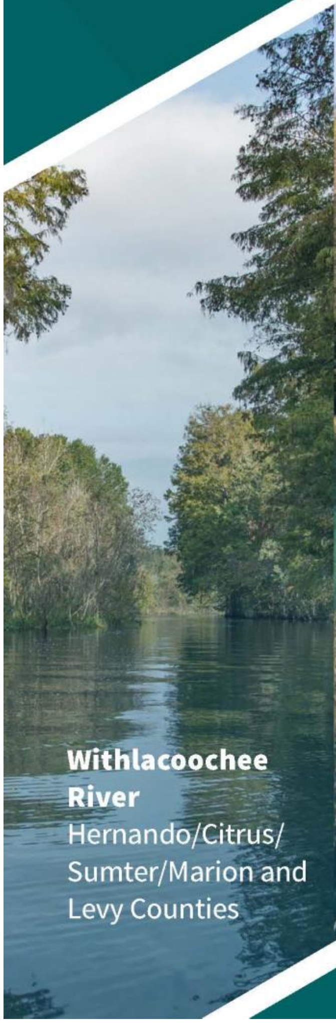
2020 Regional Water Supply Plan

Northern Planning Region

November 2020



Southwest Florida
Water Management District

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2020 Regional Water Supply Plan
Northern Planning Region

Final Draft

November 2020

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Southwest Florida Water Management District

2020 Regional Water Supply Plan

This report is produced by the Southwest Florida Water Management District

November 2020 – Final Draft

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List of Abbreviations

AG	Agriculture
AR	Aquifer Recharge
ASR	Aquifer Storage and Recovery
AWEP	Agriculture Water Enhancement Program
AWE	Alliance for Water Efficiency
AWS	Alternative Water Supply
BEBR	Bureau of Economic and Business Research
BMP	Best Management Practice
CAR	Consolidated Annual Report
CDD	Community Development District
CFI	Cooperative Funding Initiative
CFS	Cubic Feet per Second
CFWI	Central Florida Water Initiative
CII	Commercial, Industrial, and Institutional
CWCFGWB	Central West-Central Florida Groundwater Basin
DPCWUCA	Dover/Plant City Water Use Caution Area
DSS	Domestic Self Supply
DWRM	Districtwide Regulation Model
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ER	Environmental Restoration
ET	Evapotranspiration
ETB	Eastern Tampa Bay
ETBWUCA	Eastern Tampa Bay Water Use Caution Area
F.A.C.	Florida Administrative Code
FARMS	Facilitating Agricultural Resource Management Systems
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FFL	Florida-Friendly Landscaping
F.S.	Florida Statutes
FTMR	Focus Telescopic Mesh Refinement
FWS	Florida Water Star℠
FY	Fiscal Year
GAL	Gallons
GIS	Geographic Information System
GPD	Gallons per Day
GPF	Gallons per Flush
GPM	Gallons per Minute
GRP	Gross Regional Product
HET	High-Efficiency Toilets
HRWUCA	Highlands Ridge Water Use Caution Area
I/C	Industrial/Commercial
ICU	Intermediate Confining Unit
IFAS	Institute of Food and Agricultural Sciences
IPCC	Intergovernmental Panel on Climate Change
IWF	Integrated Water Factor
L/R	Landscape/Recreation

LFA	Lower Floridan aquifer
LHR	Lower Hillsborough River
MCU	Middle Confining Unit
MCU I	Middle Confining Unit I (1)
MCU II	Middle Confining Unit II (2)
M/D	Mining/Dewatering
MFL	Minimum Flows and Levels
MGD	Million Gallons per Day
MG/L	Milligrams per Liter
MIA	Most Impacted Area
NHARP	North Hillsborough Aquifer Recharge Program
NPDES	National Pollutant Discharge Elimination System
NPR	Northern Planning Region
NRCS	Natural Resources Conservation Service
NTB	Northern Tampa Bay
NTBWUCA	Northern Tampa Bay Water Use Caution Area
O&M	Operation and Maintenance
OFW	Outstanding Florida Water
OPPAGA	Office of Program Policy Analysis and Governmental Accountability
OEP	Oxygen-Reduction Potential
PG	Power Generation
PPT	Parts per Thousand
PRMRWSA	Peace River Manasota Regional Water Supply Authority
PRWC	Polk Regional Water Cooperative
PS	Public Supply
PSI	Pounds per Square Inch
QWIP	Quality of Water Improvement Program
RC&D	Florida West Coast Resource Conservation and Development Council
RIB	Rapid Infiltration Basin
RO	Reverse Osmosis
ROMP	Regional Observation and Monitor-well Program
RWSP	Regional Water Supply Plan
SHARE	South Hillsborough Aquifer Recharge Expansion
SHARP	South Hillsborough Aquifer Recharge Project
SJRWMD	St. Johns River Water Management District
SMS	Soil Moisture Sensor
SPJC	Shell, Prairie and Joshua Creek watersheds
STAG	State and Tribal Assistance Grants
SWCFGWB	Southern West-Central Florida Groundwater Basin
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management Program
SWIMAL	Saltwater Intrusion Minimum Aquifer Level
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 Load
UFA	Upper Floridan aquifer

ULFT	Ultra Low-Flow Toilet
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
WISE	Water Incentives Supporting Efficiency
WMD	Water Management District
WMP	Watershed Management Plan
WPCG	Water Planning Coordination Group
WPSPTF	Water Protection and Sustainability Program Trust Fund
WQMP	Water Quality Monitoring Program
WRAP	Water Resource Assessment Project or West-Central Florida Water Restoration Action Plan
WRD	Water Resource Development
WRPC	Withlacoochee Regional Planning Council
WRWSA	Withlacoochee Regional Water Supply Authority
WSD	Water Supply Development
WUCA	Water Use Caution Area
WUP	Water Use Permit
WUWPD	Water Use Well Package Database
WWTP	Wastewater Treatment Plant
ZLD	Zero Liquid Discharge

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Chapter 1. Introduction

The Regional Water Supply Plan (RWSP) for the Southwest Florida Water Management District (SWFWMD) (District) is an assessment of projected water demands and potential sources of water to meet these demands for the period from 2020 through 2040. The RWSP has been prepared in accordance with the Florida Department of Environmental Protection's (FDEP) 2019 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 the 2020 RWSP update for the Northern Planning Region, which includes Hernando, Citrus and Sumter counties and the portions of Lake, Levy and Marion counties within the District. In 2010, the RWSP update included the District's Northern Planning Region for the first time.

The purpose of the RWSP is to provide the framework for future water management decisions in the District. The RWSP for the Northern Planning Region shows that demand for water through 2040 can be met with fresh groundwater supplemented by the use of all available reclaimed water options and through implementation of comprehensive water conservation measures.

The RWSP also identifies a variety of potential options and associated costs for developing fresh groundwater and alternative sources. The options are not intended to represent the District's most preferable options for water supply development (WSD). They are, however, provided as reasonable concepts that water users in the planning region can pursue to meet their water supply planning 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 implement 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 was prepared pursuant to these provisions. Key components of this legislation include:

- Designation of one or more water supply planning regions within the District.
- Preparation of a Districtwide water supply assessment.
- Preparation of a 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.

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 WSD projects. In addition, the legislation intended to foster better communications among water planners, local government planners and local utilities. Local governments are now allowed 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 (AWSs) by local governments, water supply authorities and other water users.

Since 2001, the District has completed RWSPs for the 10-county area from Pasco County to Charlotte County. In this area, excessive groundwater withdrawals from the Upper Floridan aquifer (UFA) caused significant environmental impacts. Water supply planning was necessary to determine how the region's future water supply demands could be met and environmental impacts mitigated through the development of alternative sources.

The Northern Planning Region was excluded from the RWSP until 2010. The decision to include the region in the plan was in response to the Governing Board's concerns with the future water demand of thousands of undeveloped vested lots, effects of groundwater withdrawals on springs, lakes and other water resources, and the St. Johns River Water Management District's (SJRWMD) focused monitoring and study in Lake and Marion counties. The intent was to ensure that a proactive, preventive approach is taken to water management in the region. Principal goals of the approach are to develop both short- and long-term measures that can be implemented to optimize the use of available groundwater to meet future demands while preventing unacceptable impacts to the resources. The Northern Planning Region strategy emphasizes three primary courses of action to address the issues of water demand and water supply: resource monitoring, enhanced conservation and regional water supply planning. Each element of this strategy will be discussed in this volume. The goal is to implement the strategy in advance of the significant water resource impacts that have occurred in the Tampa Bay, Heartland and Southern planning regions.

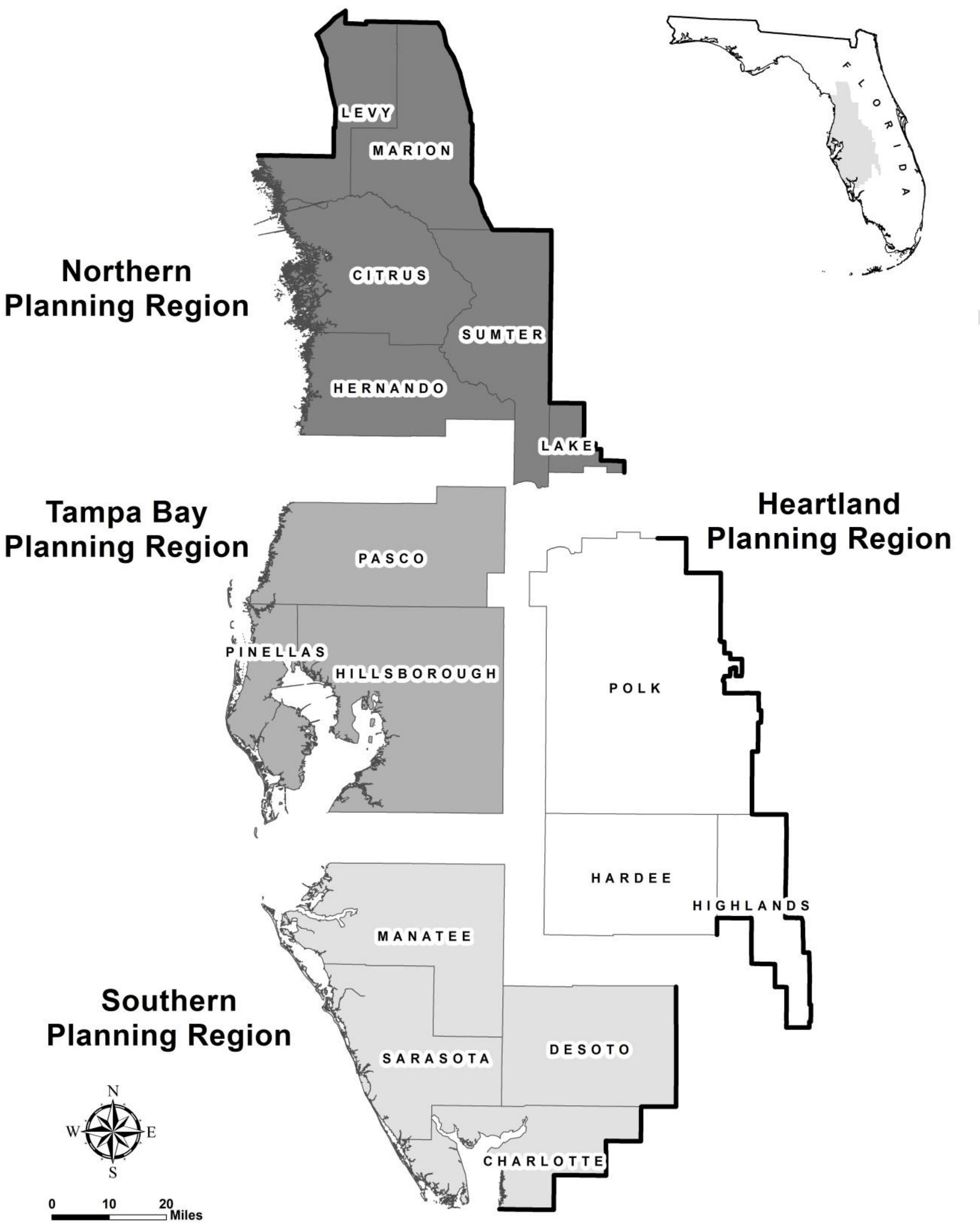


Figure 1-1. *Location of the four water supply planning regions within the District*

Part A. Introduction to the Northern Planning Region RWSP

The following describes the content of the RWSP for the Northern Planning Region:

- Chapter 1, Introduction, contains an overview of water supply planning accomplishments in the planning region prior to the development of this RWSP; a description of the land use, population, physical characteristics, hydrology, geology/hydrogeology of the region; 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 reasonably projected water supply demand through the year 2040 for public supply (PS), agricultural, industrial/commercial, mining/dewatering, power generation and landscape/recreation users and environmental restoration.
- Chapter 4, Evaluation of Water Sources, is an evaluation of the future water supply potential of traditional and alternative sources.
- Chapter 5, Water Supply Development Component, presents a list of WSD options for local governments and utilities, including surface and stormwater, reclaimed water and water conservation. For each option, the estimated amount of water available for use and the estimated cost of developing the option are provided.
- Chapter 6 is an overview of WSD projects that are currently under development and receiving District funding assistance.
- Chapter 7, 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 2040 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 2015 RWSP

This section is a summary of the District's major accomplishments in implementing the objectives of the RWSP in the planning region since the 2015 update was approved by the Governing Board in November 2015.

Section 1. Conservation and Reclaimed Water Development

1.0 Water Conservation

The District continues to promote and cooperatively fund water conservation efforts to more efficiently use existing water supplies. In the PS sector, for fiscal years 2015-2019, this includes cooperatively funded projects for toilet rebates, rain sensors, water-efficient landscape and irrigation evaluations, evapotranspiration (ET)-based smart irrigation controllers, and Florida

Water Star℠ rebates. The District has funded conservation projects undertaken by Citrus and Marion counties, the Withlacoochee River Water Supply Authority (WRWSA), the Bay Laurel Community Development District, and the North Sumter Utility Development District. The District also formed the Water Conservation Initiative to help achieve its water conservation goals.

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 (FDACS), FARMS is a cost-share reimbursement program for production-scale best management practices to reduce groundwater use and improve water quality. These projects predominantly include tailwater recovery systems as an AWS, and precision irrigation systems. To date, more than 194 operational projects Districtwide are providing a groundwater offset of more than 27 million gallons per day (mgd). An additional nine projects in the planning, design or construction phase are expected to yield another 1 mgd of offset. Within the Northern Planning Region, FARMS has funded nine operational projects providing 0.24 mgd of offset.

2.0 Reclaimed Water

The District has continued its highly successful program to cooperatively fund projects that make reclaimed water available for beneficial reuse. These include more than 385 projects between fiscal year (FY) 1987 and FY2020 for the design and construction of transmission, distribution, recharge, natural system enhancement, storage and pumping facilities, metering, feasibility studies, reuse master plans, and research projects. As a consequence of District and utility cooperation, reuse projects were developed that will result in the 2025 Districtwide utilization of reclaimed water of more than 228 mgd and a water resource benefit of more than 137 mgd (FDEP 2015 beneficial reuse plus growth and projects currently under construction). Utilities are on their way to achieving the 2040 Districtwide goals of 353 mgd utilization (75 percent) and 269 mgd of water resource benefit (75 percent efficiency).

In 2015, utilities within the Northern Planning Region were utilizing approximately 64 percent, or 12 mgd of the 19 mgd, of available wastewater treatment plant flows resulting in an estimated 10 mgd of water resource benefits (81 percent efficiency). There are three reclaimed water projects under development and another six estimated to experience additional future supply growth. The projects will supply more than 6 mgd of additional reclaimed water that is estimated to result in 5 mgd of additional post-2015 potable quality water benefits at a total cost of approximately $16 million.

Section 2. Support for Water Supply Planning

In November 2019, the Withlacoochee Regional Water Supply Authority, with District funding assistance, completed the most recent update to its 2014 RWSP. This plan is a 20-year assessment of water demands and potential water sources for meeting these demands. The objective of the update is to assist water supply utilities within the WRWSA's four-county region by developing implementable water supply options and strategies to meet future demands. Information from the update has been incorporated in this RWSP update for the Northern Planning Region.

The District is actively involved in providing technical support to local governments as they prepare statutorily required Water Supply Facilities Work Plans and related updates as part of their comprehensive plans. District staff worked with the Department of Economic Opportunity and its predecessor (Department of Community Affairs), the FDEP and the other WMDs to develop a guidance document for preparing the work plans. Staff provides ad hoc assistance to local governments and instituted a utility services program to assist utilities with planning, permitting and information/data needs.

Section 3. Minimum Flows and Levels Establishment

1.0 Established Minimum Flows and Levels

Minimum flows and water levels (MFLs) established in the planning region during or since 2015 include those for Crystal River(Kings Bay Spring Group), Gum Slough (Gum Springs Group), and Rainbow River (Rainbow Spring Group). The District continues to re-evaluate and establish new MFLs per the Priority List and Schedule for the Establishment of Minimum Flows, Minimum Water Levels and Reservations (see Chapter 2, Part B, and Appendix 2).

2.0 Minimum Flows and Levels Recovery Initiatives

All MFLs established in the planning region are currently being met and, therefore, none require recovery strategies. Reduction in groundwater withdrawals from Tampa Bay Water (TBW) wellfields in Pasco County associated with the recovery strategy for the Northern Tampa Bay Water Use Caution Area (NTBWUCA), and reduced water demand for PS in western Hernando County, have had a beneficial effect on groundwater levels, spring flows, and lakes in Hernando County. In addition, groundwater use in the remainder of the Northern Planning Region has generally remained flat or slightly declined over the last five years.

Section 4. Regulatory and Other Initiatives

Since 2011, the District has been working with public water supply utilities, the St. Johns River and South Florida WMDs, FDEP, FDACS, and multiple stakeholders on the Central Florida Water Initiative (CFWI), which includes portions of Polk and Lake counties and all or parts of four other counties in central Florida outside of the District (see Figure 2-3). This is an area where the WMDs have previously determined, through water supply planning efforts and real-time monitoring, that groundwater availability is limited. The CFWI mission is to help protect, develop, conserve and restore central Florida's water resources by collaborating to address central Florida's current and long-term water supply needs. The CFWI is led by a Steering Committee that includes a public water supply utility representative, a Governing Board member from each of the three WMDs, and representatives from FDEP and FDACS. The Steering Committee oversees the CFWI process and provides guidance to the technical teams and technical oversight/management committees that are developing and refining information on central Florida's water resources. The Steering Committee has guided the technical and planning teams in the development of the CFWI RWSP, which ensures the protection of water resources and related natural systems and identifies sustainable water supplies for all water users in the CFWI region through 2040. Those efforts, which are reflected in this 2020 RWSP update for the Northern Planning Region, will lead to adoption of new rules and management strategies. More detailed information concerning the CFWI is available on the CFWI website at http://cfwiwater.com/planning.html.

The District partnered with the WRWSA, The Villages, a large master planned active retirement community located in portions of Sumter, Lake, and Marion counties, and the City of Wildwood to expand groundwater monitoring and data collection in northern Sumter County. This project, called the North Sumter Data Collection Plan, was completed in 2012. In addition, the District continued its deep exploratory drilling and testing program that included several sites close to the boundary between the District and the SJRWMD in Marion and Sumter counties. This is a high-growth area that is hydrogeologically complex. Information gained from this work was incorporated into the Northern District groundwater flow model that was completed in late 2013 (HydroGeoLogic, 2013) and updated in 2016 through a cooperative agreement with the SJRWMD. The model was used in development of the 2020 RWSP to assess current and future groundwater withdrawal impacts on lake levels, spring flows and the Withlacoochee River. The SJRWMD and the District use this tool for MFL evaluations and regional water supply planning.

Part C. Description of the Northern Planning Region

Section 1. Land Use and Population

The Northern Planning Region is characterized by a diversity of land use types (Table 1-1). The area encompasses extensive tracts of federal, state and District-owned conservation lands that include the Withlacoochee State Forest, the Annutteliga Hammock, the Chassahowitzka Wildlife Management Area, the Weekiwachee Preserve, the Flying Eagle Preserve, Potts Preserve and the Lake Panasoffkee tract. These protected public lands are used and maintained for timber management; ecological restoration; public recreation; and conservation of hardwood swamps, fresh and saltwater marshes, river frontage, sandhill-dwelling plants and prime black bear habitat. Limestone mining activities occur primarily in Hernando, Sumter and Levy counties and numerous inactive mines are scattered throughout the northern counties. Significant agricultural activities are carried out in the region. Forestry and pasture dominate agricultural use in terms of acres, and Marion County is known for its thoroughbred horse breeding industry. Ornamental production is growing, particularly in Sumter County. Watermelons are a primary crop, with Levy County leading the region. Other crops farmed at a much smaller scale include sweet peppers, squash, cucumbers, cantaloupes and sweet corn.

The population of the planning region is projected to grow from approximately 599,932 in 2015 to 873,535 in 2040. This is an increase of approximately 273,603 new residents, a 46 percent increase over the planning period. Marion, Lake and Sumter counties include sections of The Villages retirement communities, the largest residential development in central Florida. The Suncoast Parkway extension, currently under development, may result in an increase in commercial and industrial land uses and bring new residents to Citrus and Levy counties. Residential and commercial development has also been concentrated along U.S. 19 in Hernando and Citrus counties and along SR 200 southwest of Ocala in Marion County.

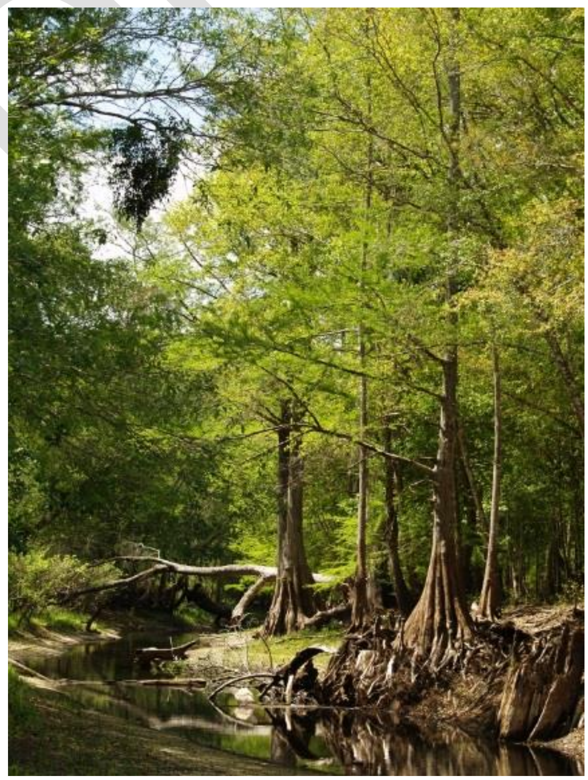
Table 1-1. *Land use/land cover in the Northern Planning Region (2017)*

Land Use/Land Cover Types	Acres	Percent
Urban and Built-up	416,963.56	24.4
Agriculture	374,476.92	21.9
Rangeland	24,381.30	1.4
Upland Forest	477,045.40	27.9
Water	22,313.08	1.3
Wetlands	338,915.84	19.8
Barren Land	5,263.79	0.3
Transportation, Communication and Utilities	22,423.00	1.3
Industrial and Mining	25,834.37	1.5
Total	**1,707,617.26**	**100.0**

Source: SWFWMD 2017 LULC GIS layer (SWFWMD, 2019).

Section 2. Physical Characteristics

The planning region is divided along the Brooksville Ridge physiographic region into two distinct watersheds. The Springs Coast watershed consists of the Coastal Swamp in western Hernando and Citrus counties along the Gulf of Mexico. It also encompasses the Gulf Coastal Lowlands between the Coastal Swamp and the Brooksville Ridge, which consists of relatively flat plains to rolling sandhills. The Withlacoochee River watershed (the second largest in the District) encompasses parts of Marion, Levy, Citrus and Hernando counties and all of Sumter County, and portions of Pasco and Polk counties outside of the Northern Planning Region.



Withlacoochee River watershed

The Brooksville Ridge runs northwest-southeast across the planning region through the central portions of Citrus and Hernando counties. Elevations along the Brooksville Ridge range from 70 to 275 feet above sea level. The Brooksville Ridge has an irregular surface due to the prevalence of karst features and is mantled with clay-rich soils within Hernando County. The Tsala-Apopka Chain of Lakes lies between the Brooksville Ridge and the Withlacoochee River within the recharge area of the coastal springs. It has a large number of interconnected lakes that are divided by peninsulas and islands. Elevations range from 35 to 75 feet above sea level.

Section 3. Hydrology

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

1.0 Rivers

Rivers in the Springs Coast watershed include the Weeki Wachee and Mud rivers in Hernando County and the Chassahowitzka, Homosassa, Halls and Crystal rivers in Citrus County. The rivers are relatively short (less than 10 miles in length) and their flow is derived primarily from spring discharge. The Withlacoochee River's tributaries include the Rainbow River in Marion County where flow is almost entirely from Rainbow Springs, the Little Withlacoochee River in northeast Hernando County and Sumter County, and Jumper Creek and the Panasoffkee Outlet River in Sumter County. From its headwaters in the Green Swamp, the Withlacoochee River traverses eight counties before discharging into the Gulf of Mexico. The Green Swamp is also the source of the Hillsborough, Peace and Ocklawaha rivers.

2.0 Lakes

Major lakes in the planning region include Lake Panasoffkee in Sumter County (4,460 acres), Lake Rousseau in Levy County (3,657 acres) and the Tsala-Apopka Chain of Lakes in Citrus County (23,300 acres). The Tsala-Apopka chain consists of interconnected ponds, marshes and the open water portions of primary pools at Floral City (9,100 acres), Inverness (8,000 acres) and Hernando (6,200 acres). Figure 1-2 depicts the locations of lakes in the planning region greater than 20 acres in size.

3.0 Springs

Five first-magnitude springs (discharge exceeds 100 cubic feet per second [cfs]) are located in the planning region. These include the Rainbow Spring Group in Marion County, the Kings Bay Spring Group, Chassahowitzka and Homosassa Spring groups in Citrus County, and the Weeki Wachee Spring Group in Hernando County. The Rainbow Spring Group consists of multiple springs, which are the source of the Rainbow River. The river flows for approximately 5.7 miles before merging with the Withlacoochee River upstream of Lake Rousseau and, based on United States Geological Survey (USGS) data, the river has a median discharge of 676 cfs (437 mgd) from 1931 through 2018.

The Gum Slough springs in Sumter County feed the Withlacoochee River

The Kings Bay Group and the Chassahowitzka and Homosassa springs groups are located on Citrus County's gulf coast. Crystal River springs, discharging into the tidally influenced Kings Bay (600 acres), are the headwaters of the Kings Bay Group and are part of a complex network of more than 70 springs. These springs have an estimated average discharge of 450 cfs (291 mgd) (HydroGeoLogic, 2008). The springs are located within the saltwater/freshwater transition zone (the boundary between freshwater and saltwater in the UFA). Consequently, most of the springs discharge water that is brackish to varying degrees. The Homosassa Springs Group discharges approximately 250 cfs (162 mgd) and, together with springs on the Halls River, provides the majority of flow for the Homosassa River. The quality of water discharging from the main spring at the head of the Homosassa River is brackish. Chassahowitzka Springs consists of a group of springs with a combined average discharge of 115 cfs (74 mgd). The springs are the primary source of water for the Chassahowitzka River. The quality of water discharging from the largest spring at the head of the river is also brackish. The Weeki Wachee Main Spring is located at the head of the Weeki Wachee River and discharges at an average rate of 172 cfs (111 mgd). Because the spring is located considerably further inland than the springs discussed above, water discharging from the spring is always fresh. Several smaller springs discharge brackish water into the Weeki Wachee River downstream of the main spring (Jones et al., 1997).

Lake Panasoffkee, Sumter County

Numerous smaller springs that are second-magnitude or less (discharge between 10 cfs and 100 cfs) are located in the planning region, but many are unnamed and difficult to locate. Springs in the Lake Panasoffkee area are good examples. Fenny Springs, a second-magnitude spring located in Sumter County, flows to Lake Panasoffkee and the Withlacoochee River. Gum Slough, a four-mile-long spring run that flows into the Withlacoochee River, is fed by several springs located at the head of the slough in northwestern Sumter County. The Aripeka Springs Group includes Hammock Creek and is composed of numerous small springs clustered in a one-square-mile area of southwestern Hernando County.

4.0 Wetlands

Prior to significant development, approximately 54 percent of Florida was covered by wetlands. However, due to drainage and development, only approximately 30 percent of the state currently remains covered by wetlands. Wetlands in the planning region can be grouped into saltwater and freshwater types. Saltwater wetlands are found bordering estuaries that are coastal wetlands influenced by the mixing of freshwater and seawater. Salt grasses and mangroves are common estuarine plants. The Withlacoochee Gulf Preserve is a large estuary located west of Yankeetown in Levy County. Significant coastal wetlands are located along the western portions of Hernando and Citrus counties. Freshwater wetlands occur in low-lying areas near lakes and the Withlacoochee River. Hardwood-cypress swamps and marshes are two major freshwater wetland systems. Both systems are found either bordering lakes and rivers or standing alone as isolated wetlands. The hardwood-cypress swamps are forested systems with water at or above land surface for a considerable portion of the year. Marshes are typically shallower systems vegetated by herbaceous plants rather than trees. Wet prairies are vegetated with a range of mesic herbaceous species and hardwood shrubs and are inundated during the wettest times of the year.

Extensive hardwood swamps and wet prairies occur throughout the Withlacoochee River watershed. The Green Swamp covers the entire southern end of Sumter County with isolated wetlands typically vegetated by herbaceous plants. Nearly half of Levy County is designated as freshwater wetlands that extend from the forested systems of the Goethe State Forest into Alachua County. The hardwood-cypress swamps in the Hálpata-Tastanaki tract are a major freshwater system in southwest Marion County.

5.0 Karst Hydrology

Intensive karst development characterizes much of the planning region including the Coastal Swamps Lowlands, the Brooksville Ridge and the Tsala-Apopka Plain. Numerous sinkholes, lack of surface drainage, and undulating topography play a dominant role in moving groundwater through the UFA. In karst areas, the dissolution of limestone has created and enlarged cavities along fractures in the limestone, which eventually collapse and form sinkholes. Sinkholes capture surface water drainage and funnel it underground, which promotes further dissolution of limestone. This leads to progressive integration of voids beneath the surface and allows larger and larger amounts of water to be funneled into the underground drainage system. Many of these paths or conduits lie below the present water table and greatly facilitate groundwater flow. Because the altitude of the water table has shifted in response to historic changes in sea level, many vertical and lateral paths have developed in the underlying carbonate strata in the area (Jones et al., 1997).

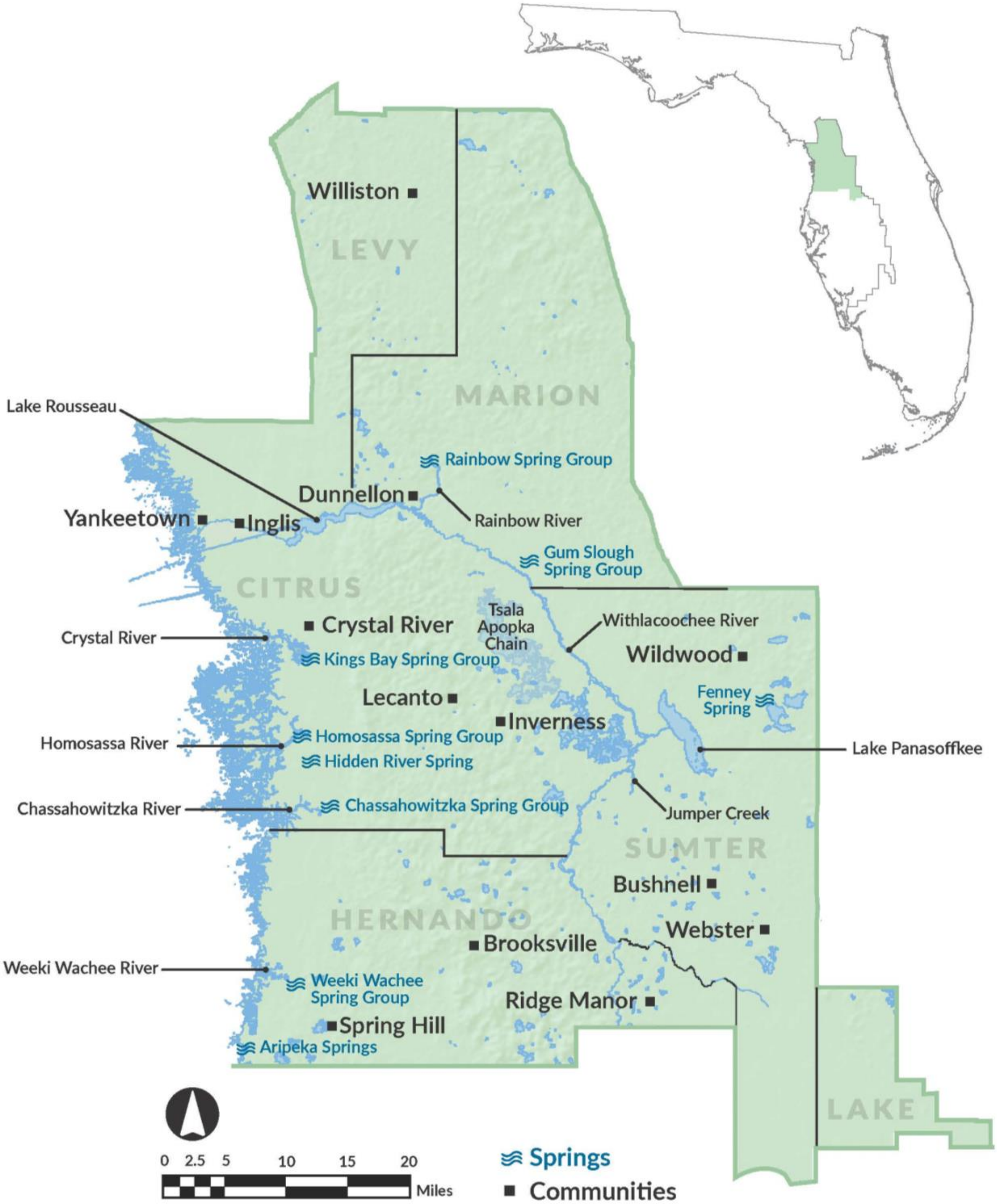


Figure 1-2. *Major hydrologic features in the Northern Planning Region*

Section 4. Geology/Hydrogeology

The UFA is the principal source of groundwater in the planning region. Figure 1-3 is a generalized north-south cross section of the hydrogeology of the District, and Figure 1-4 shows the West-Central Florida groundwater basins. As seen in the figures, the Central West-Central Florida Groundwater Basin (CWCFGWB) constitutes a hydrogeologic transition between the southern and northern parts of the District. From the Southern Planning Region to the Tampa Bay Planning Region, the intermediate aquifer system and its associated clay confining units decrease in thickness and eventually become a single confining unit in the central portion of the Tampa Bay Planning Region (the Intermediate Confining Unit [ICU]). The unit becomes discontinuous and disappears entirely in the Northern Planning Region. As a result, the UFA becomes regionally unconfined over most of the planning region (SWFWMD, 1987, HydroGeoLogic, 2013).

The UFA consists of a thick sequence of marine carbonate deposits and is the main source for water supply within the planning region. A relatively thin sequence of sands, silts and clays overlies the carbonate deposits. The upper several hundred feet of limestone and dolomite comprise the most productive and utilized portion of the UFA. Stratigraphic units of the UFA (in order of increasing geologic age and depth) include the Suwannee Limestone, the Ocala Limestone and the Avon Park Formation.

The Suwannee Limestone is approximately 300 feet thick and is present at or near land surface in Hernando County (Yon and Hendry, 1972). It contains many solution channels and forms part of the upper flow zone for the UFA, which is the source for most of the spring discharge observed in the region (SWFWMD, 1987). The Ocala Limestone is the first water-bearing unit in the UFA over most of the planning area north of Hernando County. The Ocala Limestone averages 300 feet in thickness and outcrops in southern Sumter County within the Green Swamp area. Extensive karst features can be observed in the surface outcrops and karst plains associated with both the Suwannee and Ocala Limestone.

The Avon Park Formation averages approximately 600 feet in thickness and is composed of interbedded limestones and dolostones with gypsum beds found in the middle and lower portion of the formation over most of the planning region. Where gypsum is present, it forms the bottom confining bed of the freshwater flow system and is named Middle Confining Unit 2 (MCU II) (Miller, 1986). The formation underlies the entire planning region and outcrops in several areas of limited extent, mainly within Levy and southwest Marion counties where the Ocala Limestone is eroded away. The Avon Park Formation is the deepest potable water-bearing formation and forms the lower flow zone for the UFA over most of the planning region.

