haines City, Davenport and Dundee. Utilities and municipalities in the SJRWMD and SFWMD could also obtain water from this option. It is anticipated that water from the facility would be available most of the year.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
24	TBD	TBD	TBD	TBD

Issues:
- Available quantities from this project depend on the outcome of ongoing studies conducted by SFWMD to develop a water reservation.

- An inter-basin transfer will be required under Section 373.2295, F.S.
- The SFWMD is assessing the effects of surface water diversions from the river on downstream users and natural systems to ensure proposed withdrawals do not interfere with downstream restoration efforts.
- Implementation of this option will likely be a cooperative effort between the District, SFWMD, local governments such as Polk County and Osceola County, water authorities, and municipalities in the region.
- The SFWMD is establishing reservations for the Kissimmee River and Kissimmee Chain of Lakes, which may affect water availability for out-of-district allocations.

Surface Water/Stormwater Option #2 – Peace River/Land-Use Transition Groundwater Supply

- Entities Responsible for Implementation: Polk County Municipalities, Polk County Utilities, District

This option involves the construction of a surface water treatment facility and associated reservoir to utilize water from the upper Peace River. In addition, this project would include the development of a groundwater supply for land-use transition/mitigation. This concept would allow new quantities of groundwater to be permitted by mitigating predicted impacts using quantities of groundwater that have been retired as a result of land-use transitions. The combined flows of the Peace River and Bowlegs Creek at Fort Meade could produce an annual average water supply of 5.1 mgd with a minimum reservoir size of 7.2 billion gallons. Costs include 20 miles of distribution pipelines, transfer pump station, combined surface and groundwater treatment, and storage facilities. Costs below are for the surface water component only.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5.1	$365,178,000	$70,226,540	$14.41	Included in cost/1,000 gal

Issues:
- The quantity of groundwater that would become available through land-use transition/mitigation is dependent on market forces that influence the time frame and degree to which these transitions will occur.
- The development of new groundwater quantities for public supply through land-use transition/mitigation will be evaluated on a case-by-case basis and must meet all applicable water use permit requirements.
- The quantity of water available for withdrawal from the Peace River may be limited by the District's efforts to restore minimum flows to the upper river.
- Planned WWTP effluent disposal reductions (Winter Haven #3) into the Peace River system could impact the project.

Surface Water/Stormwater Option #3 – Joint Toho Water Authority/Polk County Supply

- Entities Responsible for Implementation: Toho Water Authority, STOPR Group, District, SFWMD

This option would involve a partnership between the Toho Water Authority (TWA), Polk County and possibly other municipalities or agencies to develop a regional surface water and/or groundwater supply from the Kissimmee River and the Cypress Lakes wellfield. Partnering with TWA would spread development costs among a number of users.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
5	$60,000,000	$12,000,000	$2.20	TBD

Issues:
- The quantity of water available for water supply is currently being determined through ongoing studies.

Surface Water/Stormwater Option # 4 – Joint Tampa Bay Water/Polk County Supply

- Entities Responsible for Implementation: Tampa Bay Water, Polk County Utilities, Polk County Municipalities, District

This option would involve a partnership between Tampa Bay Water (TBW) and Polk County to develop a 25 mgd seawater desalination facility or a second off-stream reservoir. The partnership would entitle Polk County to receive 10 mgd of water supply from TBW. The District and TBW are currently investigating the feasibility of an additional reservoir that would obtain water from the Alafia River and/or new groundwater quantities that could be permitted through mitigation provided by the direct or indirect recharge of highly treated reclaimed water. The quantity of water this option would provide was determined through TBW's Alafia River evaluations. The cost analysis was based on 35 miles of transmission pipeline from the City of Lakeland to the location of the proposed reservoir. The capital cost is Polk County's share of the cost of infrastructure, such as surface water pumps, water treatment facility and transfer pumping facilities.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
10	$293,100,000	$29,310,000	$6.49	--

Issues:
- TBW faces a number of complex permitting issues, including increasing permitted withdrawals from the Alafia River, permitting the recharge of reclaimed water into the Upper Floridan aquifer and permitting additional fresh groundwater withdrawals in the SWUCA.

Section 2. Reclaimed Water

The planning region's diverse mix of urban land uses along the I-4 corridor, extensive mining and industrial areas, and large tracts of agricultural lands provides opportunities to use large quantities of reclaimed water in numerous, beneficial ways. Since the WWTPs for the many towns are small, inter-system connections are not among the example options for maximizing reclaimed water. Instead, the focus is on discontinuing the disposal of treated wastewater in rapid infiltration basins and spray fields and using it beneficially within the towns and surrounding agricultural lands. Listed below are the different types of reclaimed water options that

A reclaimed water pump station.

are compatible with the geology, hydrology, geography and available reclaimed water supplies in the planning region.

- **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 reclaimed water 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:** reclaimed water storage in ground storage tanks and ponds
- **Streamflow Augmentation:** introduction of reclaimed water downstream of water withdrawal points as replacement flow to enable additional utilization of the 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

Fifty reclaimed water project options were developed for the planning region through coordination with utilities and other interested parties as part of the Polk County Comprehensive Water Supply Plan. 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 4 of the 58 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 5-3.

Flow and capital cost data for the 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 and capital cost for each of the following options. 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 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.

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Table 5-3. *Reclaimed water options for the Heartland Planning Region*

Option Name and Entity Responsible for Implementation	County	Type	Supply (mgd)	Offset (mgd)	Capital Cost	Cost/Ben ($/1,000 gal)	O&M/Offset ($/1,000 gal)
Reuse Expan in Hardee Correctional WWTP 2011-2030, FL Dept. of Corrections	Hardee	Sys. Expan. Toilet Flushing/Laundry	0.16	0.16	$922,720	$1.14	$0.30
Reuse Expan in Zolfo Spgs WWTP 2011-2030, Twn of Zolfo Spgs	Hardee	Sys. Expan. Ag.	0.10	0.07	$576,700	$1.56	$0.30
Reuse Flow Expan in Bowling Green WWTP 2011-2030, City of Bowling Green (to existing customer)	Hardee	Sys. Expan.	0.01	0.01	0	$0.00	$0.30
Reuse Flow Expan in Wauchula WWTP 2011-2030, City of Wauchula (to existing customer)	Hardee	Sys. Expan	0.38	0.38	0	$0.00	$0.30
Reuse Expan in Lake Placid WWTP 2011-2030, Lake Placid	Highlands	Sys. Expan.	0.09	0.09	$519,030	$1.56	$0.40
Reuse Expan in Sun n Lake WWTP 2011-2030, Sun n Lake Improvement District	Highlands	Sys. Expan.	0.50	0.30	$2,883,500	$1.56	$0.40
Reuse Expan in Avon Park WWTP 2011-2030, City of Avon Park	Highlands	Sys. Expan.	0.75	0.56	$4,325,250	$1.56	$0.40
Highlands Co. Reuse Regionalization, Various Util.	Highlands	Intercon.	TBD	TBD	TBD	TBD	TBD
Reuse Expan in Sebring WWTP 2011-2030, City of Sebring	Highlands	Sys. Expan.	1.50	1.12	$8,650,500	$1.56	$0.40
Sebring Agricultural Reuse, City of Sebring	Highlands	Sys./Ag. Reuse	1.50	1.12	$8,650,500	$1.56	$0.40
W. Haven Plant #2 WWTP 2011-2030, City of Winter Haven	Polk	Sys. Expan./Inter.	2.00	1.50	$11,534,000	$1.56	$0.40
W. Haven Plt #2 to #3 WWTP Interconnect, City of Winter Haven	Polk	Sys. Expan./Inter.	0.54	0.20	$12,840,000	$12.65	$0.40
Winter Haven Plant #3 WWTP 2011-2030, City of Winter Haven	Polk	Sys. Expan./Inter.	5.00	3.75	$28,835,000	$1.56	$0.40
W. Haven Plant #3 IND Reuse, City of Winter Haven	Polk	Ind Reuse	2.00	2.00	$11,534,000	$1.14	$0.30
W. Haven Plant #3 Indirect Potable Reuse, City of Winter Haven	Polk	Recharge	5.00	5.00	$28,835,000	$1.14	$0.30
Lakeland Pwr ZLD Indus Reuse, Cty of Lakeland/Lakeland Electric	Polk	Ind Treatment	2.00	2.00	$8,000,000	$0.79	$1.37
Lakeland WWTP (Northside & Glendale) Reuse Expan. To TECO 2011-2030, City of Lakeland	Polk	Sys. Expan./Inter.	5.25	5.25	$30,276,750	$1.14	$0.30
Lakeland WWTP (Northside & Glendale) Reuse Expan. 2011-2030, City of Lakeland (IND, Power, Others)	Polk	Sys. Expan.	7.00	5.25	$40,369,000	$1.56	$0.40
Polk Co. Reuse Efficiency Study, Various Util.	Polk	Efficiency	TBD	TBD	TBD	TBD	TBD

Southwest Florida Water Management District

Table 5-3. *Reclaimed water options for the Heartland Planning Region (continued)*

Option Name and Entity Responsible for Implementation	County	Type	Supply (mgd)	Offset (mgd)	Capital Cost	Cost/Ben ($/1,000 gal)	O&M/Offset ($/1,000 gal)
Reuse Expan in Polk Co. NE Reg. CEMEX 2011–2030, Polk Co.	Polk	Sys. Expan.	0.75	0.75	$4,325,250	$1.14	$0.30
Reuse Expan in Polk Co. NE Reg. WWTP 2011–2030, Polk Co.	Polk	Sys. Expan.	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Expan in Polk Co. NW Reg. WWTP 2011–2030, Polk Co.	Polk	Sys. Expan.	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Expan in Polk Co. SE Reg. WWTP 2011–2030, Polk Co.	Polk	Sys. Expan	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Recharge Expan in Polk Co. Oak Hill WWTP 2011–2030	Polk	Recharge	0.14	0.12	TBD	TBD	$0.30
Reuse Recharge or Other Expan in Polk Co. Polo Park WWTP 2011–2030	Polk	Recharge/Sys. Expan.	0.25	0.22	TBD	TBD	$0.30
Reuse Interconnect Polk Co. SW Regional to NW Regional WWTPs 2011–2030 (Flows from NW)	Polk	Interncon/Sys. Expan.	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Expan in Polk East/Central/Waverly WWTP 2011–2030, Polk Co.	Polk	Sys. Expan/Inter	1.00	0.75	$5,767,000	$1.56	$0.40
Reuse Expan in Auburndale Allred (South WWTP) 2011–2030, City of Auburndale	Polk	Sys. Expan.	0.25	0.19	$1,441,750	$1.56	$0430
Reuse Expan in Auburndale Regional (North WWTP) 2011–2030, City of Auburndale	Polk	Sys. Expan.	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Expan in Auburndale Regional & Allred Interconnect 2011–2030, City of Auburndale	Polk	Interconnect	TBD	TBD	TBD	TBD	$0.30
Reuse TENOROC Expan in Auburndale Regional (North WWTP) 2011–2030, City of Auburndale	Polk	Sys. Expan./NAT	0.75	0.75	$2,650,000	$0.70	$0.30
Reuse Expan in Auburndale Regional (North WWTP) USF Campus, City of Auburndale	Polk	Sys. Expan.	0.75	0.75	$11,080,000	$2.91	$0.30
Reuse Expan in Avon Park Correctional WWTP 2011–2030, FL Dept. of Corrections	Polk	Sys. Expan. Toilet Flushing/Laundry	0.25	0.25	$1,441,750	$1.14	$0.30
Reuse Expan in Bartow WWTP 2011–2030, City of Bartow (To existing customer)	Polk	Ind Sys. Expan	4.00	4.00	$0	$TBD	$0.30
Reuse Expan in Bartow WWTP 2011–2030, City of Bartow (To new customers)	Polk	Sys. Expan	4.00	3.00	$23,068,000	$1.56	$0.40
Reuse Expan in Fort Meade WWTP 2011–2030, Fort Meade (To existing customer)	Polk	Ind Sys. Expan	0.22	0.22	$0	$TBD	$0.30

Table 5-3 *Reclaimed water options for the Heartland Planning Region (continued)*

Option Name and Entity Responsible for Implementation	County	Type	Supply (mgd)	Offset (mgd)	Capital Cost	Cost/Ben ($/1,000 gal)	O&M/Offset ($/1,000 gal)
Reuse Expan in Cypress Lakes WWTP 2011–2030, Cypress Lakes Util. (To existing customer)	Polk	Sys. Expan	0.04	0.03	$0	$TBD	$0.30
Reuse Expan. In Davenport WWTP 2011–2030, City of Davenport	Polk	Sys. Expan./Inter	0.36	0.27	$2,076,120	$1.56	$0.40
Davenport Recharge, City of Davenport	Polk	Recharge	0.36	0.36	$2,076,120	$1.14	$0.30
Reuse Expan. In Frostproof WWTP 2011–2030, City of Frostproof	Polk	Sys. Expan.	1.30	0.98	$7,497,100	$1.56	$0.40
Reuse Expan in Haines City WWTP 2011–2030, Haines City	Polk	Sys. Expan/Inter	1.28	0.96	$7,381,760	$1.56	$0.40
Reuse Expan (IND, Power, Other) in Lake Alfred System 2011–2030, Lake Alfred	Polk	Sys. Expan.	0.50	0.37	$2,883,500	$1.56	$0.40
Reuse Expan in Lake Wales WWTP 2011–2030, City of Lake Wales	Polk	Sys. Expan	0.50	0.37	$2,883,500	$1.56	$0.40
Reuse Expan in Mulberry WWTP (Includes Landstar) 2011–2030 to Industrial or Other, City of Mulberry	Polk	Sys. Expan/Inter	0.40	0.30	$2,306,800	$1.56	$0.40
Reuse Expan in Polk City Mt. Olive WWTP 2011–2030, Polk City	Polk	Sys. Expan/Inter	0.75	0.56	$4,325,250	$1.56	$0.40
Reuse Expan. In Skyview WWTP 2011–2030, Skyview Util.	Polk	Sys. Expan	0.20	0.15	$1,153,400	$1.56	$0.40
Reuse Expan. In Swiss Golf WWTP 2011–2030, Swiss Util.	Polk	Sys. Expan	0.05	0.04	$288,350	$1.56	$0.40
Reuse Expan. In Swiss Vill. WWTP 2011–2030, Swiss Vill. Util.	Polk	Sys. Expan	0.03	0.02	$173,010	$1.56	$0.40
Reuse Expan. In Greenelefe Golf WWTP 2011–2030, Swiss Util.	Polk	Sys. Expan/Inter	0.12	0.09	$692,040	$1.56	$0.40
Reuse Expan Polk Co. Correctional WWTP 2011–2030, FL Dept. of Corrections	Polk	Sys. Expan. Toilet Flushing/Laundry	0.15	0.15	$865,050	$1.14	$0.30
Total: 50 Options			**55.93**	**47.21**			

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 & 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 #1 – Lakeland Zero Liquid Discharge Reuse

- Entity Responsible for Implementation: City of Lakeland Utilities

The City of Lakeland's WWTPs produce approximately 12 mgd of wastewater, of which 5 mgd is used by the city's McIntosh power plant for cooling purposes. The power plant discharges approximately 2 mgd of highly mineralized effluent into a wetland treatment system. In addition to the reclaimed water used for cooling purposes, 5 to 8 mgd of reclaimed water is discharged directly into the wetland as a dilution agent, which achieves compliance with a discharge permit. Approximately 6 mgd of the resulting wetland related flows will be utilized by Tampa Electric Company in southwest Polk County.

The Zero Liquid Discharge (ZLD) is a potential treatment method for the mineralized cooling tower effluent that would enable the city to reuse the blowdown effluent more efficiently. The cooling tower effluent could be treated and reused to produce approximately 2.0 mgd of high quality water. The project option would include the following elements:

- A reverse osmosis (RO) unit that provides 80 percent efficiency to treat up to 2.0 mgd of blowdown effluent from the power plant. The resulting 1.6 mgd of permeate would have ultra-pure water quality and would be suitable for many applications at the power facility.
- The 0.4 mgd of concentrate discharge could be treated in a ZLD unit to produce nearly 0.4 mgd of ultra-pure water and a solid material that could be disposed of in a landfill.

This process would eliminate the city's blowdown effluent concentrate disposal into wetlands and allow nearly 100 percent of the 2 mgd of blowdown to be beneficially utilized. The option of installing a brine concentration unit has been evaluated previously but proved cost-prohibitive. However, recent advances in membrane and vapor extraction technology have reduced the cost of these systems, warranting a reevaluation of the applicability of the system. A lower pressure RO (nano-filtration) system would have capital costs in the range of $4 million per million gallon capacity and O&M of $500,000 annually per million gallon capacity. These costs are based upon capacity costs from a number of systems including the City of Clearwater and Dunedin's potable RO systems, Tampa Bay Water's Mid-Pinellas Brackish Potable Facility option, the West Basin reclaimed water system in California, and others such as the Advanced Treatment Cost Analysis (Carollo Engineers, 2006). The option would make an annualized supply of 2.0 mgd available and realize an annualized offset of 2.0 mgd. 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 (2[1])	$8,000,000	$4,000,000	$0.79	$1.37

[1]Beneficial offset.