In northeast Sumter County, the MCU II unit is absent and another confining unit is present in the upper Avon Park Formation. This unit consists of a tight, dense, carbonate lithology and is referred to as Middle Confining Unit 1 (MCU I) (Miller, 1986). The Avon Park Formation below MCU I contains fresh groundwater and is referred to as the Lower Floridan aquifer (LFA). The MCU I and the LFA extend eastward from Sumter County into the SJRWMD.

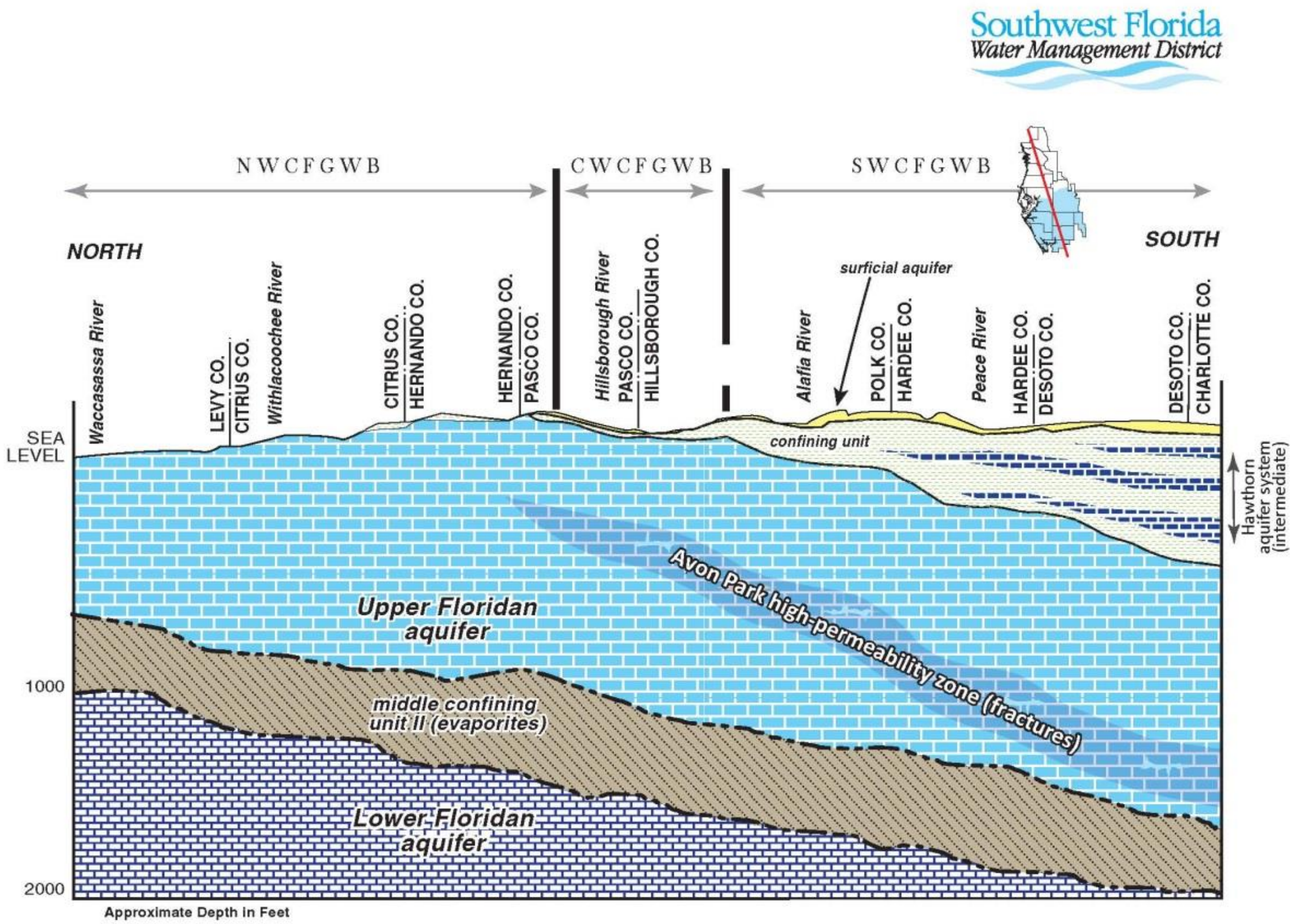


Figure 1-3. *Generalized north-south geologic cross section through the District*

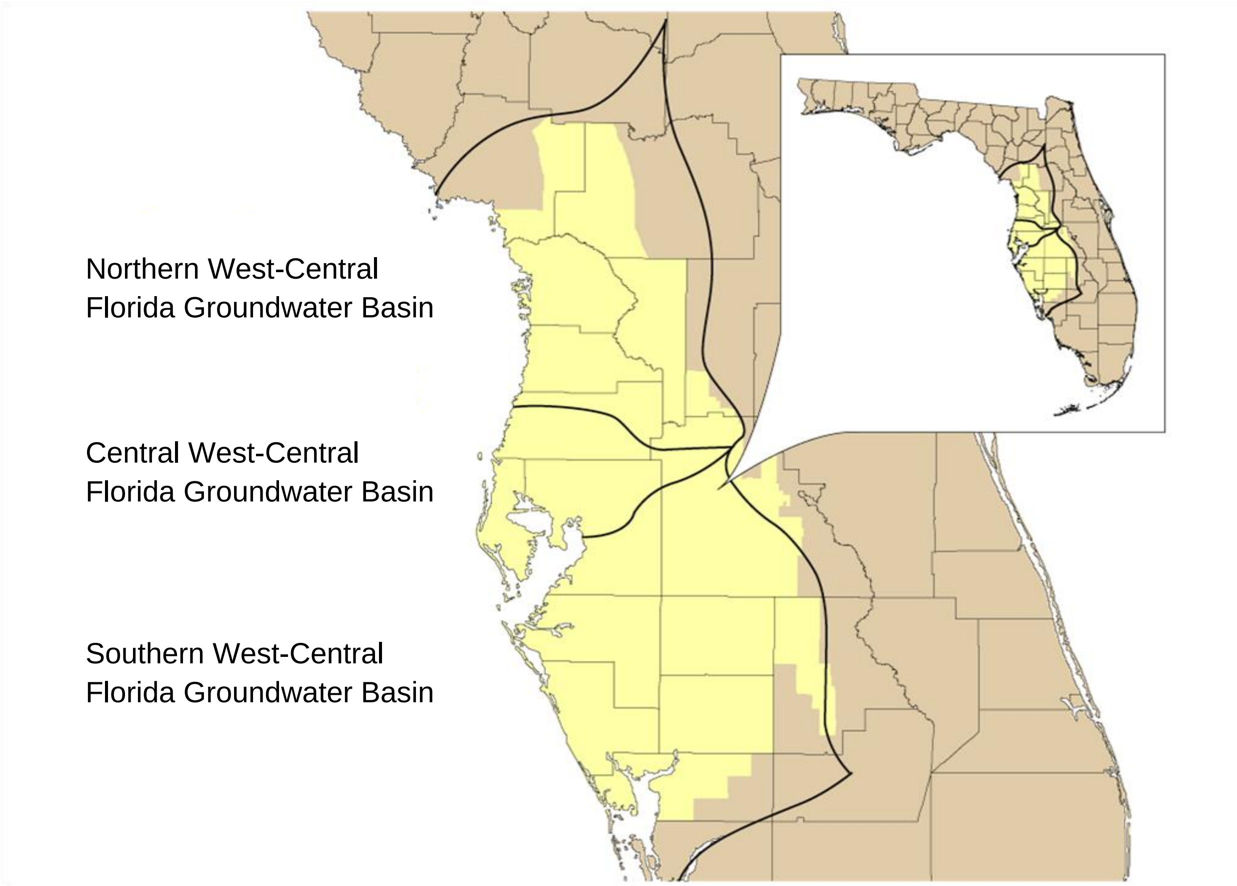


Figure 1-4. *The District and the West-Central Florida Groundwater Basins*

Part D. Previous Technical Investigations

The 2020 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 the District with an understanding of the complex relationships between human activities (i.e., surface water and groundwater usage and large-scale land-use alterations), climate cycles, aquifer/surface water interactions, aquifer and surface hydrology, and water quality. Investigations conducted in the 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 were 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 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 and groundwater interactions. Approximately 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.

During the 1980s, hydrologic and biologic monitoring from the District's expanded data collection networks began to reveal water resource impacts in other areas of the District. In the late 1980s, the District initiated a detailed water resource assessment project (WRAP) in the Northern Tampa Bay (NTB) area to determine causes of water level declines and to address water supply availability. Resource concerns in this area included lowered lake and wetland levels.

Based on the preliminary findings of the WRAP study and continued concern about water resource impacts, the District established the NTBWUCA in 1989. The District 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 NTBWUCA. These meetings are summarized in the Northern Tampa Bay Work Group Report (SWFWMD, 1990a) and Management Plan (SWFWMD, 1990b). These deliberations led to major revisions to the District's water use permitting rules, as special conditions were added that applied to the NTB and other WUCAs.

A WRAP is currently being conducted for the Northern Planning Region (NPR) to gain a better understanding of the water resource issues from Pasco County north to Levy County. Exploratory drilling and testing data are being collected to enhance understanding of the groundwater system, characterize the saline water interface, identify areas of poor groundwater quality, determine the nature of flow to major springs, and provide information for regional flow models. This effort will also assist in the evaluation of future water supply planning assessments and MFL establishment. The CFWI is a collaborative approach to study whether the Floridan aquifer system is reaching its sustainable limits of use and exploring the need to develop additional water supplies. The area includes southern Lake, Orange, Osceola, Seminole, and Polk counties. It is a multi-district effort that includes the St. Johns River, South Florida, and Southwest Florida WMDs. Additionally, stakeholders, such as the FDEP and FDACS, regional public water supply utilities, and others are participating in this collaborative effort that builds on work started for a prior effort called the Central Florida Coordination Area. A CFWI RWSP that included a solutions component was developed in 2015. Current CFWI work is focused on enhancing the regional data collection network and development of the 2020 CFWI RWSP.

Homosassa Springs is included in the District's Springs Management Plan

The District developed a Springs Management Plan (SWFWMD, 2013) that includes Rainbow Springs, Kings Bay, Homosassa Springs, Chassahowitzka Springs, and Weeki Wachee Springs. The plan addresses four priority issues that affect the ecological integrity of the spring systems. The priority issues are flow, water clarity, aquatic vegetation, and fish and wildlife. The plan is a roadmap describing the overall approach the District is taking to conserve and restore the ecology of all springs within its borders. Quantifiable objectives of the plan are aquatic habitat conservation and restoration; MFLs development; water quality standard compliance; and communications plan development. An adaptive management strategy to achieve the objectives is outlined in the plan and it includes planning, monitoring, and restoration components and a list of specific projects.

Section 2. U.S. Geologic Survey 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 been focused on regional hydrogeology, water quality and data collection. Over the years, several groundwater and surface water cooperative projects have been completed in and around the planning region. In addition, a number of projects and data collection activities are in progress. Completed and ongoing cooperative District/USGS investigations and data collection activities are listed in Table 1-2.

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

Investigation Type	Description
Completed Investigations	
Groundwater	Regional Groundwater Flow System Models of the SWFWMD; Cypress Creek, Cross Bar and Morris Bridge Wellfields; and the St. Petersburg Aquifer Storage and Recovery Site.
Surface Water	Statistical Characterization of Lake Level Fluctuations
	Lake Stage Statistics Assessment to Enhance Lake Minimum Level Establishment
	Lake Augmentation Impacts
	Primer on Hydrogeology and Ecology of Freshwater Wetlands in Central Florida
	Methods to Define Storm Flow and Base Flow Components of Total Stream Flow in Florida Watersheds
	Factors Influencing Water Levels in Selected Impaired Wetlands in the NTB Area
Groundwater and Surface Water	Interaction Between the UFA and the Withlacoochee River
	Hydrology, Water Budget, and Water Chemistry of Lake Panasoffkee, West-Central Florida
	Occurrence and Distribution of Nitrate in the Silver Springs Basin
	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
	Surface and Groundwater Interaction in the Upper Hillsborough River Basin
	Relationship Between Groundwater Levels, Spring Flow, Tidal Stage and Water Quality for Selected Springs in Coastal Pasco, Hernando and Citrus Counties
	Surface and Groundwater Interaction in the Upper Hillsborough River Basin
	Hydrologic Characterization of Lake Tsala Apopka
	Relative Importance of Surface-Water and Groundwater Flows to Tsala-Apopka Lake, West-Central Florida
Ongoing Investigations/Data Collection Activities	
Data Collection	MFL Data Collection
	Surface Water Flow, Level and Water Quality Data Collection
	Statewide LiDAR Mapping
	Mapping Actual ET Over Florida Model Support
	Statewide Geostationary Operational Environmental Satellites (GOES) ET Project

Section 3. Water Supply Investigations

Water Supply investigations for the planning region were initiated in the 1960s as part of the U.S. Army Corps of Engineers (USACE) Four River Basins project. The Four River Basins project began as a flood control project developed in response to severe coastal and inland flooding caused by Hurricane Donna in September 1960. The District was formed in 1961 to help implement this federal project, which led to development of several large control structures including the Tampa Bypass Canal (TBC), the Lake Tarpon and Tsala Apopka Outfalls, and the Masaryktown Canal.

Following a period of drought conditions in the mid-1960s that led to numerous dry well complaints, along with findings of project-related ecological studies, there was an apparent need for a broader-based approach to water management than just flood control. The scope of the Four River Basins project was expanded into a more comprehensive effort to assess water resources in the region and determine ways to utilize excess surface water and groundwater for regional water supply solutions. The revised approach led to changes for the TBC design to allow surface water transfers to the City of Tampa; the use of land preservations for water recharge and natural flood attenuation; and the cancellation of other structural projects that would have greatly altered environmental resources.

Control structure at Tsala-Apopka Outfall

Since the 1970s, the District has conducted numerous hydrologic investigations 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 (Chapter 373.0395, F.S.) covering areas deemed appropriate by the WMD's Governing Boards. The District completed inventory reports for the 13 counties predominantly located within its jurisdiction. These reports described the groundwater resources of the individual counties and respective groundwater basins.

Based on the hydrologic assessments and the District's continuous hydrologic and biologic monitoring programs, the District established three WUCAs in the late 1980s in response to observed impacts of groundwater withdrawals. The District subsequently prepared the Water Supply Needs & Sources: 1990–2020 study (SWFWMD, 1992) to assess future water demands through the year 2020 and groundwater supply limitations in some areas. One objective of the study was to optimize resource management to provide for reasonable and beneficial uses without causing unacceptable impacts to water resources, natural systems, and existing legal users. Major recommendations of the study included reliance on local sources to the greatest extent practicable before pursuing more distant sources; requiring users to increase their water use efficiency; and pursuing a regional approach to water supply planning and future development.

In 1997, the Florida Legislature significantly amended Chapter 373, F.S., to include specific regional water supply planning requirements for the WMDs. The statutes were revised to require the preparation of a Districtwide Water Supply Assessment; the designation of one or more water supply planning regions within each district; and the preparation of a RWSP for any planning regions where sources of water were determined to be inadequate to meet future demands. The statute requires the reassessment of the need for a RWSP every five years, and that each RWSP shall be based on a minimum 20-year timeframe (Section 373.0361, F.S.). In response to the amended statutes, the District completed a Water Supply Assessment in 1998 that quantified water supply needs through the year 2020 and identified areas where future demand could not be met with traditional groundwater sources (SWFWMD, 1998). The District published its first RWSP in 2001 for the 10 counties located in the Southern Water Use Caution Area (SWUCA) and NTBWUCA (SWFWMD, 2001). The 2001 RWSP quantified water supply demands through the year 2020 within these counties and identified water supply options for developing sources other than fresh groundwater.

The RWSP was updated in 2006, and the planning period was extended to 2025. The 2006 RWSP concluded that fresh groundwater from the UFA 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 (SWFWMD, 2006). It also concluded that a regional approach to meeting future water demands, including regional transmission systems, was required for some areas that had limited access to alternative water supplies.

The District's 2010 and 2015 RWSP updates (SWFWMD, 2010 and SWFWMD, 2015) extended the planning horizons to 2030 and 2035, respectively, and included four regional volumes covering all counties of the District, based on four planning regions originally defined in previous assessments. For both the 2010 and 2015 RWSPs, it was concluded that the Northern Planning Region demand for water through the respective planning horizons could be met with fresh groundwater; however, the need for additional fresh groundwater supplies could be minimized through the use of available reclaimed water and implementation of comprehensive water conservation measures. This could result in averting impacts, such as those witnessed in other regions.

Section 4. Minimum Flows and Levels Investigations

Extensive field-data collection and analysis is typically required to support MFLs development. These efforts include measurement of water levels and flows, assessment of aquatic and semi-aquatic plant and animal species or communities and their habitats, water quality characterization, and assessment of current and projected withdrawal-related impacts. Ultimately, ecological and hydrological information are linked using some combination of conceptual, statistical and numerical models to assess environmental changes associated with potential flow or level reductions. Goals for these analyses include identifying sensitive criteria that can be used to establish MFLs and prevent significant harm to a wide-range of human-use and natural system values.

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 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 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 was collected and computers became more sophisticated, the models developed by the District have 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

Beginning in the late 1970s, the USGS, with cooperative funding from the District, created several models of the Hernando, Pasco, Pinellas and Hillsborough counties area that were generally used to evaluate effects of withdrawals for specific wellfield areas. Using information from these models, the District (Bengtsson, 1987) developed a transient groundwater model of this area with an active water table to assess effects of withdrawals on surficial aquifer water levels. In 1993, the District completed development of the NTB model, which covered approximately 1,500 square miles from Hernando to Pinellas counties (Hancock and Basso, 1993). Together with monitoring data, the NTB model was used to characterize and quantify the magnitude of groundwater withdrawal impacts occurring in the region. In addition to the models developed by the District and USGS, models have been developed by TBW to support requests for surface water and groundwater withdrawals.

The Northern Planning Region groundwater flow model (also known as the Northern District Model [NDM]) covers the northern half of the District, and portions of the St. Johns and Suwannee River WMDs (HydroGeoLogic, Inc., 2008, 2010, 2011, 2013, Dynamic Solutions Inc. and HydroGeoLogic, Inc., 2016). This model, first completed in 2008, was updated in 2010, 2011, 2013, and most recently in 2016 with version 5. When first developed, the model was unique for west-central Florida in that it was the first regional groundwater flow model that represented the aquifer system as fully three-dimensional. The model contains seven active layers, which include the surficial aquifer or unsaturated zone, the ICU, Suwannee Limestone, Ocala Limestone, Avon Park Formation, Middle Confining Unit (MCU) and the LFA. The model was expanded eastward in 2013 to the St. Johns River to encompass all of Marion County through a cooperatively funded agreement between the District, SJRWMD, WRWSA, and Marion County. The model was expanded at the request of Marion County so that one model could be used by both districts for Marion County water resource investigations. The Northern Planning Region model serves as an important tool to examine potential impacts to wetlands, lakes, springs and the Withlacoochee River from regional groundwater withdrawals. The results of these predictions have been used by the District to support water supply planning assessments and establishment of MFLs.

The Districtwide Regulation Model (DWRM) was developed 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 withdrawal quantities in water use permit (WUP) applications have the potential to cause unacceptable impacts to existing legal users, off-site land uses and environmental systems on an individual and cumulative basis. The DWRM Versions 1, 2, 2.1, and 3 (Environmental Simulations, Inc., 2004, 2007, 2011, 2014) incorporate Focused Telescopic Mesh Refinement (FTMR), which was developed to enable 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 WUP analysis. The DWRM Version 3 simulates groundwater flow of the entire District using a quasi-3D conceptualization of the

Modular finite Difference Groundwater Flow Model code (MODFLOW2005). The DWRM3 simulates groundwater flow in the surficial, intermediate, Upper Floridan, and Lower Floridan aquifers and supports current regulatory functions as a core business process addressed in the District's Strategic Plan.

2.0 Saltwater Intrusion Models

Although regional saltwater intrusion in the NTB and NPR areas is not a significant resource concern, salinity increases have been observed in local areas. Saltwater intrusion models completed for the area include Dames and Moore, Inc. (1988), GeoTrans, Inc. (1991), HydroGeoLogic, Inc. (1992) and Tihansky (2005). These models have generally confirmed the localized nature of saltwater intrusion in the NTB area. HydroGeoLogic, Inc. completed a regional saltwater intrusion model in 2008 that covered the coastal region of Pasco, Hernando, Citrus and Levy counties. This work was completed in conjunction with the development of the Northern District groundwater flow model. Results of the saltwater intrusion model showed no significant regional movement of the saltwater interface over the next 50 years (HydroGeoLogic, Inc., 2008).

3.0 Integrated Groundwater/Surface Water Models

In 1997, SDI-Environmental developed the first fully integrated model of the area that covered an area larger than that of the NTB model. The District worked with TBW to develop a new generation of integrated model, the Integrated Northern Tampa Bay (INTB) model, which was first completed in 2007 with its most recent version finalized in 2013 (Geurink, and Basso, 2013). It covers a 4,000-square-mile area that extends from southern Citrus and Sumter counties to northern Manatee County. This advanced tool combines a traditional groundwater flow model with a surface water model and contains an interprocessor code that links both systems, which allows for simulation of the entire hydrologic system. It can be used to assess changes in rainfall, land use and groundwater withdrawals. The model has been used in MFL investigations of the Anclote, Hillsborough and Pithlachascootee rivers and Crystal and Weeki Wachee springs. The INTB model is used in water supply planning to determine future groundwater availability, evaluate MFLs, and evaluate recovery in the NTB area resulting from the phased reductions in groundwater withdrawals from TBW's 11 central-system wellfields as required by the Partnership Agreement.

Chapter 2. Resource Protection Criteria

This chapter addresses the primary strategies the District employs to protect water resources, which include water use caution areas (WUCA), minimum flows and levels (MFLs), prevention and recovery strategies, reservations, climate change, and establishment of the Central Florida Water Initiative (CFWI).

Part A. Water Use Caution Areas

Section 1. Definitions and History

Water Use Caution Areas (WUCAs) are areas where the District's Governing Board has determined that regional action is necessary to address cumulative water withdrawals that are causing adverse impacts to the water and related natural resources or the public interest. The District has not declared a WUCA in the Northern Planning Region (NPR); however, the St. Johns River Water Management District (SJRWMD) has declared a priority water resource caution area adjacent to the District boundary in Lake and Marion counties.

District regional water supply planning is the primary tool in ensuring water resource sustainability in WUCAs. Florida law requires regional water supply planning in areas where it has been determined that existing sources of water are not adequate for all existing and projected reasonable-beneficial uses, while sustaining the water resources and related natural systems. Regional water supply planning quantifies the water needs for existing and projected reasonable-beneficial uses for at least 20 years, and identifies water supply options, including traditional and alternative sources. In addition, MFLs, established for priority water bodies pursuant to Chapter 373, Florida Statutes (F.S.), identify the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. If the existing flow or level of a water body is below, or is projected to fall below, the applicable minimum flow or level within 20 years, a recovery or prevention strategy must be implemented as part of the regional water supply plan (RWSP). Figure 2-1 depicts the location of the District's WUCAs. In order to determine whether an area should be declared a WUCA, the Governing Board must consider the following factors:

- 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 (NTBWUCA), Eastern Tampa Bay (ETBWUCA), and Highlands Ridge (HRWUCA). For each of the initial WUCAs, a three-phased approach to water resource management was implemented, including: short-term actions that could be put into place immediately, mid-term actions that could be implemented concurrent with the ongoing WRAPs, and 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) in the ETBWUCA. The MIA consists of the coastal portion of the Southern Water Use Caution Area (SWUCA) in southern Hillsborough, Manatee and northern Sarasota counties. Within this area, no increases in permitted groundwater withdrawals from the Upper Floridan aquifer (UFA) were allowed and withdrawals from outside the area could not cause further lowering of UFA levels within the area. The ETBWUCA and HRWUCA were superseded in 1992 by the establishment of the SWUCA, which encompasses the entire southern portion of the District. The NTBWUCA was expanded in 2007 to include an additional portion of northeastern Hillsborough County and the remainder of Pasco County. In 2011, the District established the Dover/Plant City Water Use Caution Area in eastern Hillsborough and western Polk counties following impacts from intense frost/freeze protection withdrawals.

Rural agricultural and pasture lands in the Northern Planning Region

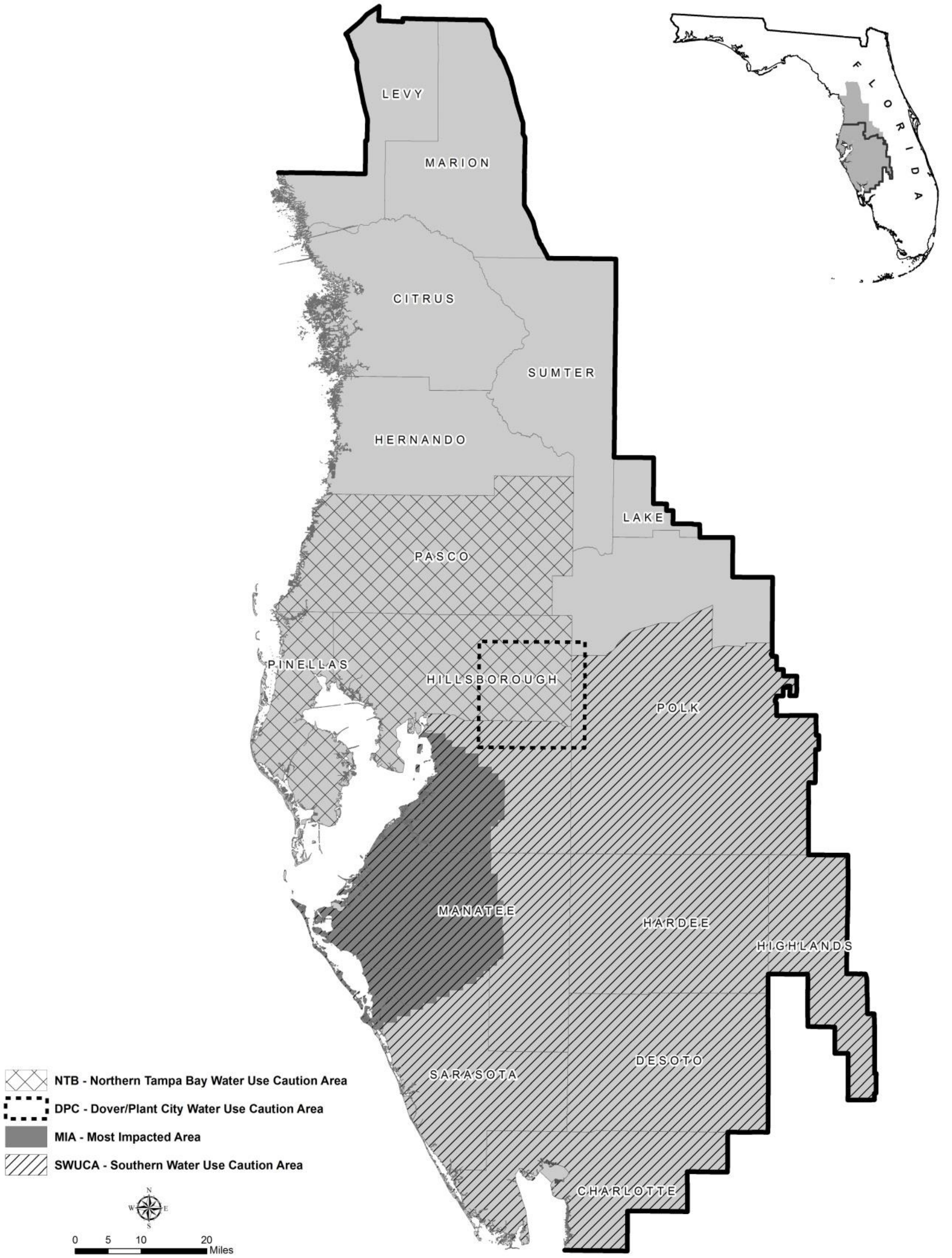


Figure 2-1. *Location of the District's water use caution areas and the MIA of the SWUCA*

Part B. Minimum Flows and Levels

Section 1. Definitions and History

Section 373.042 of the Florida Water Resources Act of 1972 (Chapter 373, F.S.), directs the Florida Department of Environmental Protection (FDEP) or the water management districts (WMDs) to establish minimum flows or minimum water levels, i.e., MFLs, for priority water bodies using the best available information. The minimum flow for a given watercourse is defined by statute as the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The minimum water level of an aquifer or surface waterbody is similarly defined by statute as the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

Minimum flows and levels (MFLs) are established and used by the District for water resource planning; as one of the criteria used for evaluating water use permit (WUP) applications, and for the design, construction and use of surface water management systems. Water bodies with MFLs benefit from District funding of water resource and water supply development (WSD) projects that are part of a recovery or prevention strategy identified for achieving an established MFL. The District's MFLs program addresses all MFLs-related requirements expressed in the Florida Water Resources Act and the Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code [F.A.C.]).

Section 2. Priority Setting Process

In accordance with the requirements of Sections 373.036(7) and 373.042(2), F.S., the District annually updates its priority list and schedule for the establishment of MFLs. As part of developing the priority list and schedule, which also identifies water bodies scheduled for development of reservations, 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.
- Stakeholder input.

The updated priority list and schedule is submitted to FDEP for approval by November 15th each year and, as required by statute, is published in the District's Consolidated Annual Report. The District's current priority list and schedule is also posted in the District website and is included in the Chapter 2 Appendix to this RWSP.

Section 3. Technical Approach to the Establishment of Minimum Flows and Levels

District methods used to establish MFLs for wetlands, lakes, rivers, springs and aquifers are briefly summarized in the Chapter 2 Appendix to this RWSP. Additional details regarding MFLs methods are provided in District rules (Chapter 40D-8, F.A.C.) and within MFLs reports that are developed for individual priority water bodies and posted on the District website. Refinement and development of new MFLs methods, ongoing and new data collection efforts ensure that MFLs are established and reevaluated, as necessary, using the best available information.

The District's technical approach for MFLs development assumes that alternative hydrologic regimes may exist that differ from historic conditions but are sufficient to protect water resource features 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 small withdrawals that have no measurable effect on the historic regime to large withdrawals that could substantially alter the regime. A threshold hydrologic regime may exist that includes water levels of flows that are lower or less than those of the historic regime, but which protects the water resources and ecology of the system from significant harm. This threshold regime could conceptually allow for water withdrawals, while protecting the water resources and ecology of the area. MFLs established based on such a hydrologic regime may therefore represent minimum acceptable, rather than historic or potentially optimal, hydrologic conditions.

1.0 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 establish MFLs. In addition, the District or FDEP may decide to voluntarily subject MFLs to independent scientific peer review, based on guidelines provided in Rule 62-40.473, F.A.C.

Currently, the District voluntarily seeks independent scientific peer review of methods used to develop MFLs for all water body types. Similarly, the District voluntarily seeks peer review of MFLs proposed for all flowing water bodies and aquifer systems, based on the unique characteristics of the data and analyses used for the supporting analyses.

Section 4. Established and Proposed Minimum Flows and Levels

Figure 2-2 depicts priority MFLs water resources as of October 22, 2019, that are in or partially within the Northern Planning Region. A complete list of water resources with established MFLs in the District is provided in the Chapter 2 Appendix.

Water resources with established MFLs within or extending into the planning region include the:

- Chassahowitzka River System and Spring Group and Blind Spring;
- Citrus County Lakes – Ft. Cooper, Tsala Apopka – Floral City, Inverness and Hernando Pools;
- Crystal River/Kings Bay Spring Group (OFS);
- Gum Slough Spring Run;

- Hernando County Lakes – Hunters, Lindsey, Mountain, Neff, Spring, Tooke, Weekiwachee Prairie, and Whitehurst;
- Homosassa River/Homosassa Spring Group (OFS);
- Levy County Lake – Marion;
- Marion County Lakes – Bonable, Little Bonable, and Tiger;
- Rainbow River/Rainbow Spring Group (OFS);
- Sumter County Lakes – Big Gant, Black, Deaton, Miona, Okahumpka, and Panasofkee;
- Weeki Wachee River System and Springs (includes Weeki Wachee, Jenkins Creek, Salt, Little Weeki Wachee and Mud River Springs).

Priority water resources within or extending into the planning region for which MFLs have not yet been established or are being reevaluated include the:

- Withlacoochee River (lower segment) Withlacoochee River (upper segment, U.S. Geological Survey Holder gage to U.S. Geological Survey Wysong gage);
- Withlacoochee River (upper segment, U.S. Geological Survey Wysong gage to U.S. Geological Survey Croom gage);
- Withlacoochee River (upper segment, upstream of U.S. Geological Survey Croom gage; located partially in the Tampa Bay Planning Region and Heartland Planning Region)

Jenkins Creek

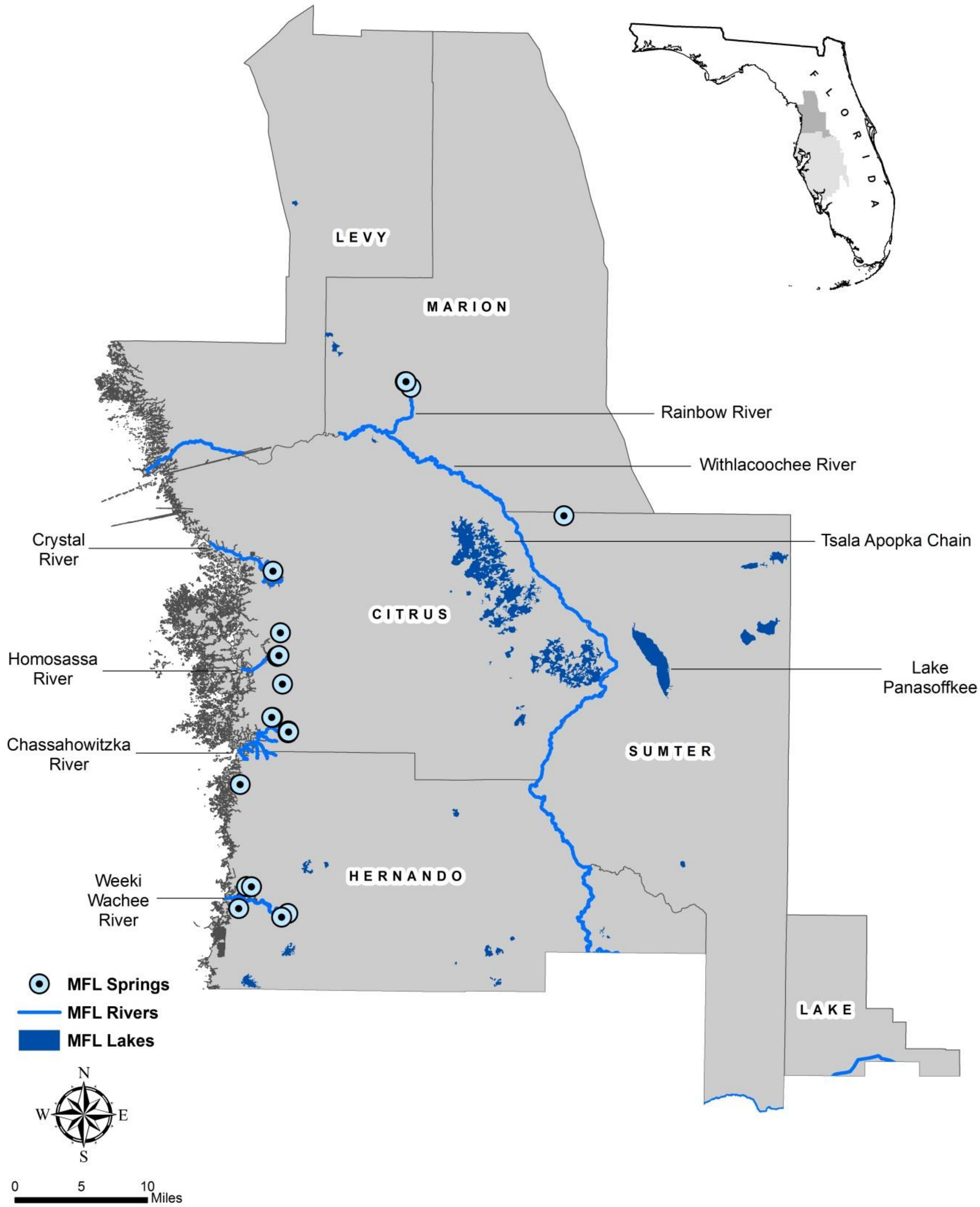


Figure 2-2. *MFL priority water resources in the Northern Planning Region*

Part C. Prevention and Recovery Strategies

Section 1. Prevention Activities

Section 373.0421(2), F.S., requires that a prevention strategy be developed if within 20 years the flow or level in a water body is projected to fall below an applicable MFL. 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 the development of a RWSP for the Northern Planning Region, the District and other entities in the region are engaged in additional water resource assessments and planning efforts that are coordinated with and complement those of the District. A goal of these efforts is to ensure that future water supply demands will be met without adversely impacting proposed or established MFLs. These activities are discussed below.

1.0 Northern Planning Region Strategy

In response to rapidly increasing development pressure in the planning region, the District developed a process in 2006 to evaluate options for long-term water resource management. The strategy focuses on minimizing current and future water use through best management and conservation practices so that use of groundwater as a source of supply can be extended as long as possible prior to the development of alternative water sources (AWSs). The strategy is being implemented to prevent significant water resource impacts, such as those that have occurred in the Tampa Bay, Heartland and Southern planning regions.

Principal goals of the strategy are to develop short-term measures that can be implemented to optimize the use of available groundwater to meet future demands while preventing unacceptable impacts to water resources. The Northern Planning Region strategy emphasizes three primary courses of action to address the issues of water demand and water supply in the planning region: resource monitoring, enhanced conservation and reuse, and collaborative regional water supply planning.

In 2014, the District adopted rules to expand the public supply (PS) permit holder per capita water use requirements that existed in the WUCAs to those areas of the District that were not subject to them. The requirements include the calculation of per capita water use according to adopted SWUCA rules and service area population estimation methodology, the submission of an annual per capita water use report and associated data via the annual PS survey, refined service area delineation requirements and reporting, calculation of reclaimed and stormwater credits, and a phased-in utility per capita compliance of 150 gallons per person per day by December 31, 2019.

The District has also expanded water conservation rules that were in effect for the SWUCA and NTBWUCA to the entire District. Enhanced conservation standards for this planning region include requirements to submit a conservation plan, eliminate irrigation of golf course roughs, justify unused permitted quantities, submit reclaimed water feasibility evaluations, submit reclaimed water suppliers reports, submit AWS receiver reports and, for water supply permit holders, implement water conserving rate structures. Finally, the District has conducted a public outreach campaign to engage stakeholders, decision-makers, residents, and regulated communities. Efforts have included a conservation summit for local governments and utilities, individual meetings with local government staff, and joint coordination meetings with the Withlacoochee Regional Water Supply Authority (WRWSA), the Withlacoochee Regional Planning Council, news-media editorial boards, and other agencies.

2.0 Withlacoochee Regional Water Supply Authority Master Regional Water Supply Planning and Implementation Program

The District cooperated with the WRWSA to update the WRWSA RWSP for 2019. The plan reviews potential water supply project options based on 2040 population projections and possible member partnerships. The update addresses how conservation and water reuse can prolong the availability of current water resources. An assessment of PS water conservation in the WRWSA four-county region was conducted for the planning period using the Water Conservation Tracking Tool that was developed by the Alliance for Water Efficiency. The update includes recently studied Lower Floridan aquifer resources in its list of water supply project options, along with options for traditional groundwater, desalination, surface water, conservation, and reclaimed water availability based on updated population and MFLs criteria. The update incorporated numerous changes to regulatory and economic factors affecting demands and source availability. Cost estimates and supply quantities for project options were recalculated by the WRWSA and are incorporated within the District's 2020 RWSP.

The WRWSA first developed their Master Regional Water Supply Plan in 1995, and a 2005 Regional Water Supply Master Plan Update was completed in March 2007. A 2010 Feasibility Analysis was developed following Marion County's inclusion into the WRWSA in 2008 and provided a revised list of proposed water supply, reclaimed water optimization, and water conservation options. Each update included population projections for Authority members, the associated water demands, and water supply options that could be developed to meet those demands. The 2014 and 2019 updates continue the WRWSA's efforts to provide a regional approach to planning and developing cost-effective, sustainable water supplies for its member governments.

Northern Planning Region modeling and technical support for local communities is being conducted simultaneously with the WRWSA water supply planning efforts. The District entered into a cooperative agreement with the SJRWMD, Marion County, and the WRWSA to expand and recalibrate the Northern District groundwater model eastward to the St. Johns River in 2013. This project was completed in November 2013, and the final report and model files were submitted to all parties. The Northern District version 4.0 model has been run from non-pumping to 2035 pumping conditions to note regional changes in aquifer levels, springflow, and Withlacoochee River flow. This information was used by the WRWSA to update groundwater availability in their 2014 RWSP. As part of the District's 2020 RWSP update, the Northern District version 5.0 model, completed in 2016, was run from non-pumping to 2040 pumping conditions to note regional changes in aquifer levels, springflow, and Withlacoochee River flow. The District again worked cooperatively with the WRWSA for their 2019 RWSP update. In addition to joint groundwater modeling efforts, the WRWSA provides qualified expertise and technical support to local member communities to help them prepare and interpret technical modeling data.

3.0 Springs Management

There are more than 150 documented springs within the District. Most of these springs have experienced significant ecological changes over the past half century as a result of natural variability and human activities. The District developed a Springs Management Plan in 2013 (SWFWMD, 2013) that included a general restoration strategy, an overview of the goals and issues, and a list of proposed projects for the five-year period from 2013-2017. The plan recognizes the need to manage all springs within the District; however, it places a priority on the five first-magnitude spring groups: Rainbow, Kings Bay, Homosassa, Chassahowitzka, and Weeki Wachee. The vision for this effort is to conserve and restore the ecological balance of spring systems, thereby supporting regional economies and quality of life.

Weeki Wachee Springs, Hernando County, is a first-magnitude spring

The ecological integrity of springs may be based on four attributes: flow, water clarity, aquatic vegetation, and fish and wildlife. District management actions are intended to maintain these attributes for springs that are healthy and restore attributes that have been degraded. Five priority issues common in the five first-magnitude spring groups are habitat loss, nutrient enrichment, flow declines, salinity increase, and water use. These issues are addressed by the Springs Management Plan, which is designed to be an adaptive management strategy. An adaptive management strategy allows for the plan to be refined, as the considerable uncertainty about the causes of ecologic degradation is reduced through research and project implementation. Monitoring will be a key component of adaptive management, both for identifying the causes of ecological changes and evaluating the effects of restoration activities to optimize ecosystem management.

The adaptive management strategy is comprised of several components with associated projects or programs. Projects include natural systems restoration, water quality restoration, monitoring that includes data collection and mapping, research and development, and reclaimed WSD. Looking into the future, the District will create specific management plans for each of the five first-magnitude spring groups. As management of these springs progresses, the second–magnitude and smaller springs will receive increased attention. The District will also continue to develop partnerships with other agencies and stakeholders, such as the Springs Coast Steering Committee, so the full range of issues and values associated with springs are considered.

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 body is below an applicable MFL. The District has established recovery strategies by rule in Chapter 40D-80, F.A.C. When an MFL for a water resource is not being met or, as part of a recovery strategy, is not expected to be met for some time in the future, the District will first evaluate the established MFL in light of any newly obtained scientific data or other relevant information to determine whether or not it should be revised. If no revision is necessary, management tools that may be considered include the following:

- Developing AWSs.
- Implementing structural controls and/or augmentation systems to raise levels or increase flows in water bodies.
- Reducing water use through conservation.
- Reducing water use permitting allocations.

District water resource assessments and MFL investigations have so far concluded that recovery strategies are not required in the Northern Planning Region.

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…” Reservations of water are established by rule.

The District will consider establishing a reservation of water when a District water resource development project will produce water needed to achieve adopted MFLs. The rule-making process associated with reservation adoption 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. 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. There are currently no plans to establish a reservation in the Northern Planning Region.

Part E. Climate Change

Section 1. Overview

Climate change has been a growing global concern for several decades. According to the Intergovernmental Panel on Climate Change (IPCC), the global mean average land and ocean temperatures have likely increased approximately 1.4 to 2.2°F from pre-industrial levels (IPCC, 2018). Such increases are driving a slow but persistent increase in sea levels and are altering precipitation regimes. These conditions will likely have local impacts including changes to natural habitats, encroachment of seawater into surface and groundwater resources, risk to public infrastructure, warmer temperatures that increase evaporation and impact agriculture, and changes to seasonal and annual rainfall patterns. Climate change is a global issue that requires international coordination and planning, although strategies for assessing vulnerabilities and developing adaptation plans are necessary on the local, regional, and statewide level.

In recent years, numerous agencies and organizations in Florida have developed initiatives to address climate change. Many of the state’s Regional Planning Councils (RPCs) have pooled resources and are developing vulnerability assessments, climate adaptation plans, and post-disaster redevelopment plans for member communities. The Florida Department of Environmental Protection’s Community Resilience Initiative provides planning tools and promotes collaboration among RPCs and coastal communities. The WMDs and other agencies participate in focus groups organized by RPCs, Florida Sea Grant, and other entities to consolidate climate information, develop consistent approaches to planning, and provide technical expertise when appropriate. Other participants in these initiatives include the National Weather Service; regional water supply authorities; state universities; and Florida Fish and Wildlife Conservation Commission, Department of Transportation, Department of Health, Department of Environmental Protection, and the Division of Emergency Management.

Climate change is one water supply challenge among others such as droughts, water quality deterioration, and limitations on the availability of water resources. This section of the RWSP addresses climate issues for water supply planning, identifies current management strategies in place to address these concerns, and considers future strategies necessary to adaptively manage water supply resources.

Section 2. Possible Effects

The District's water supply planning efforts may be affected by climate change in three primary ways: sea level rise, air temperature rise, and changes in precipitation regimes.

1.0 Sea Level Rise

Data from the NOAA tide gauge in St. Petersburg shows that monthly mean water levels have already increased 7.8 inches from the gauge's first reliable records in 1946 to 2019 (CSAP, 2019). The latest NOAA projections over this report's 20-year horizon (2020-2040) estimate that local sea levels will rise by 3.5 inches based a linear extrapolation, 4.3 inches by factoring the likely acceleration, and over 12 inches if accounting for potential polar ice sheet instabilities. With a 50-year horizon (2020-2070), a common lifecycle for infrastructure design, the NOAA projections range from 9 inches to over three feet (Sweet et al, 2017).

Sea level rise is likely to stress the District's water resources in a variety of ways. The inundation or upward migration of coastal wetlands may affect their ability to improve the quality of stormwater runoff and provide natural habitats. Estuarine water encroachment in coastal rivers may reduce the viable withdrawal periods at non-isolated freshwater intakes of water treatment facilities. Saltwater intrusion reduces water quality in aquifers that supply urban, agricultural, and industrial water users. Aging municipal sewer systems can experience infiltration that reduces the quality of reclaimed water currently used to offset fresh water demands.

Sea level rise is projected to occur relatively slowly, although persistently, which allows time to thoroughly evaluate the impacts to natural resources and public infrastructure, plan and implement adaptation strategies, and continue to use most existing coastal infrastructure for several decades. The cost of initiating sea level rise planning or incorporating it into other existing efforts is relatively low compared to disaster recovery efforts.

2.0 Air Temperature Rise

The IPCC estimates that current green-house emission levels will cause mean global air temperatures to reach or stabilize at approximately 2.7°F above pre-industrial levels (1850-1900) by the end of this century, with greatest warming at inland and polar regions (IPCC, 2018). The impacts to southwest Florida will likely be more hot days and few cold days seasonally. Evaporation is likely to increase with a warmer climate, which could result in lower surface water levels and increased irrigation demand. Increased evaporation is likely to impact stormwater runoff, soil moisture, groundwater recharge, and reservoir storage losses (Bates et al., 2008). Additionally, higher air temperatures may exacerbate algal blooms and declines in reservoir water quality that could raise treatment costs for potable water supply.

3.0 Precipitation Regimes and Storm Frequency

Increasing temperatures are expected to change global precipitation patterns, although changes will likely be more pronounced in the earth's tropical and temperate zones. Southwest Florida, being sub-tropical, has climatic precipitation patterns largely influenced by Atlantic multidecadal oscillations (AMO) of ocean sea surface temperatures, along with shorter-term El Nino southern oscillations (ENSO). The AMO warm periods tend to make the region's summer-fall seasons wetter, while strong ENSO phases, caused by warming in the eastern Pacific, make the region's winter and spring seasons wetter (Cameron, 2018). An AMO warm phase is currently in effect.

Warming temperatures in the Atlantic and Gulf of Mexico can increase the likelihood of intense tropical storms and hurricanes that can generate storm surge, strong winds, and heavily concentrated rainfall. Hurricane activity near Southwest Florida is statistically more common during AMO warm periods. Higher summer temperatures and humidity may also increase the frequency of local convective weather events, resulting in thunderstorms, higher peak surface water flows, and increased flooding in some areas (Groisman et al., 2005).

Section 3. Current Management Strategies

The District has taken several steps to address the management of water resources that will also benefit efforts to plan and prepare for climate change impacts. 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 for natural systems and 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 due to groundwater withdrawal impacts, 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 Coastal Groundwater Quality Monitoring and Water Use Permit networks are the largest and longest ongoing well sampling networks of their kind at the District. The networks currently have a combined total of over 350 wells that cover 13 counties, and new wells have been added to the networks at a rate of 5 to 10 wells per year. Having long-term water quality data will become increasingly important with continued demands for groundwater withdrawals in the District and statewide. Although the entire coastal region of the District is included in the monitoring effort, much emphasis is placed on the southern region of the District formally designated as the SWUCA due to regional saltwater intrusion occurring in southwest Hillsborough, Manatee, and northwest Sarasota Counties. District staff is also determining how to use or modify existing groundwater models to predict density and water-level driven changes to aquifers utilized for water supply. Through cooperative funding, the District is assisting water utilities and regional water supply authorities with wellfield evaluations for improving withdrawal operations and planning for brackish treatment upgrades.

The District also encourages maximizing the use of diverse water supply sources and establishing system redundancies to ensure a resilient water supply. The District promotes water conservation across all use sectors, including agricultural and industrial uses, which not only saves supplies for the future but also reduces chemical and energy use. Through partnerships, the District continues to increase the availability and use of reclaimed water, the development of wet-weather storage facilities, and enhanced water efficiencies. 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 helps to fund environmentally sustainable and drought-resistant water supply options such as reclaimed water, stormwater reuse, brackish groundwater treatment, surface water reservoirs, aquifer storage and recovery (ASR), aquifer recharge (AR), and seawater desalination.

Section 4. Future Adaptive Management Strategies

While ongoing District efforts can provide critical information and allow flexibility to accommodate future changes in water supply, local governments and industries are principally tasked with developing and communicating the appropriate risk assessment and adaptation strategy for each municipality or other significant water user. The commonly evaluated community adaptation strategies can be grouped into three generalized approaches: armament, accommodation, or organized retreat. The District is able to provide a supporting role during the planning and implementation for each of these approaches.

- Armament. An armament strategy involves the erection of defensive barriers such as dykes and pumping systems to protect existing infrastructure from storm surges and sea level rise. Armament may be a preferred approach for dense urban and commercial areas, although they may limit transitional natural habits and create an effective tipping point for inundation. The community’s existing water supply infrastructure and demand centers would be maintained.
- Accommodation. An accommodation strategy utilizes improved infrastructure such as elevated roads and buildings and canal systems that allow coastal inundation to occur. Accommodation strategies may suit growing municipalities that can apply innovative community planning to assure longevity. The District’s water supply planning efforts may involve the technological development of AWSs including AR systems, direct and indirect reuse, and reverse osmosis treatment options for these communities. The District would also have a role in assuring the transitional health of water bodies.
- Organized Retreat. An organized retreat strategy may involve the rezoning of property threatened by inundation, or transfer to public ownership, potentially through rolling easements or post-disaster development plans. Retreat strategies typically include ecological engineering projects to assist the transition of natural habitats that will also provide shelter to upland infrastructure.

The District would account for these strategies through the five-year update schedule of the RWSP. The schedule allows sufficient time to anticipate transitional changes to population centers in the water demand projections, and to develop appropriate water supply options. Continued development of regionally interconnected water systems also allows large-scale water treatment facilities to adjust distribution to new demand locations.

Climate change may have a 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 the 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. For these reasons, the District is maintaining a "monitor and adapt" approach toward the protection of natural resources from 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 our region as the effects of climate change become more evident.

Part F. Central Florida Water Initiative

Section 1. Formation

The Central Florida Water Initiative (CFWI) focuses on the CFWI Planning Area, which includes southern Lake, Orange, Osceola, Seminole and Polk counties (see Figure 2-3). The CFWI was undertaken to provide a coordinated approach for water management in a region where the boundaries of three WMDs intersect and where water withdrawals in one district may impact water resources and water users throughout the area. The District, along with the SJRWMD, SFWMD, FDEP, Florida Department of Agriculture and Consumer Services (FDACS), regional public water supply utilities and other stakeholders are collaborating on the initiative to develop a unified process to address current and long-term water supply needs in central Florida. The guiding principles of the CFWI are to:

- Review and update the 2015 CFWI RWSP as well as the sustainable quantities of traditional groundwater sources available in the CFWI area that can be used without causing unacceptable harm to the water resources and associated natural systems.
- Monitor progress of regional strategies and solutions identified in the 2015 CFWI Plan; review and update strategies to meet water demands that are in excess of the sustainable yield of existing traditional groundwater sources.
- Establish consistent rules and regulations for the three WMDs that meet the Collaborative Process Goals and implement the results of this CFWI.
- Encourage funding for regional strategies necessary to achieve the objectives of the CFWI.

Section 2. Central Florida Water Initiative Regional Water Supply Plan

The first ever RWSP for the CFWI Planning Area was prepared and approved in 2015. The 2015 CFWI RWSP addressed water demand estimates and projections, assessment of water resources and, in conjunction with a Solutions Plan component, development of feasible water supply and water resource development options that would meet future water supply needs in a manner that sustains the water resources and related natural systems. Modeling results and groundwater availability assessments concluded that fresh groundwater resources alone cannot meet future water demands in the CFWI Planning Area without resulting in unacceptable impacts to water resources and related natural systems. Assessments identified areas susceptible to the effects of groundwater withdrawals, including the Wekiva Springs/River System, western

Seminole and Orange counties, southern Lake County, the Lake Wales Ridge, and the portion of the SWUCA in Polk County. The evaluations also indicated that expansion of withdrawals associated with projected demands through 2035 could increase the existing areas of water resource stress within the CFWI Planning Area. The 2015 CFWI RWSP identified 142 potential WSD project options that could potentially provide up to 411 million gallons per day of additional water supply, including maximized use of reclaimed water, increased water storage capacity, limited use of fresh and brackish groundwater, use of surface water, and use of desalinated seawater.

The CFWI Solutions Planning Team, consisting of representatives from the WMDs, FDEP, FDACS, PS utilities, the agricultural industry, environmental groups, business representatives, and regional leaders used the 2015 CFWI RWSP to further develop specific water supply projects through partnerships with water users. The final work product of the Solutions Planning Team was the CFWI 2035 Water Resources Protection and Water Supply Strategies document, which was incorporated into the CFWI RWSP. The document also includes the necessary financing, cost estimates, potential sources, feasibility and permitting analysis, identification of governance structure options, and any potential recovery needs. The 2020 CFWI RWSP is currently under development, with ongoing coordination occurring to ensure consistency is maintained between the CFWI RWSP and the District's RWSP.

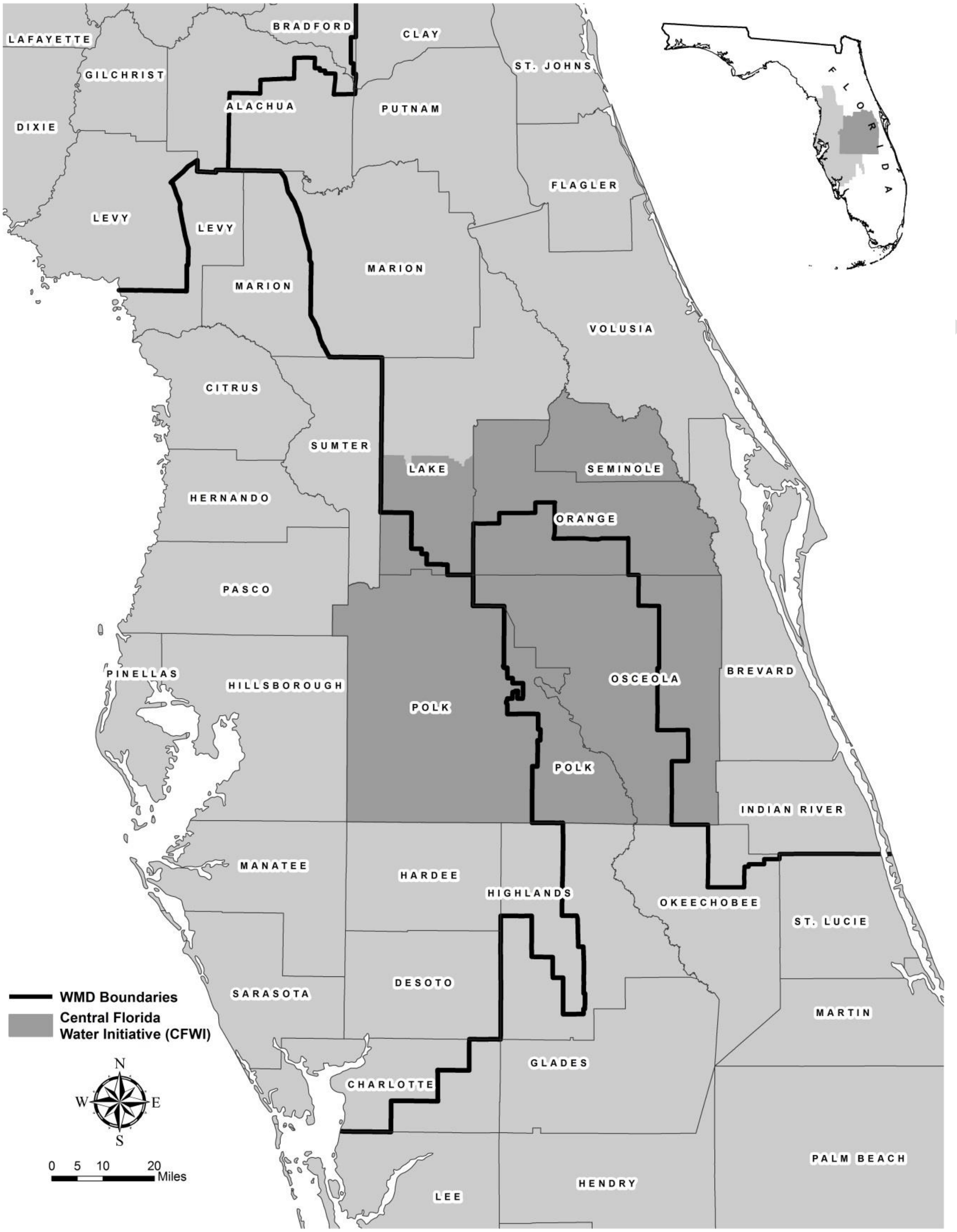


Figure 2-3. *Location of the Central Florida Water Initiative Area*

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Chapter 3. Demand Estimates and Projections

This chapter is a comprehensive analysis of the demand for water for all use categories in the Northern Planning Region for the 2015 to 2040 planning period. The chapter includes 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. The Southwest Florida Water Management District (District) projected water demand for the public supply (PS), agricultural (AG), industrial/commercial (I/C), mining/dewatering (M/D), power generation (PG) and landscape/recreation (L/R) sector for each county in the planning region. 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.

The demand projections represent those reasonable and beneficial uses of water that are anticipated to occur through the year 2040. The District determined 5-in-10 (average condition) and 1-in-10 (drought condition) demands for each five-year increment from 2015 to 2040 for each sector. The demand projections for counties located partially in other water management districts (WMDs) (Lake, Levy and Marion) reflect only the anticipated demands in those portions located within the District's boundaries.

General reporting conventions for the Regional Water Supply Plan (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 Florida Department of Environmental Protection (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:

- <u>Establishment of a base year</u>: The year 2015 was agreed upon as a base year to develop and report water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group. The data for the base year consists of reported and estimated usage for 2015; whereas, data for the years 2020 through 2040 are projected demands.
- <u>Water use reporting thresholds</u>: Minimum thresholds of water use within each water use category were agreed upon as the basis for projection.
- <u>5-in-10 versus 1-in-10</u>: 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 I/C, M/D, and PG. In general, demand is reported for a 5-in-10 average annual effective rainfall condition and a 1-in-10 drought year condition (an increase in water demand having a 10 percent probability of occurring during any given year).

The projected demand represents the total amount of water required to meet reasonable and beneficial water needs through 2040. 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 sectors: (1) PS, (2) AG, (3) I/C, M/D, (4) PG, and (5) L/R. The categorization provides for the projection of demand for similar water uses under similar assumptions, methods and reporting conditions.

Section 1. Public Supply

1.0 Definition of the Public Supply Water Use Sector

The PS sector consists of four subcategories: (1) large utilities (permitted for 0.1 million gallons per day [mgd] or greater), (2) small utilities (permitted for less than 0.1 mgd), (3) domestic self-supply (DSS) (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 [WUP]) and (4) additional irrigation demand (water from domestic wells that do not require a WUP 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 2015 would be the base year from which projections would be determined. The District calculated the 2015 population by extrapolating back from GIS Associates, Inc.'s 2016 population estimate. Utilities with permitted quantities less than 100,000 gallons per day (gpd) are not required to report population or submit service area information. Consequently, population was obtained from the previously issued permit.

2.2 Methodology for Projecting Population

The population projections developed by the University of Florida's 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. Subsequently, the District's projections are BEBR projections disaggregated to land parcel level, which is the smallest area of geography possible for population studies. In turn, these parcel-level projections are normalized to the BEBR medium projection for the counties. Using this methodology, the District contracted with GIS Associates, Inc. to provide small-area population projections for the 16 counties entirely or partly within the District.

3.0 2015 Base Year Water Use and Per Capita Rate

3.1 Base Year Water Use

The 2015 PS base year water use for each large utility is derived by multiplying the average 2011-2015 unadjusted gross per capita rate by the 2015 estimated population for each individual utility. For small utilities, per capita information is found in the last issued permit. If no per capita information is available, the per capita is assumed to equal the average county per capita. Base year water use for small utilities is obtained by multiplying the per capita from the current permit by the 2015 estimated population from the last issued permit. Domestic self-supply (DSS) base year is calculated by multiplying the 2015 DSS population for each county by the average 2011-2015 residential countywide per capita water use.

4.0 Water Demand Projection Methodology

4.1 Public Supply

Water demand is projected in five-year increments from 2020 to 2040. To develop the projections, the District used the 2011-2015 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 inches, do not require a WUP 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 (DSS) is any portion of the county population not served by a utility. County DSS population estimates and projections were calculated as the difference between the total county population estimate or projection and the total population served by the utilities. For counties that are in multiple districts, only that portion of the population within the District was included.

5.0 Water Demand Projections

Table 3-1 presents the projected PS demand for the planning period. The table shows that demand will increase by 41.2 percent or 36.77 mgd for the 5-in-10 condition. These projections are lower than those in the District's 2015 RWSP. The differences can be attributed to slower than anticipated regional population growth and more accurate utility level population projections using a GIS model which accounts for growth and build-out at the parcel level.

Table 3-1. *Projected PS demand, DSS, and private irrigation wells in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2015 Base		2020		2025		2030		2035		2040		Change 2015-2040		% Change	
	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
Citrus	19.95	21.14	20.87	22.13	21.74	23.04	22.46	23.81	23.06	24.44	23.53	24.95	3.58	3.81	17.9%	18.0%
Hernando	24.32	25.78	26.20	27.77	27.94	29.62	29.42	31.19	30.75	32.60	31.88	33.80	7.56	8.02	31.1%	31.1%
Lake	0.14	0.15	0.17	0.18	0.20	0.21	0.24	0.25	0.27	0.29	0.31	0.33	0.17	0.18	121.4%	120.0%
Levy	1.62	1.72	1.68	1.78	1.73	1.83	1.77	1.87	1.80	1.91	1.82	1.93	0.20	0.21	12.3%	12.2%
Marion	15.21	16.13	16.69	17.69	18.01	19.09	19.16	20.30	20.25	21.47	21.29	22.56	6.08	6.43	40.0%	39.9%
Sumter	27.96	29.64	33.05	35.03	37.15	39.38	40.63	43.07	44.10	46.75	47.14	49.97	19.18	20.33	68.6%	68.6%
Total	**89.20**	**94.56**	**98.66**	**104.58**	**106.77**	**113.17**	**113.68**	**120.49**	**120.23**	**127.46**	**125.97**	**133.54**	**36.77**	**38.98**	**41.2%**	**41.2%**

Note: Summation and/or percentage calculation differences occur due to rounding. See Appendix 3-3 for source values.

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 Sector

Agriculture represents the second largest sector of water use in the District after PS. Included in this category are irrigated crops and other miscellaneous water uses associated with agricultural commodity production within the District. Irrigation demand was determined and reported in the RWSP for each of the following major categories of irrigated crops: (1) citrus, (2) field crops, (3), fruits (non-citrus), (4) greenhouse/nursery, (5) hay, (6) potatoes, (7) sod, and (8) fresh market vegetables. Most of these crop categories are self-explanatory, but some include several crops which are grouped together for reporting purposes by Florida Department of Agriculture and Consumer Services (FDACS). The fruits category includes several prominent crops in the District, such as strawberries, blueberries, and peaches, and the fresh market vegetables category includes tomato production along with cucumbers, peppers and other vegetables. Water demands associated with non-irrigated agriculture such as aquaculture and livestock were also estimated and projected.

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 developed by the FDACS as part of the Florida Statewide Agricultural Irrigation Demand (FSAID5) projections through 2040. These projections were based on trends in historic National Agricultural Statistics Service irrigated acreage data. Irrigation requirements were adjusted from the FSAID5 demands and were based on permit-level metered water use data. Where possible, permit by permit water use rates were maintained, and in non-metered operations, average application rates were developed for each crop category by county. Per acre water use for each crop category was held constant, and changes in projected water demands are based on increases or decreases in irrigated acreages for each crop type. The methodologies are described, and data provided in more detail, in Appendix 3-1.

Non-irrigation demand (e.g., aquaculture and livestock) was based on a combination of metered water use at the permit level and estimated demands from the FSAID5 geodatabase which were based primarily on livestock count data and water demands per head. The projected trends were based on the FSAID5 projections, and demands were held steady throughout the planning period, based on steady statewide livestock counts and lack of data upon which to make better projections. The methodologies are described, and data provided in more detail, in Appendix 3-1.

In addition to the method developed by the District, which is based on the FSAID5 acreage projections and District metered water use rates, the FDACS has also developed a complete set of alternate water use projections through 2040. The District elected to use its modified FSAID5 approach to meet the statutory directive to use the best available data in developing agricultural water use projections. In this case, the District has extensive metered data on agricultural water use at the permit level, and the use of direct metered water use application rates will provide a more accurate assessment of local water use than synthesized modeled water use rates. This allows the District projections to capture permit-level and regional variations in grower irrigation practices. This also means that the application rates in the projections will also be reflective of the progress made in agricultural conservation through the District's Facilitating Agricultural Resource Management Systems program and other regional efforts such as the Southern Water Use Caution Area Recovery Strategy.

3.0 Water Demand Projections

Agriculture in the Northern Planning Region has historically been practiced at a considerably smaller scale than in the District's planning regions to the south, however, FDACS projects that irrigated acreage in the planning region is expected to increase significantly over the 2016 to 2040 timeframe. Irrigated acreage is expected to increase by nearly 60 percent, from 22,700 acres in 2016 to over 36,000 acres in 2040. This projection indicates that the Northern Planning Region would be the fastest growing agricultural region in the District. Total agricultural water use in this region has been relatively steady in this region since the 1990s and has hovered between 20 and 30 mgd from 2001 to 2014 depending on rainfall patterns. There was a slight decrease in water use in the 2014-2016 range, when average water use was about 19 mgd.

Current average year demands are estimated at 18.4 mgd for 2016 acreage levels. In 2040, the District projects that the projected increase in acreage will result in a 45 percent increase in water demands to about 26.7 mgd for a typical year. Most of the increase in acreage will be in fresh market vegetables and field crops, with smaller increases in hay and fruits (likely blueberries). Field crops are expected to continue to make up the majority of irrigated acres. FDACS forecasts that the SWFWMD portions of Levy and Marion counties will gain nearly 14,000 acres of irrigated land, while Sumter county is expected to have a 50 percent decrease in irrigated acreage of about 1,900 acres. The Northern Planning Region lies north of the freeze line and has historically had significantly different agricultural patterns than counties further to the south, with significantly more field crop production and minimal citrus acreage. Additionally, the Northern Planning Region is located farther from the Tampa-Orlando I-4 corridor and experiences less development pressure than more urban areas, with the exception of The Villages development and surrounding areas. These trends are expected to continue into the future as irrigated agriculture expands in the region. Table 3-2 displays projected combined agricultural irrigation and non-irrigation demands for the 5-in-10 (average) and 1-in-10 (drought) conditions for the planning period.

4.0 Stakeholder Review

District staff began presenting draft agricultural demand projections to our Agricultural and Green Industry Advisory Committee, permit evaluation staff, and FDACS staff in September 2018. The District additionally requested input from the Agricultural and Green Industry Advisory Committee on the FSAID5 water use projections and methodology as well as the adjusted FSAID5 method developed by the District. The Committee wished to take time to consider the proposed methods and adjourned to solicit feedback from industry groups and other stakeholders. In October 2018, the Committee reconvened, and District staff provided an additional presentation on the potential agricultural projections methods and draft results. Stakeholders present included representatives from the Florida Turfgrass Association, Florida Citrus Mutual, the Florida Strawberry Growers Association, the Florida Nursery Growers and Landscape Association, and the University of Florida IFAS, among others. After discussion, the Agricultural and Green Industry Advisory Committee voted to support the District's updated Agricultural Water Demands Projections Methodology based on the FSAID5 projected acreages and adjustments to incorporated District metered water use data. The vote was passed unanimously. Additionally, the District consulted with staff from the FDACS Office of Agricultural Water Policy on the proposed method, and FDACS accented to the Districts' method based on FSAID5 acreage projections, and District metered water use data.

Non-irrigation agricultural demand includes livestock watering

Table 3-2. *Projected agricultural demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2015 Base		2020		2025		2030		2035		2040		Change 2015-2040		% Change	
	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
Citrus	1.62	2.12	1.74	2.28	1.77	2.31	1.80	2.35	1.83	2.39	1.88	2.46	0.26	0.34	16.0%	16.0%
Hernando	1.87	2.36	2.07	2.62	2.25	2.87	2.53	3.21	2.78	3.52	3.04	3.85	1.17	1.49	62.6%	63.1%
Lake[1]	0.66	0.96	0.59	0.86	0.51	0.74	0.31	0.43	0.31	0.43	0.28	0.39	-0.38	-0.57	-57.6%	-59.4%
Levy	7.27	9.07	7.82	9.78	8.27	10.36	8.92	11.2	9.87	12.43	10.62	13.39	3.35	4.32	46.1%	47.6%
Marion	1.7	2.11	2.99	3.74	4.13	5.22	5.31	6.77	6.27	8.04	7.4	9.51	5.70	7.40	335.3%	350.7%
Sumter	5.32	6.06	4.96	5.64	4.72	5.35	4.31	4.85	3.89	4.35	3.49	3.87	-1.83	-2.19	-34.4%	-36.1%
Total	**18.44**	**22.68**	**20.17**	**24.92**	**21.65**	**26.85**	**23.18**	**28.81**	**24.95**	**31.16**	**26.71**	**33.47**	**8.27**	**10.79**	**44.8**	**47.6%**

[1] Lake County projections derived from the 2020 CFWI RWSP (March 2020).

Note: Summation and/or percentage calculation differences occur due to rounding. See Appendix 3-1 for source values.

Section 3. Industrial/Commercial and Mining/Dewatering

1.0 Description of the Industrial/Commercial and Mining/Dewatering Water Use Sectors

Industrial/commercial (I/C) and mining/dewatering (M/D) 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. M/D water use is associated with a number of products mined in the planning region, including limestone and sand.

2.0 Demand Projection Methodology

Demand projections for the 2020 RWSP were developed by multiplying the 2015 amount of water used for each I/C and M/D facility by growth factors based on Woods & Poole Economics' gross regional product (GRP) forecasts by county in five-year increments. For example, if an I/C facility used 0.30 mgd in 2015 and the county calculated growth factor from 2015 to 2020 was three percent, the 2020 projection for that facility would be 1.03 x 0.30 = 0.31 mgd. If the 2015 to 2020 growth factor was four percent, the 2020 projection would be 0.32 mgd. Water use for 2015 is derived from the District's 2015 Water Use Well Package Database (WUWPD). Based on the well package, in 2015 there were 53 I/C and 15 M/D water use permittees in the planning region.