Issues:

- Estimated annual O&M would be $1 million. O&M costs may decrease with related technological advancements.
- The reduction of effluent discharged into the wetland treatment system could affect the operation of the system and the viability of other downstream projects associated with the wetland (see TECO Reclaimed), as well as flows to the North Prong of the Alafia River.
- Additional feasibility studies should be performed and District cooperative funding may be required to make this project feasible.

Reclaimed Water Option # 2 – Winter Haven Reclaimed Water Industrial

- Entity Responsible for Implementation: City of Winter Haven

This option involves using reclaimed water to serve industrial manufacturers, energy facilities or others near Winter Haven in Polk County. The option would include design, permitting and construction of a high service pump station, a five million gallon storage tank and transmission main to users. Approximately 2.0 mgd of reclaimed water would be available for industrial reuse to offset 2.0 mgd of groundwater withdrawals. The implementation timeframe is expected to be between 2011 and 2030.

Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons	O&M per 1,000 Gallons Offset
2(2[1])	$11,534,000	$5,767,000	$1.14	$0.30

[1]Beneficial offset

Issues:
- Seasonal and long-term demands for reclaimed water could affect the viability of the project.
- WWTP effluent disposal reductions could impact the Peace River system.

Reclaimed Water Option # 3 – Zolfo Springs Agricultural Reuse

- Entity Responsible for Implementation: City of Zolfo Springs

This option involves redirecting wastewater treated at the City of Zolfo Springs WWTP from its absorption field disposal site to local agricultural operations. The option includes design and construction of 8,000 feet of 6-inch transmission main to transmit 0.10 mgd of reclaimed water to agricultural customers and offset 0.07 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 per 1,000 Gallons Offset
0.10 (0.07[1])	$576,700	$7,689,333	$1.56	$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 #4 – Sebring Agricultural Reuse

- Entity Responsible for Implementation: City of Sebring

This option involves redirecting the City of Sebring's treated wastewater from rapid infiltration basins to agricultural operations. The option includes design and construction of a high service pump station, 5-million gallon storage tank, and 26,000 feet of 12-inch transmission main. Approximately 1.5 mgd of reclaimed water would be transmitted to agricultural customers to offset 1.12 mgd of groundwater. The implementation time frame for the option is expected to be between 2011–2030.

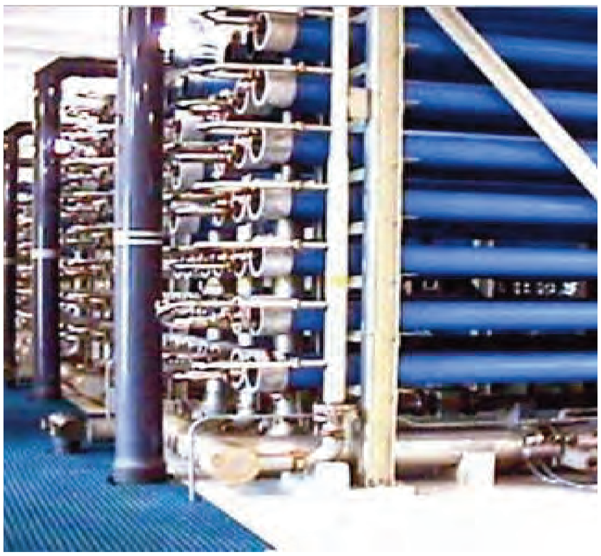
Quantity Produced (mgd)	Capital Cost	Cost/mgd Offset	Cost/1,000 Gallons Offset	O&M per 1,000 Gallons Offset
1.50 (1.12[1])	$8,650,500	$7,723,660	$1.56	$0.40

[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.

Section 3. Brackish Groundwater Desalination



Reverse osmosis membranes in a brackish groundwater treatment facility.

Water quality in the Upper Florida aquifer over much of the planning region can be characterized as fresh; however, groundwater in the Lower Floridan is typically of brackish quality. 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. Another potential source of brackish groundwater in the planning region is the Lower Floridan aquifer. As discussed in Chapter 4, this aquifer is used extensively in central Florida for drinking water supplies. The District, in cooperation with Polk County, is investigating the water quality and supply production characteristics of the aquifer in northeastern Polk County.

Brackish Groundwater Desalination Option #1 – Lower Floridan Aquifer Groundwater Blending

- Entities Responsible for Implementation: Polk County, Municipalities, District, SFWMD

This option involves drilling a well into the Lower Floridan aquifer to develop a groundwater supply. If the water is determined to be fresh, it will be used directly for water supply following disinfection. If it is brackish, it would be blended to meet primary standards either with raw fresh groundwater from the Upper Floridan aquifer or with finished water from a water treatment plant. There are 54 potential locations where this option could be developed in Polk County. Costs were obtained from the Polk County Comprehensive Water Supply Plan and include the drilling and construction of a Lower Floridan aquifer well. Capital costs include planning, permitting and design fees, infrastructure construction costs and land costs. Unit costs include both capital and annual O&M costs. Cost information for this option at all the potential locations is contained in Table 5-4.

Issues:

- Depending on the location of the wells, more than one WMD may need to be involved in the water use permitting process.

Southwest Florida Water Management District

Table 5-4. *Brackish groundwater options for the Heartland Planning Region*

Description	User Group	Potential Quantity Available (mgd)	Capital Cost	Cost/mgd	Unit Cost ($/1,000 gal)	Annual O&M
SE Polk Co Wellfield	PS	15	90,400,000	6,027,000	1.52	Included in Unit Cost
Lakeland: C.W. Combee WTP Groundwater Blending	PS	1.2	4,300,000	3,580,000	0.67	Included in Unit Cost
NE Polk Co. LFAS Well	PS	4	28,400,000	7,100,000	1.76	Included in Unit Cost
Lakeland: T. B. Williams WTP Groundwater Blending	PS	3.03	6,900,000	2,277,000	0.42	Included in Unit Cost
Winter Haven Wtr Dept: Fairfax WTP Groundwater Blending	PS	0.74	2,510,000	3,392,000	0.64	Included in Unit Cost
Bartow: 7 Mgd WTP – Groundwater Blending	PS	0.63	2,100,000	3,333,000	0.65	Included in Unit Cost
Auburndale: Atlantic WTP Groundwater Blending	PS	0.62	2,100,000	3,387,000	0.66	Included in Unit Cost
Haines City: WTP No 1 Groundwater Blending	PS	0.31	2,020,000	6,516,000	1.22	Included in Unit Cost
Northeast: Berry WTP Groundwater Blending	PS	0.37	2,060,000	5,568,000	1.05	Included in Unit Cost
Auburndale: Winona Park WTP Groundwater Blending	PS	0.29	2,000,000	6,897,000	1.30	Included in Unit Cost
Northeast: Van Fleet WTP Groundwater Blending	PS	0.49	2,310,000	4,714,000	0.88	Included in Unit Cost
SW/Polk Co. Util: Imperial Lakes WTP Groundwater Blending	PS	0.22	1,970,000	8,954,000	1.68	Included in Unit Cost
Lake Wales: High School WTP Groundwater Blending	PS	0.32	1,930,000	6,031,000	1.14	Included in Unit Cost
Winter Haven Wtr Dept: Winterset Gardens WTP Groundwater Blending	PS	0.21	1,960,000	9,333,000	1.76	Included in Unit Cost
Winter Haven Wtr Dept: 3rd Street WTP Groundwater Blending	PS	0.34	2,040,000	6,000,000	1.13	Included in Unit Cost
Haines City: WTP #2 Groundwater Blending	PS	0.35	2,120,000	6,057,000	1.15	Included in Unit Cost
Lake Wales: Grove Ave. WTP Groundwater Blending	PS	0.29	1,800,000	6,207,000	1.17	Included in Unit Cost
Fort Meade: Fort Meade WTP Groundwater Blending	PS	0.16	1,820,000	11,375,000	2.14	Included in Unit Cost

Table 5-4. *Brackish groundwater options for the Heartland Planning Region (continued)*