3.0 Water Demand Projections

Table 3-3 shows the projected I/C and M/D regional water demand for the planning period. The table shows an increase in demand from 6.36 mgd in 2015 to 7.19 mgd in 2040, an increase of 0.83 mgd, or 13.0 percent. The projections for the District's portion of Lake County is zero for this water demand category based on the projections from the Central Florida Water Initiative (CFWI) RWSP. The projection is quite reasonable given that the portion of Lake County that is within the District is very small and rural.

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. Non-consumptive dewatering uses are no longer included in permitted quantities. Starting with the 2010 RWSP, demand projections were included for all 16 counties; whereas, earlier RWSPs included demand projections for only the 10 southern counties. Additionally, quantities permitted for product entrainment were not included in the 2010 or 2015 projections, because the District no longer considers them part of actual water demand (i.e., quantities necessary to conduct mining operations).

In accordance with the 2019 Format and Guidelines, the 5-in-10 and 1-in-10 demands are the same. The uses "are assumed to be reasonably the same in a 1-in-10-year drought event as in an average year (i.e., no significant demand variation)" (FDEP et al., 2019).

Table 3-3. *Projected I/C and M/D demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2015 Base	2020	2025	2030	2035	2040	Change 2015-2040	% Change
Citrus	0.22	0.23	0.23	0.24	0.24	0.25	0.03	13.6%
Hernando	5.42	5.55	5.69	5.83	5.96	6.08	0.66	12.2%
Lake[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Levy	0.01	0.01	0.01	0.01	0.01	0.01	0.00	11.0%
Marion	0.01	0.01	0.01	0.01	0.01	0.01	0.00	10.0%
Sumter	0.70	0.74	0.76	0.79	0.82	0.84	0.14	20.0%
Total	**6.36**	**6.54**	**6.70**	**6.88**	**7.04**	**7.19**	**0.83**	**13.1%**

[1] Lake County projections derived from the 2020 CFWI RWSP.

Note: Summation and/or percentage calculation differences occur due to rounding. See Appendix 3-2 for source values. Changes in small demand numbers across time can represent a large percent change in demand over time that is not readily seen from the rounded values in the table.

4.0 Stakeholder Review

The demand projection methodology, results and analyses were provided to the District's water use permitting staff and I/C and M/D 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 additional stakeholder comments, the District reviewed suggested changes and, when appropriate, included updates.

Section 4. Power Generation

1.0 Description of the Power Generation Water Use Sector

The PG uses within the District include water for thermo-electric PG used for cooling, boiler make-up, or other purposes associated with the generation of electricity. The PG quantities have previously been grouped with I/C and M/D quantities but are provided separately in this section per the 2019 Format and Guidelines (FDEP et al., 2019).

2.0 Demand Projection Methodology

Demand projections for the 2020 RWSP were developed by multiplying the 2015 amount of water used for each PG facility by growth factors based on Woods & Poole Economics' gross regional product (GRP) forecasts by county in five-year increments. For example, if a PG facility used 0.30 mgd in 2015 and the county calculated growth factor from 2015 to 2020 was three percent, the 2020 projection for the facility would be 1.03 x .030 =0.31 mgd. If the 2015 to 2020 growth factor was four percent, the 2020 projection would be 0.32 mgd. Water use for 2015 is derived from the WUWPD.

3.0 Water Demand Projections

Table 3-4 shows the projected PG water demand for the planning period. The table shows a change in demand from 2.94 mgd in 2015 to 2.21 mgd in 2040, a decrease of 0.73 mgd, or 25.0 percent. The demand projections do not include reclaimed, seawater or non-consumptive use of freshwater. In accordance with the 2019 Format and Guidelines, the 5-in-10 and 1-in-10 demands are the same. Power generation (PG) uses "are assumed to be reasonably the same in a 1-in-10-year drought event as in an average year (i.e., no significant demand variation)" (FDEP et al., June 2009).

Table 3-4. *Projected PG demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2015 Base	2020	2025	2030	2035	2040	Change 2015-2040	% Change
Citrus	2.94	1.80	1.85	1.96	2.08	2.21	-0.73	-24.8%
Hernando	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Lake[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Levy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Marion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Sumter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Total	**2.94**	**1.80**	**1.85**	**1.96**	**2.08**	**2.21**	**-0.73**	**-248%**

[1] Lake County projections derived from the Draft 2020 CFWI RWSP (March 202020).

Note: Summation and/or percentage calculation differences occur due to rounding. See Appendix 3-2 for source values. Changes in small demand numbers across time can represent a large percent change in demand over time that is not readily seen from the rounded values in the table.

4.0 Stakeholder Review

The demand projection methodology, results, and analyses were provided to the District's water use permitting staff and 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 additional stakeholder comments, the District reviewed suggested changes and, when appropriate, included updates.

Section 5. Landscape/Recreation

1.0 Description of the Landscape/Recreation Water Use Sector

The L/R sector 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 major users within this category.

2.0 Demand Projection Methodology

Landscape/Recreation (L/R) baseline use data is from the WUWPD (SWFWMD, 2017). This database includes metered use for active individual/general permits and estimated use for General Permits by Rule. The projection methodologies are divided into those for golf and those for other landscape and recreation. A more detailed description of the methodologies used is contained in Appendix 3-5.

Based on comments from knowledgeable stakeholders that initial demand projections for golf may be too high, the District engaged the services of a respected golf industry consulting firm to develop county-level percent changes in demand for 18-hole equivalent golf courses for each five-year period of the planning period. The percent changes were then applied to the previous five-year period's pumpage beginning with the 2015 baseline pumpage. The projected percentage changes were based on projected socioeconomic factors such as, household income and ethnicity, and golf play rates associated with those socioeconomic factors.

Other (non-golf) L/R demands are based on population growth within each county. Water use for this sector is assumed to grow at the projected county-level percent change in population. The five-year population percent changes for each five-year period were calculated and then applied to the previous five-year period's pumpage, beginning with the baseline pumpage.

3.0 Water Demand Projections

Table 3-5 provides total L/R demand for the planning period (both golf and other L/R demand). An increase in demand of 5.29 mgd for the 5-in-10 condition is projected between 2015 and 2040, an increase of 35.4 percent. In 2015, golf water demand made up over 80 percent of total L/R water use in this planning region.

4.0 Stakeholder Review

The demand projection methodology, results and analyses were provided to the District's water use permitting staff and L/R use sector stakeholders for review and comment. Comments received from the District's Agriculture and Green Industry Advisory Committee noted agreement with the golf portion of the projections remaining relatively flat to 2040. These projections are largely based on participation and course closure trends in the golf industry.

Table 3-5. *Projected L/R demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2015 Base		2020		2025		2030		2035		2040		Change 2015-2040		% Change	
	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
Citrus	4.31	5.60	4.52	5.87	4.71	6.11	4.87	6.32	4.99	6.48	5.09	6.61	0.78	1.01	18.1%	18.04%
Hernando	4.22	5.44	4.32	5.56	4.40	5.67	4.48	5.77	4.55	5.86	4.61	5.93	0.39	0.49	9.2%	9.01%
Lake[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%	0.00%
Levy	0.21	0.27	0.21	0.28	0.21	0.28	0.22	0.28	0.22	0.28	0.22	0.28	0.01	0.01	4.8%	3.70%
Marion	3.17	4.10	3.34	4.31	3.57	4.61	3.77	4.86	3.95	5.10	4.11	5.30	0.94	1.20	29.7%	29.3%
Sumter	3.03	3.92	3.70	4.77	4.41	5.70	5.05	6.53	5.66	7.32	6.20	8.01	3.17	4.09	104.6%	104.3%
Total	**14.94**	**19.33**	**16.09**	**20.79**	**17.31**	**22.36**	**18.38**	**23.75**	**19.37**	**25.03**	**20.23**	**26.13**	**5.29**	**6.80**	**35.4%**	**35.2%**

[1] Lake County projections derived from the Draft 2020 CFWI RWSP (March 2020).

Note: Summation and/or percentage calculation differences occur due to rounding. See Appendix 3-4 for source values.

Section 6. Summary of Projected Change in Demand

Table 3-6 summarizes the increases and decreases in demand respectively for the 5-in-10 and 1-in-10 conditions for all use categories. Previously, increases and decreases in demand were tracked separately, now they are totaled by demand for the labeled year. 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 future ER requirements.

Chassahowitzka River

Table 3-6 shows that 50.4 mgd of additional water supply is needed from existing sources or will need to be developed to meet demand in the planning region through 2040. Public supply (PS) water use will increase by 36.8 mgd over the planning period. Agricultural and I/C, M/D, and PG water use will increase by a combined 8.4 mgd. L/R water use will increase by 5.3 mgd.

Table 3-7 summarizes the projected demand for each county in the planning region for the 5-in-10 condition.

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

Water Use Category	2015 Base		2020		2025		2030		2035		2040		Change 2015-2040		% Change	
	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
PS	89.20	94.55	98.65	104.57	106.77	113.18	113.68	120.50	120.23	127.44	125.98	133.54	36.78	38.99	41.2%	41.2%
AG	18.44	22.68	20.17	24.92	21.65	26.85	23.18	28.81	24.95	31.16	26.71	33.47	8.27	10.79	44.8%	47.6%
I/C & M/D	6.35	6.35	6.52	6.52	6.70	6.70	6.87	6.87	7.03	7.03	7.19	7.19	0.84	0.84	13.2%	13.2%
PG	2.94	2.94	1.80	1.80	1.85	1.85	1.96	1.96	2.08	2.08	2.21	2.21	-0.73	-0.73	-24.8%	-24.8%
L/R	14.96	19.33	16.09	20.79	17.31	22.36	18.38	23.75	19.37	25.03	20.23	26.13	5.27	6.80	35.2%	35.2%
Total	**131.89**	**145.85**	**143.23**	**158.60**	**154.28**	**170.94**	**164.07**	**181.89**	**173.66**	**192.74**	**182.32**	**202.54**	**50.43**	**56.69**	**38.2%**	**38.9%**

Note: Summation and/or percentage calculation differences occur due to rounding. Changes in small demand numbers across time can represent a large percent change in demand over time that is not readily seen from the rounded values in the table.

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

Water Use Category	Planning Period						Change 2015-2040	
	2015	2020	2025	2030	2035	2040	mgd	%
Citrus								
PS	19.95	20.87	21.74	22.46	23.06	23.53	3.59	17.9%
AG	1.62	1.74	1.77	1.8	1.83	1.88	0.26	16.0%
I/C & M/D	0.22	0.23	0.23	0.24	0.24	0.25	0.03	13.6%
PG	2.94	1.80	1.85	1.96	2.08	2.21	-0.74	-25.2%
L/R	4.31	4.52	4.71	4.87	4.99	5.09	0.78	18.1%
Cumulative Total	**29.04**	**29.16**	**30.30**	**31.33**	**32.20**	**32.96**	**3.92**	**13.5%**
Hernando								
PS	24.32	26.2	27.94	29.42	30.75	31.88	7.57	31.1%
AG	1.87	2.07	2.25	2.53	2.78	3.04	1.17	62.6%
I/C & M/D	5.42	5.55	5.69	5.83	5.96	6.08	0.67	12.0%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
L/R	4.22	4.32	4.40	4.48	4.55	4.61	0.39	9.2%
Cumulative Total	**35.83**	**38.14**	**40.28**	**42.26**	**44.04**	**45.61**	**9.78**	**27.3%**
Lake								
PS	0.14	0.17	0.2	0.24	0.27	0.31	0.17	121.4%
AG	0.66	0.59	0.51	0.31	0.31	0.28	-0.38	-57.6%
I/C & M/D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
L/R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Cumulative Total	**0.80**	**0.76**	**0.71**	**0.55**	**0.58**	**0.59**	**-0.21**	**-26.3%**
Levy								
PS	1.62	1.68	1.73	1.77	1.80	1.82	0.20	12.3%
AG	7.27	7.82	8.27	8.92	9.87	10.62	3.35	46.1%
I/C & M/D	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.0%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
L/R	0.21	0.21	0.21	0.22	0.22	0.22	0.01	4.8%
Cumulative Total	**9.11**	**9.72**	**10.22**	**10.92**	**11.9**	**12.67**	**3.56**	**39.1%**
Marion								
PS	15.21	16.69	18.01	19.16	20.25	21.29	6.08	40.0%
AG	1.70	2.99	4.13	5.31	6.27	7.40	5.70	335.3%
I/C & M/D	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.0%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
L/R	3.17	3.34	3.57	3.77	3.95	4.11	0.94	29.7%
Cumulative Total	**20.09**	**23.03**	**25.72**	**28.25**	**30.48**	**32.81**	**12.72**	**63.3%**
Sumter								
PS	27.96	33.05	37.15	40.63	44.1	47.14	19.18	68.6%
AG	5.32	4.96	4.72	4.31	3.89	3.49	-1.83	-34.4%
I/C & M/D	0.70	0.74	0.76	0.79	0.82	0.84	0.14	20.0%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
L/R	3.03	3.70	4.41	5.05	5.66	6.20	3.17	104.6%
Cumulative Total	**37.01**	**42.45**	**47.04**	**50.78**	**54.47**	**57.67**	**20.66**	**55.8%**
Region Total	**131.88**	**143.26**	**154.27**	**164.09**	**173.67**	**182.31**	**50.43**	**38.2%**

Note: Summation and/or percentage calculation differences occur due to rounding. Changes in small demand numbers across time can represent a large percent change in demand over time that is not readily apparent from the rounded values in the table.

Section 7. Comparison of Demands between the 2015 Regional Water Supply Plan and the 2020 Regional Water Supply Plan

There are several notable differences between the 2015 and 2020 RWSP demand projections in the PS, AG, I/C & M/D, PG, and L/R water use sectors. This includes a reduction in demands for all sectors from those projections used in the 2015 RWSP. These differences are largely attributable to methodology changes and slower than anticipated regional population growth. Regarding the PS category, the 2015 RWSP projected an increase of 51.36 mgd for the 2010–2035 planning period, while the 2020 RWSP projects an increase of 36.77 mgd for 2015–2040 planning period. For AG projections, the 2015 RWSP projected an increase of 1.85 mgd for the 2010–2035 planning period, while the 2020 RWSP projects an increase of 8.26 mgd for the planning period. Differences in I/C & M/D demand projections included a 2015 RWSP projected increase of 1.54 mgd for this category, while the 2020 RWSP projects a 0.84 mgd increase. There was a 0.31 mgd increase in PG demand for the 2015 RWSP, whereas the 2020 RWSP projects a 0.74 mgd decrease. For L/R demand, the 2015 RWSP projected an increase of 7.78 mgd, while the 2020 RWSP projects just a 5.27 mgd increase.

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Chapter 4. Evaluation of Water Sources

This chapter presents the results investigations by the Southwest Florida Water Management District (District) to quantify the amount of water that is potentially available from all sources of water within the planning region to meet demands through 2040. Sources of water that were evaluated include surface water, stormwater, reclaimed water, seawater desalination, brackish groundwater desalination, fresh groundwater and conservation. 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 2040.

Part A. Evaluation of Water Sources

Fresh groundwater from the Upper Floridan aquifer (UFA) currently is by far the major source of supply for all use categories in the planning region. In addition, the principal source of water to meet the projected 2040 demand is likely to be new quantities of fresh groundwater. However, localized impacts resulting from groundwater withdrawals in southwest Hernando and northern Sumter counties may limit future availability of groundwater in these areas. Establishment of minimum flows for first-magnitude springs may also limit the future availability of groundwater in certain areas. To ensure that low-cost groundwater supplies are available in the future, water users throughout the region are increasingly developing reclaimed water systems and implementing conservation measures. These measures will enable water supply systems to support more users with the same quantity of water and hydrologic stress. Although its likely to be beyond the 2040 planning period, the region’s continued growth will eventually require the development of alternative sources such as brackish groundwater, seawater and surface water with off-stream storage reservoirs. Efficient use of available groundwater quantities while meeting established minimum levels and flows will postpone the eventual need for these more costly alternative sources. The following discussion summarizes the evaluation of all water supply sources and the potential for those sources to be used to produce new water supplies in the planning region.

Section 1. Fresh Groundwater

Fresh groundwater from the UFA is the principal source of water supply for all use categories in the planning region. Although there is a surficial aquifer in the planning region, the lack of a confinement between the Upper Floridan and surficial aquifers in most places causes the aquifers to function as a single unit. In 2017, approximately 94 percent (121.3 million gallons per day [mgd]) of 128.9 mgd of water (including domestic self-supply [DSS]) used in the planning region was from groundwater sources. Approximately 65 percent (79.3 mgd) of the fresh groundwater was used for PS (permitted and DSS). The following is an assessment of the availability of fresh groundwater in the UFA and Lower Floridan aquifer (LFA) in the planning region.

1.0 Upper Floridan Aquifer

The UFA consists of a thick sequence of marine carbonate deposits and is the main source for water supply within the planning region. A relatively thin sequence of sands, silts and clays overlies the carbonate deposits. The upper several hundred feet of limestone and dolomite comprise the most productive and utilized portion of the aquifer. The UFA is mostly unconfined over the planning region (SWFWMD, 1987; Hydrogeologic, 2013).

The bottom boundary of the freshwater flow system occurs in the middle and lower portion of the Avon Park Formation where gypsum beds are present over most of the Northern Planning Region. This unit forms the bottom confining bed of the freshwater flow system and is named Middle Confining Unit 2 (MCU II) (Miller, 1986). The LFA is found below MCU II, but groundwater is highly mineralized throughout much of the region and is not used.

Minimum flows and levels (MFLs) have been established for the Weeki Wachee, Chassahowitzka, Homosassa, Gum, Rainbow, and Kings Bay spring groups as well as several lakes in the planning region. The Chassahowitzka and Homosassa system MFLs were re-evaluated and revised minimum flows adopted for the spring groups in 2020. The Rainbow River and Rainbow Spring Group MFLs, originally adopted in 2017 as part of an emergency rulemaking process, were affirmed subsequent to the successful outcome of an administrative challenge.

Currently, all established MFLs are being met and all spring MFLs are projected to be met through 2040. For 2040 there is the possibility that MFLs for Weeki Wachee Prairie (Lake Theresa) and Hunters Lake in southwest Hernando County could be exceeded if the projected demand is met only with UFA groundwater from existing facilities. In addition, minimum levels for Lakes Miona, Okahumpka and Deaton in northeast Sumter County may be exceeded by 2040 if projected PS demand is met with groundwater from this area. In both counties, reductions in demand through the use of reclaimed water, the implementation of strict demand management measures (conservation) and the development of groundwater sources outside of these areas, or development of LFA groundwater, can prevent these MFLs from being exceeded. Future groundwater availability will be governed by compliance with these MFLs.

Computer flow modeling using the Northern District model has shown that groundwater from the UFA is available to meet demand through 2040 by utilizing conservation and reuse initiatives (Cardno-Entrix, 2019). The conservation initiatives include demand reductions of 10 percent for both PS and AG uses, and 20 percent for L/R uses. Reuse projects include those planned through 2040. The simulations analyzed the change in surficial and UFA water levels from pre-pumping conditions to 2040 using projections of future demand. In this model scenario, changes to spring flow and Withlacoochee River base flow, due to groundwater withdrawals from pre-pumping conditions to 2040, were 10 percent or less (see Tables 4-1 and 4-2). All springs with established minimum flows were also projected to be met. In most of the planning region, predicted drawdown within the surficial aquifer or UFA (where it is unconfined) is less than one foot, except in localized areas where concentrated groundwater withdrawals for PS occur in northeast Sumter and western Hernando counties. In these areas, management strategies such as increased monitoring, conservation, use of reclaimed water, and LFA groundwater extraction (Northern Sumter) are being promoted to offset potential future impacts to MFL water bodies.

Table 4-1. *Predicted flow changes for springs from non-pumping to 2040 conditions based on the Northern District Groundwater Flow Model (Cardno-Entrix, 2019)*

Spring Name	No Pumping Flow (cfs)	Predicted 2040 Flows (cfs)	2040 Percent Change	MFL Allowable Percent Flow Reduction (%)
Weeki Wachee Spring Group	215.9	202.8	6.1	10.0
Chassahowitzka Spring Group	208.0	204.5	1.7	8.0
Homosassa Spring Group	261.9	256.3	2.1	5.0
Gum Slough[1]	98.8	94.7	4.2	6.0
Kings Bay Springs	449.0	441.8	1.6	11.0
Rainbow Springs and River	661.4	650.7	1.6	5.0

[1] Withdrawal impacts for Gum Slough flow based on estimated springflow contribution of 72 percent.

Table 4-2. *Predicted changes in baseflow contribution to rivers from non-pumping to 2040 conditions based on the Northern District Groundwater Flow Model (Cardno-Entrix, 2019)*

River Segment	No Pumping Flow (cfs)	Predicted 2040 Flow (cfs)	2040 Percent Flow Change
Withlacoochee River at Croom[1]	78.3	79.3	+1.3
Withlacoochee River near Holder	322.7	304.8	5.5

[1] Unadjusted 2040 demand results in a 0.2 cfs decline in flow at Croom. The addition of reclaimed water and conservation initiatives results in a small increase in flow.

1.1 Upper Floridan Aquifer Permitted/Unused Quantities

A number of PS 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 PS water use permits, approximately 24 mgd of additional groundwater quantities are available to PS utilities from the UFA. However, to ensure that environmental impacts from groundwater withdrawals are minimized, it is the District's intent that the 2040 demand that will be met by groundwater will be significantly reduced by maximizing the efficient use of reclaimed water and implementing conservation measures.

2.0 Lower Floridan Aquifer

In northeast Sumter County and portions of Marion County, the MCU II unit is absent and another confining unit is present in the Upper Avon Park Formation. This unit consists of a tight, dense, limestone and is referred to as Middle Confining Unit 1 (MCU I) (Miller, 1986). The Avon Park Formation below MCU I contains fresh groundwater and is also referred to as the LFA. The base of the LFA lies over 2,000 feet below land surface near the top of the Cedar Keys Formation where gypsum mixes with dolomite and forms the bottom boundary of the Floridan aquifer system.

The MCU I and the LFA extend eastward from Sumter County into the St. Johns River Water Management District (SJRWMD).

The City of Wildwood and The Villages development in northeast Sumter County have explored the LFA below MCU I and found good quality groundwater that is highly productive. The Villages development utilizes nearly 10 mgd of water from the LFA for irrigation. The City of Wildwood is planning to use the LFA to meet some of their future demand. The City of Ocala and Marion County utilities have also completed exploratory drilling and testing of the LFA below MCU I. The degree of confinement of MCU I is variable, but recent testing at Wildwood has shown it to be relatively tight with little observed impact to the overlying UFA. If this verifies across the region, then LFA withdrawals could reduce a portion of future impact from the UFA, since they would have less effect on lakes, wetlands, rivers, and springs within the UFA.

The 2019 Regional Water Supply Plan update for the Withlacoochee Regional Water Supply Authority anticipated additional quantities of 4.1 mgd from the LFA for the City of Wildwood and 8.2 mgd from the LFA available for Marion County by 2040 (WRWSA, 2019). Additional data collection from exploratory drilling and testing that is planned over the next five years along with refinement of regional groundwater flow models will further understanding of withdrawal impacts and ultimate quantities available from the LFA. In those areas where it is demonstrated that development of groundwater quantities from the LFA can be done without exceeding any established MFLs, and will otherwise avoid harm caused by withdrawals, such LFA quantities are designated as nontraditional sources. Demonstration of meeting these requirements must be done on a case-by-case basis.

Section 2. Water Conservation

1.0 Non-Agricultural Water Conservation

Non-agricultural water conservation is defined as the beneficial reduction of loss, waste, or other inefficient uses of water accomplished through the implementation of mandatory or voluntary activities that enhance the efficiency of both the production and distribution of potable water (supply-side measures) and indoor or outdoor water use (demand-side measures). The implementation of a comprehensive portfolio of conservation measures creates the benefits listed below:

- Infrastructure and Operating Costs. The conservation of water allows utilities to defer expensive expansions of potable water and wastewater systems while limiting operation and maintenance costs at existing treatment plants, such as the use of electricity for pumping and treatment or expensive water treatment chemicals.
- Fiscal Responsibility. Most water conservation measures have a cost-effectiveness that is more affordable than that of other alternative water supply (AWS) sources such as reclaimed water or desalination. 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 designs and practices, including the promotion of Florida-Friendly Landscaping™ (FFL), can provide natural habitat for native wildlife as well as reduce unnecessary runoff from properties into water bodies. This, in-turn, can reduce nonpoint-source pollution, particularly from operations that use fertilizers, pesticides or fungicides which, in turn, may hamper a local government's overall strategy

of dealing with total maximum daily load (TMDL) restrictions within their local water bodies or maintain spring water quality health.

Since the 1990s, the District has provided financial and technical assistance to water users and suppliers in the planning region for the implementation of local and regional water conservation efforts. The District has a long history of successful water use reduction projects, which encourages water users to seek assistance by working with District staff when implementing water-saving and educational water conservation programs.

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

Economic measures, such as inclining block rate structures, are designed to promote conservation by providing price signals to customers of public water supply systems to reduce inefficient use. 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, high-efficiency toilets (HET), low-flow faucet aerators, high-efficiency showerheads, smart irrigation controllers, rain sensors, and soil moisture sensors (SMS). Recognition programs, such as the District's Water CHAMP℠ and Florida Water Star℠ (FWS), are also incentive programs that recognize homeowners and businesses for their environmental stewardship.

The District performs leak detection surveys in an effort to reduce water loss.

The District's Utilities Services Group provides guidance and technical expertise to PS water utilities and helps identify and reduce water loss. The non-regulatory assistance and educational components of the program maximize water conservation throughout the PS water use sector and improve both local utility system efficiency and regional water resource benefits. Among the services provided upon request are leak detection surveys, meter accuracy testing, and water audit guidance and evaluation. Since the program's inception, the leak detection team has conducted 155 leak detection surveys throughout the District, locating 1,554 leaks of various sizes and totaling an estimated 5.86 mgd. In the Northern Planning Region, the District leak detection team has conducted 60 leak detection surveys, locating 677 leaks totaling an estimated 2.60 mgd.

For the past ten years, the District has administered the statewide FWS voluntary water conservation certification program for new and existing homes and commercial developments. Residences, businesses, and communities can earn FWS certification through meeting efficiency standards in appliances, plumbing fixtures, irrigation systems, and landscapes.

A single-family home built to meet FWS criteria may use at least 40 percent less water outdoors and approximately 20 percent less water indoors than a home built to the current Florida Building Code. Local governments that adopt FWS criteria as their standard for new construction can expect greater long-term savings to occur than for similar structures built to conventional standards. In addition, FWS offers installation and BMPs training for landscapers and irrigation contractors, providing an opportunity for them to become FWS accredited professionals.

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 measurable, the effort greatly increases the success of all other facets of a 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 conservation education programs accompanied with other effective conservation measures can be an effective supplement to a long-term water conservation strategy. On a Districtwide scale, water conservation efforts have contributed to declining unadjusted gross per capita use rates, from 115 gallons per day (gpd) per person in 2005 to 97 gpd per person in 2015. The per capita use rate for the District is the lowest of all five WMDs. The per capita trend for the Northern Planning Region is also declining as shown in Figure 4-1.

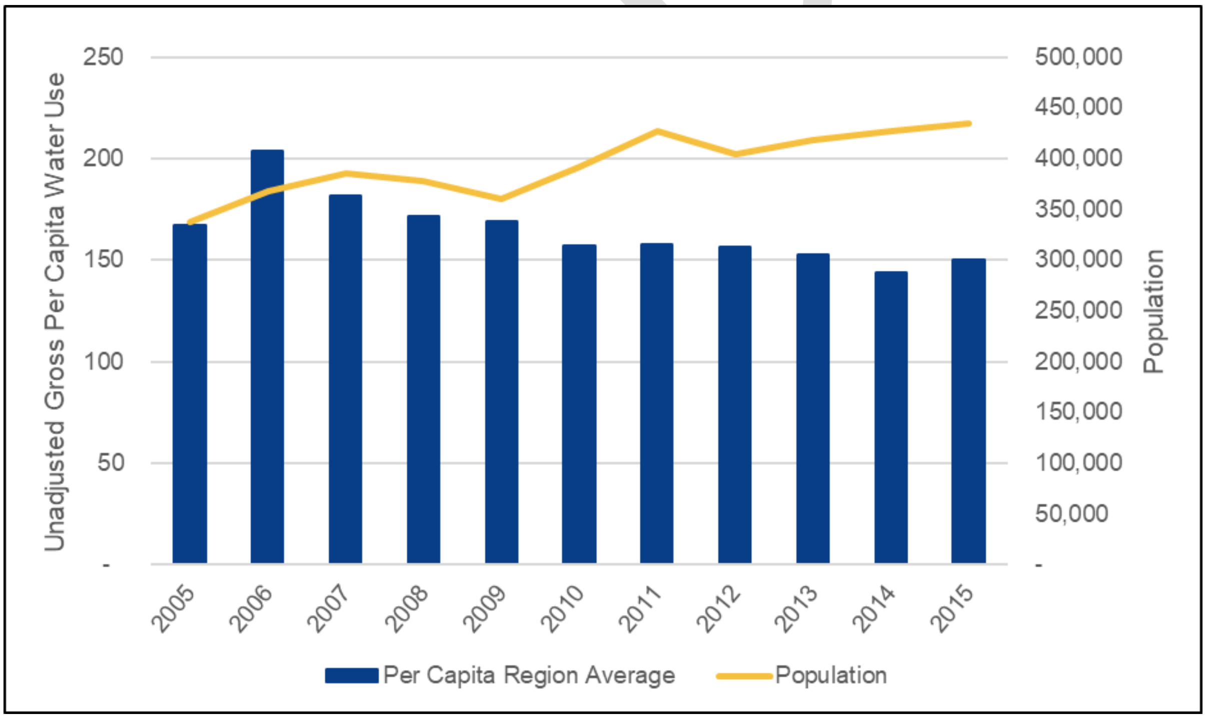


Figure 4-1. *Per capita water use rates in the Northern Planning Region, 2005-2015*

1.1 Public Supply

The PS sector includes all water users that receive water from public water systems and private water utilities. The PS sector may include non-residential customers such as hospitals and restaurants that are connected to a utility potable distribution system. Water conservation in the PS sector will continue to be the primary source of water savings in the District. Public supply (PS) systems lend themselves most easily to the administration of conservation programs since they measure each customer's water use and can focus, evaluate, and adjust the program to maximize savings potential. The success of the District's water conservation programs for PS systems to date is demonstrated by the 15.8 mgd in savings that has been achieved within the District since programs began in 1991. Within the region, it is estimated that savings for the PS sector could be 10.88 mgd by 2040 if all water conservation programs presented below are implemented (see Table 4-3).

1.1.1 Water Conservation Potential in the Northern Planning Region

Estimated conservation potential for the planning region is based in part on the Withlacoochee Regional Water Supply Authority (WRWSA) 2019 Regional Water Supply Plan (RWSP). This plan uses the 2020-2040 planning horizon and the Alliance for Water Efficiency Water Conservation Tracking Tool (AWE Tool) to calculate the savings and costs of both passive and active conservation for 10 benchmark utilities. The savings for these 10 benchmark utilities were then projected onto the additional 27 utilities within the WRWSA.

1.1.2 Assessment Methodology

WRWSA includes four counties (Citrus, Hernando, Marion, and Sumter) that lie primarily within the District, with a portion of Marion County (3 of the benchmark utilities) within the St. John's Water Management District (SJWMD). In order to assess the planning region's entire conservation potential excluding SJWMD demands, the District has projected the WRWSA estimates onto the District demands for these four counties, which are discussed in Chapter 3. However, the Northern Planning Region also includes portions of Lake and Levy counties, which are not addressed in the WRWSA 2019 RWSP. Levy County estimates are derived by projecting the total WRWSA percent savings onto Levy County demands. Meanwhile, the conservation potential for the SWFWMD portion of Lake County is not addressed as a part of this 2020 RWSP. This is because the projected 2040 demand for the District's portion of Lake County is only 0.31 mgd for both PS and DSS, making any conservation savings insignificant in comparison with those of the rest of the region. Therefore, the sum of the estimates for Citrus, Hernando, Marion, Sumter, and Levy counties equates to the total estimated water conservation potential for the Northern Planning Region.

The WRWSA divides water conservation into three tiers. Tier 1 is conservation that occurs passively. Tier 2 is Tier 1 conservation plus additional conservation that occurs actively through conservation activities that are already being implemented. Tier 3 includes both Tier 1and Tier 2 savings plus conservation that could occur through the implementation of additional conservation activities. In order to be consistent with the calculations for the other planning regions within the 2020 RWSP, Tier 2 and Tier 3 savings, excluding those attributable to Tier 1, are combined in this plan to yield one total estimate for active conservation. Passive and active conservation and the estimation methodology for each are described further below.

Passive Conservation

Passive water conservation savings refer to water savings that occur as a result of users implementing water conservation measures in the absence of utility incentive programs. These are typically the result of building codes, manufacturing standards, and ordinances that require the installation of high-efficiency plumbing fixtures and appliances in new construction and renovations. Passive water conservation has been observed as a major contributor to decreasing per capita water use across the country. Projections were developed using the AWE Tool along with information from property appraiser databases, Public Supply Annual Reports, and census data. The AWE Tool calculates passive water conservation savings for toilets, showerheads, clothes washers, and dishwashers. There are two components in the AWE Tool's passive water conservation savings calculation:

- Natural Replacement Savings: This accounts for water savings that occur as a result of the natural fixture and appliance replacements during the planning horizon. This occurs as older devices reach the end of their service lives or are otherwise replaced by newer, more efficient models.

- Water Savings Adjustment Factor: Newer homes built over the planning horizon are more efficient in their indoor water use than existing older homes. When newer homes are combined with existing homes, the ratio of high-efficiency to low-efficiency fixtures and appliances will increase as compared to the ratio in the 2015 baseline from which demands were based.

The percent of savings due to passive conservation seen for each county in the WRWSA 2019 RWSP is applied to the District demand for the county in order to derive the passive savings expected to be seen in the planning region over the planning horizon. As previously mentioned, Levy County is not a member of WRWSA. Therefore, the passive savings percent for the entire WRWSA is used in lieu of a county-specific rate.

Active Conservation

Active water conservation encompasses a variety of measures, practices, and programs sponsored or encouraged by utilities and municipal governments which result in water use reductions. By their nature, active water conservation programs are typically funded and administered by PS utilities or other regional entities. Using the AWE Tool and other data provided by the benchmark utilities, WRWSA estimated the conservation potential and costs for several conservation activities that utilities could implement in single-family residential homes. It is important to note that not all conservation activities were considered in each county. Additionally, while only single-family homes were considered in the WRWSA analysis, some of these activities can also be implemented on multi-family, industrial, and commercial properties. Conservation activities included in the WRWSA analysis along with the corresponding counties can be found in Table 4-3 below.

Table 4-3. *Conservation activities in District counties*

Conservation Activity	Citrus County	Hernando County	Marion County	Sumter County	Levy County[1]
(HET) and Ultra-low Flow Toilets	Yes	Yes	Yes	Yes	-
Smart Irrigation Controllers	Yes	No	Yes	No	-
High-efficiency and Low-flow Showerheads	Yes	Yes	Yes	No	-
High-efficiency Clothes Washers	Yes	Yes	No	No	-
Landscape and Irrigation Evaluations/Audits	Yes	Yes	Yes	Yes	-
Rain Sensors	Yes	Yes	Yes	Yes	-
Faucet Aerators	Yes	Yes	Yes	No	-
Florida Water Star[SM] for New Construction	No	No	Yes	No	-
Irrigation Restriction Ordinance[2]	Yes	No	No	No	-
Smart Irrigation Controllers in New Construction	Yes	No	No	No	-
Reclaimed Water	No	No	No	Yes	-

[1]Levy County is not part of the WRWSA and is therefore not considered in their analysis.
[2]Refers to an irrigation allowance of one day per week

While reclaimed water is included within the Tier 2 conservation estimates for Sumter County in the 2019 WRWSA RWSP, it is not included as conservation in the District's 2020 RWSP. Rather, the percent reduction in demand due to reclaimed water was applied to the other ongoing conservation activities within the county. More information on the reclaimed water potential within the region can be found in Chapter 4 Section 1.1.3 below. The percent savings for each county due to current and potential active conservation activities found in the Draft 2019 WRWSA RWSP are applied to District demands and combined to determine the total active conservation potential for the planning region. Similar to the passive savings calculation, the authority's overall savings percentages are used for the Levy County estimate.

1.1.3 Results

Irrigation restriction ordinances were identified as a major potential source of water savings.