Description	User Group	Potential Quantity Available (mgd)	Capital Cost	Cost/mgd	Unit Cost ($/1,000 gal)	Annual O&M
Lake Alfred: Lake Alfred WTP Groundwater Blending	PS	0.18	1,830,000	10,167,000	1.92	Included in Unit Cost
Northwest: Palmore WTP Groundwater Blending	PS	0.18	1,830,000	10,167,000	1.92	Included in Unit Cost
Davenport: Davenport WTP Groundwater Blending	PS	0.17	1,800,000	10,588,000	2.02	Included in Unit Cost
Winter Haven Wtr Dept: Winterset WTP Groundwater Blending	PS	0.17	1,820,000	10,706,000	2.02	Included in Unit Cost
Winter Haven Wtr Dept: Inwood WTP Groundwater Blending	PS	0.15	1,810,000	12,067,000	2.27	Included in Unit Cost
Northeast: Oak Hill WTP Groundwater Blending	PS	0.18	1,830,000	10,167,000	1.92	Included in Unit Cost
Winter Haven Wtr Dept: Garden Grove WTP Groundwater Blending	PS	0.14	1,800,000	12,857,000	2.43	Included in Unit Cost
SW/Polk Co Util: Turner Road WTP Groundwater Blending	PS	0.17	1,820,000	10,706,000	2.02	Included in Unit Cost
Northwest: Lake Gibson WTP Groundwater Blending	PS	0.13	1,790,000	13,769,000	2.61	Included in Unit Cost
SW/Polk Co. Utility: Gus Stewart WTP Groundwater Blending	PS	0.22	1,850,000	8,409,000	1.59	Included in Unit Cost
Winter Haven Wtr Dept: Ridge VO Tech WTP Groundwater Blending	PS	0.12	1,780,000	14,833,000	2.82	Included in Unit Cost
Northwest: Timberidge Subdivision WTP Groundwater Blending	PS	0.12	1,790,000	14,917,000	2.82	Included in Unit Cost
SE/Polk Co. Util: Polk Co. Jail WTP Groundwater Blending	PS	0.05	870,000	17,400,000	3.31	Included in Unit Cost
Winter Haven Water Dept: Callen WTP Groundwater Blending	PS	0.11	1,780,000	16,182,000	3.05	Included in Unit Cost
Northwest: Indianwoods Sub WTP Groundwater Blending	PS	0.10	1,770,000	17,700,000	3.33	Included in Unit Cost
Central: Gordonville WTP Groundwater Blending	PS	0.10	1,770,000	17,700,000	3.33	Included in Unit Cost
Northeast: Loma Linda WTP Groundwater Blending	PS	0.09	1,770,000	19,667,000	3.69	Included in Unit Cost
Northeast: Regal Inn WTP Groundwater Blending	PS	0.07	1,760,000	25,143,000	4.72	Included in Unit Cost

Table 5-4. *Brackish groundwater options for the Heartland Planning Region (continued)*

Description	User Group	Potential Quantity Available (mgd)	Capital Cost	Cost/mgd	Unit Cost ($/1,000 gal)	Annual O&M
Northeast: Edgehill WTP Groundwater Blending	PS	0.12	1,790,000	14,917,000	2.82	Included in Unit Cost
NW; Homestead Subdivision WTP Groundwater Blending	PS	0.09	1,770,000	19,667,000	3.69	Included in Unit Cost
Mulberry: Mulberry Plant #1 Groundwater Blending	PS	0.09	1,770,000	19,667,000	3.69	Included in Unit Cost
Frostproof: Frostproof WTP #3 Groundwater Blending	PS	0.07	1,750,000	25,000,000	4.71	Included in Unit Cost
East: Sunair Country Club WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
East: Timber Lake Plant Groundwater Blending	PS	0.03	1,750,000	58,333,000	10.90	Included in Unit Cost
Central: Tanamora WTP Groundwater Blending	PS	0.08	1,770,000	22,125,000	4.14	Included in Unit Cost
Winter Haven Wtr Dept: Eloise Wood WTP Groundwater Blending	PS	0.07	1,760,000	25,143,000	4.72	Included in Unit Cost
Dundee: Lake Riner WTP #1 Groundwater Blending	PS	0.06	1,740,000	29,000,000	5.38	Included in Unit Cost
Lake Hamilton: Lake Hamilton WTP Groundwater Blending	PS	0.06	1,740,000	29,000,000	5.47	Included in Unit Cost
Northeast: Polo Davenport WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
SW/Polk Co. Util: Valley View WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
Dundee: Lake Ruth WTP #1 Groundwater Blending	PS	0.05	1,730,000	34,600,000	6.53	Included in Unit Cost
Lake Wales: Market Street WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
Polk City: Bougainvilla WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
Winter Haven Wtr Dept: Cypresswd WTP Groundwater Blending	PS	0.05	1,750,000	35,000,000	6.58	Included in Unit Cost
Frostproof: Frostproof WTP #2 Groundwater Blending	PS	0.05	1,730,000	34,600,000	6.53	Included in Unit Cost
Frostproof: Frostproof WTP #1 Groundwater Blending	PS	0.04	1,720,000	43,000,000	8.10	Included in Unit Cost
Polk City: Commonwealth Plant Groundwater Blending	PS	0.01	1,740,000	174,000,000	32.54	Included in Unit Cost

Section 4. Seawater Desalination

Because of the inland location of the planning region, seawater desalination was not considered to be a viable water supply source. However, Polk County and Tampa Bay Water (TBW) have discussed the potential for the county to partner with TBW to share a portion of the cost of a 25 mgd desalination plant. In exchange for the funding commitment, TBW would supply a set quantity of water to the county through an interconnect from the Lakeland area to TBW's regional system in the Lithia area of Hillsborough County.

Section 5. Fresh Groundwater

A large drill rig constructing a well into the Upper Floridan aquifer for agricultural irrigation.

Fresh groundwater options were developed as part of the Polk County Comprehensive Water Supply Plan and the Heartland Water Alliance water supply planning effort. The Heartland Water Alliance plan was developed by Polk, Highlands, DeSoto and Hardee counties and the District in 2003 to assess water supply needs and sources in these counties through 2025. Because of the inland location of these counties, access to alternative sources is limited and, therefore, many options developed as part of both planning efforts included additional development of fresh groundwater. Future requests for groundwater from the Upper Florida aquifer in the planning region will be evaluated based on projected effects on existing legal users and water resources, including those with established MFLs. In particular, projected effects of groundwater withdrawals cannot impact groundwater levels in the most impacted area (MIA) of the SWUCA and cannot cause lake levels to fall below their established minimums. Requests for groundwater for new uses will be considered if the requested use is reasonable and beneficial, incorporates maximum use of conservation and there are no available alternative sources of water. If regional groundwater levels have declined to levels that are causing established MFLs in the SWUCA to be violated, it will be necessary for those effects to be offset prior to issuance of a water use permit. It may be possible to use permitted groundwater quantities transitioned from other uses to mitigate the predicted impacts of new withdrawals.

<u>Fresh Groundwater Option #1 – Polk County Land-Use Transitions/Mitigation</u>

- Entities Responsible for Implementation: Polk County Municipalities, District

The option uses the land-use transition/mitigation concept to develop wellfields in Polk County (including areas in southeast Polk County and Mulberry). Land-use transition/mitigation involves the use of a portion of retired agricultural, institutional or industrial permitted groundwater quantities as mitigation to offset predicted adverse impacts from proposed new groundwater withdrawals. The viability of a proposed land-use transition will be determined through an evaluation using the Districtwide regulation model (DWRM II). Costs include 10 miles of transmission pipelines, well construction, pumping systems, conventional groundwater treatment and transfer pumping system. Unit costs include both capital and O&M costs.

Quantity Available (mgd)	Capital Cost	Cost/mgd	Cost/1,000 Gallons	Annual O&M
30	$73,300,000	$2,443,333	0.47	Included in Unit Cost

Issues:

- Use of the land-use transitions/mitigation concept must meet all permitting requirements, including a DWRM II impacts analysis, and is subject to review and approval by District water use permitting staff.
- The District has created a land-use transition guidance document to help potential permittees understand the process.

Fresh Groundwater Option #2 – Polk County Wellfield Sharing/Interconnects

- Entities Responsible for Implementation: Polk County Municipalities, District

The wellfield sharing option involves the interconnection of utility systems on a local level while the regional water grid system involves connecting all of the major cities, municipalities and utility service areas to a countywide transmission system. This grid system could be designed to receive source water from TBW, PRMRWSA, the STOPR group (an alliance of central Florida utilities) and the southeast wellfield located in the SFWMD.

Option	User Group	Avg Annual Yield (mgd)	Capital Cost ($1,000/mgd)	Unit Cost ($/1,000 gal)	Annual O&M ($1,000)	Storage Method/Level of Treatment	Distribution Method
Wellfield Sharing	PS	6	1,620	0.33	Included in unit cost	Dependent on location and storage	Piped to WTP(s) for public supply/regional system
Regional Water Grid System	PS	TBD	226.3	7.21	Included in unit cost	Dependent on location and water sources	Regional grid interconnect system

Section 6. Water Conservation Options

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

1.0 Non-Agricultural Water Conservation

The District identified a series of conservation measures that are appropriate for implementation by the public supply, domestic self-supply, recreational aesthetic, and industrial/commercial/mining water use. 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 that 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 in the Chapter 5 Appendix.

Non-Agricultural Water Conservation Option #1 – Clothes Washer Rebates (Residential and Commercial Users)

- 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 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 also varies depending on how often the washer is used. The savings are 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 in 2030 (mgd)	Cost-Effectiveness ($/1,000 gal)	Total Cost
Public Supply	0.38	$2.31	$3,725,715
Domestic Self-Supply	**N/A**	**N/A**	**N/A**
Total	**0.38**	**$2.31**	**$3,725,715**

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 in 2030 (mgd)	Cost Effectiveness ($/1,000 gal)	Total Cost
Public Supply	1.0	$0.24	$1,001,619
Domestic Self-Supply	0.004	$0.24	$4,200
Total	**1.0**	**$0.24**	**$1,005,819**

Non-Agricultural Water Conservation Option #3 – Ultra Low-Flow Toilets (ULFT) Rebates (Residential and Commercial Users)

- 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 using less water (high-efficiency toilets, or HETs; and dual-flush toilets, or DFTs) use even less water but can be rebated for the same amount, resulting in even higher savings than those presented here. HETs use about 1.28 gpf or less, 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. A DFT rebate program may be used in conjunction with a ULFT or HET 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. Toilet rebate 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.

ULFT Rebate			
Sector	Water Savings in 2030 (mgd)	Cost Effectiveness ($/1,000 gal)	Total Cost
Public Supply	2.22	$1.18	$11,095,342
Domestic Self-Supply	0.01	$1.18	$46,238
I/C,M/D,PG	0.003	$1.18	$17,132
Total	2.23	$1.18	$11,158,711

Non-Agricultural Water Conservation Option #4 – Water-Efficient Landscape and Irrigation Evaluations and Large Landscape Surveys (All Users)

- 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 have a five-year life, the “life span” of the water savings is limited to five years.

Water-Efficient Landscape and Irrigation Evaluation and Rebate			
Sector	Water Savings in 2030 (mgd)	Cost Effectiveness ($/1,000 gal)	Total Cost
Public Supply	2.56	$2.09	$8,401,929
Domestic Self-Supply	0.03	$2.09	$106,076
I/C,M/D,PG	0.01	$2.09	$19,458
Recreational/Aesthetic	0.003	$2.09	$9,246
Total	2.6	$2.09	$8,536,709

Large Landscape Survey			
Sector	**Water-Savings Rate in 2030 (mgd)**	**Cost Effectiveness ($/1,000 gal)**	**Total Cost**
Public Supply	0.016	$1.30	$32,228
Recreational/Aesthetic	0.01	$1.30	$17,588
Total	**0.026**	**$1.30**	**$49,816**

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 they could potentially save greater quantities that those presented below.

Sector	Water Savings in 2030 (mgd)	Cost Effectiveness ($/1,000 gal)	Total Cost
Public Supply	11.81	$0.51	$9,449,750
Domestic Self-Supply	0.08	$0.51	$62,341
I/C,M/D,PG	0.004	$0.51	$3,384
Recreational/Aesthetic	0.004	$0.51	$3,216
Total	**11.90**	**$0.51**	**$9,518,691**

Non-Agricultural Water Conservation Option #6 – Industrial Commercial Pre-Rinse Spray Valve 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-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 (gpm), 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 the 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	0.49	$0.11	$226,673
I/C,M/D,PG	0.01	$0.11	$3,892
Total	**0.50**	**$0.11**	**$230,565**

<u>Non-Agricultural Water Conservation Option #7 – Industrial, Commercial, Institutional Facility Assessment (Industrial, Commercial, Institutional Users)</u>

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

The objective of industrial, commercial, institutional (ICI) facility assessment is to reduce water consumption by conducting surveys 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 it will also increase the program costs. In addition, it should be noted that many performance contractors are also available to conduct ICI surveys and 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	1.50	$0.35	$2,247,490
I/C,M/D,PG	0.1	$0.35	$145,935
Total	**1.60**	**$0.35**	**$2,393,425**

<u>Non-Agricultural Water Conservation Option #8 –Water Budgeting (All Users)</u>

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

A water budget is a calculation of an adequate amount of water for 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	0.60	$0.09	$84,381
Domestic Self-Supply	N/A	N/A	N/A
Recreational/Aesthetic	0.003	$0.09	$442
Total	**0.60**	**$0.09**	**$84,823**

2.0 Agricultural Water Conservation Options

Nearly 45 percent of irrigated agricultural acreage in the District is located in the Heartland Planning Region. In 2010, 198 mgd will be used to irrigate 171,000 acres of agricultural commodities. From 2005 to 2030, irrigated acreage is expected to decrease by approximately 3 percent, or 4,800 acres. Most of the loss in acreage will be in citrus, but it will remain the predominant commodity, accounting for 89 percent of the total irrigated acreage in the planning region. The majority of citrus acreage, approximately 86,000 acres, is located in Polk County, followed by Hardee County with approximately 51,000 acres. Even with these declines in acreage, agriculture will still be a large

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

water user in the planning region in 2030. The District has a comprehensive strategy to significantly increase the water use efficiency of agricultural users 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 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 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 Facilitation of 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 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 Institute of Food and Agricultural Sciences (IFAS) Research and Education Projects

The District provides funding for IFAS to investigate a variety of agricultural 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.

2.3 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.

2.4 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 15 model farms projects that are either in operation or planned for implementation in the planning region.

2.5 Best Management Practices (BMPs)

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. Below are a number of 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 equipment 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 system in the planning region that was developed through the FARMS Program is the Polkdale Farms project located in Polk County. Polkdale Farms is a 20-acre blueberry farm located in northeastern Polk County. The project offsets groundwater withdrawals through the use of a tailwater recovery trench located on the downgradient side of the property. The project includes a surface water pump station, filtration and a pipeline to connect the reservoir to the existing irrigation system. This project is permitted for an annual average groundwater withdrawal of 0.04 mgd, which is offset nearly 100 percent by the use of tailwater.

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, which measure and monitor discrete subsurface 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.

BMP Option #3 – Farm-Sited Weather Stations


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.

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 make decisions of when to initiate a daily irrigation event or to 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 such that damage is likely 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.

BMP Option #4 – 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.

2.6 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 time. This scenario could be permitted for an annual average irrigation quantity of approximately 1.5 mgd. A 500-foot intake ditch would convey water from a stream to a sump where it would be withdrawn by a pump and conveyed via a pipeline to a 30-acre reservoir. Water from the reservoir would be distributed to the fields using two 2,500-gpm pumps and 25,000 feet of irrigation lines. 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 programs such as FARMS and the NRCS Environmental Quality Incentives Program, costs 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).

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 it (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 to be irrigated. 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 subsurface 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 Turner Groves-Hickory Groves property located in Highlands County. This project reduces groundwater withdrawals through the use of an existing in-stream surface water reservoir to irrigate a portion of a citrus grove. Major components of the project include surface water withdrawal pumps, filtration system, piping and infrastructure necessary to connect the reservoir into the existing irrigation system. The operation is permitted for an annual average groundwater and surface water withdrawal of 4.9 mgd for the irrigation of 3,961 acres of citrus. The estimated reduction in groundwater withdrawals resulting from the project is 1.1 mgd.

Option	Potential Savings (mgd)	Capital Cost	Cost/1,000 Gallons
Turner Groves Surface Water Project	1.1	$450,000	$0.08

Water supply systems in the Heartland Planning Region may eventually be interconnected as has been done in other planning regions with the help of District matching funds.

This chapter is an overview of water supply projects that are under development in the Heartland 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 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 129 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 for impacted natural systems in the planning region. As of 2010, it is estimated that at least 16 percent of that demand (22 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 development and expansion of reclaimed water systems including the Southwest Polk County/Tampa Electric Reclaimed Water Project, aquifer recharge projects and conservation projects for public supply and agriculture.

Section 1. Reclaimed Water

Table 6-1 is a list 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 – Polk County NERUSA Holly Hill Reclaimed Water Storage/Pumping and Lower Floridan Aquifer Well.