After projecting the passive savings rates calculated in the 2019 WRWSA RWSP onto the District demands, it is estimated that approximately 10.88 mgd of combined active and passive PS savings could be achieved in the planning region by 2040 (Table 4-4). This equates to a 12.17 percent reduction in projected 2040 PS sector demand. This includes industrial and commercial entities that are connected to PS utilities.

The bulk of savings are attributable to active conservation. This component represents approximately 76 percent of the PS savings available in the region. That's a 9 percent reduction in 2040 total demand, or about 8.24 mgd. The most impactful conservation activity identified was the irrigation restriction ordinance. Meanwhile, passive savings constitutes approximately 24 percent of total PS savings, which corresponds to a nearly 3 percent decrease in 2040 total demand. The drop in regional demand over time associated with both passive and active savings is shown in Figure 4-2 below.

For the purposes of this RWSP, the cost effectiveness of the active conservation activities analyzed are calculated using SWFWMD methods rather than those of WRWSA. The unit cost is amortized at 8 percent and compared to the unit savings over the activity's anticipated service life. On average, the 10 conservation activities (excluding reclaimed water) cost $0.80 per thousand gallons. The region-wide total cost for active programs across the planning horizon is estimated at $12.8 million.

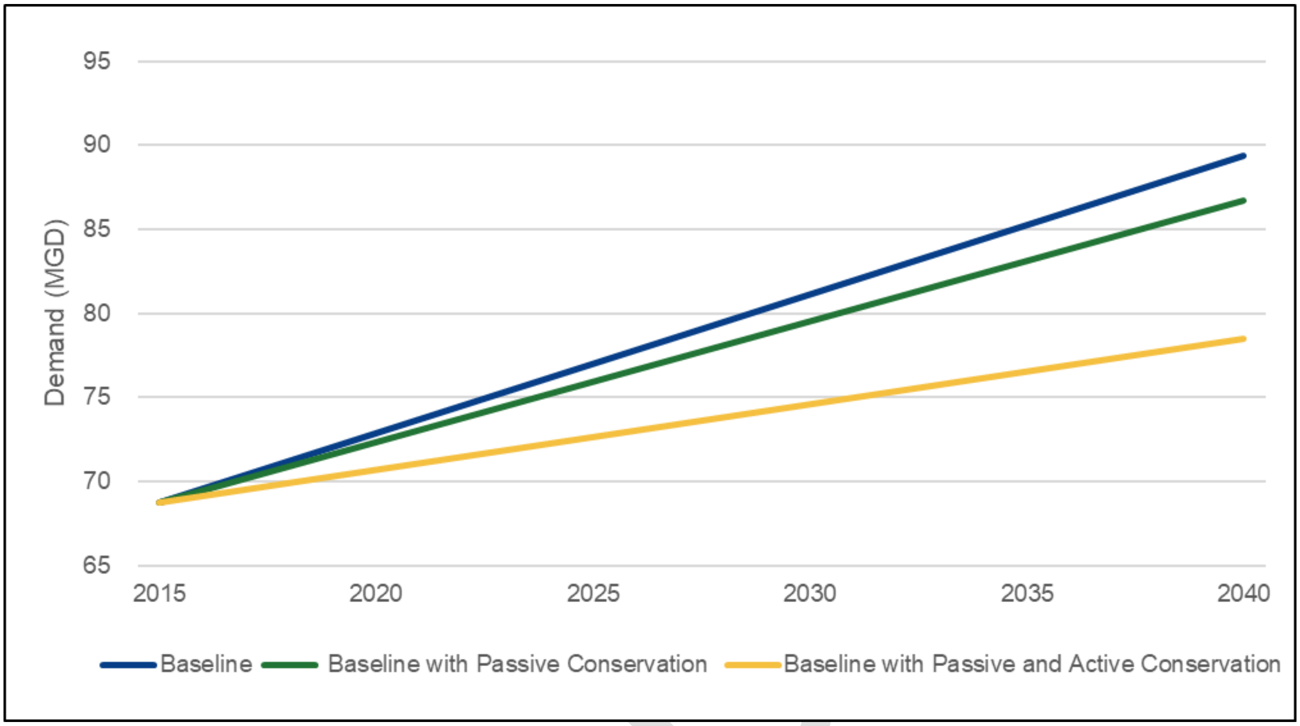


Figure 4-2. *Potential effects of conservation on projected PS demand*

1.1.4 Additional Considerations

The active conservation analysis builds on the passive estimate as it considers only the inefficient stock not already replaced passively. However, it is not comprehensive as there are many other activities that could result in substantial water savings. Even for those activities that were modeled, much higher participation rates could be achieved than those estimated here. It should be noted that for those items that have a short life expectancy (e.g., rain sensors), repetitive implementations and reoccurring costs are required just to maintain savings.

1.2 Domestic Self-Supply

The DSS sector includes individual private homes and businesses that are not utility customers and receive their domestic water supply from a well or from a surface supply for uses such as irrigation. DSS wells do not require a District WUP, as the well diameters do not meet the District's requirement for a permit. DSS systems are commonly not metered and, therefore, changes in water use patterns are less measurable than those that occur in the PS sector. Only passive conservation was estimated for DSS systems in this RWSP. Within the region, it is estimated that passive savings for the DSS sector could be 0.89 mgd by 2040 (Table 4-4).

1.2.1 Domestic Self-Supply Assessment Methodology

To calculate DSS passive savings, it was assumed that the DSS sector will experience the same percent savings as the PS sector over the planning horizon. The percent of PS passive savings calculated was therefore applied to the SWFWMD DSS 2040 demand projection for the Northern Planning Region, excluding Lake County. In other words, the DSS 2040 demand (30.08 mgd) was multiplied by the PS passive savings rate (2.95 percent) to yield the DSS passive savings estimate (0.89 mgd).

1.3 Industrial/Commercial Self-Supply

This water use sector includes factories and other industrial enterprises that obtain water directly from surface water and/or groundwater sources through a WUP. Businesses try to minimize water use to reduce pumping, purchasing, treatment, and disposal costs. To date, the District has focused efforts on education, indoor and outdoor surveys, and commercial applications, such as spray valves and high-efficiency toilets. The industrial processes being used in this category present unique opportunities for water savings and 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 sector could be 0.16 mgd by 2040 (Table 4-4).

1.3.1 I/C Assessment Methodology

The I/C savings estimate utilized the same methodology outlined in the 2020 Draft Central Florida Water Initiative (CFWI) RWSP. This methodology was based on a study by Dziegielewski et al. (2000) that examined the impact of water audits on improving water efficiency within this sector. The lower-bound savings determined in this study was 15 percent, and this number was used in lieu of the higher estimate to be more conservative. The 15 percent participation rate used in the 2020 Draft CFWI RWSP was also assumed. Therefore, the self-supplied I/C 2040 demand (6.99 mgd) multiplied by both the savings and participation rates (15 percent for both) yields the estimated water savings over the planning horizon for the self-supplied I/C sector within the Northern Planning Region (0.16 mgd).

1.4 Landscape/Recreation

The L/R water use sector 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 PS 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. Within the region, it is estimated that savings for the L/R water use sector could be 1.18 mgd by 2040 (Table 4-4).

1.4.1 L/R Assessment Methodology

As with the self-supplied I/C sector, the estimate of the water conservation potential of the L/R sector was derived using the same methodology as the 2020 Draft CFWI RWSP. Conservation in this sector primarily comes from updating inefficient sprinkler heads and installing smart irrigation controllers, such as SMSs or weather-based controllers. Based on two studies by the University of Florida, it was determined that the lower-bound savings from retrofits and smart irrigation controllers are 10 percent and 20 percent, respectively. These values were used along with the 15 percent savings rate also assumed in the 2020 Draft CFWI RWSP to estimate self-supplied L/R water conservation. In other words, the 2040 L/R demand (26.13) was multiplied by the participation rate (15 percent), and this product was multiplied by each of the savings rates (10 percent and 20 percent). The sum of these final two numbers (0.39 mgd and 0.78 mgd) equates to the total L/R savings over the planning horizon (1.18 mgd). The 1-in-10 2040 demand projections were used instead of the 5-in-10 projections in an effort to be more conservative in our calculations.

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

Table 4-4 summarizes the potential non-agricultural water conservation savings in the Northern Planning Region. This table shows that, through the implementation of all conservation measures listed above for the PS, DSS, I/C, and L/R water use sectors, it is anticipated that approximately 13.10 mgd could be saved by 2040 at a total projected cost of $12.8 million. This is an 8.59 percent reduction in total demand.

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

Sector	2040 Demand (mgd)	Savings (mgd)	Percent Reduction in Demand (%)	Average Cost-Effectiveness ($/1kgal.)
Public Supply (PS) Total	89.37	10.87	12.17%	-
PS Passive	-	*2.64*	*2.95%*	-
PS Active	-	*8.24*	*9.22%*	*$0.80*
DSS	30.08	0.89	2.95%	-
I/C	6.99	0.16	2.25%	-
L/R	26.13	1.18	4.50%	-
Total	**152.58**	**13.10**	**8.59%**	**-**

2.0 Agricultural Water Conservation

The Florida Department of Agriculture and Consumer Services (FDACS) develops conservation projections as part of the Florida Statewide Agricultural Irrigation Demand (FSAID5) projections. Those conservation projections were based on historical trends (1973-2013) in irrigation of water applied per acre per year. The historical trend of the ratio was used to predict future irrigation conservation through 2040. The trend accounts primarily for gains in irrigation system distribution uniformity. However, future savings could still come from developing new technology, sensor-based automation, and scheduling changes.

This RWSP uses the trend as a percent reduction (approximately 13%) in 2040 demand. The county-by-county savings percentages derived from FSAID5 data were applied to the 2040 agricultural demands shown in Table 3-2 which are District specific demand projections and lower than FSAID5 demands. Results are shown below in Table 4-5.

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

County	Projected 2040 demand (mgd)	Savings as a percentage (derived from FSAID5)	Agricultural Conservation Potential by 2040 (mgd)
Citrus	1.83	12.5%	0.23
Hernando	3.01	13.1%	0.40
Lake	0.27	13.4%	0.04
Levy	10.61	13.3%	1.41
Marion	7.34	13.0%	0.96
Sumter	1.70	12.6%	0.21
Total	**24.76**		**3.25**

These estimates should be considered potential conservation and should not be treated as “water supply” or directly removed from agricultural water demand estimates. Substantial investments will be necessary to realize these savings. District investment paired with other government assistance programs like FDACS and Natural Resources Conservation Service could accelerate the rate at which these savings occur. Water resource benefits from the Facilitating Agricultural Resource Management Systems (FARMS) Program are categorized as water resource development (WRD) or water conservation (gains in efficiency). Benefits associated with WRD (primarily tail water recovery) projects are estimated to be 0.06 mgd during the planning horizon. Additional information on the FARMS Program and its potential impact on water resources is located in Chapter 5 and 7.

Section 3. 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 to accomplish a number of goals, including decreasing reliance on potable water supplies, increasing groundwater recharge and restoring natural systems. Figure 4-2 illustrates the reclaimed water infrastructure, utilization and availability of reclaimed water within the District in 2015, as well as planned utilization that is anticipated to occur by 2025 as a result of funded projects.

Existing and funded projects are expected to result in reclaimed water increases of 6 mgd, bringing utilization within the planning region to approximately 18 mgd by 2025. Appendix 4-1 contains anticipated 2025 reclaimed water utilization.

The benefit that can be obtained from the use of reclaimed water is governed by the concepts of utilization and water resource benefit. Utilization is the percent of treated wastewater from a WWTP that is utilized in a reclaimed water system. The utilization rate of a reclaimed water system varies by utility. Typically, only 50 to 70 percent of treated wastewater flows go to reclaimed water customers. The highest utilization rates occur in utilities in urban areas where large industries and numerous residential customers can be supplied. Utilization is also limited by seasonal supply and storage. A utility cannot expand its reuse system beyond peak flow demand, which occurs during dry periods when demand is highest, without experiencing shortages. For example, a reclaimed water system with a 1 mgd 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 six main options to increase utilization beyond 50 percent include seasonal storage, system interconnects, an interruptible customer base, environmental enhancement/recharge, potable reuse, and supplementing reclaimed water supplies with other sources.

Seasonal storage is the storage of excess reclaimed water in surface reservoirs or aquifer storage and recovery (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 "offline" 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.

Environmental enhancement and recharge involves using excess reclaimed water to enhance wetland habitat, meet MFLs or recharge the UFA to achieve water resource benefits. Potable reuse involves purifying reclaimed water to a quality for it to be used as a raw water source for potable supplies.

Supplementing reclaimed water supplies with other water sources, such as stormwater and groundwater for short periods to meet peak demand, enables systems to serve a larger customer base.

Water resource benefit is the amount of potable-quality groundwater or surface water that is replaced by reclaimed water usage or the amount of reclaimed water used for environmental enhancement. 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 approximately 330 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 this amount (804 gpd). In this example, the benefit rate would be 41 percent (330 gpd offset for 804 gpd reclaimed water utilization). Different types of reclaimed water use have different benefit potentials. For example, a power station or industry using one mgd of potable water for cooling or process water will, after converting to reclaimed water, normally use approximately the same quantity. In this example, the benefit 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 benefit rate is estimated to be 65 percent. The District is actively cooperating with utilities to help identify ways to increase reclaimed water utilization and benefit. 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 75 percent utilization of all WWTP flows and 75 percent benefit efficiency of all reclaimed water used by 2040. This goal is intended to reduce the overuse of reclaimed water and increase potable and groundwater benefits. Opportunities may exist for utilization and benefits 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.

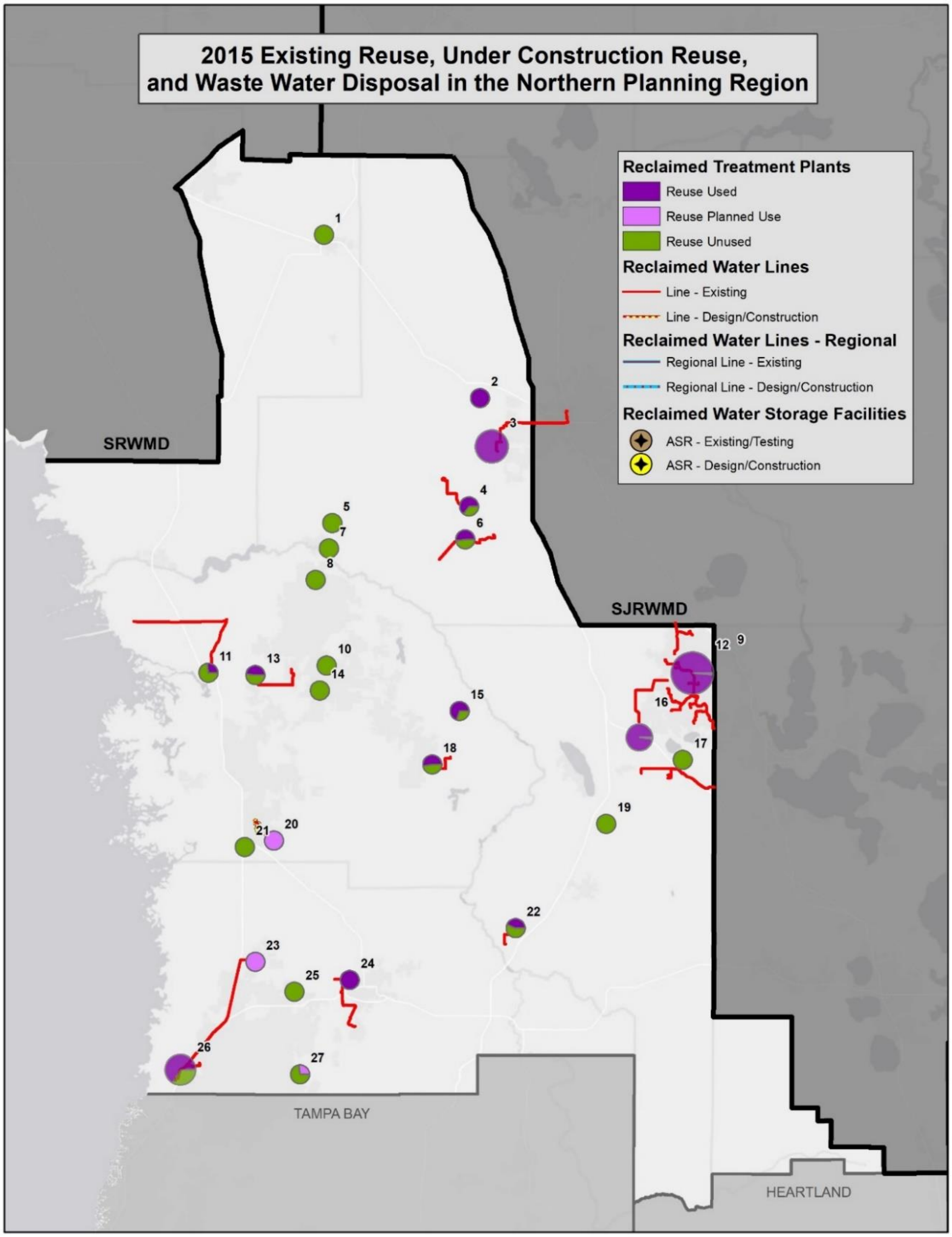


Figure 4-3. *Northern Planning Region reclaimed water map (information on numbered facilities is available at http://www.swfwmd.state.fl.us/conservation/reclaimed/*

1.0 Potential for Water Supply from Reclaimed Water

Table 4-6 provides information on the current and future availability of reclaimed water in the planning region and the potential to achieve potable-quality water benefits through 2040. In 2015, there were 29 WWTPs in Levy, Citrus, Sumter, Marion, Hernando and Lake counties, collectively producing 19.1 mgd of wastewater. Of that quantity, 12.3 mgd was used resulting in 10 mgd of benefits to traditional water supplies. Therefore, only approximately 64 percent of the available reclaimed wastewater produced in the region was provided to customers for irrigation, industrial cooling or other beneficial purposes. By 2040, it is expected that more than 75 percent of reclaimed water available in the planning region will be used. It is further expected that efficiency of use will be close to 75 percent through a combination of measures such as customer selection metering, volume-based rates and education. As a result, by 2040, it is estimated that 20.9 mgd (more than 75 percent) of the 26.3 mgd of wastewater treated will be beneficially used. This will result in approximately 15.6 mgd of benefits, of which 5.6 mgd are post-2015 benefits (75 percent efficiency).

Table 4-6. *2015 actual versus 2040 potential reclaimed water availability, utilization and benefit (mgd) in the Northern Planning Region*

County	2015 Availability, Utilization and Benefit[1]				2040 Potential Availability, Utilization and Benefit[2]			
	Number of WWTPs in 2015	WWTP Flow in 2015	Utilization in 2015 (64%)	Potable-Quality Water Benefit in 2015 (81%)	2040 Total WWTP Flow	2040 Utilization (75%)[3]	2040 Potable-Quality Water Benefit (75%)[3]	Post 2015 Benefit
Levy	1	0.20	0.00	0.00	0.23	0.17	0.13	0.13
Citrus	9	3.21	0.75	0.61	4.65	3.49	2.61	2.00
Sumter	7	6.44	5.88	5.30	8.96	7.86	5.90	0.60
Marion	7	4.16	3.29	2.08	5.44	4.08	3.06	0.98
Hernando	8	5.14	2.40	2.01	7.07	5.30	3.97	1.96
Lake	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**32**	**19.15**	**12.32**	**10.00**	**26.35**	**20.90**	**15.67**	**5.67**

[1] Estimated at 81 percent Regionwide average.
[2] See Table 4-1 in Appendix 4.
[3] Unless otherwise noted.

Section 4. Surface Water

The Withlacoochee River is the only major river system in the planning region. When established, MFLs will ultimately constrain the potential yield of the Withlacoochee River for water supply.

1.0 Criteria for Determining Potential Water Availability

Since the MFL for the Withlacoochee River has not yet been established, the available yield was calculated using a planning-level minimum flow criteria. The five-step process used to estimate potential surface water availability includes: (1) estimation of unimpacted flow, (2) selection of the analysis period, (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 description of this process is included in Chapter, 4 Appendix 4-2.

2.0 Overview of the Withlacoochee River System

The Withlacoochee River watershed covers approximately 2,100 square miles. The river originates in the Green Swamp in Polk County and flows northward for 157 miles where it discharges into the Gulf of Mexico near Yankeetown, Florida. In 1989, the river and its connected lakes and tributaries were designated an Outstanding Florida Water (OFW). Within the Green Swamp near Highway 98, where the Withlacoochee River is close to the headwaters of the Hillsborough River, a low, natural saddle separates the two watersheds. The Withlacoochee River can discharge to the Hillsborough River during high flows, but overflow seldom occurs.

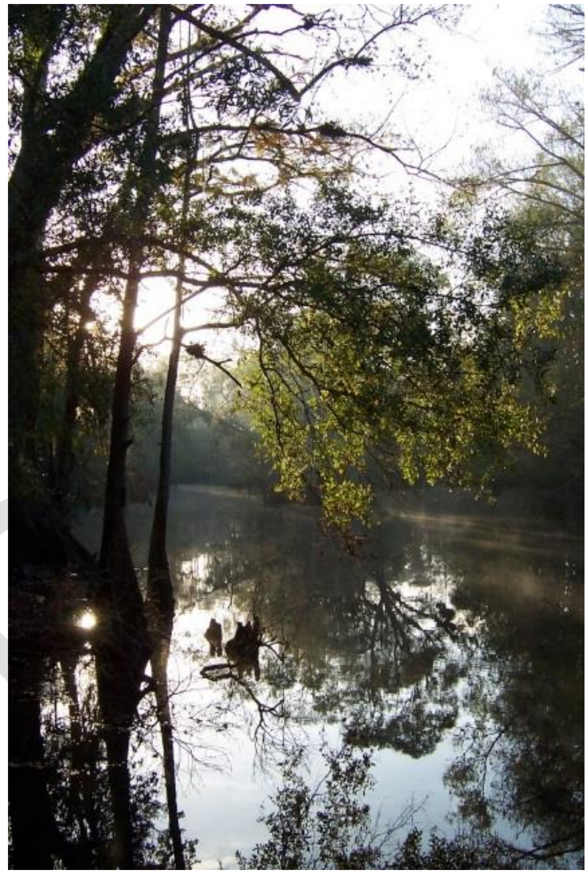
The upper reaches of the Withlacoochee River in the Green Swamp consist mostly of agricultural lands and wetlands. The river corridor is more developed near Dade City in Pasco County but, for the most part, it remains relatively rural in character. From the Lake Tsala Apopka area downstream to Dunnellon, isolated areas of development are present, but much of the landscape is wilderness or rural. The main tributaries to the Withlacoochee River are Pony, Grass and Jumper creeks, Gator Hole and Gum sloughs, and the Little Withlacoochee, Panasoffkee Outlet, and Rainbow rivers. Several springs flow into the river, including Dobes Hole, Riverdale, Nichols, Gum Slough, Wilson Head, Blue, and Rainbow. There are several control structures that affect flow in the Withlacoochee River, including the Inglis Dam at Lake Rousseau, structures between Lake Tsala Apopka and the river, and the Wysong-Coogler Dam located two miles downstream from the mouth of the Panasoffkee Outlet River.

Panasoffkee Outlet River

West of Lake Rousseau, the Withlacoochee River flows to the Gulf of Mexico where it discharges into the Withlacoochee Bay estuary. From Inglis to the Gulf, the river has been greatly altered by the construction of a lock, dam and bypass canal. Construction of the Cross Florida Barge Canal changed the hydrologic regime of the lower portion of the Withlacoochee River. The barge canal limits the high flow conditions historically experienced by the estuary, with an overall reduction to long-term average flows.

The Withlacoochee River is generally a gaining stream with increasing groundwater discharge in the downstream direction (Trommer et al., 2009). It was estimated that, during the period from October 2003 to March 2007, approximately 40 percent of the total river flow at Holder was from groundwater seepage, 30 percent was from tributary flow and 30 percent was from spring flow.

The WRWSA, in cooperation with the District, completed an update to their RWSP estimating the availability of surface water from the Withlacoochee River based on a draft minimum flow (Cardno Entrix, 2019). The WRWSA used a draft minimum flow because the District had not yet established a minimum flow for the river. The draft minimum flow was developed using data from the Croom and Holder U.S. Geologic Survey (USGS) gaging stations where the available flow record is most comprehensive. This study did not include development of a threshold for the lower Withlacoochee River, since it has been significantly altered by construction of the Inglis Dam and the Cross Florida Barge Canal. The most downstream point included in the WRWSA study was Holder, which excludes flow from the Rainbow River located further downstream. Because the Rainbow River was not included in the WRWSA study, it was not used to calculate surface water availability in this RWSP.



Withlacoochee River

The District applied planning level minimum flow criteria to flow data obtained from the USGS gauge near Holder to make the calculation. Once minimum flows are established for the Withlacoochee River, water supply availability estimates will be refined. The average annual discharge at the gauge near Holder is approximately 511 mgd (791 cubic feet per second) for the period 1965–2018. There are currently no permitted annual average withdrawals from the Withlacoochee River. Actual average annual diversions from the Withlacoochee River were not included in the surface water availability estimate because they are negligible. Based on the planning level minimum flow criteria, approximately 49.7 mgd of water supply is potentially available from the Withlacoochee River.

3.0 Potential for Water Supply from Surface Water

Table 4-7 summarizes potential surface water availability from the Withlacoochee River. The estimated surface water that could potentially be obtained from the Withlacoochee River in the planning region is approximately 49.7 mgd. Additional factors that could affect the quantities of water that are ultimately developed for water supply include the future establishment of minimum flows, variation in discharges to the river from outside sources, changes in groundwater pumping as more permits are issued, and the ability to develop sufficient storage capacity.

Section 5. Brackish Groundwater Desalination

Brackish groundwater suitable for water supply is available from two general sources within the District; in the UFA and intermediate aquifer system along coastal areas, and inland at greater depths within the LFA below MCU II. The coastal brackish groundwater is found as a depth-variable transition between fresh and saline waters. Figure 4-4 depicts the generalized location of the freshwater/saltwater interface (as defined by the 1,000 milligrams per liter (mg/L) isochlor) in the Avon Park high production zone of the UFA in the southern and central portions of the District. Generally, water quality declines to the south and west.

Table 4-7. *Summary of current withdrawals and potential availability of water from the Withlacoochee River in the Northern Planning Region (mgd) based on planning-level minimum flow criteria*

Water Body	In-stream Impoundment	Adjusted Annual Average Flow[1]	Potentially Available Flow Prior to Withdrawal[2]	Permitted Average Withdrawal Limits[3]	Current Withdrawal[4]	Unpermitted Potentially Available Withdrawals	Days/Year New Water Available[5]		
							Avg	Min	Max
Withlacoochee River near Holder	Yes	511	51.1	0.0	0.0	49.7	310	26	366
Total			**51.1**	**0.0**	**0.0**	**49.7**			

[1] Mean flow based on recorded USGS flow. Period of record used is 1965–2018.
[2] Based on 10 percent of mean flow.
[3] Based on individual WUP permit conditions, which may or may not follow current 10 percent diversion limitation guidelines.
[4] Equal to remainder of 10 percent 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).
[5] 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.

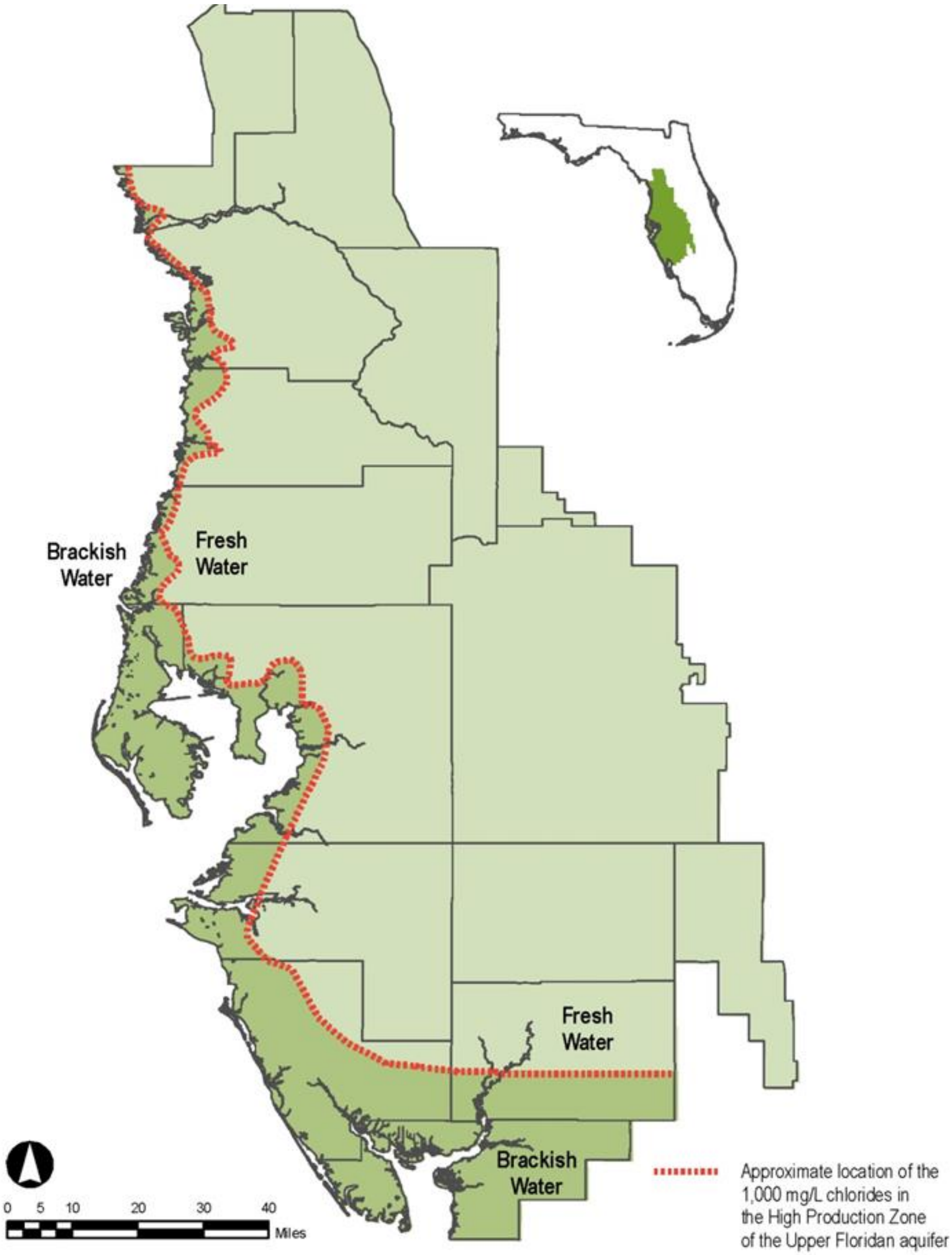


Figure 4-4. *Generalized location of the freshwater/saltwater interface in the District*

Outside of the immediate coastal zone, brackish water also exists in the LFA, from mixing with relic seawater or contact with evaporitic and organic-rich strata. Recent hydrogeologic investigations in Polk County have found groundwater below MCU II to be mildly brackish, and also reasonably confined from the UFA, to suggest development of the source may be feasible. At greater depths the groundwater is saline, so future projects must address potential upwelling of saline groundwater to supply wells that could deteriorate water quality over time.

Brackish groundwater is defined as groundwater having impurity concentrations greater than drinking water standards (i.e., total dissolved solids (TDS) concentration greater than 500 mg/L), but less than seawater (SWFWMD, 2001). Seawater has a TDS concentration of approximately 35,000 mg/L. Brackish water treatment facilities typically use source water that slightly or moderately exceeds potable water standards. Raw water with TDS values less than 6,000 mg/L is preferable for treatment due to recovery efficiency and energy costs. Groundwater with TDS greater than 10,000 mg/L generally exceeds feasibility because treatment would require high-pressure pumps and reverse osmosis (RO) membranes that are more costly to operate. Many treatment facilities will blend fresher water or recirculate some RO permeate to maintain a consistent raw water quality for efficient operation. Pure RO permeate can have very low TDS and may be corrosive to pipe metals and prior mineral deposits, so bypass blending of some raw water into the RO permeate is common for buffering, and also increasing the total yield.

The District's ROMP program exploring the Lower Floridan aquifer in Sumter County

While RO is the most common brackish water treatment technology, electro-dialysis reversal (EDR) systems may also be viable and are in use within the District at the T Mabry Carlton facility in Sarasota County. The EDR method uses an electrical current to pull ionic minerals outward from water flowing through a gel membrane, and the electrical current is frequently reversed to prevent buildup in the membrane. Both RO and EDR systems should be considered in brackish water supply project conceptualization and feasibility studies.

Both RO and EDR treatment systems generate a concentrate byproduct that must be disposed of through methods that may include surface water discharge, deep-well injection, or dilution at a WWTP. Surface water discharges require a National Pollutant Discharge Elimination System (NPDES) permit and may be restrained by TMDL limitations. In some cases, brackish water treatment 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 is becoming more prevalent. Deep-well injection may not be permittable in some areas with unsuitable geologic conditions. An additional but costly disposal option is zero liquid discharge (ZLD). Zero liquid discharge (ZLD) is the treatment of concentrate for a second round of high recovery desalination, then crystallization or dehydration of the remaining brine. The resulting solids might have economic value for various industrial processes.

The Florida Legislature declared brackish groundwater an AWS in 2005 (Senate Bill 444). However, it remains a groundwater withdrawal and must occur in a manner that is consistent with applicable rules, regulations, and water use management strategies of the District. Factors affecting the development of supplies include the hydrologic 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, recognizing brackish groundwater as an AWS and allowing for assistance with construction projects. Since then, the District has assisted constructing five brackish groundwater treatment projects in the cities of North Port, Oldsmar, Tarpon Springs, Clearwater, and Punta Gorda. Each City has a regionally interconnected water supply system. The District is also co-funding two additional brackish groundwater projects for the PRWC that are under design. The funding is intended to incentivize the development of integrated, robust, multijurisdictional systems that are reliable, sustainable, and utilize diverse water sources. While the District's regional water supply development processes have traditionally been based on meeting increasing demand projections, several brackish groundwater projects have been pursued for other needs: to blend permeate with treated surface water in order to meet finished water quality standards, to maintain viability of existing wellfields with deteriorating water quality, and to provide seasonal source substitution to meet an MFL. Future projects might also incorporate indirect potable reuse. The District recognizes the importance of maintaining the viability of existing supplies, but also encourages the consideration of alternate options based on economics and long-term regional benefit. A phased approach to brackish groundwater development is recommended that includes hydrogeologic evaluations to determine project viability, design phases that help refine the economic and permitting feasibility, and construction procured through a competitive bidding process.

1.0 Potential for Water Supply from Brackish Groundwater

In the coastal portions of the planning region, salt water is close to the surface and exists as a wedge beneath a relatively thin freshwater lens in the UFA. Combined with the fact that the UFA in these areas is unconfined and highly transmissive, this results in a very significant potential for induced saltwater intrusion from brackish groundwater withdrawals. Extensive analysis and modeling will be required to determine the permittability of sustainable brackish groundwater withdrawals in coastal areas. In some inland areas, the freshwater zone in the UFA may only be a few hundred feet thick. Below this level, water becomes increasingly more mineralized, mainly due to the presence of sulfate. The variability of sulfate concentrations with depth across the planning region is significant. For example, sulfate concentrations in groundwater pumped from depths of 600 to 1,000 feet at The Villages development in northeast Sumter County varied from 10 to 50 mg/L, which is well within potable water standards. The Villages uses higher-sulfate water for landscape irrigation, without advanced treatment, to offset demand for potable-quality groundwater in the upper portions of the aquifer.

The District is conducting tests through exploratory drilling to determine and map water quality within the LFA in northern Sumter and western Marion counties. The water quality has been generally fresh below MCU I in areas tested but degrades where water is near contact with evaporitic minerals contained in the deeper MCU II.

Because fresh groundwater continues to be available in much of the planning region, specific project options for brackish groundwater supply have not been thoroughly evaluated. As a result, it is not possible to determine the availability of brackish groundwater from the UFA and LFA. In the near term, the availability of brackish groundwater in the planning region for water supply must be determined on a case-by-case basis through the permitting process or further investigated for select areas in partnership with other entities, such as the WRWSA.

Section 6. Aquifer Recharge

Natural recharge of rainfall infiltration to the surficial aquifer and underlying aquifers is the primary source maintaining aquifer levels. Aquifer recharge (AR) is the process of beneficially using excess water to directly or indirectly recharge aquifers. Aquifer recharge (AR) may be accomplished by using wells or rapid infiltration basins. In order to maximize environmental and water supply benefits, AR projects will generally target the fresher portions of the aquifer.

Successful AR projects will improve groundwater levels. This water level improvement may provide for (1) improving local groundwater quality, (2) mitigating or offsetting existing drawdown impacts due to withdrawals, (3) providing storage of seasonally available waters and thereby augmenting water supplies, and (4) potentially providing for additional new permitted groundwater withdrawals in areas of limited water supply. Aquifer Recharge (AR) project success criteria can include demonstration of the level to which aquifers have been restored, demonstrated improvements to aquifer water quality and/or increases in available water supply for existing and future users.

Sources of water for use in AR projects are often available seasonally and may include high quality reclaimed water, surface water and stormwater. Of the 796.7 mgd of reclaimed water used Statewide in 2018 (FDEP, 2019), 93.2 mgd was used for groundwater recharge, which constitutes approximately 12 percent of the total volume.

Each individual AR project will have distinctively different construction specifications, regulatory requirements and operational maintenance considerations. The hydrogeologic setting of an area often determines which AR approach can be used.

1.0 Direct Aquifer Recharge

Direct AR uses wells to inject water meeting applicable FDEP water quality standards into an aquifer. Direct AR water recovery may occur through other wells constructed in the area. However, direct AR projects are often designed to improve aquifer conditions.

Characterization of the targeted aquifer for direct AR is fundamental in the design, operation, and maintenance of a direct AR system. Understanding the permeability and the degree of aquifer confinement above and below the injection interval, along with a characterization of the difference in water quality between the injection source water and the ambient groundwater in the injection interval and existing aquifers above and below, is critical to direct AR project success. Direct AR system designs must address the potential for mobilization of naturally occurring arsenic on a site-specific basis. If not addressed in the design of a direct AR project, the related and undesirable geochemical reactions may occur when the injection water reacts with the aquifer. Properly designed projects can avoid or manage these reactions through the adjustment of injection water chemistry, such as the removal of dissolved oxygen. In certain circumstances, the FDEP may allow these chemical reactions to occur if an adequate property area is controlled by ownership and it a can be demonstrated the reaction is limited to the controlled area and will not require any other users of the aquifer to implement additional treatment to continue their use.

Recent experience with operational ASR projects incorporating oxygen degasification systems and post treatment stabilization have proven that metals mobilization can be minimized and controlled by reducing the dissolved oxygen content in the injection source water in addition to maintaining a negative oxygen-reduction potential (ORP). Aquifer Recharge (AR) projects will need to function in the same manner. Groundwater flow resulting from injection and the natural groundwater flow gradient will have the potential to move dissolved metals down gradient. For this reason, it will be important to establish necessary aquifer monitoring and institutional controls to guard against public access to potentially contaminated groundwater if metals are mobilized.

2.0 Indirect Aquifer Recharge

Indirect AR is when water is applied to land surface where it can infiltrate and recharge the aquifer. Indirect AR can be accomplished by using a variety of techniques, including spray fields, recharge wetlands, large-scale drain fields, and RIBs. This recharge approach is used in areas where there is a good connection between the surface and source aquifer for water supply. Water applied to the surface must meet minimum water quality standards approved by the FDEP. Infiltration capacity and permeability of the soil, presence of drainage features, depth to the water table, local hydrogeology, locations of nearby drinking water wells, as well as locations of nearby wetlands and lakes are all important to identify, test and to determine the feasibility of indirect AR. In favorable regions, indirect AR can provide additional natural water quality treatment to the water as it percolates through sediments during infiltration, in addition to subsequently increasing aquifers levels. It is estimated by the District that 19.24 mgd of available reclaimed water (Districtwide) was being applied through RIBs for indirect AR as of 2018 (FDEP Reuse Inventory of 2019).

Section 7. Seawater Desalination

Seawater is defined as water in any sea, gulf, bay or ocean having a TDS concentration of 35,000 mg/L or more (SWFWMD, 2001). Seawater can provide a stable, drought proof water supply that may be increasingly attractive as the availability of traditional supplies diminish and advances in technology and efficiency continue to reduce costs. There are five principal elements to a seawater desalination system that require extensive design considerations: an intake structure to acquire the source water, pretreatment to remove organic matter and suspended solids, RO desalination to remove dissolved minerals and microscopic constituents, post-treatment to stabilize and buffer product water and prepare it for transmission, and concentrate disposal management (National Research Council, 2008). Each of these elements is briefly discussed below.

The intake structure is utilized to withdraw large amounts of source water for the treatment process. The volume of water withdrawn may significantly exceed the amount treated if concentrate dilution is necessary. The intake design and operation must address environmental impacts because much of the District’s near-shore areas have been designated as either OFW or aquatic preserves. Ecological concerns include the risk of impingement and entrainment of aquatic life at the intake, entrainment of sediments and oils, and perturbation to seagrasses and hard-bottom communities.

The pretreatment of source water is imperative to protect the sensitive RO membranes from fouling prematurely from organic carbon and particulates, and this may be the most critical design element. A pretreatment system may require coagulation and/or microfiltration technology similar to the treatment of fresh surface water. A robust pretreatment may seem duplicative, but lessons learned from Tampa Bay Water and other facilities have demonstrated the importance of pretreatment to the long-tern viability of the facility.

High-pressure RO membrane treatment is the most widely accepted seawater desalination technology. The RO system pressurizes saline water above the osmotic pressure of the solutes and passes the water through a network of semi-permeable membranes. Fresh water passes through the membranes, while a constant flow of raw water prevents the dissolved minerals from fouling the membrane's surface. The membranes are susceptible to fouling or damage from dissolved organic matter and fine suspended particles, which is why an effective pretreatment method is necessary. The pressurization step can be energy intensive. Seawater treatment requires pressures from 600 to 1,000 pounds per square inch (psi), compared to brackish groundwater systems (with <10,000 mg/L TDS) operating at 30 to 250 psi (FDEP, 2010). Most large-capacity seawater facilities have energy recovery systems that use turbines driven by high-pressure flow exiting the RO membranes to boost pressure to the pumps feeding the source water. Energy recovery systems reduce electrical demands, alleviate redundant pumping capacities, lower operational costs, and reduce the facility's carbon footprint.

The post-treatment element is necessary to protect the facility's infrastructure and distribution piping. The RO product water has a very low hardness and alkalinity, which can corrode piping and add unwanted metals into the finished water. Chemical post-treatment such as lime or caustic soda addition is often used for buffering and pH adjustment. A settling system may be necessary to reduce turbidity generated by chemical treatment. A degassing system may also be necessary, as dissolved gasses such as hydrogen sulfide can pass through RO membranes and create a noticeable odor in the finished water.

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

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

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

1.0 Potential for Water Supply from Seawater Desalination (NPR)

The District's 2015 RWSP identified an option for a 15 mgd seawater desalination facility in the planning region co-located at the Crystal River power station near the Gulf of Mexico in Citrus County. This option was reevaluated for the WRWSA's 2019 RWSP Update, in cooperation with the District. Conceptual details and estimated costs of this project option have been modified due to operational changes at the Crystal River power station.

Lake Rousseau Dam

The Duke Energy Crystal River Energy Complex (CREC) contains a once-through seawater cooling water system capable of withdrawing over 1,800 mgd of seawater, and a canal discharge system that transports the cooling water flows over 2 miles from the shoreline. The once-through cooling system was historically used for the nuclear power generating unit and two coal-fired generating units. However, these units are in the process of being decommissioned. The CREC will continue operations utilizing generating units equipped with more efficient closed-cycle cooling systems. In late 2018, Duke Energy completed construction of the Citrus Combined Cycle Project (CCCP), a new natural gas-fired plant at the CREC. Due to the projected reduction in cooling water flow and elevated level of salinity in the discharge, using the cooling water stream for waste concentrate disposal is no longer feasible, as there is not enough water to achieve the necessary dilution factor for the desalination concentrate.

Given this, the WRWSA evaluated the siting of a seawater desalination facility at the Cross Florida Barge Canal north of the CREC in Citrus County. The feedwater for such a facility would be brackish surface water pumped from the Cross Florida Barge Canal rather than direct seawater, with waste concentrate disposal occurring through either deep well injection, zero liquid discharge technologies, or ocean outfall. Seawater desalination project option costs are presented in Chapter 5. The proposed location, along with other existing and proposed seawater and brackish groundwater desalination facilities within the District, is shown in Figure 4-5.

Section 8. Stormwater

The FDEP and the WMDs define stormwater as the flow of water which results from, and which occurs immediately following, a rainfall event and which is normally captured in ponds, swales, or similar areas for water quality treatment or flood control. Development of the natural landscape can result in significant changes to the characteristics of stormwater flows. Stormwater runoff can provide considerable volumes of water that can be captured and beneficially used, resulting in water supply, AR, water quality, and natural system benefits. Rule 62-40, Florida Administrative Code, defines "stormwater recycling" as the capture of stormwater for irrigation or other beneficial use. The reliability of stormwater can vary considerably depending upon climatic conditions and storage capability. Therefore, the feasibility of effectively utilizing stormwater as an AWS source often relies on the ability to use it in conjunction with another source (or sources) in order to decrease operational vulnerability to climatic variability (aka "conjunctive use"). Stormwater represents a potentially AWS at the local level, particularly for reclaimed water supplementation and irrigation water uses.

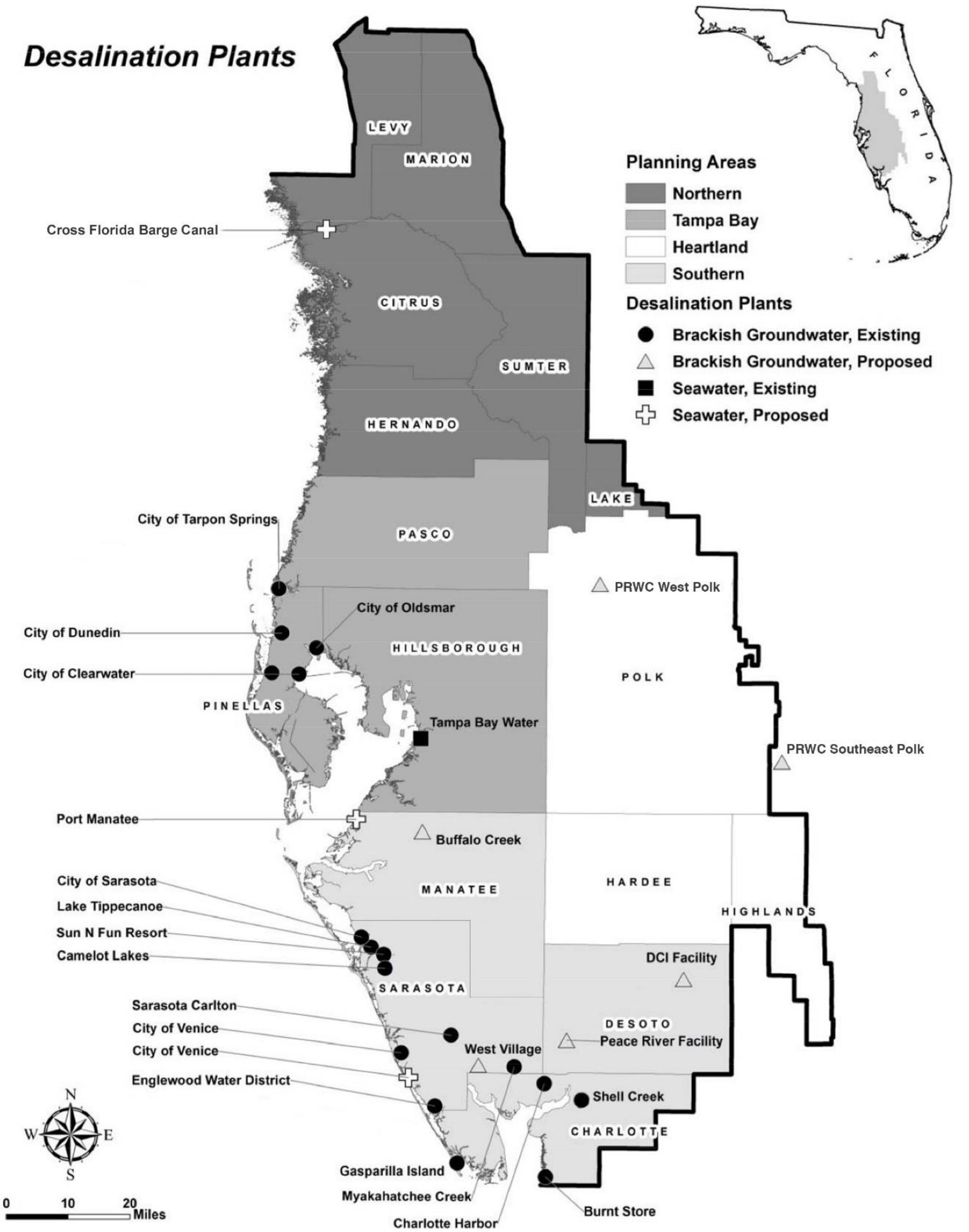


Figure 4-5. *Location of existing and potential seawater and brackish groundwater desalination facilities in the District*

In the Northern Region, the Villages has had historical success in developing stormwater supplies in conjunction with reclaimed water for landscape irrigation. As this area continues to develop, stormwater is expected to continue to be a significant source of water locally to meet landscape irrigation demands. A major future opportunity for stormwater development is the ability for local governments and utilities to partner with the Florida Department of Transportation (FDOT) on stormwater capture and harvesting projects. Presently, FDOT's Efficient Transportation Decision Making Process (ETDM) gives the WMDs and other agencies an opportunity to provide comments during the Planning Screen phase of a project. When FDOT projects advance to the Project Development and Environment (PD&E) phase, FDOT uses Environmental Look Arounds (ELAs) to proactively look for cooperative and regional stormwater management opportunities. ELAs can assist the districts, other agencies, and local utilities with identifying sources of stormwater for activities such as reclaimed water augmentation and MFL recovery.

Section 9. Summary of Potentially Available Water Supply

Table 4-8 is a summary of the additional quantity of water that will potentially be available from all sources of water in each county in the planning region from 2015 through 2040. The table shows that the total additional quantity available is 100.89 mgd.

Part B. Determination of Water Supply Deficits/Surpluses

Future water supply deficits/surpluses in the planning region were calculated as the difference between projected demands for 2040 and demands calculated for the 2015 base year (Table 3-6). The projected additional water demand in the planning region for the 2015–2040 planning period is approximately 50.43 mgd. As shown in Table 4-8, up to 100.89 mgd is potentially available from water sources in the planning region to meet this demand. Based on a comparison of projected demands and available supplies, it is concluded that sufficient sources of water are available within the planning region to meet projected demands through 2040.

Table 4-8. *Potential additional water availability in the Northern Planning Region through 2040 (mgd)*

County	Surface Water[1]		Reclaimed Water	Desalination		Fresh Groundwater[3]		Water Conservation		Total
	Permitted Unused	Available Unpermitted	Benefits	Seawater	Brackish Groundwater	Surficial and Intermediate	Upper Floridan Permitted Unused	PS	AG	
Hernando	-	-	1.96	-	-	-	3.72	1.74	0.40	7.82
Citrus	-	-	2.00	15	-	-	3.65	5.39	0.23	26.27
Sumter	-	-	0.60	-	-	-	7.05	2.29	0.21	10.15
Levy	-	-	0.13	-	-	-	0.23	0.08	1.41	1.85
Lake	-	-	0.00	-	-	-	0.00	0.00	0.04	0.04
Marion	0.54	49.7	0.98	-	-	-	1.21	1.37	0.96	54.76
Total	**0.54**	**49.7**	**5.67**	**15**	**TBD**	**NA**	**15.86[2]**	**10.87**	**3.25**	**100.89**

[1] Available surface water from the Withlacoochee River is split between Citrus and Marion counties because the calculation was based on flows at a location between these two counties; however, future withdrawals from other counties may be available.
[2] Groundwater that is permitted but unused for PS. Based on 2018 Estimated Water Use (SWFWMD, 2019). It is anticipated that regional future demand can be met with groundwater, provided existing and anticipated local impacts are mitigated or avoided with conservation and reclaimed water use. The quantity of groundwater available in each county is equivalent to each county's projected 2040 demand.
[3] Fresh Groundwater does not include quantities potentially available from the LFA in portions of the planning region. These quantities will be further evaluated in future updates of this RWSP for the Northern Planning Region.

Chapter 5. Overview of Water Supply Development Options

The water supply development (WSD) component of the Regional Water Supply Plan (RWSP) requires the Southwest Florida Water Management District (SWFWMD) (District) to identify water supply options from which water users 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, sources of water potentially available to meet projected demand in the planning region include fresh groundwater, water conservation, reclaimed water, surface and stormwater, Aquifer Storage and Recovery and Aquifer Recharge, and seawater desalination. 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.

The RWSP Executive Summary presents statutory guidance on how water supply entities are to incorporate WSD options from the RWSP into their water supply planning and development of their comprehensive plans.

Part A. Water Supply Development Options

The District developed the reclaimed water options in this chapter. Surface water/stormwater, fresh groundwater, and seawater desalination options were developed by the Withlacoochee Regional Water Supply Authority (WRWSA) as part of their 2019 RWSP, which was co-funded by the District. The water conservation options were developed as a collaborative effort between the District and the WRWSA.

The options presented in this chapter are not necessarily the District's preferred options but are reasonable concepts that water users in the region could pursue in their water supply planning. A number of the options are of such a scale that they would likely be implemented by the WRWSA. Other options, such as those involving reclaimed water and conservation, could be implemented by individual utilities. The District anticipates that users will choose an option or combine elements of different options that best fit their needs for WSD. 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.

The WRWSA's 2019 RWSP provided unit production cost estimates for the surface water, groundwater, and desalination options. Currency is based on 2018 U.S. dollars. Water production costs in $/1,000 gallons provided by the WRWSA are a function of the capital cost debt service based on a 30-year life cycle at 3.0 percent interest (2018 federal discount rate for water projects), annual operation and maintenance (O&M) costs, and amount of water produced.

Section 1. Fresh Groundwater Options

Fresh groundwater project options for the planning region were reevaluated as part of the WRWSA's 2019 RWSP Update. To assess the need for groundwater project options, an analysis was conducted to identify public supply (PS) utilities in the WRWSA's four-county region that were likely to experience water supply deficits by the year 2040. This was accomplished by comparing the 2040 projected demand for each utility (permitted for more than 0.1 million gallons per day [mgd] as of 2015) to their currently permitted groundwater quantities. Utilities with 2040 projected demands that exceed their currently permitted groundwater quantities were identified as having the potential for a water supply deficit. Ten utilities that met this criterion are shown in Table 5-1.

Table 5-1. *Utilities with 2040 demands exceeding permitted quantities*

Utility Name	2015 Demand (MGD)	2040 Demand (MGD)	Increase in Demand 2015-2040 (MGD)	Currently Permitted Quantity (MGD)	2040 Deficit (MGD)	Deficit as Percentage of 2040 Demand
Citrus County						
Citrus County - Sugarmill Woods	2.15	2.72	0.57	2.36	-0.36	13.24%
Marion County (SWFWMD)						
Bay Laurel Center Public Water Supply System	2.50	3.10	0.60	2.56	-0.54	17.42%
City of Dunnellon	0.84	1.16	0.32	1.12	-0.04	3.45%
Marion County (SJRWMD)						
Sunshine Utilities / South Marion Regional System	0.18	0.24	0.06	0.15	-0.09	37.50%
Marion County Utilities Consolidated Permit	5.18	7.62	2.44	6.44	-1.18	15.49%
Sumter County						
Lake Panasoffkee Water Association Inc.	0.23	0.59	0.35	0.41	-0.18	30.51%
City of Bushnell	0.38	1.44	1.06	1.37	-0.07	4.86%
City of Webster	0.12	0.28	0.16	0.10	-0.18	64.29%
City of Wildwood	2.21	9.42	7.20	6.44	-2.98	31.63%
City of Center Hill	0.12	0.32	0.20	0.17	-0.15	46.88%

Section 2. Water Conservation Options

1.0 Non-Agricultural Water Conservation

WRWSA identified a series of conservation activities that are appropriate for implementation by the PS sector. However, while this analysis only estimates active conservation savings and costs for PS, some of these activities can also be implemented by the domestic self-supply, industrial/commercial (I/C), and landscape/recreation water use sectors. A complete description of the criteria used in selecting these activities and the methodology for determining the water savings potential for each activity are described in detail in Chapter 4.

Some readily applicable conservation activities are not addressed due to the wide variance in implementation costs and the site-specific nature of their implementation. One such measure is water-conserving rate structures, which have savings potential but are not addressed as part of the 2020 RWSP. The District strongly encourages these measures and, when properly designed, 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 (WUP) application or renewal process. The following is a description of each non-agricultural water conservation option. Savings and costs for each conservation activity evaluated in the 2020 RWSP are also summarized in Table 5-2 below.

The types of activities implemented in this region are expected to be similar to WRWSA as most PS demands in the region are part of WRWSA. Figure 5-1 below depicts which activities will produce what portion of the projected savings. It is understood that over time the breakout will change, but this is what is considered to be the best available information. It is important to note that the savings and costs in Table 5-2 and Figure 5-1 do not include those associated with Levy County, which is not a member of WRWSA.

Table 5-2. *Conservation activity options for PS sector*

Conservation Activity	2040 PS Savings (mgd)[1]	Average Cost Effectiveness ($/kgal)	Total Cost[2]
Residential			
High-efficiency and Ultra-low Flow Toilets	0.40	$1.95	$3,093,259
Smart Irrigation Controllers	0.51	$1.22	$1,455,828
High-efficiency and Low-flow Showerheads	0.06	$0.49	$41,834
High-efficiency Clothes Washers	0.08	$2.22	$741,273
Landscape and Irrigation Evaluations/Audits	2.86	$1.12	$5,930,422
Rain Sensors	0.57	$2.92	$1,432,708
Faucet Aerators	0.09	$0.30	$18,753
Florida Water Star[SM] in New Construction	0.05	$0.09	$10,407
Irrigation Ordinance	3.24	$0.00	$0
Smart Irrigation Controllers in New Construction	0.31	$0.00	$0
Total PS	**8.17**	**$0.80[3]**	**$12,724,484**

[1]2040 PS savings do not include those estimated for Levy County, which is not a member of WRWSA.
[2]Total cost does not include cost estimates for active conservation in Levy County.
[3]Total cost efficiency is weighted by each project's percent share of total savings in relation to the cost.

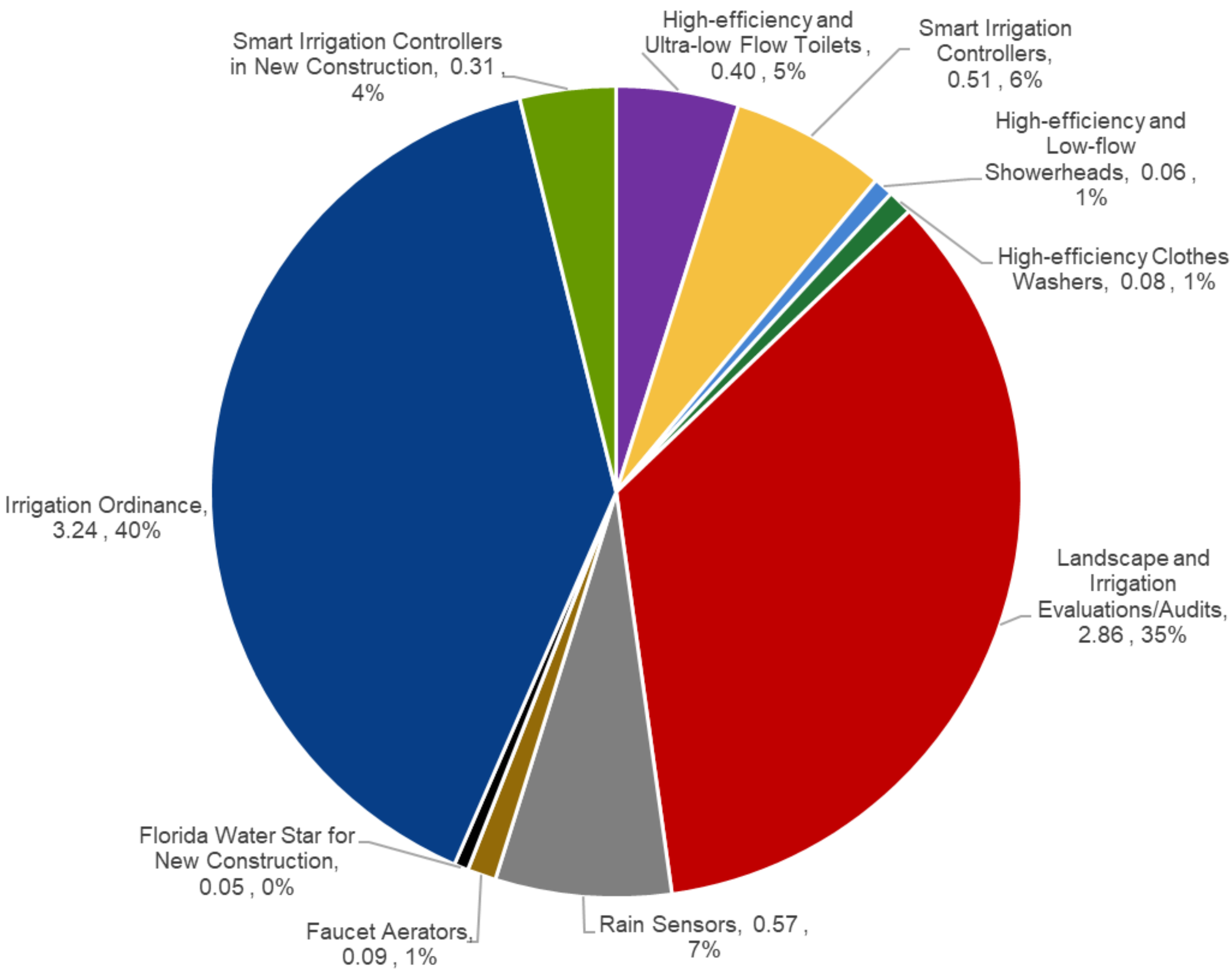


Figure 5-1. *Total 2040 active water savings (mgd) in Northern Region, by conservation activity*

1.1 Description of Non-Agricultural Water Conservation Options

1.1.1 Ultra Low-Flow Toilet and High-Efficiency Toilet Rebates (Residential)

High-Efficiency Toilet (HET) and Ultra Low-Flow Toilet (ULFT) rebate programs offer $100 rebates as an incentive for replacement of inefficient high-flow toilets with more water-efficient models. High-Efficiency Toilets (HETs) use 1.28 gallons per flush (gpf) and ULFTs use 1.6 gpf, as opposed to older, less efficient models that could use 3.5 gpf or more depending on the age of the fixture. Savings estimated in this plan are based on converting a 3.5 gpf to a 1.6 or 1.28 gpf model. Dual-flush toilets and HETs are WaterSense® labeled by the U.S. Environmental Protection Agency (EPA). Also, gradually becoming more popular on the marketplace are 0.8 gpf models, which offer a 50 percent savings compared to 1.6 gpf models that are currently required by building code.

1.1.2 High-Efficiency and Low-Flow Showerheads

This practice involves installing EPA WaterSense®-labeled, high-efficiency showerheads. This is a low-cost conservation option that is easy to implement for both residential and I/C users. Savings figures shown in this chapter reflect upgrading 2.5 gallons per minute (gpm) showerheads to a 2.0 gpm WaterSense®-labeled version.

1.1.3 Landscape and Irrigation Evaluations/Audits

Water-efficient landscape and irrigation evaluations generate water savings by evaluating individual irrigation systems, providing expert tips on opportunities to increase water efficiency, optimizing run times, pointing out broken heads and leaks, and sometimes offering targeted rebates or incentives based on those recommendations. Evaluations can focus on three areas: (1) operation, (2) repair, and (3) design. They are normally only available to high-use accounts that have inground irrigation systems and are likely over-watering.

Irrigation system evaluations were identified as a major potential source of water conservation.

1.1.4 Rain Sensors

Section 373.62, Florida Statutes, requires all new automatic landscape irrigation systems to be fitted with properly installed automatic shutoff devices. This is typically a rain sensor. As with showerheads, rain sensors are an easily implemented, low-cost conservation option. They are often paired with a landscape and irrigation evaluation/audit but can also be given away to homeowners with irrigation systems.

1.1.5 Smart Irrigation Controllers

Smart irrigation controllers go a step further than rain sensors. This technology automatically adjusts irrigation runtimes according to the needs of the local landscape. It is often based on temperature, climate, rainfall, soil moisture, rain, wind, slope, soil, plant type, and more. This data is obtained by an on-site evapotranspiration sensor or through the internet. Some units can be operated by smart phone and can incorporate a weather forecast to anticipate coming rain. As an example, winter season run times may be automatically dialed down 30 percent from summer run times.

1.1.6 High-efficiency Clothes Washers

Clothes washer conservation programs involve the replacement of old, inefficient clothes washers with EPA Energy Star rated ones. Energy Star clothes washers not only save energy, but also use less water per load of laundry. Water use is measure by an Integrated Water Factor (IWF), which is defined as gallons of water per cycle per cubic foot. Energy Star washers have an IWF of 4.2 or less, depending on the model, compared to inefficient washers that have an IWF of up to 22.

1.1.7 Faucet Aerators

This practice involves installing EPA WaterSense®-labeled, high-efficiency kitchen and bathroom faucet aerators. Similar to showerheads, this is a low-cost conservation option that can be easily implemented. Efficient aerator flow rates are 1.5 gpm for bathroom faucets and 2.5 gpm for kitchen faucets.

1.1.8 Florida Water Star℠ for New Construction

Florida Water Star ℠ (FWS) is a certification program for both residential and commercial buildings. Certified buildings uphold higher standards for water conservation and efficiency, both indoors and outdoors. The primary water saving feature of FWS is the limit on high volume irrigation (maximum of 60 percent of the irrigable area). Savings estimated in this plan are based on mandating FWS certification for all new construction.

1.1.9 Irrigation Ordinances

Many utilities choose to enact irrigation ordinances that restrict residential irrigation to certain days of the week. Violation of the ordinances typically results in a written notice and subsequent fines to the homeowner. In this 2020 RWSP, a one day per week irrigation allowance is considered as a potential active conservation measure in the estimates for Citrus County.

1.1.10 Smart Irrigation Controllers for New Construction

This activity serves as a supplement to the smart irrigation controller activity discussed previously. Rather than provide incentives for smart irrigation controller installations, this measure mandates that all new construction automatically have smart irrigation controllers installed from the beginning. In this 2020 RWSP, this mandate is considered as a potential active conservation measure in the estimates for Citrus County.

2.0 Agricultural Water Conservation Options

The District has a comprehensive strategy to significantly increase the efficiency of agricultural water use over the next 20 years. A key component of this strategy is the cooperative programs the District has established with other agencies to provide the agricultural community with a wide array of technical and financial assistance programs to facilitate increases in water use efficiency. For nearly 30 years, the District has administered programs that have provided millions of dollars to fund more than 100 projects that have helped farmers increase the efficiency of their water use and improve water quality. Water conservation options for which the District will provide assistance as part of the Facilitating Agricultural Resource Management Systems (FARMS) and other programs are described below. For some of the programs, examples of options that could be implemented by growers are included with basic technical specifications and costs.

2.1 Facilitating Agricultural Resource Management Systems

The District, in cooperation with the Florida Department of Agriculture and Consumer Services (FDACS), initiated the FARMS Program in 2003. The FARMS Program provides cost-share reimbursement for the implementation of agricultural best management practices (BMPs) that involve both water-quantity and water-quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help farmers become more efficient in their water use, improve water quality and restore and augment natural systems. The FARMS Program is a public/private partnership among the District, 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 FARMS program achieves resource benefits through two main types of projects: (1) alternative water supply (AWS); and (2) conservation through precision irrigation. These types of projects will be discussed below. The goal for the FARMS Program is to offset 40 mgd of agricultural groundwater use for agriculture in the Southern Water Use Caution Area. Out of 194 operational FARMS projects, there are nine operational projects within the Northern Planning Region.

2.2 Facilitating Agricultural Resource Management Systems Conservation Potential

Districtwide, as of September 2019, FARMS has funded more than 200 projects with agricultural cooperators, for a total estimated reduction in groundwater use of more than 29 mgd. In the Northern Planning Region, there are nine operational projects with an estimated reduction in groundwater use of approximately 0.243 mgd. The actual offset for these operational projects is approximately 0.302 mgd. While the rate of FARMS participation has varied over time, difficulties within the citrus industry and the nature of agriculture in the Northern Planning Region has resulted in a decreasing FARMS participation trend. Historically funded project information (2004-2019) was used to develop a long-term trend line as a means of estimating potential future program activity. With the decreasing participation trend, during the current planning horizon from fiscal year (FY) 2015 through FY2040, the FARMS program has the potential to reduce groundwater use by approximately 0.06 mgd through development of AWSs. There is not enough data to detect a trend in precision agriculture projects in the Northern Planning Region.

<u>Typical FARMS Project - Tailwater Recovery</u>

Tailwater recovery has proven to achieve both water-quality improvements and groundwater conservation across the District. Tailwater ponds are typically excavated below ground level at the low end of a farm to collect excess irrigation water and stormwater runoff. To utilize the pond as a source of irrigation water, pumps, filters and other appurtenances are needed to connect the pond to the existing irrigation system. The use of these ponds for irrigation offsets a portion of the groundwater used to irrigate the commodity and can improve water quality of the downstream watershed by reducing the concentration of mineralized groundwater applied to fields.

An example of a tailwater recovery project is the Blueberry Hill blueberry farm in Lake County. The farm is permitted to withdraw up to 0.140 mgd of groundwater to irrigate 53 acres of blueberries. The goal of the project is to reduce groundwater withdrawals through the use of two tailwater recovery/surface water collection reservoirs. The project was implemented in two phases with two reservoirs, includes two surface water pump stations, filtration, and infrastructure necessary to operate and connect the reservoir to an existing irrigation system. The projected reduction in groundwater withdrawals is 50 percent, or 0.07 mgd of its permitted quantities.

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.

2.3 Mobile Irrigation Laboratory

The mobile irrigation lab program is a cooperative initiative between the District and the United States Department of Agriculture 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 Best Management Practices

Best management practices (BMPs) are individual agricultural practices or combinations of practices that, based on research, field testing, and expert review, have been determined to be the most effective and practical means for maintaining or improving the water quality of surface and groundwaters and conserving groundwater resources. Best management practices (BMPs) typically are implemented in combination to prevent, reduce, or treat pollutant discharges off-site. Best management practices (BMPs) must be based on sound science, be technically feasible, and be economically viable. In Florida, agricultural BMPs are detailed in crop specific BMP manuals developed by the Services FDACS in cooperation with a wide spectrum of stakeholders within the community specific to that crop. Best management practices (BMP) manuals are available on the FDACS website and are used to evaluate a farm's intent to implement practices that conserve groundwater, protect water quality, reduce nutrient impacts, control erosion, and implement integrated pest management to reduce environmental impacts.

Section 3. Reclaimed Water Options

Reclaimed water systems in the planning region are generally in the early stages of development and, as such, the representative project options are dominated by golf course, large industrial and new residential development options. The focus is on selectively discontinuing the disposal of treated wastewater in rapid infiltration basins and spray fields and using it beneficially and/or increasing reclaimed water quality. Listed below are the different types of reclaimed water options that are compatible with the geology, hydrology, geography, and available reclaimed water supplies in the planning region.

- **Augmentation with Other Sources:** introduction of another source (stormwater, surface water, groundwater) into the reclaimed water system to expand available supply
- **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 and future uses)
- **Interconnect:** interconnection of systems to enhance supply and allow for better utilization of the resource or to enable agricultural or other WUP exchanges
- **Natural System Enhancement/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, and storage) necessary to deliver reclaimed water to more customers
- **Transmission:** construction of large mains to serve more customers
- **Potable reuse:** purification of reclaimed water to meet drinking water standards prior to introduction

The beneficial utilization of reclaimed water has for decades been a key component of water resource management within the District. For the past several years, Districtwide reclaimed water utilization has been at around 50 percent for non-potable purposes such as landscape irrigation, agricultural irrigation, aesthetic uses, groundwater recharge, industrial uses, environmental enhancement, and fire protection purposes.

Recently, as drought and long-term water shortages have occurred within other states and countries, reclaimed water has been investigated as a potable source. The "unintentional" use of reclaimed water as a potable source is not new, as many surface water sources that are used for potable raw water supplies have upstream wastewater/reclaimed water discharges. For instance, much of the flow of the Trinity River in Texas during the dry season comes from Dallas and Fort Worth wastewater treatment plants and the Trinity River is the main source of drinking water for the City of Houston. However, what is relatively new is the discussion of "direct potable reuse" with little to no lag time between discharge of purified water from a reclamation facility and use as raw water by a potable water facility.