This project includes design, permitting and construction of a 2 million gallon reclaimed water storage tank and high service pumping facility off-site from the Northeast Regional Wastewater Treatment Facility (NERWWTF) to expand the total storage capacity of the NER Reclaimed Utility Service Area to meet future needs within the region. It also consists of design and construction of a Lower Floridan Aquifer observation well at the NERWWTF Holly Hills site. The

Table 6.1. *List of reclaimed water projects under development in the Heartland Planning Region*

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs		
		Produced	Offset	Stored	Type	Total	Total	District	$/1,000g
Highlands County									
Town of Lake Placid	Trans,Pump,Store L153	0.09	0.05	0.50	Ag,Rec	4	$1,374,200	$962,574	$0.49
Polk County									
Polk County	Transmission F035	4.64	2.32	N/A	Variety	5,969	$2,722,500	$985,750	$0.23
	Pump,Store,Telemetry H028	0.00	0.00	8.00	N/A	5,825	$2,173,500	$1,091,469	N/A
	Pump,Store,Telemetry H029	0.00	0.00	8.00	N/A	3,233	$1,700,500	$850,250	N/A
	Store,Pump H090	0.00	0.00	2.00	N/A	N/A	$3,032,920	$1,516,460	N/A
	Trans,Pump H091	TBD	TBD	0.00	Ind	1	$2,500,000	$1,250,000	TBD
	Trans,Pump,Store K300	2.00	1.20	3.00	Res	2,703	$4,815,734	$2,407,867	$0.79
	Pump/Store N024	0.00	0.00	80.00	N/A	N/A	$5,535,000	$2,767,500	N/A
	Trans N156	0.22	0.13	0.00	Res	561	900,000	460,000	$1.36
	Pump/Store L475	0.00	0.00	10.00	N/A	N/A	$2,794,912	$920,308	N/A
City of Winter Haven	Feasibility study L483	N/A	N/A	N/A	N/A	N/A	$100,000	$50,000	N/A
	Transmission N075	0.91	0.45	0.00	Res	1,514	$2,204,000	$1,162,164	$0.96
City of Lake Wales	Trans,Pump,Store P727	2.03	1.25	2.00	Res,Com,Ag	1,003	$5,626,387	$2,092,000	$0.89
City of Auburndale	Feasibility study N001	N/A	N/A	N/A	N/A	N/A	$100,000	$50,000	N/A
City of Haines City	Trans/Pump N065	0.31	0.30	0.00	Ind,Rec,Com	4	$4,302,000	$2,401,000	$2.81
Tampa Electric Company	Trans/ Pump H076 (Phase I)	6.00	6.00	0.00	Ind	1	$65,686,800	$34,093,400	$2.16
Town of Dundee	Trans/Pump/Store L553	1.50	0.76	4.50	Rec, Res	0	$4,016,000	$3,080,433	$1.04
Total	**17 Projects**	**17.70**	**12.46**	**118.00**		**20,818**	**$109,584,453**	**$56,131,175**	**$1.73**

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

2,200 foot deep well will be drilled to conduct aquifer performance tests, which are anticipated to yield results that can be used regionally. The total cost of this project is estimated to be $3,032,920, of which the District is funding 50 percent. Funding has also been allocated from the West-Central Florida Water Restoration Action Plan (WRAP) Fund.

Reclaimed Water Project #2 – Polk County SWRUSA Reclaimed Water Connection to TECO

This project consists of design and construction of a pipeline from the reclaimed water system in the Polk County Southwest Regional Utilities Service Area to the infrastructure associated with the project that will deliver reclaimed water from the City of Lakeland to the Tampa Electric Company (TECO) Polk Power Station. The pipeline sizes and diameters and the reclaimed water flows and offsets are being determined. This project will likely be combined with the Southwest Polk County/Tampa Electric Reclaimed Water Project, which is designed to maximize reclaimed water flows not currently being beneficially used by the City of Lakeland and Polk County and potentially other utilities such as Plant City. This interconnect will expand the regional infrastructure of Phase I of the project, which includes design and construction of 15 miles of reclaimed water transmission main from the City of Lakeland's wastewater effluent wetland treatment system to the TECO Polk Power Station for power generation expansion. The cost is estimated to be $2.5 million. The project is anticipated to be completed in 2013.

Reclaimed Water Project #3 – Southwest Polk County/Tampa Electric Reclaimed Water Project

This project will maximize the use of reclaimed water flows that are not currently being beneficially used by the City of Lakeland and potentially other utilities such as Plant City. The project is composed of two elements, the first of which is a traditional reclaimed water supply project consisting of transmission pipelines and storage to provide reclaimed water to industrial users from one or more WWTFs. This element will be implemented in at least two phases. Phase I includes the design and construction of approximately 15 miles of transmission main from the City of Lakeland's wastewater effluent wetland treatment system to TECO's Polk Power Station for power generation expansion. Phase I also includes the additional treatment necessary, including one deep disposal well, for TECO to treat the water to an acceptable level for cooling and other potential uses. The cost of Phase I is estimated to be $65,686,800. The first phase is anticipated to be completed in 2014. Phase II of the first element may bring additional reclaimed water to TECO to meet power generation expansion needs at the Polk Power Station in the future. Phase II may also provide reclaimed water to additional customers, including Mosaic. The source of reclaimed water for this second phase is being evaluated.

The second element is more innovative in concept and seeks to create opportunities for additional potable groundwater withdrawals in the SWUCA through direct or indirect recharge of reclaimed water into the Upper Floridan aquifer in southern Hillsborough and/or western Polk counties. Utilization of reclaimed water would eliminate current equivalent discharges, which would result in a reduction of nitrogen loading to receiving waters. The District allocated $500,000 for a feasibility study to investigate reclaimed water aquifer recharge. The feasibility study was completed in 2009, when the project was previously identified as the Regional Reclaimed Water Partnership Initiative.

2.0 Reclaimed Water Projects – Research, Monitoring and Education Projects

Continued support of reclaimed water research and monitoring is central to maximizing reclaimed water use and to increasing benefits. The District assists utilities in exploring opportunities for increased utilization of 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 use regardless of the water source. To provide reclaimed water information to a broader audience, the District has developed a web page which 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. *Reclaimed water research, monitoring and education projects under development in the District*

Cooperator	General Project Description	Costs	
		Total[1]	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 DISTRICTWIDE	**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 2. Aquifer Storage and Recovery/Aquifer Recharge

There are two aquifer recharge projects under development in the Heartland Planning Region. Table 6-3 provides project information including stage of development, project yield, number of wells and costs. When completed, these projects will produce 4.6 mgd of water for dry-season use if constructed as originally planned. The District has co-funded the development of these projects. Figure 4-2 shows ASR project locations in the District.

Table 6-3. *Summary of aquifer recharge and recovery projects under development in the Heartland Planning Region*

Project Site	Status[1]	Test Well Annual Stored Volume Goal (mg)	Final System Goal			Total Costs (District Share 50% of Total Costs)
			Annual Stored Volume (mg)	100 Day Dry Season Yield (mgd)[2, 4]	Total Number of Wells	
Progress Energy Florida Institute Phosphate (FIPR) Research Hines Energy Complex Polk Co.	Construct/testing. Construction permitting completed. Project postponed until surplus water available. No funding available from Progress Energy or FIPR.	7.7	TBD	2.0	1	Feasibility Program = $782,004
Polk County Aquifer Recharge Project to Relieve Flooding and Augment Groundwater Supplies	Feasibility. Two test wells and monitor wells installed, 1 year of water quality sampling planned in 2010. If surficial aquifer results acceptable to FDEP, Upper Floridan aquifer monitor wells will be installed at sites and water quality monitored for additional year. Remainder of wells constructed if project determined feasible and permitted by FDEP.	10.5[3]	260	2.6	25	Phase 1 Feasibility Program = $250,000

[1]Feasibility includes analysis of existing data to evaluate potential for ASR; analysis of injection water quality, availability/demand for water, hydrogeology of sites; installation of exploratory wells to check TDS/hydrogeology; and inventory of wells near sites. Construction/testing generally includes demand projections, water quality assessment, construction permitting, site selection, well design, geologic testing, cycle testing, and final report.
[2]Estimated.
[3]Assumes one well transmitting 20 gpm, 24 hr/day/365 days/yr based on limited site-specific geological information.
[4]Withdrawal location not near recharge sites.
TBD = To Be Determined

Section 3. Water Conservation

1.0 Non-Agricultural Conservation

1.1 Indoor Water Conservation Projects

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

Water conservation planning and implementation, relatively new to the planning region, is an area with opportunities for partnerships through the Cooperative Funding Initiative. Since 1993, the District has assisted local utilities with the distribution of nearly 260 ultra low-flow or high-efficiency toilets and 1,000 plumbing retrofit kits. These programs have cost the District and cooperating local governments $74,752 and have yielded a potable water savings of 36,060 gallons per day. In 2009, local governments in Polk County, with assistance from the District, developed their own water supply plan. This plan included models for each local government that calculated the cost, savings and applicability of various water conservation measures specific to each local government's demographics to provide a cost-efficient path for developing water conservation plans. These measures included toilet rebates, plumbing fixture retrofit kits, non-residential water audits, pre-rinse spray valve retrofits, and high-efficiency clothes washer rebates. To support these efforts, the District offers technical assistance to local entities to develop conservation programs, participates in research to ensure the latest conservation information is available to stakeholders, and retrofits restrooms at District service offices with ultra low-volume plumbing fixtures. Table 6-4 provides information on indoor water conservation projects under development.

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

Cooperator	Project Number	General Description	Savings (gpd)	Devices & Rebates	Total Cost[1]	District Cost	$/1,000 gal Saved
Polk County	L159	Toilet Rebate	3,312	135	$13,703	$6,851	$0.97
Lakeland	L914	Retrofit and Toilet Rebate	128,768	6,700	$600,000	$300,000	$1.10
Lakeland	L915	Retrofit Commercial	60,000	300	$45,000	$22,500	$0.48
Lakeland	N112	Retrofit Res. Toilet Rebate	82,000	4,000	$293,260	$146,630	$1.07
Winter Haven	N074	Retrofit Res. Toilet Rebate	24,175	2,000	$107,500	$53,750	$1.04
Totals			298,255	13,135	$1,059,463	$529,731	$0.96[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

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, which accounts for as much as 50 percent of each residential account's metered use, can be a significant portion of a water supply utility's total demand. 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. Table 6-5 provides information on outdoor conservation projects under development.

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

Cooperator	Project Number	General Description	Savings (gpd)	Sensors/ Audits	Total Cost[1]	District Cost	$/1,000 gal Saved
Polk County	N161	Rain Sensor Rebate	129,500	1,295	$116,550	$58,275	$0.60
Highlands County	N165	Landscape Irrigation Audit	8,400	35	$10,850	$5,425	$0.86
Winter Haven	N221	Weather-based Irrigation Controller Pilot	340,000	50	$45,000	$22,500	$0.09
Totals			**477,900**	**1,380**	**$172,400**	**$86,200**	**$0.24**

2.0 Agricultural Water Conservation Projects

The following is information on agricultural water conservation projects that are under development in the planning region. The District's largest agricultural water conservation initiatives, the 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.

The District provides funding assistance for development of methods to reuse irrigation water such as this tailwater recovery project.

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 and then promotes the results to the agricultural community. Table 6-6 is a listing 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 District.*

Project	Total Project Cost + District Cooperator	Total Project and Land Cost	Funding Source	Planning Region(s)[1]
Evaluation and Development of an ET Reference Model for Irrigation of Woody Ornamentals	$99,900	$99,900	District	Tampa Bay Heartland
Study of Cold/Chill Protection of Tropical Plants in Nursery	$160,000	$160,000	District	Southern Heartland
Irrigation Scheduling for Trees	$100,000	$100,000	District	Tampa Bay Heartland
Protecting Water Quality through the Use of Effective Water and Nutrient Management Practices for Strawberry	$180,000	$180,000	District IFAS Other	Tampa Bay Heartland
Total Cost	**$539,900**	**$539,900**		

[1]Selected projects affecting several planning regions. The outcome of research projects can benefit all planning regions. Districtwide list of all research projects is available upon request

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 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 below. 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.

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**	

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 funding program with the USGS. Data collected from this program allows the District to gauge changes in the health of the water resource, 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 as well as 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 portion of the District where additional data is needed to support preventative measures. 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.

3.0 Quality of Water Improvement Program (QWIP)

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.

4.0 Flood Control Projects

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

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

4.1 Data Collection

Data collection related to flood protection includes the regular assembly of information on such key indicators as rainfall, water levels 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) implementing BMPs to improve a watershed when its level of service is below targets assigned by local governments, and (5) maintaining 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.

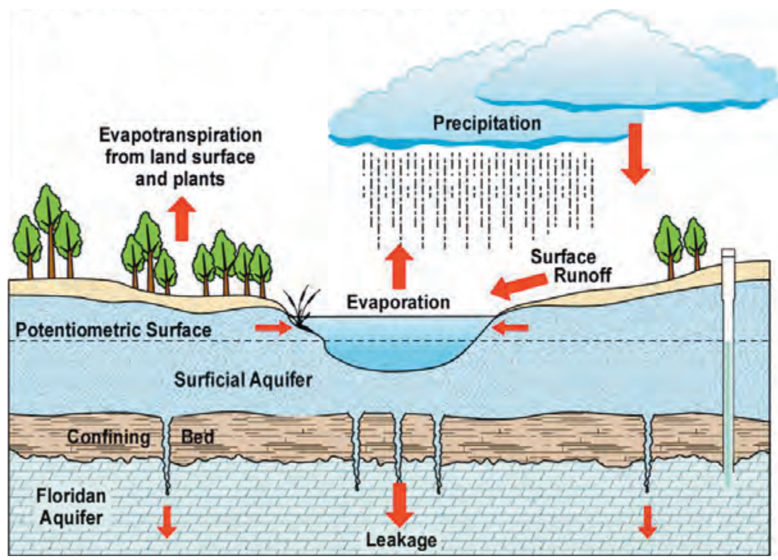
4.3 Lake Levels Program

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 detailed District WRAP studies, each of which is described below:

5.1 USGS Hydrologic Studies



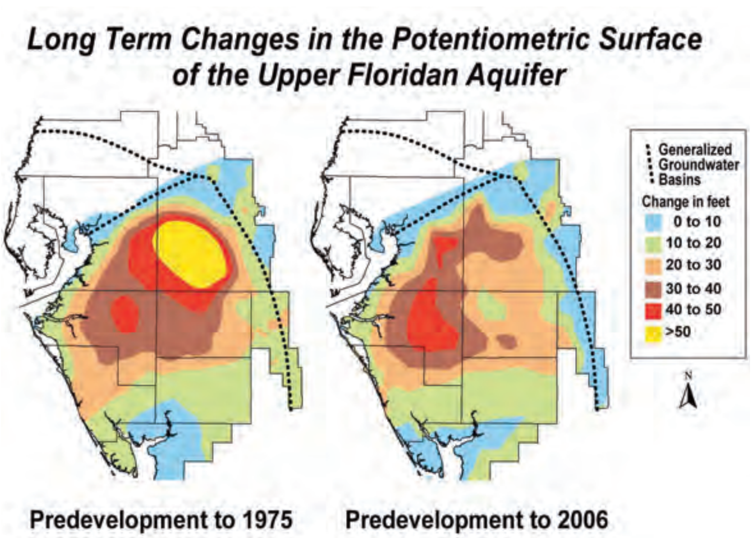
The movement of water between lakes and the Upper Floridan aquifer in the Lake Wales Ridge is now better understood as a result of studies conducted by the USGS in cooperation with the District.

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 with the USGS; 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)



The District's water resource assessment projects identified impacts from groundwater withdrawals and laid the foundation for strategies that were adopted to recover stressed water resources.

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 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. 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.

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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. Fifteen of the District's 20 projects are located in or will benefit the 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 many 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 different mechanisms described in Executive Summary for the RWSP. Each of the projects included in Table 7-2 is described in greater detail below.

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.

1.0 Alternative Water Supply Research, Restoration, and Pilot Projects

Alternative water supply research, restoration and/or 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, feasibility projects for recharging the Upper Floridan aquifer from surface water, a lake augmentation project, and an initiative to update information on the hydrogeology and water quality of Highlands County.

a. **USGS Hydrogeology and Quality of Groundwater in Highlands County.** The purpose of this study is to update information on the hydrogeology and water quality of the surficial, intermediate and Upper Floridan aquifer systems in Highlands County and to assess long-term water resource trends. Information on groundwater resources in Highlands County has not been comprehensively studied for more than 50 years. This effort will enable water resource managers to better evaluate current hydrologic conditions, define present-day baseline conditions and identify what additional hydrologic data are needed. The study will include three phases: researching of existing information, collection of new data, and production of a written report. Phase 1 consisted of compiling data from area stakeholders and characterizing current groundwater quality conditions, assessing long-term trends and identifying data gaps. Phase 2 consisted of measuring groundwater levels, developing maps and hydrogeologic cross sections, evaluating water level trends, and collecting and analyzing groundwater quality samples. Results of the study will be published in a USGS scientific investigations report as part of Phase 3. More than 200 geological and geophysical logs were compiled to date for Highlands and

Southwest Florida Water Management District

Table 7-2. *Project cost and District funding for water resource development projects that benefit the Heartland Planning Region*