Several high-profile projects have been investigated in western states and in other countries which involve the process of treating reclaimed water to state and federal drinking water standards so that it can be recycled for potable water supply uses. Three notable potable reuse projects that have been implemented using purified water are the Big Springs Texas Water Supply Project, the Las Vegas/Southern Nevada Water Supply Authority augmentation of Lake Meade, and the Singapore NEWater Project.

Although direct potable reuse is not currently being implemented by utilities within the District, there is increasing interest in the concept, and it is included as a viable future water supply option in this RWSP.

The District developed 5 reclaimed water project options for the planning region with input from utilities and other interested parties. The District determined the quantity of reclaimed water available for each option based on an analysis of wastewater flows anticipated to be available in 2040 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 use the same reclaimed water source. The options are listed in Table 5-3.

Flow and capital cost data for the 39 funded reclaimed water construction projects identified as being under development (2015-2020) within the District were used to develop a representative cost per 1,000 gallons supplied and capital cost for each option. The data show that, for the 39 new reclaimed water projects anticipated to come online between 2015 and 2025, the average capital cost is approximately $10.27 million for each 1 mgd supplied. This figure was used in cost calculations for individual reclaimed water options, unless specific cost data were available.

Table 5-3. *List of reclaimed water options for the Northern Planning Region*

Option Name and Entity	County	Type	Supply (mgd)	Offset (mgd)	Capital Cost (Millions)
Citrus Co./Inverness Holden Park Reuse	Citrus	System Expansion	0.05	0.04	$0.30
Wildwood-Continental Country Club Golf Reuse	Sumter	System Expansion	0.12	0.09	$0.50
Brooksville-Hernando Oaks Golf Reuse	Hernando	System Expansion	0.25	0.20	$0.60
Brooksville-Cascades Residential Reuse	Hernando	System Expansion	0.07	0.05	$0.25
Villages-Reuse Interconnection with Leesburg	Sumter, Lake	Interconnection	2.10	2.10	$21.57
Totals: 5 Options			**2.59**	**2.48**	**$23.22**

The use of italics denotes SWFWMD estimations.
Benefit = (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 330 gpd.

Section 4. Surface Water/Stormwater Options

Chapter 4 discusses the availability of surface water in the Withlacoochee River Basin for PS water use. Use of surface water entails specific treatment, reliability of quantity and quality of source waters, and management of any associated environmental impacts to downstream ecology and water resources. These characteristics should be identified and addressed at the planning level. The surface water options identified below are based on the Withlacoochee River System's flow characteristics, future demand for water supply in the region, and associated environmental resource data. More detail on all the surface water options can be found in the WRWSA 2019 RWSP update (WRWSA, 2019).

Surface Water/Stormwater Option #1. Withlacoochee River Surface Water Supply Facility in Northern Sumter County

- Entity Responsible for Implementation: WRWSA

This option is for a surface water supply facility that could provide up to 25 mgd conjunctive use facility with a raw water reservoir. A transmission system would serve customers in the City of Wildwood and The Villages. The proposed intake structure would be located on the Withlacoochee River in northern Sumter County, approximately 1.8 miles upstream of Wysong-Coogler Dam. During low-flow periods when withdrawals from the river would be limited, the facility would be supplemented by groundwater withdrawals in Sumter County. The use of surface water would extend the availability of groundwater by reducing the frequency and duration of groundwater withdrawals. The proposed location of the facility is on property owned by the District west of Lake Panasoffkee and north of the Outlet River. Conceptual project components include a river intake and raw water pump station, a storage reservoir with an area of approximately 461 acres, a raw water transfer pump station, a water treatment facility, two 10-million gallon tanks for finished water storage, a finished water pumping station, and approximately 22 miles of finished water transmission mains. See Table 5-4 for a summary of this option's potential costs.

Table 5-4. *Withlacoochee River Surface Water Supply Facility option costs (Northern Sumter County)*

Quantity Produced (mgd)	Capital Cost	Capital Cost/mgd	O&M Annual Costs	Total Cost/1,000 Gallons
25	$397,783,310	$15,911,332	$17,100,000	$4.10

Issues:

- A detailed study of the effect of the river intake on the natural environment in the area and on the river flow regime will need to be performed in order to determine the exact location and design of the intake structure.
- Minimum lake levels have been established for Lake Panasoffkee and the Tsala Apopka Chain of Lakes. Impacts to these lakes will be an important consideration during the process to permit additional groundwater and surface water withdrawals in the vicinity.
- Further geologic evaluation of the proposed reservoir area will be needed. Due to the high permeability of geologic units in the area, a reservoir liner to prevent excessive water loss was included in the conceptual design.

Surface Water/Stormwater Option #2. Withlacoochee River Surface Water Supply Near Holder

- Entity Responsible for Implementation: WRWSA

This option is for a surface water supply facility with a capacity of 25 mgd that could potentially serve customers in the City of Ocala and northwest Citrus and western Hernando counties. Water would be withdrawn from the Withlacoochee River near SR 200 and would require an off-stream reservoir to achieve the desired supply reliability. The proposed location of the facility is on property owned by the District in Marion County, northeast of the Town of Holder. Conceptual project components include a river intake and pumping station, an off-stream reservoir with a storage capacity of 3 billion gallons, a transfer pump station to move water from the reservoir to the treatment facility, a water treatment facility, finished water storage tanks, a finished water pumping station, and approximately 51 miles of finished water transmission mains. See Table 5-5 for a summary of this option's potential costs.

Table 5-5. *Withlacoochee River Surface Water Supply option costs (Near Holder)*

Quantity Produced (mgd)	Capital Cost	Capital Cost/mgd	O&M Annual Costs	Total Cost/1,000 Gallons
25	$470,391,830	$18,815,673	$17,100,000	$4.50

Issues:

- A detailed study of the effect of the river intake on the natural environment in the area and on the river flow regime will need to be performed in order to determine the exact location and design of the intake structure.
- Further geologic evaluation of the proposed reservoir area will be needed. Due to the high permeability of geologic units in the area, a reservoir liner to prevent excessive water loss was included in the conceptual design.

Surface Water/Stormwater Option #3. Surface Water Treatment Facility at Lake Rousseau

- Entity Responsible for Implementation: WRWSA

There are two options for a surface water supply facility with a capacity of 25 mgd with the potential to serve customers in the City of Ocala and northwest Citrus and western Hernando counties. Water would be withdrawn directly from Lake Rousseau and pumped north of the lake, approximately four miles, to a water treatment plant in southern Levy County on property owned by the FDACS. An off-stream reservoir is not included because of the year-round high-volume inflow from Rainbow Springs via the Rainbow River. Project components include a river intake and pumping station, a raw water transmission main, a water treatment facility, finished water storage tanks, a finished water pumping station, and approximately 63 miles of finished water transmission main. There are two options to achieving a facility with the capacity of 25-mgd. The first project option requires significantly less raw transmission main, while the second option provides more area for expansion and flexibility for potential growth. See Table 5-6 for a summary of this option's potential costs.

Table 5-6. *Surface Water Treatment Facility at Lake Rousseau option costs*

Quantity Produced (mgd)	Capital Cost	Capital Cost/mgd	O&M Annual Costs	Total Cost/1,000 Gallons
Option 1: 25	$344,865,500	$13,794,620	$17,100,000	$3.80
Option 2: 25	$361,732,400	$14,469,296	$17,100,000	$3.90

Issues:

- The District will not be setting a minimum level for Lake Rousseau because it is a reservoir. However, the U.S. Army Corps of Engineers regulation schedule at the Inglis Dam will need to be considered.

Section 5. Brackish Groundwater Desalination Options

Brackish groundwater is treated and used extensively in the Southern and Tampa Bay planning regions for potable supply. In some areas of the Northern Planning Region, brackish groundwater could be a viable source of water supply. However, no groundwater options requiring costly brackish treatment systems have been evaluated for the RWSP because of the availability of fresh groundwater, reclaimed water, and high conservation potential to meet demands within the timeframe. Any requests for brackish groundwater withdrawals would be evaluated similarly to requests for fresh groundwater withdrawals.

Section 6. Seawater Desalination Options

As discussed in Chapter 4, the WRWSA again evaluated options for development of a seawater desalination facility with the Crystal River power station as part of its 2019 RWSP. Operational changes at the power station have necessitated conceptual modifications to the project options, as the high-capacity flows for once-through cooling at the power station have already or are in the process of being decommissioned. These changes have reduced the benefits of using the station's existing intake and discharge facilities for dilution of concentrate byproduct. The

WRWSA's 2019 RWSP includes conceptual design alternates using similar production capacity and distribution configurations with a variety of concentrate disposal options, including deep well injection, ocean outfall, and zero-liquid discharge systems. The option utilizing deep well injection for concentrate disposal was found to be the most economically feasible and is presented below.

Seawater Desalination Option #1. Crystal River Power Station

- Entity Responsible for Implementation: WRWSA

This option is for the development of a seawater desalination plant with a capacity of 15 mgd that would be co-located with the Crystal River power station complex in Citrus County. The facility could serve multiple utilities in Citrus, Marion, and Hernando counties. The facility's production capacity would be 15 mgd. The withdrawal location would be in the Cross Florida Barge Canal, seaward of the Inglis Dam, and would consist of a concrete weir with screens and a floating barrier. The raw water intake and pumping station would require 3.7 miles of 42-inch raw water transmission lines to the treatment facility.

Since the Barge Canal receives large freshwater discharges from Lake Rousseau, water salinity or total dissolved solids in the Barge Canal typically fluctuate between 15 to 20 parts per thousand (ppt) and can vary from fresh to seawater (35 ppt). The typical salinity range of 20 ppt or below is desirable in comparison to direct seawater to reduce operating costs associated with pumping at high pressures for reverse osmosis (RO). The facility would be designed to deal with the variability in Barge Canal water quality, including an extensive pretreatment system necessary during periods when Lake Rousseau is discharging to the Barge Canal in order to remove organic constituents that would impact performance of RO membranes.

The treatment and appurtenant facilities would require a 10-acre site. Two storage tanks would be provided on site for plant downtime and transmission system interruptions. A deep well injection system would pump concentrate into confined subsurface rock formations, likely thousands of feet below surface, and capital expenses would include a geological evaluation at the site. The conceptual project costs, as shown below in Table 5-7, include approximately 34 miles of transmission lines to provide regional supply to multiple demand centers and include easement acquisitions. Due to the difference in chemistry between treated seawater and treated groundwater supplies at existing utility systems, blending stations capable of stabilization for corrosion control and disinfection byproducts would be necessary at utility connection points.

Table 5-7. *Crystal River Power Station options and costs*

Disposal Option and Quantity Produced (mgd)	Capital Cost	Capital Cost/mgd	O&M Annual Costs	Total Cost/1,000 Gallons
Deep Well Injection - 15	$258,878,480	$17,258,565	$21,300,000	$6.22
Zero Liquid Discharge - 15	$393,063,140	$26,204,209	$49,552,000	$12.60
Ocean Outfall - 15	$354,978,700	$23,665,247	$21,217,000	$7.08

Issues:

- Changing land uses at and near the Crystal River power station and Barge Canal may impact the feasibility of the desalination option; including operation of the current power station and other future developments.

Chapter 6. Water Supply Projects Under Development

This chapter is an overview of water supply projects that are under development in the Northern Planning Region. Projects under development are those the Southwest Florida Water Management District (District) is co-funding and are either (1) actively in the planning, design, or construction phase, or (2) not yet in the planning phase, but have been at least partially funded through FY2019, or (3) have been completed since the year 2015 and are included to report on the status of implementation since the previous Regional Water Supply Plan (RWSP).

The demand projections presented in Chapter 3 show that approximately 50.4 million gallons per day (mgd) of new water supply will need to be developed during the 2020 to 2040 planning period to meet demand for all use sectors in the planning region. As of 2019, it is estimated that at least 13 percent of that demand (6.7 mgd) has either been met or will be met by projects that meet the above definition of being “under development.” In addition to these projects under development, it is probable that additional water supplies are being developed by various entities in the planning region outside of the District’s funding programs.

Section 1. Water Conservation

1.0 Non-Agricultural Water Conservation

1.1 Indoor Water Conservation Projects

Since 2015, the District has cooperatively funded the distribution of approximately 1,141 ultra low-flow or high-efficiency fixtures within the Northern Planning Region. These programs have cost the District and cooperating local governments a combined $153,256 and have yielded a potable water savings of approximately 24,144 gallons per day (gpd). Table 6-1 provides information on indoor water conservation projects that are under development in the planning region.

1.2 Outdoor Water Conservation

Since 2015, the District has cooperatively funded 2,023 outdoor devices and programs, including rain sensor rebates, landscape and irrigation evaluations, and smart irrigation controller rebates, in the planning region. These programs have cost the District and cooperating local governments a combined $836,324 and have yielded a potable water savings of approximately 255,915 gpd. Table 6-1 also provides information on outdoor water conservation projects that are under development.

Table 6-1. *Water conservation projects under development in the Northern Planning Region*

Cooperator	Project Number	General Description	Savings (gpd)	Devices and Rebates	Total Cost[1]	District Cost	$/1,000 gal Saved
Indoor Projects							
Citrus County	N634	Toilet Rebate	3,388	191	$19,208	$6,397	$1.58
Marion County	N639	Toilet Rebate	2,614	142	$19,364	$9,682	$2.07
Marion County	N678	Toilet Rebate	2,917	150	$21,466	$10,733	$2.05
Marion County	N779	Toilet Rebate	5,035	258	$29,218	$14,609	$1.62
Marion County	N999	Toilet Rebate	10,190	400	$64,000	$32,000	$1.75
Indoor Total			*24,144*	*1,141*	*$153,256*	*$73,421*	*$1.77*[2]
Outdoor/Other Projects							
Citrus County	N620	Rain Sensor Rebate	1,506	107	$4,216	$1,393	$1.92
WRWSA	N640	Irrigation System Evaluation	20,169	140	$70,102	$35,051	$2.38
Bay Laurel	N757	Smart Irrigation Controller Rebate	14,004	300	$79,486	$39,743	$2.32
WRWSA	N822	Irrigation System Evaluation	86,944	416	$200,000	$100,000	$1.58
Citrus County	N860	Smart Irrigation Controller Rebate	16,658	75	$33,750	$16,875	$0.83
Bay Laurel	N921	Smart Irrigation Controller Rebate	22,794	300	$87,520	$43,760	$1.57
Bay Laurel	N922	Florida Water Star Rebate	7,920	75	$52,500	$26,250	$2.71
Citrus County	N958	Smart Irrigation Controller Rebate	11,106	50	$33,750	$16,875	$1.24
North Sumter County	Q018	Rain Sensor Rebate	9,600	120	$40,000	$20,000	$2.86
WRWSA	Q040	Irrigation System Evaluation	38,740	260	$145,000	$72,500	$2.57
Citrus County	Q070	Smart Irrigation Controller Rebate	26,474	180	$90,000	$45,000	$1.39
Outdoor/Other Total			*255,915*	*2,023*	*$836,324*	*$417,447*	*$1.83*
Total			**280,059**	**3,164**	**$989,580**	**$490,868**	**$1.90**

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

2.0 Agricultural Water Conservation Projects

The following provides information on agricultural water conservation projects that are under development in the planning region. The District's largest agricultural water conservation initiatives, the Facilitating Agricultural Resource Management Systems 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, Water Resource Development.

2.1 Institute of Food and Agricultural Sciences Research and Education Projects

The District provides funding for Institute of Food and Agricultural Sciences (IFAS) to investigate a variety of agriculture/ urban issues that involve water conservation. These include, but are not limited to, development of tailwater recovery technology, determination of crop water use requirements, evaluation of alternative irrigation methods, field irrigation scheduling, frost/freeze protection, residential irrigation, and urban water use. The results of research conducted by IFAS is then promoted to the agricultural community. The District has funded research on strawberries, citrus, tomatoes, potatoes, peaches, biofuel grasses, turf grass, peppers, blueberries, and various landscape and nursery ornamental plants and trees. Of the 58 research projects, 48 have been completed. Completed projects include 10 projects dealing with urban landscape issues and 38 involving various agricultural commodities. While the research projects are not specific to each planning region, they are specific to a commodity group that has a strong presence in each region. The research will help develop best management practices that will conserve water Districtwide. Specific benefits to the planning region are dependent on the commodities dominant in that planning region. The 10 ongoing projects are described in Table 6.2.

Table 6.2. *List of water conservation research projects*

Project	Total Project Cost + District Cooperator	Total Project and Land Cost	Funding Source	Planning Region(s)[1]
Leaching Fraction-Adjusted Irrigation Impact on Nutrient Load and Plant Water Use	$81,320	$81,320	District	All
Florida Automated Weather Network Data Dissemination and Education	$100,000	$100,000	District	All
Blueberry Water Allocation and Irrigation Scheduling Using Evapotranspiration-based Methods	$ 210,000	$ 210,000	District	All
Reduction of Water Use for Citrus Cold Protection	$21,000	$21,000	District	All
Effect of Water Scheduling and Amounts on Growth of Young Citrus Trees in High Density Plantings	$168,623	$168,623	District	All
New Practical Method for Managing Irrigation in Container Nurseries	$165,310	$165,310	District	All
Effect of Composting at Animal Stock Facilities on Nutrients in Groundwater	$175,000	$175,000	District	All
Evaluating Fertigation with Center Pivot Irrigation for Water Conservation on Commercial Potato Production	$400,000	$400,000	District	All
Evaluation of Water Use & Water Quality Effects of Amending Soils & Lawns with Compost Material	$60,000	$60,000	District	All
Evaluation of Nitrogen leaching from reclaimed water applied to lawns, spray fields, and rapid infiltration basins.	$294,000	$294,000	District	All
Total	**$1,675,253**	**$1,675,253**		

[1] Selected research projects affect the Southern Planning Region, but the outcome can benefit other planning regions.

Section 2. Reclaimed Water

1.0 Reclaimed Water Projects: Research, Monitoring, and Education

Continued support of reclaimed water research and monitoring is central to maximizing reclaimed water use and 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 6-3 is a list, description and summary of the benefits and costs that have been or will be realized by three reclaimed water projects currently under development and another six estimated to experience additional future supply growth. It is anticipated that these projects will be online by 2025.

Table 6-4 includes general descriptions and a summary of 10 research projects for which the District has provided more than $1,026,000 in funding. The District has also committed to developing a comprehensive reclaimed water education strategy. All reclaimed water construction projects funded by the District require education programs that stress the value and benefits of efficient and effective water use, regardless of the 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, including GIS and other data. 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.

Construction of Crystal River to Duke Energy reclaimed water pipeline

Table 6-3. *List of Reclaimed water projects under development in the Northern Planning Region*

Cooperator	General Project Description	Reuse (mgd)			Customer (#)		Costs	
		Produced	Benefit	Stored	Type	Total	Total	District[1]
Citrus County								
Citrus County Point O Woods	Growth of Flow to Golf Course	0.01	0.01	-	GC	1	Prior	Prior
City of Crystal River	Growth of Flow to Power Plant	0.53	0.53	Prior	IND	1	Prior	Prior
Citrus Sugarmill Woods	Trans/Store/Pump	0.50	0.375	1	GC	2	$3,918,000	$1,959,000
Hernando County								
Hernando County	Trans N696	0.30	0.30	NA	GC	1	$12,000,000	$9,000,000
Hernando County	Trans Q047	0.20	0.12	NA	Rec	1	$400,000	$200,000
City of Brooksville	Growth of Flow to Mine	0.24	0.24	NA	Ind	1	Prior	NA
Marion County								
Marion County NW	Growth of Flow to Golf Course	0.03	0.02	NA	GC	1	Prior	NA
Sumter County								
Villages	Growth of Flow to Golf Courses	0.63	0.47	Prior	GC	TBD	Prior	NA
Wildwood	Growth of Flow to Villages	4.01	3.00	Prior	GC	TBD	Prior	Prior
Total	**9 Projects**	**6.45**	**5.07**	**1.00**		**8**	**$16,318,000**	**$11,159,000**

[1] Costs include all revenue sources budgeted by the District.

Table 6-4. *List of reclaimed water research projects co-funded in the District*

Cooperator	General Project Description	Costs[1]	
		Total	District[2]
WateReuse Foundation	Water Treatment Study L112	$500,000	$275,000
WateReuse Foundation	Water Quality Study P872	$520,000	$282,722
WateReuse Foundation	Pathogen Study P173	$216,000	$34,023
WateReuse Foundation	Research Cost Study P174	$200,000	$70,875
WateReuse Foundation	Research Study ASR P175	$393,000	$72,410
WateReuse Foundation	Storage Study P694	$300,000	$100,000
WateReuse Foundation	Soil Aquifer Treatment P695	$200,000	$66,667
WateReuse Foundation	Wetlands Study P696	$200,000	$66,667
WateReuse Foundation	Nutrient Study P698	$305,100	$16,700
WateReuse Foundation	Nutrient II P966	$380,000	$41,666
Total (Districtwide)	**10 Projects**	**$3,214,100**	**$1,026,730**

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

Section 3. Brackish Groundwater

There are no Brackish Groundwater projects under development in the Northern Planning Region.

Section 4 Aquifer Recharge

1.0 Indirect Recharge

Although government utilities have active projects using indirect aquifer recharge (AR) in the Northern Planning Region by implementation of reclaimed water rapid infiltration basins or spray field sites, the locations of these sites and the water quality of the reclaimed water sources are not optimal. Suitable indirect AR locations and source water quality are important when considering AR in regions where the Upper Floridan aquifer is unconfined and existing springs are in proximity and susceptible to water quality degradation. Indirect AR projects should be located further inland and up-gradient in the regional groundwater flow systems. Indirect AR projects should be designed such that nutrient loading is minimized. There are no direct AR projects in the planning region.

Chapter 7. Water Resource Development Component

This chapter addresses the legislatively required water resource development activities and projects that are conducted primarily by the District. The intent of water resource development projects is to enhance the amount of water available for regional-beneficial uses and for natural systems. Section 373.019, Florida Statutes (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[24], F.S.). The District is primarily responsible for implementing water resource development; however, additional funding and technical support may come from state, federal, and local entities.

Part A. Overview of Water Resource Development Efforts

The District classifies water resource development efforts into two categories. The first category encompasses data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities, and others. These activities are discussed in Section 1, below. The second category includes more narrowly defined "projects," which are regional projects designed to create an identifiable supply of water for existing and/or future reasonable-beneficial uses. These projects are discussed in Section 2.

Section 1. Data Collection and Analysis Activities

The District budgets significant funds annually to implement the water resource development data collection and analysis activities, which support the health of natural systems and water supply development. Table 7-1 displays the fiscal year (FY) 2020 budget and anticipated five-year funding levels for Districtwide data collection and analysis activities. Approximately $40.8 million will be allocated toward these activities annually for a five-year total of approximately $204 million. Because budgets for the years beyond FY2020 have not yet been developed, but are projected to be fairly constant, future funding estimates for activities are set equal to FY2020 funding. Funding for these activities is primarily from the Governing Board's allocation of ad valorem revenue collected within the District. In some cases, additional funding is provided by water supply authorities, local governments, and the U.S. Geological Survey (USGS). The activities listed in Table 7-1 are described in subsections 1.0 through 5.0, below.

1.0 Hydrologic Data Collection

The District has a comprehensive hydrologic conditions monitoring program that includes the assembly of information on key indicators such as rainfall, surface and groundwater levels and water quality, and stream flows. The program includes data collected by District staff and permit holders, as well as data collected as part of the District's cooperative funding program with the

USGS. This data collection allows the District to gauge changes in the health of water resources, monitor trends in conditions, identify and analyze existing or potential resource problems, and

Table 7-1. *Water Resource Development data collection and analysis activities (Districtwide)*

WRD Data Collection and Analysis Activities		FY2020 Funding	Anticipated 5-Year Funding	Funding Partners
1.0	**Hydrologic Data Collection**			SWFWMD, other WMDs, USGS, DEP, FWC
1.1	Surface Water Flows and Levels	$2,715,842	$13,579,210	
1.2	Geohydrologic Data Well Network (includes ROMP)	$3,149,091	$15,745,455	
1.3	Meteorologic Data	$278,408	$1,392,040	
1.4	Water Quality Data	$1,003,524	$5,017,620	
1.5	Groundwater Levels	$891,391	$4,456,955	
1.6	Biologic Data	$1,502,627	$7,513,135	
1.7	Data Support	$3,776,719	$18,883,595	
2.0	**Minimum Flows and Levels Program**			SWFWMD
2.1	Technical Support	$1,718,986	$8,594,930	
2.2	Establishment	$678,495	$3,392,475	
3.0	**Watershed Management Planning**	$7,456,686	$37,283,430	SWFWMD, Local Cooperators
4.0	**Quality of Water Improvement Program**	$743,025	$3,715,125	SWFWMD
5.0	**Stormwater Improvements: Implementation of Storage and Conveyance BMPs**	$16,927,435	$84,637,175	SWFWMD, USGS
TOTAL		**$40,842,229**	**$204,211,145**	

develop programs to correct existing problems and prevent future problems from occurring. This data collection also supports District flood control structure operations, water use and environmental resource permitting and compliance, minimum flows and levels (MFL) evaluation and compliance, the Surface Water Improvement and Management (SWIM) program, the Southern Water Use Caution Area (SWUCA) recovery strategy, modeling of surface water and groundwater systems, and many resource evaluations and reports.

The categories of hydrologic data that are collected and monitored by District staff are discussed below. The District also evaluates the hydrologic data submitted by Water Use Permit (WUP) permit holders to ensure compliance with permit conditions and to assist with monitoring and documenting hydrologic conditions.

1.1 Surface Water Flows and Levels

This includes data collection at the District's 808 surface water level gauging sites, and cooperative funding with the USGS for discharge and water-level data collection at 129 river, stream and canal sites. The data is available to the public through the District's Water Management Information System, and through the USGS Florida Water Science Center Web Portal.

1.2 Geohydrologic Data Well Network

The Geohydrologic Data Well Network is a monitor well network that supports various projects throughout the District including the Central Florida Water Initiative (CFWI), Water Resource Assessment Projects, Water Use Caution Areas, recovery strategies, the Springs Team, sea level rise and other salt-water intrusion assessments, and development of alternative water supplies (AWSs). The network includes the Regional Observation and Monitor-well Program which has been the District's primary means for hydrogeologic data collection since 1974. Data from monitor well sites are used to evaluate seasonal and long-term changes in groundwater levels and quality, as well as the interaction and connectivity between groundwater and surface water bodies. During construction of new monitor well sites, valuable hydrogeologic information is collected including the lithology, aquifer hydraulic characteristics, water quality, and water levels.

1.3 Meteorologic Data

The meteorologic data monitoring program consists of measuring rainfall totals at 171 rain gauges, most of which provide near real-time data. Annual funding is for costs associated with measurement of rainfall, including sensors, maintenance, repair, and replacement of equipment. Funding allows for the operation of one District evapotranspiration (ET) station for reference near Lake Hancock, and for District participation in a cooperative effort between the USGS and all five Florida water management districts (WMDs) to map statewide potential and reference ET using data measured from the Geostationary Operational Environmental Satellites. The program also includes a collaborative effort between the five WMDs to provide high-resolution radar rainfall data for modeling purposes.

1.4 Water Quality Data

The District's Water Quality Monitoring Program (WQMP) collects data from water quality monitoring networks for springs, streams, lakes, and coastal and inland rivers. Many monitoring sites are sampled on a routine basis, with data analysis and reporting conducted on an annual basis. The WQMP develops and maintains the Coastal Groundwater Quality Monitoring Network, which involves sample collection and analysis from approximately 380 wells across the District to monitor saltwater intrusion and/or the upwelling of mineralized waters into potable aquifers.

1.5 Groundwater Levels

The District maintains 1,618 monitor wells in the data collection network, including 856 wells that are instrumented with data loggers that record water levels once per hour, and 762 that are measured manually by field technicians once or twice per month.

1.6 Biologic Data

The District monitors ecological conditions as they relate to both potential water use impacts and changes in hydrologic conditions. Funding for biologic data collection includes support for routine monitoring of approximately 150 wetlands and a five-year assessment of over 400 wetlands to document changes in wetland health and assess level of recovery in impacted wetlands. Funding also supports an effort to map the estuarine hard bottom of Tampa Bay, as well as SWIM program efforts for mapping of seagrasses in priority water bodies including Tampa Bay, Sarasota Bay, Charlotte Harbor, and the Springs Coast area.

1.7 Data Support

This item provides administrative and management support for the WQMP, hydrologic and geohydrologic staff support, the District's chemistry laboratory, and the District's LoggerNet data acquisition system.

2.0 Minimum Flows and Levels Program

Minimum flow and water levels are ecologically based, hydrologic standards that are used for permitting and planning decisions concerning how much water may be withdrawn from or near a water body without causing significant harm to water resources or ecology of the area. Chapter 373.042, F.S., requires the state water management districts or the FDEP to establish MFLs for aquifers, surface watercourses, and other surface water bodies to identify the limit or level at which further withdrawals would be significantly harmful. Rivers, streams, estuaries, and springs require minimum flows; while minimum levels are developed for lakes, wetlands, and aquifers. Minimum flows and levels (MFLs) are adopted into District rules, Chapter 40D-8, Florida Administrative Code (F.A.C.), and are used in the District's WUP and water supply planning programs.

Reservations are rules that reserve water from use by permit applications, as necessary for the protection of fish and wildlife or public health and safety. Reservations are adopted into District rules, Chapter 40D-2, F.A.C., pursuant to Chapter 272.223, F.S., and are also used for water use permitting and water supply planning.

The District's processes for establishing MFLs and reservations include opportunities for interested stakeholders to review and comment on proposed MFLs or reservations and participate in public meetings. An independent scientific peer review process is used for establishing MFLs for flowing water bodies, MFLs for all water body types that are based on methods that have not previously been subjected to peer review, and for establishing reservations. Stakeholder input and peer review findings are considered by the Governing Board when deciding whether to adopt proposed MFLs and reservations. District monitoring programs provide data for evaluating compliance with the adopted MFLs and reservations, determining the need for MFLs recovery or prevention strategies and assessing the recovery of water bodies where significant harm has occurred.

The District has planned to monitor and assess the status of 210 adopted MFLs, including MFLs for 23 river segments, 10 springs or spring groups, 127 lakes, 41 wetlands, 7 wells in the Northern Tampa Bay Water Use Caution Area, and the Upper Floridan aquifer (UFA) in the most impacted area (MIA) of the SWUCA and in the Dover/Plant City Water Use Caution

Area (DPCWUCA). The District is scheduling the establishment or reevaluation of 96 additional MFLs and one reservation through FY2029. The District's annual MFL Priority List and Schedule and Reservations List and Schedule is approved by the Governing Board in October, submitted to FDEP for review in November, and subsequently published in the Consolidated Annual Report. The approved and proposed priority lists and schedules are also posted on the District's Minimum Flows and Levels Documents and Reports webpage at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports

3.0 Watershed Management Planning

The District addresses flooding problems in existing areas by preparing and implementing Watershed Management Plans (WMPs) in cooperation with local governments. The WMPs define flood conditions, identify flood level of service deficiencies, and evaluate best management practices (BMPs) to address those deficiencies. The WMPs include consideration of the capacity of a watershed to protect, enhance, and restore water quality and natural systems while achieving flood protection. The plans identify effective watershed management strategies and culminate in defining floodplain delineations and constructing selected BMPs.

Local governments and the District combine their resources and exchange watershed data to implement the WMPs. Funding for local elements of the WMPs is provided through local governments' capital improvement plans and the District's Cooperative Funding Initiative. Additionally, flood hazard information generated by the WMPs is used by the Federal Emergency Management Agency to revise flood insurance rate maps. This helps better define flood risk and is used extensively for land use planning by local governments and property owners. Since the WMPs may change based on growth and shifting priorities, the District also cooperates with local governments to update the WMPs, when necessary, giving decision-makers opportunities throughout the program to determine when and where funds are needed.

4.0 Quality of Water Improvement Program

The Quality of Water Improvement Program (QWIP) was established in 1974 through Section 373.207, F.S., to restore groundwater conditions altered by well drilling activities for domestic supply, agriculture, and other uses. The program'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 prevents mineralized groundwater from contaminating surface water bodies. Thousands of wells constructed prior to current well construction standards were often deficient in casing, which interconnected aquifer zones and enabled poor-quality mineralized water to migrate into zones containing potable-quality water.

Plugging wells involves filling the abandoned well with cement or bentonite. Isolation of the aquifers is reestablished, and the mixing of varying water qualities and free flow is stopped. Prior to plugging an abandoned well, geophysical logging is performed to determine the reimbursement amount, the proper plugging method, and to collect groundwater quality and geologic data for inclusion in the District's database. The emphasis of the QWIP is primarily in the SWUCA where the UFA is confined. Historically, the QWIP has proven to be a cost-effective method to prevent waste and contamination of potable ground and surface waters.

5.0 Stormwater Improvements: Implementation of Storage and Conveyance Best Management Practices

The District's WMPs and SWIM programs implement stormwater and conveyance BMPs for preventative flood protection to improve surface water quality, particularly in urban areas, and to enhance surface and groundwater resources. The BMPs involve construction of improvements identified and prioritized in the development of WMPs. Most of the activities are developed through cooperative funding with a local government entity, Florida Department of Transportation, or state funding. As stormwater is a primary contributor of water quality degradation in older urban areas, the District seeks opportunities to retrofit or improve these systems to reduce impacts to receiving waters. The FY2020 funding includes new storage and conveyance projects in the Tampa Bay area, particularly in Hillsborough and Pasco county, as well as several continuing Tampa Bay projects.

Section 2. Water Resource Development Projects

As of FY2020, the District has 20 ongoing projects that meet the definition of water resource development "projects." The projects are listed in Table 7-2, below, along with their funding to date, total costs, participating cooperators, the estimated water quantity to be become available, and the planning region benefitted by the project. The total cost of these projects is approximately $150 million and a minimum of 78 million gallons per day (mgd) of additional water supply will be produced or conserved.

These projects include feasibility and research projects for new alternative water supply (AWS), Facilitating Agricultural Resource Management Systems (FARMS) projects to improve agricultural water use efficiency, and environmental restoration (ER) projects that assist MFLs recovery. District funding for a number of these projects is matched to varying degrees by local cooperators, including local governments, regional water supply authorities, and others; and some projects have received state and federal funding provided through mechanisms described in Chapter 8. The operation and maintenance costs for developed infrastructure will be the responsibility of local cooperators, unless otherwise noted in the project descriptions provided in this section.

1.0 Alternative Water Supply Research, Restoration, and Pilot Projects

The following projects are research and/or pilot projects designed to further the development of the innovative AWS described in the Regional Water Supply Plan (RWSP). Included in these projects are feasibility projects for recharging the UFA with excess reclaimed water and the exploration of Lower Floridan aquifer (LFA) zones as a viable water source for inland utilities. These projects may lead to the development and protection of major sources of water supply in the future.

1.1 South Hillsborough Aquifer Recharge Program (SHARP) (N287)

This is an aquifer recharge pilot testing project that will design, permit, construct, and test a 2 mgd reclaimed water UFA recharge well in the MIA of the SWUCA. Project will beneficially use reclaimed water and improve aquifer levels in the MIA to help meet the Saltwater Intrusion Minimum Aquifer Level (SWIMAL) defined in the SWUCA Recovery Strategy.