Project	Total Prior District Funding ($)	FY2010 District Cost ($)	Total Cost District + Cooperator	Funding[1] Source	Quantity Developed Or Conserved (mgd)
(1) Alternative Water Supply Research, Restoration and Pilot Projects					
a. Hydrogeology and Quality of Groundwater in Highlands Co.	$71,942	$5,016	$590,508	District, USGS, Highlands Co, SFWMD	N/A
b. Pilot Augmentation Project for Lake Lotela	$133,216	$0		District	TBD
c. ASR Pretreatment Investigation	$304,666	$32,185	$736,851	District, PRMRWSA, Bradenton, other WMDs	N/A
d. Polk Co Aquifer Recharge to Relieve Flooding and Augment GW supplies	$139,347	$6,293	$963,140	District, Polk County	7-8 mgd
(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
(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
Totals	**$56,136,256**	**$8,235,453**	**$76,390,297**		

[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. Ongoing components of the FARMS Program specific to the Heartland Planning Region are included in Table 7-3.
[3]Future funding budget estimates have not yet been determined. Many of the projects included under 4) 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.

adjacent counties. These data were used to construct high-resolution maps depicting the thickness of the surficial aquifer, thickness of the ICU/IAS and depth to the Upper Floridan aquifer in Highlands County. Portions of the county contain little or no geologic data. To fill these gaps, 180 drillers' logs were obtained and 40 of the most reliable were used to improve the hydrogeologic maps. Water quality sampling of wells began in September 2007. Groundwater quality maps were constructed with data from 52 wells sampled by the USGS and 82 wells sampled by the District, the SFWMD, FDEP and Highlands County. The maps show the areal variability of specific conductance, chloride, sulfate, hardness and nitrate in the surficial, intermediate and Upper Floridan aquifers. In August 2009, the first draft of the report was submitted to the USGS supervisor and the reports specialist for review.

b. **Pilot Augmentation Project for Lake Lotela.** The purpose of this project is to evaluate and design a pilot lake augmentation system at Lake Lotela, located in Highlands County in the SWUCA. The District has established minimum levels for Lake Lotela and other lakes in the region. Historically, a number of these lakes have fluctuated below their established minimums. Developing an augmentation system will ensure that the lake will fluctuate at a higher level. The project will involve a review and evaluation of the overall condition of the lake and development of design criteria for a potential augmentation system.

c. **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 three 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 it 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.

d. **Polk County Aquifer Recharge to Relieve Flooding and Augment Groundwater Supplies.** This purpose of this project is to evaluate the feasibility of reducing flooding by expediting the recharge of excess surface water to the Upper Floridan aquifer through wells. The project will support ongoing efforts by the District to restore and enhance historic wetland and floodplain storage in Peace Creek. Additional benefits include recharging the Upper Floridan aquifer in the SWUCA and potentially providing future water supplies for the area. The project concept is to allow water in the lower part of the surficial aquifer, which is filtered and treated as it moves downward through the surficial sediments, to recharge the underlying Upper Floridan aquifer via valve-regulated, gravity-driven connector pipes/recharge wells. The county will construct two surficial aquifer test wells to determine the quality of surficial aquifer water. This data is needed to ensure that the quality of surficial aquifer groundwater will meet FDEP water quality standards for injection into the Upper Floridan aquifer. Additional monitor wells will also be installed and equipped with continuous recorders to measure water levels. If the quality of surficial aquifer groundwater meets FDEP requirements, the county will proceed with additional feasibility work to construct an exploratory well and will request additional funding from the District for future years. If water quality does not meet FDEP requirements, the project will not go forward.

   Preliminary sediment and hydrological analyses were completed, reports were provided and data were evaluated to develop well construction specifications. Drilling was completed and a step-drawdown test was conducted in March 2009 at the first site to determine specific capacity and well efficiency to estimate the required pump size for the well. Pump installations are now complete and sampling commenced in August 2009 at both sites. The project will not progress further until 12 months of sampling have been completed on the test wells and there is reasonable assurance that it can be permitted.

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, 7 were back-plugged in the Peace River watershed, 6 in the Alafia River watershed, 2 in the Manatee River watershed, 1 in the Myakka River watershed and 1 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 on 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 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 purpose of this program is to provide an incentive to the agricultural community to implement agricultural 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 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 Flatford Swamp and the effectiveness of FARMS projects.

The FARMS Program has 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 the 14 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

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

Project Name/Location	Project Description	Offset (gpd)	Project Cost	District Funding
H521 Highlands Co.	Groundwater reduced through installation of 9 soil moisture stations. Soil moisture data transmitted to computer for analysis/storage.	125,000	$183,066	$91,533
H523 Polk Co.	Groundwater reduced through installation of 4 soil moisture stations and automation of 4 pump stations. Soil moisture data collected from stations transmitted to project's computer for analysis and storage.	46,500	$56,137	$28,068
H524 Polk Co.	Tailwater recovery trench on property includes pump station, filtration and pipe to connect reservoir to existing irrigation system. Blueberries: 20 acres.	36,400	$181,290	$86,827
H535 Highlands Co.	Existing in-stream reservoir used to irrigate 1,073 acres of 3,691-acre citrus grove. Components include 1 pump station, filtration, piping and infrastructure to connect reservoir to existing irrigation system.	1,148,040	$358,378	$268,784
H537 Highlands Co.	Groundwater reduced through a weather station, automated pump controls and soil moisture sensors. Citrus: 189 acres.	28,500	$62,834	$31,417
H509 Hardee Co.	Existing reservoir and installation of 1 pump station, filtration, piping and infrastructure to connect reservoir to existing irrigation system. Blueberries: 120 acres.	124,650	$440,602	$204,250
H586 Hardee Co.	Mitigates excess runoff to watershed. Existing reservoir irrigates 50 acres of blueberries. Pump station, controls, filtration, pipeline to irrigation system and cross-connection to irrigation system for portion of citrus grove.	64,000	$340,666	$255,000
H564 Hardee Co.	Two reservoirs, 2 pump stations, controls, filtration and pipeline to irrigation system, weather station to optimize irrigation scheduling. Blueberries: 80 acres.	71,200	$353,394	$255,868
H540 Hardee Co.	Soil moisture sensors/telemetry to facilitate efficient use of irrigation quantities and reduce groundwater use. Existing irrigation system has automated valves and ability to turn off pump remotely.	60,000	$170,000	$85,000
H580 Hardee Co.	Solar-powered field sensors uplinked to Internet to monitor soil parameters and climate conditions. Citrus: 200 acres.	8,200	$13,600	$6,800
H551 Polk Co.	Controls frequency/duration of irrigation events. Weather station controls operation of automated hydraulic irrigation valves, based on local climatic conditions. Nursery: 62 acres.	27,200	$30,000	$15,000
H525 Polk Co.	Weather station, moisture sensors, automated pump control to reduce frequency/duration of irrigation events. Citrus: 949 acres.	68,935	$99,188	$45,594
H572 Polk Co.	Converts irrigation system from overhead sprinkler to double row drip tape. Improves efficiency by 25%. Blueberries: 110 acres.	134,175	$352,000	$176,000
H543 Hardee Co.	Solar-powered field sensors/radio telemetry uplinked to Internet to monitor soil moisture and climate conditions. Citrus: 2,268 acres.	109,900	$10,000	$5,000
	Totals	**2,052,700**	**$2,651,155**	**$1,555,141**

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. Eight of the projects are operational and are being monitored for groundwater use offset, two are under construction and four are awaiting contractual approval. Collectively, these projects are expected to offset approximately 2.0 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 in the Southern Planning Region.

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 within the District, 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 Mini-FARMS 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 419,250 gpd. Future projects are a priority with the FDACS and the District in the upper Myakka and SPJC watersheds.

3.0 Restoration of Minimum Flows to the Upper Peace River

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 release 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.

The Lake Hancock Outfall Structure (P-11) will be rebuilt to enable water levels in Lake Hancock to be maintained at higher levels.

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.

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 Peace Creek 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 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 Peace Creek. The District continues to provide aquatic plant maintenance in the creek 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, as well as immediate maintenance, have been completed. A canal maintenance evaluation report was completed in May 2005 that 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.

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.


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.

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 (WMD), 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, 2005) 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 Tampa Bay Water's C. W. Bill Young Regional Reservoir and the Peace River Manasota Regional Water Supply Authority's 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, Tampa Bay Water 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[1].

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 (Kulakowski, 2005) risks are beyond public sector tolerance, a project is new and standalone, construction and long-term operation are combined, there are clearly defined performance specifications and there are clearly defined payment obligations.

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

[1] http://www.ncppp.org/cases/tampabay.shtml downloaded October 20, 2009 (NCPPP, 2009).

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 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*

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.

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