Table 7-2. *Water Resource Development projects costs and District funding*

Water Resource Development Projects		Prior District Funding through FY2019	Total Project Cost (District + Cooperator)	Funding Source	Water to Become Available	Planning Region of Benefit
1) Alternative Water Supply Feasibility Research and Pilot Projects						
1.1	South Hillsborough Aquifer Recharge Program (SHARP) (N287)	$1,382,500	$2,765,000	SWFWMD, Hillsborough County	2 mgd	TBPR
1.2	Bradenton Aquifer Protection Recharge Well (N842)	$1,500,000	$5,050,000	District, City of Bradenton	5 mgd	TBPR
1.3	PRMRWSA Partially Treated Water ASR (N854)	$495,500	$8,300,000	District, PRMRWSA	0 mgd	SPR
1.4	Southern Hillsborough Aquifer Recharge Project (SHARP) Phase 2 (N855)	$4,500,000	$9,700,000	District, Hillsborough County	4 mgd	TBPR
1.5	Braden River Utilities ASR Feasibility (N912)	$2,736,250	$5,995,000	District, Braden River Utilities	TBD	SPR
1.6	Hydrogeologic Investigation of Lower Floridan Aquifer in Polk County (P280)	$11,375,000	$12,000,000	SWFWMD	TBD	HPR
1.7	Optical Borehole Imaging Data Collection from LFA Wells (P925)	$100,200	$167,000	District, USGS	NA	HPR
1.8	Sources/Ages of Groundwater in LFA Wells (P926)	$368,300	$555,800	District, USGS	NA	HPR
1.9	City of Venice Reclaimed Water Aquifer Storage Recovery (Q050)	$0	$5,065,000	District, City of Venice	0.17 mgd	SPR
1.10	Direct Aquifer Recharge-North Hillsborough Aquifer Recharge Program Phase 2 (Q064)	$0	$1,500,000	District, Hillsborough County	TBD	TBPR
1.11	Direct Aquifer Recharge-South Hillsborough Aquifer Recharge Program Phase 3 (Q088)	$0	$13,000,000	District, Hillsborough County	6 mgd	TBPR
2) Facilitating Agricultural Resource Management Systems (FARMS)						
2.1	FARMS Projects	$40,780,456	$71,791,225	SWFWMD, FDACS, State of FL, private farms	29 mgd	All
2.2	Mini-FARMS Program	$616,237	$150,000 (annual)	SWFWMD	2 mgd	All
3) Environmental Restoration and Minimum Flows and Levels (MFL) Recovery						

Water Resource Development Projects		Prior District Funding through FY2019	Total Project Cost (District + Cooperator)	Funding Source	Water to Become Available	Planning Region of Benefit
3.1	Lower Hillsborough River Recovery Strategy (H400)	$5,464,712	$10,857,462	SWFWMD, City of Tampa	3.1 mgd	TBPR
3.2	Lower Hillsborough River Pumping Facilities	$394,512	$4,850,044	SWFWMD, City of Tampa	TBD	TBPR
3.3	Pump Stations on Tampa Bypass Canal (H404)	$486,428	$1,236,428	SWFWMD	3.9 mgd	TBPR
3.4	Haines City Reclaimed Water MFL Recharge & Advanced Treatment Feasibility Study (N888)	$225,000	$357,710	SWFWMD, Haines City	0.7 mgd	HPR
3.5	Lake Hancock Lake Level Modification (H008)	$9,989,166	$10,428,490	SWFWMD, State of FL, Federal	TBD	HPR, SPR
3.6	Aquifer Recharge for SWIMAL Recovery at Flatford Swamp with Natural Systems Enhancement (H089)	$5,044,012	$31,000,000	SWFWMD	10.0 mgd	SPR, HPR

Note: Tampa Bay Planning Region (TBPR); Southern Planning Region (SPR); Heartland Planning Region (HPR)

1.2 Bradenton Aquifer Protection Recharge Well (N842)

The project is for design, permitting, construction, and testing of one recharge well in the Avon Park production zone of the UFA and associated facilities to help prevent nutrient loading to the Manatee River and Tampa Bay and to replenish groundwater in the MIA. The third-party review will provide necessary information to support District funding past the 30 percent design to final design, permitting, and construction.

1.3 PRMRWSA Partially Treated Water ASR (N854)

The project consists of site feasibility testing, 30 percent design, and third-party review of a partially treated water Aquifer Storage and Recovery (ASR) project located at the Peace River Manasota Regional Water Supply Authority (PRMRWSA) ASR facility. Feasibility pilot testing will be implemented using partially treated surface water pumped from Reservoir No. 1 to recharge the UFA at two existing ASR wells and subsequently delivered back to the raw water reservoir system. The third-party review will provide the necessary information on construction costs and project benefits to support District funding in future years to complete design, permitting, and construction.

1.4 Southern Hillsborough Aquifer Recharge Project (SHARP) Phase 2 (N855)

This project is for a third-party review of the County's 30 percent design, completion of design and permitting, and the initiation of construction for Phase 2 of the SHARP project. Pending third-party review and approval, project will construct 9,500 feet of transmission mains, two reclaimed water recharge wells (2 mgd each), eight monitoring wells, and associated appurtenances. The SHARP Phase 2 project expands upon the county's SHARP Phase 1 project (N287).

1.5 Braden River Utilities ASR Feasibility (N912)

This project will perform a third-party review for reclaimed water ASR feasibility studies at two sites. Pending the review, the project may include the construction of an ASR well at each site, monitoring wells, and partial infrastructure necessary to sufficiently and cost-effectively perform two cycle tests in accordance FDEP permit requirements.

1.6 Hydrogeologic Investigation of LFA in Polk County (P280)

This project explores the LFA in Polk County to assess its viability as an AWS source and to gain a better understanding of the Lower Floridan characteristics and groundwater quality. Three sites have been identified. At each site, if the tests on the initial exploration monitor well drilled are positive, a test production well may be constructed to conduct an aquifer performance test to obtain transmissivity and leakance information and to determine the quality of the formation water. The data gathered from the wells will improve the District's understanding of this potential AWS source, enhance groundwater modeling of the LFA, and determine the practicality of developing the LFA as an AWS source in areas facing future water supply deficits. Data from this project will also add to the geologic inputs in the Districtwide Regulation Model for the LFA to assess potential withdrawal-related impacts to water resources in the District. If the tests prove that the water quality and quantity are suitable, the water may be used by the regional entity established in Polk County as an additional source of public water supply.

1.7 Optical Borehole Imaging Data Collection from LFA Wells (P925)

This project collects optical borehole imaging data from LFA wells in Polk County. This data will aid in understanding the aquifer characteristics and groundwater quality in Polk County. The USGS is testing and providing the processed data to the District. Currently, nine LFA well sites have been identified for testing.

1.8 Sources/Ages of Groundwater in LFA Wells (P926)

This project collects isotope data from LFA wells from various sites in Polk County. The groundwater analysis will determine the sources and ages of the water from productive zones within the LFA and lower portions of the UFA. This data will aid in understanding the LFA characteristics (including flow paths) and groundwater quality in Polk County. The USGS is testing and providing the processed data to the District. Currently, six LFA well sites have been identified for testing.

1.9 City of Venice Reclaimed Water Aquifer Storage Recovery (ASR) (Q050)

This project is for the 30 percent design and third-party review of an ASR system to store and recover at least 25 million gallons per year of reclaimed water on-site at the City's Eastside Water Reclamation Facility, an advanced wastewater treatment plant. If constructed, ASR would let the City store excess reclaimed water in the wet season, to be used in the dry season when demand exceeds plant flow. The City has self-funded a feasibility study for FY2019, which will clarify

project requirements, but its planning level study expects two production wells (1 mgd capacity each).
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1.10 Direct Aquifer Recharge-North Hillsborough Aquifer Recharge Program (NHARP) Phase 2 (Q064)

This project includes completion of a direct aquifer recharge feasibility study, which includes the construction and testing of three exploratory wells necessary to evaluate recharge locations for the NHARP. The study will aid in the determination of the hydrogeological characteristics and water quality of the targeted Avon Park Formation of the UFA and the approximate depth of the base of the underground source of drinking water in the general vicinity of NHARP.

1.11 Direct Aquifer Recharge-South Hillsborough Aquifer Recharge Program (SHARP) Phase 3 (Q088)

This project is for the third-party review of the County's 30 percent design, completion of design, permitting, construction, testing, and Independent Performance Evaluation for SHARP Phase 3. The Phase 3 project will design, permit, construct, and test three recharge wells (2 mgd each) and design and construct well heads, appurtenances, monitoring wells, and approximately 4,000 feet of pipelines to connect the recharge wells to existing reclaimed water transmission mains. This project expands upon the County's SHARP Phase 1 and 2 recharge projects resulting in six recharge sites anticipated to recharge approximately 14 mgd collectively.

2.0 Facilitating Agricultural Resource Management Systems (FARMS) Projects

The FARMS Program is an agricultural BMP cost-share reimbursement program consisting of many site-specific projects. The FARMS Program is a public/private partnership developed by the District and the Florida Department of Agriculture and Consumer Services. The purpose of the FARMS initiative is to provide an incentive to the District's agricultural community to implement agricultural BMPs that will provide resource benefits including water quality improvement, reduced UFA withdrawals, and enhancements to the water resources and ecology.

The FARMS Program has five specific goals: (1) offset 40 mgd of groundwater within the SWUCA; (2) improve surface water quality impacted by mineralized groundwater within the Shell, Prairie and Joshua Creek watersheds (SPJC); (3) improve natural systems impacted by excess irrigation and surface water runoff within the Flatford Swamp region of the upper Myakka River watershed; (4) prevent groundwater impacts within the northern areas of the District; and (5) reduce frost-freeze pumpage by 20 percent within the DPCWUCA. These goals are critical in the District's overall strategy to manage water resources.

2.1 FARMS Cost-Share Projects

FARMS projects employ many of the agricultural water conservation strategies described in the RWSP 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. Each project's performance is tracked to determine its effectiveness toward program goals. Since actual use of permitted quantities is dependent on hydrologic conditions, one of the objectives of FARMS projects is to reduce groundwater use regardless of hydrologic conditions. FARMS projects not only offset groundwater use with surface water, but also increase the overall efficiency of irrigation water use. The District has routinely budgeted approximately $6 million annually for these projects. A listing of cost-share projects within the planning region that meet the RWSP definition of being under development is provided in Table 7-3.

As of September 2019, there were 208 approved FARMS projects including nine in the Northern Planning Region (NPR). The projects are projected to have a cumulative groundwater offset of 29.0 mgd Districtwide and 0.24 mgd for the projects within the NPR.

Table 7-3. *Specific FARMS cost-share projects within the Northern Planning Region funded post-FY 2015*

Project Description	District Budget FY2015-2019	Benefit (mgd)
M & B Products, Inc	$247,596	Pilot Project for Nutrient reduction Benefits
Blueberry Hill – Phase 2	$262,651	0.050
Total	**$510,247**	**0.050**

Notes: Projects were selected by funds budgeted in years FY2015 to FY2019, meeting District RWSP definition of "projects under development." The benefit is based on projected offset.,

2.2 Mini-FARMS Program

Mini-FARMS is a scaled down version of the District's FARMS cost-share reimbursement program to implement agricultural BMPs on agricultural operations of 100 irrigated acres or less to conserve water and protect water quality within the District. Mini-FARMS is intended to assist in the implementation of the SWUCA Recovery Strategy, DPCWUCA Recovery Strategy, the Shell and Prairie Creek WMP, and the District's Strategic Plan. Much like the FARMS projects, the Mini-FARMS Program implements BMPs on agricultural operations to reduce UFA groundwater use and/or improve water quality conditions throughout the District. The maximum cost-share amount available from Mini-FARMS projects is $8,000 per agricultural operation per year, and the maximum cost-share rate is 75 percent of project costs.

From FY2006 through FY2018, the District's portion of the Mini-FARMS Program has reimbursed 159 water conservation BMP projects. The total cost of the Mini-FARMS projects was $856,086 and the District's reimbursement was $597,256. The Mini-FARMS Program continues to receive a strong demand from growers within the District, and it is projected that at least $150,000 will be budgeted for projects annually.

2.3 FARMS Irrigation Well Back-Plugging Program

This program offers financial and technical assistance to well owners within the SWUCA to back-plug irrigation wells that produce highly mineralized groundwater. Back-plugging is a recommended practice to rehabilitate irrigation wells by identifying and restricting the intrusion of highly mineralized groundwater that often occurs from deeper aquifer zones in certain areas of the District. This program is separate from the QWIP, which focuses on proper well abandonment. The program was initiated in 2002 to improve water quality in watershed systems of the SWUCA, and later became an addition to the FARMS Program in 2005. Field investigations indicated that highly mineralized groundwater produced from older or deeper irrigation wells was the most likely source adversely impacting water quality downstream in Punta Gorda's public supply reservoir. Growers experience several advantages from well back-plugging including elevated crop yields from reduced salts in irrigation groundwater, decreases in soil-water requirements and pumping costs, and reduced corrosion and fouling of irrigation equipment.

A total of 85 wells have been back plugged in the SWUCA through FY2014, with 63 of these wells located in the SPJC priority watersheds. Analytical results for all back-plugged wells indicated conductivity, total dissolved solids, and chloride were decreased by averages of 42 percent, 42 percent, and 58 percent, respectively, with well volume yields retained at an average of 77 percent. Routine water quality monitoring of select back-plugged wells assures that these improvements are sustained long-term.

3.0 Environmental Restoration and Minimum Levels and Flows Recovery Projects

As of FY2020, the District has six ongoing ER and MFL recovery projects that benefit water resources. The Lower Hillsborough River Recovery Strategy, Lower Hillsborough River Pumping Facilities, and Pump Stations on the Tampa Bypass Canal (TBC) projects are in the Tampa Bay Planning Region. The Haines City Reclaimed Water MFL Recharge and Advanced Treatment Feasibility Study and the Lake Hancock Lake Level Modification projects are in the Heartland Planning Region. The Upper Myakka/Flatford Swamp Hydrologic Restoration and Implementation project is in the Southern Planning Region.

3.1 Lower Hillsborough River Recovery Strategy (H400)

The District established revised MFLs for the Lower Hillsborough River in 2007. Because the MFLs were not being met, the District incorporated a recovery strategy for the river into Rule 40D-80.073(8), F.A.C. As part of the recovery strategy, the District entered into a joint funding agreement and additional project-specific agreements with the City of Tampa to assess and implement projects associated with diversion of water from various sources to meet minimum flow requirements in the river.

3.2 Lower Hillsborough River Pumping Facilities and
3.3 Pump Stations on the Tampa Bypass Canal

In accordance with the recovery strategy, the City has diverted water from Sulphur Springs to the base of the Hillsborough River Reservoir Dam, as necessary to support river recovery. In addition, the District and more recently the City have diverted water from the Tampa Bypass Canal to the Hillsborough River Reservoir for subsequent diversion to the lower river. The City assumed responsibility for these diversions from the canal through the reservoir in 2018, with transfers of water from the reservoir to the lower river made using a newly constructed sluice gate in the dam that was cooperatively funded by the District and the City. In 2017, the City, with support from the District, completed the Blue Sink Project, which facilitates diversion of water from Blue Sink to the base of the dam for minimum flow recovery, and use of the sink as a recovery source was initiated in 2018. A project between the District and City associated with investigation of storage or additional supply options was completed in 2018 and identified the proposed Tampa Augmentation Project as a potential source for additional water that may be needed for recovery of the lower river. Permitting, design and permit-required monitoring associated with a project involving potential diversion of water from Morris Bridge Sink for river recovery have also been completed, although project implementation is contingent upon future recovery need assessments.

3.4 Haines City Reclaimed Water MFL Recharge and Advanced Treatment Feasibility Study (N888)

This project is for the evaluation of reclaimed water recharge sites, components, and advanced treatment necessary to assist in meeting MFLs on Lake Eva in the "Ridge Lakes" area of the CFWI.

3.5 Lake Hancock Lake Level Modification (H008)

This project is part of the recovery strategy to restore minimum flows in the upper Peace River, which is one of the four goals defined in the SWUCA Recovery Strategy. The project involved raising the control elevation of the existing outflow structure on Lake Hancock in order to slowly release the water during the dry season to help meet the minimum flow requirements in the upper Peace River between Bartow and Zolfo Springs. Increasing the operating level also helps restore wetland function for several hundred acres of contiguous lands to Lake Hancock and provide recharge to the UFA through exposed sinks along the upper Peace River. Construction is complete and the project is currently in the monitoring phase.

3.6 Aquifer Recharge for SWIMAL Recovery at Flatford Swamp with Natural Systems Enhancement (H089)

Hydrologic alterations and excess runoff have adversely impacted the Flatford Swamp in the upper Myakka watershed, and quantities of water should be removed from the swamp and surrounding areas to restore hydroperiods close to historic levels. The District has conducted evaluations to explore potential beneficial uses of water. In 2016, evaluations began on an injection recharge option that would use excess flow affecting the swamp to recharge the UFA in the vicinity of the MIA of the SWUCA to slow saltwater intrusion. The recharge system would assist with the SWUCA Recovery Strategy's goal of meeting the SWIMAL to help recover and protect groundwater resources in or near the MIA. The ongoing evaluation includes construction of test recharge wells in the Flatford Swamp and the design and permitting of diversion infrastructure for source water.

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Chapter 8. Overview of Funding Mechanisms

This chapter provides an overview of mechanisms available to generate the necessary funds to implement the water supply and water resource projects proposed by the District and its cooperators to meet the water supply demand projected through 2040 and restore minimum flows and levels (MFLs) to impacted natural systems.

Table 8-1 shows the projected increase in demand for each planning region for the planning period, as described in Chapter 3 of each volume of the Regional Water Supply Plan (RWSP). The table shows that approximately 209.7 million gallons per day (mgd) of new water supply is needed to meet user demands and to restore natural systems.

Table 8-1. *Summary of total projected increases in demand (5-in-10) (mgd) by each planning region from base year 2015 to 2040*

Planning Region	Projected Demand Increase
Heartland	38.9
Northern	50.4
Southern	44.4
Tampa Bay	76.0
Total	**209.7**

Note: Summation differences occur due to decimal rounding.

A portion of the Districtwide total demand shown above will be met by existing permitted quantities; however, new regional infrastructure may be required to deliver permitted quantities to end users, and additional water supply development (WSD) is necessary to maintain adequate capacity for peak demand periods and continuing growth shown in Table 8-1 funded by the District.

To prepare an estimate of the capital cost for projects needed to meet the portion of demand not yet under development, the District has compiled a list of large-scale WSD projects (Table 8-2) through the District. No large-scale WSD projects are listed for the Northern Planning Region because a significant portion of water demand in the region will be met with fresh groundwater, conservation, and reclaimed water initiatives available to the region. The District anticipates that a large portion of the remaining demand will be met through projects that users will select from the water supply options listed in Chapter 5 of this RWSP.

The amount of funding that will likely be generated through 2040 by the various utility, District, state, and federal funding mechanisms is compared to the capital cost of the potential large-scale projects. This comparison allows an evaluation of funding adequacy for support of projects necessary to meet water demands.

Part A. Statutory Responsibility for Funding

Section 373.705, Florida Statutes (F.S.), describes the responsibilities of the Water Management Districts (WMDs) in regard to funding WSD and water resource 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., further 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 Florida Legislature, direct beneficiaries of WSD projects should generally bear the costs of projects from which they benefit. However, affordability and benefits to natural resources are valid considerations recognized in Section 373.705(4)(a), F.S. for funding assistance from the WMDs:

(4)(a) Water supply development projects that are consistent with the relevant regional water supply plans and that meet one or more of the following criteria shall receive priority consideration for state or water management district funding assistance:

1. *The project supports establishment of a dependable, sustainable supply of water which is not otherwise financially feasible;*
2. *The project provides substantial environmental benefits by preventing or limiting adverse water resource impacts, but requires funding assistance to be economically competitive with other options; or*
3. *The project significantly implements reuse, storage, recharge, or conservation of water in a manner that contributes to the sustainability of regional water sources.*

Currently, the District funds both WSD and water resource development (WRD) projects. As discussed in Chapter 7, the District considers its WRD activities to include resource data collection and analysis, as well as projects. In terms of WSD, 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 WSD and WRD projects are addressed below.

Part B. Funding Mechanisms

Section 1. Water Utilities

Water supply development (WSD) 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 variety 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 WSD 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 use, 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 (O&M).

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. Community development districts (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 (TBW), 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 for 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.

While some utility 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 will be added. Projects built late in the 20-year planning period will continue to generate revenues for debt service for many years after the planning period. Financing through volume-related charges is the most economically efficient means to finance new WSD. 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 (AWS), the impact on ratepayers 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.

Conservation incentivized by block rate structures, in combination with collecting project revenues in advance of construction, can distribute price increases more evenly over time and buffer price fluctuations inherent in common water-pricing practices. This allows customers to adjust water use practices and technology over time. Indexing of prices is another means of distributing price increases over time. If changes to water rates are revenue-neutral, additional conservation can still occur, as the difference between average and marginal price blocks for larger water users increases. 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's publications Avoiding Rate Shock: Making the Case for Water Rates (AWWA, 2004) and Thinking Outside the Bill: A Utility Manager's Guide to Assisting Low-Income Water Customers (AWWA, 2014).

Section 2. Water Management District

The District's Governing Board provides significant financial assistance for conservation, planning, and AWS projects through programs including the Cooperative Funding Initiative (CFI) and other District initiatives. Financial assistance is provided primarily to governmental entities, but private entities also participate in these programs. Portions of state funding are also allocated by the District through state appropriations for the state's Water Protection and Sustainability Program, the District's West-Central Florida Water Restoration Action Plan, the state's Florida Forever Program, the District's Facilitating Agricultural Resource Management Systems (FARMS) Program, and FDEP funding for the Springs Initiative.

1.0 Cooperative Funding Initiative

The primary funding mechanism is the District's CFI, which includes funding for major regional water supply and WRD projects and localized projects throughout the District's 16-county jurisdiction. The Governing Board, through its regional subcommittees, jointly participates with local governments and other entities to ensure proper development, use, and protection of the regional water resources of the District. The CFI is a matching grant program and projects of mutual benefit are generally funded 50 percent by the District and 50 percent by the public or private cooperators. Any state and federal funds received for the projects are applied directly against the project costs, with both parties benefitting equally. This program, which has been highly successful since 1988, has resulted in a combined investment (District and cooperators) of approximately $3.3 billion for a variety of water projects addressing the District's four areas of responsibility: (1) water supply, (2) natural systems, (3) flood protection, and (4) water quality. From fiscal year (FY) 2016 through FY2020, the District's adopted budget included an average of $56.8 million in ad valorem tax dollars for the CFI program, of which $30 million (53 percent) was for WRD and WSD assistance.

2.0 District Initiatives

Projects funded through the District Initiatives program are of great importance or a regional priority. The District can increase its percentage match and, in some cases, provide total funding for the project. Examples of these initiatives include: (1) the Quality of Water Improvement

Program to plug deteriorated, free-flowing wells that waste water and cause inter-aquifer contamination, (2) the Utilities Services Group to conserve water by assisting utilities in controlling their water loss, (3) data collection and analysis to support major District initiatives such as the MFL program, and (4) the FARMS program and other various agricultural research projects designed to increase the water-use efficiency of agricultural operations, (5) water resource development investigations and MFL Recovery projects which may not have local cooperators, and (6) the Water Incentives Supporting Efficiency (WISE) program launched in 2019 offers cost-share funding for a wide variety of water conservation projects (max of $20 thousand per project) to non-agricultural entities. From FY2016 through FY2020, the District's adopted budget included an average of $24.5 million in ad valorem tax dollars for District Initiatives, of which $9 million (37 percent) was for WRD and WSD assistance.

The average total commitment from FY2016 through FY2020 for CFI and District Initiatives was approximately $81.3 million. The continued level of investment for these programs depends on various economic conditions, resource demands, and the District's financial resources. However, the District believes its resources are sufficient to ensure the long-term sustainability of the region's water resources moving forward.

Section 3. State Funding

1.0 The Springs Initiative

The FDEP Springs Initiative is a special legislative appropriation that has provided revenue for protection and restoration of major springs systems. The District has allocated Springs Initiative funding to implement projects to restore aquatic habitats, to reduce groundwater withdrawals and nutrient loading within first-magnitude springsheds, and to improve the water quality and quantity of spring discharges. Projects include the reestablishment of aquatic and shoreline vegetation near spring vents, construction of infrastructure necessary to convey wastewater currently treated in septic systems or package plants to a centralized wastewater treatment facility which may increase reclaimed water production and implementation of other best management practices within springshed basins.

The Northern Planning Region contains several unique first-magnitude springs

The first year of the appropriation was FY2014, when the District received $1.35 million from FDEP to allocate for springs restoration. To date, the District has been allocated over $55.2 million in Springs Restoration funding from the FDEP, including $19.25 million for FY2020, of which $7 million will be budgeted in future years. This funding has provided for reclaimed water projects that will provide approximately 4 mgd in additional reuse flows and 5 mg in reclaimed water storage. The projects are located primarily in the Northern Planning Region, where the majority of first and second magnitude springs within the District are located.

2.0 Water Protection and Sustainability Program

Large areas of Florida do not have sufficient traditional water resources to meet the future needs of the state's growing population and the needs of the environment, agriculture and industry. The state’s Water Protection and Sustainability Program Trust Fund (WPSPTF) was created in the 2005 legislative session through Senate Bill 444 to accelerate the development of alternative water sources and later recreated in Chapter 373, F.S., as part of the 2009 legislative session. Legislation focused on encouraging cooperation in the development of alternative water supplies and improving the linkage between local governments' land use plans and water management districts' regional water supply plans. The program provides matching funds to the District for alternative WSD assistance. From FY2006 through FY2009, the District received a total of $53.75 million in legislative allocations through the program for WSD projects. Annual WPSPTF funding resumed in FY2020 with $250,000 allocated to the District.

Program funds are applied toward a maximum of 20 percent of eligible project construction costs. In addition, the Legislature established a goal for each WMD to annually contribute funding equal to 100 percent of the state funding for alternative WSD assistance, which the District has exceeded annually. The legislation also requires that a minimum of 80 percent of the WPSPTF funding must be related to projects identified in a district water supply plan. The District’s Regional Water Supply Plan (RWSP) is utilized in the identification of the majority of WPSPTF-eligible projects.

Projects are evaluated for funding based on consideration of the 12 factors described in Subsections 373.707(8)(f) and (g), F.S., and additional District evaluation factors as appropriate. If the Legislature continues to fund the state's Water Protection and Sustainability Program, it could serve as a significant source of matching funds to assist in the development of alternative water supplies and regional supply infrastructure in the region.

3.0 The Florida Forever Program

The Florida Forever Act, as originally passed by the Florida Legislature in 1999, established the 10-year $3 billion statewide Florida Forever Program. The Program was extended by the Legislature during the 2008 legislative session, allowing the Program to continue for 10 more years at $300 million annually. Since 1999, the District has allocated $95 million ($81.6 million for land acquisition and $13.4 million for water body restoration) of Florida Forever funding Districtwide in support of WRD. A “water resource development project” eligible for funding is defined in Section 259.105, F.S. , as a project 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, aquifer storage and recovery (ASR) facilities, surface water reservoirs, and other capital improvements. Numerous tracts have been acquired in the northern region including Potts and Flying Eagle preserves, Three Sisters Springs, and coastal preserves at Weeki Wachee and Chassahowitzka Rivers. A primary example of how the funds were used by the District for WRD 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 expended $35.7 million in ad valorem-based funding to complete the acquisition of lands associated with the Lake Hancock project, acquired on a voluntary basis and through eminent domain proceedings.

4.0 State Funding for the Facilitating Agricultural Resource Management Systems Program

Operating under Chapter 40D-26, Florida Administrative Code, the FARMS Program, through the District, utilizes additional state funding when available. 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 by the state from FY2016 through FY2020.

5.0 West-Central Florida Water Restoration Action Plan

The Water Restoration Action Plan (WRAP) is an implementation plan for components of the Southern Water Use Caution Area (SWUCA) recovery strategy adopted by the District. Although the Northern Planning Region is outside of the SWUCA, the WRAP is an example of how state funding could be generated for future recovery strategies. The WRAP 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 SWUCA. 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; however, no new funding has been provided via state appropriation since that time.

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 AWS 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.

Within the District, Federal matching funds from this initiative helped fund the construction of the Peace River Manasota Regional Water Supply Authority (PRMRWSA) reservoir and plant expansion. Funding for Tampa Bay Water's C.W. Bill Young Regional Reservoir came from individual project grant allocations through the State and Tribal Assistance Grants (STAG) program. However, Congress has not funded any individual project STAG grants for several years, so future funding for individual projects through this mechanism is uncertain. Congressional authorization through the Water Resources 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 FDEP, the U.S. Army Corps of Engineers, and the members of the Florida Congressional Delegation to secure federal funding.

1.0 U.S. Department of Agriculture Natural Resources Conservation Service programs

The Natural Resources Conservation Service's (NRCS) Environmental Quality Incentives Program (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, and tribal environmental laws that encourage environmental enhancement. The program is achieved through the implementation of a conservation plan that includes structural, vegetative, and land management practices. The program is carried out primarily in priority areas where significant resource concerns exist. Agricultural water supply and nutrient management through detention/retention or tailwater recovery ponds can be pursued through this program.

In addition to EQIP, the FARMS Program has partnered with NRCS through the Agriculture Water Enhancement Program and the Florida West Coast Resource Conservation and Development Council (RC&D) to bring additional NRCS cost-share funding. The AWEP was created by the 2008 Farm Bill with similar goals as the EQIP program, including conserving and/or improving the quality of ground and surface water. The RC&D is a nonprofit organization that promotes sustainable agriculture and local community food systems in Hillsborough, Manatee, Pinellas, and Sarasota counties.

The District's FARMS Program works cooperatively with the NRCS EQIP, AWEP, and RC&D programs on both financial and technical levels, and dual cost-share projects have been coordinated 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. As of FY2019, 41 FARMS projects Districtwide have involved some level of dual cost-share with EQIP, AWEP, and/or the RC&D, 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. For 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.

Section 5. Public-Private Partnerships and Private Investment

As traditional water sources reach their capacity, alternative sources must be developed that involve specialized technical expertise and risky financial investments. The development of such technologies may be beyond the ability and level of tolerance of many water utilities. A range of public/private partnership options are available to provide this expertise and shift the financial risk. These options range from all-public to all-private ownership, design, construction, and facility operation. Investment and competition among private firms desiring to fund, build, or operate WSD projects could 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) public-private partnerships consisting of public utilities or regional water supply authorities contracting with private entities to design, build, or operate facilities; (2) cooperative institutions such as irrigation districts contracting with private entities; and (3) private entities, which could identify a customer base and become a water supplier to one or more water use types.

1.0 Public-Private Utility Partnerships

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

Public-private partnerships are becoming more common as water technology and regulation becomes increasingly complex. Increasing numbers of regulated pollutants and new higher-risk technologies drive privatization of some public water supply responsibilities. Partnerships work best where risks are beyond public sector tolerance, a project is new and standalone, construction and long-term operation are combined, there are clearly defined performance specifications, and there are clearly defined payment obligations (Kulakowski, 2005). Small utilities may not have the resources or project sizes sufficient to attract private interest but may participate through multi-utility agreements or through a regional water supply entity. A significant benefit of cooperation in larger projects is the economies of scale common in the water supply industry.

2.0 Cooperatives

Cooperatives are arrangements where 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 lengthy transmission systems are required, such as in the western U.S. where surface water is distributed to water districts and for irrigation. Water is usually obtained from a supplier at a cost and then distributed among members by the water district. Members cooperatively fund the construction of transmission and distribution facilities. As groundwater resources become increasingly limited and reclaimed water systems expand, the same type of economic forces that created irrigation and water districts in the west could develop in portions of Florida. Cooperatives may also shift financial risk by entering into design, build, and operate arrangements with contractors. One example of this structure is the Polk Regional Water Cooperative, formed in 2016 to address the development and provision of alternative water sources to its member local governments. Other forms of cooperative institutions in Florida, such as drainage districts and grower cooperatives, have effectively reduced competition and litigation over resources (OPPAGA, 1999).

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

Private Supply Investment is where investors identify an unserved customer base and develop water facilities to meet those needs. This type of investment may facilitate the development of AWSs. Such private financial investment occurs where firm regulatory limits are in place to protect water resources and related environmental features, and further development of traditional sources are not allowable. Although the purpose of the regulatory measures is resource protection, they indirectly create a customer base for alternative source developers.

Part C. 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

Below is a summary of projected resources that could be generated by the District and state funding programs for water resource development and WSD projects. An explanation follows as to how the funding amounts are derived.

1.0 Cooperative Funding Initiative

With the Governing Board's direction for a continued investment in vital projects to protect the region's water resource needs, the District's most recent long-range funding plan estimated $1.33 billion in ad valorem tax dollars would be allocated for the CFI from 2021 through 2040. Assuming these funds are used for projects that would be matched by a partner on an equal cost-share basis, this would collectively result in $2.66 billion generated through this program. If the funding allocation summary of the program remains consistent with the previous five years, approximately $1.41 billion (53 percent) could potentially be utilized for water source development and WSD assistance. However, the allocation of resources is typically driven by new requests submitted through the CFI program each year, which could significantly influence this funding projection, as the Governing Board may direct more funding for the District's other areas of responsibility (i.e., flood protection, water quality, and natural systems). It is important to note that funding does not include state or federal funds, which the District and its partners continue to seek.

2.0 District Initiatives

Also consistent with the District's most recent long-range funding plan, an estimated $579 million in ad valorem tax dollars would be allocated for District Initiatives from 2021 through 2040. If the funding allocation of the program remains consistent with the previous five years, approximately $214 million (37 percent) could potentially be utilized for water source development and WSD assistance. However, the allocation of resources is typically driven by strategic priorities which could significantly influence this funding projection, as the Governing Board may direct more funding for the District's other areas of responsibility (i.e., flood protection, water quality, and natural systems.) It is important to note that funding does not include state, federal or local funds, which the District continues to seek.

3.0 Springs Initiative

The amount of future state funding for the Springs Initiative cannot be determined at this time. Any funding allocated to this District will be used for projects for the protection and restoration of major springs systems, including projects to reduce groundwater withdrawals and improve stormwater systems.

4.0 Water Protection and Sustainability Trust Fund

The amount of future state funding for this program cannot be determined at this time. As economic conditions improve and the state resumes funding, any funding allocated for this District will be used as matching funds for the development of alternative water supply projects.

5.0 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 WRD.

If funding allocations remain consistent with the previous five years, approximately $1.62 billion could potentially be generated or made available to fund CFI and District Initiative projects necessary to meet the water supply demand through 2040 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 legislative appropriations.

Section 2. Evaluation of Project Costs to Meet Projected Demand

Of the 209.7 mgd of Districtwide projected demand increases during the 2015 to 2040 planning period to meet the demand for all users and to restore MFLs for impacted natural systems, it is estimated that 46 mgd, or 22 percent of the demand, has either been met or will be met by reclaimed water and conservation projects that are under development. The total District share of cost for the projects currently under development including regional transmission, ASR, and brackish groundwater treatment systems is $490 million.

To develop an estimate of the capital cost of projects necessary to meet demand, the District compiled a list of large-scale WSD projects proposed for development within the 2040 planning timeframe. Projects proposed by the PRMRWSA, Tampa Bay Water, and Polk Regional Water Cooperative could produce up to 105 mgd of water supply. There were no major WSD projects proposed for development by the Withlacoochee Regional Water Supply Authority through 2040 in the Northern Planning Region, as traditional sources, conservation, and reclaimed water initiatives are projected to meet demands in the region. Estimated costs and the quantity of water these projects will produce are listed in Table 8-2. The categories shown each contain several projects that could be chosen for development to meet future needs. Many of these are AWS projects that would be eligible for co-funding by the District. The table shows the estimated total cost of the 100 to 105 mgd of water supply that will be produced by these projects is up to $1.81 billion.

A portion of new water demand in the Northern Planning Region will be met using available quantities of fresh groundwater, for which the District does not provide matching financial resources. The District is planning to assist with AWS options, including reclaimed water and conservation projects, which can help meet future demands in the Northern Planning Region and help prevent negative impacts on water resources from occurring. The potential water supply project options are discussed in Chapter 5.

Table 8-2. *Proposed large-scale water supply and water resource development projects by 2040 (millions of $)*

Project	Entity to Implement	Quantities (mgd)	Capital Costs
Peace River Facility Surface Water System Expansion and Regional Reservoir	PRMRWSA	15	$332
Phase II Capacity Expansion, New RO Water Treatment Plant, and Regional Loop System	PRMRWSA	10	$365
Aquifer Recharge for SWIMAL Recovery at Flatford Swamp with Natural Systems Enhancement	TBD	10	$31
Southeast Wellfield and West Polk County Lower Aquifer Deep Wells	PRWC	45	$650
Big Bend Desalination	TBW	10-12.5	$244
Enhanced Surface Water Expansion from Alafia River	TBW	10-12.5	$88
New Regional Feed Line to Balm Area	TBW	N/A	$76-97
Subtotal Southern Planning Region		**35**	**$728**
Subtotal Heartland Planning Region		**45**	**$650**
Subtotal Tampa Bay Planning Region		**20-25**	**$408-429**
Total – Districtwide		**100-105**	**$1,786-1,807**

Section 3. Evaluation of Potential Available Funding to Assist with the Cost of Meeting Projected Demand

The conservative estimate of $2.66 billion in cooperator and District financial resources that will be generated through 2040 for funding is sufficient to meet the projected $1.79 to $1.81 billion total cost of the large-scale projects listed in Table 8-2. State and federal funding sources may also assist with any remaining and/or high-end costs for future alternative water supply projects and water conservation measures where fresh groundwater resources are limited. Although it is not currently anticipated in the planning timeframe, future funding for major AWS projects in the Northern Planning Region can be planned for in a similar manner. These financial projections are subject to economic conditions that may affect the level of District ad-valorem tax revenue and the availability of federal and state funding; however, such conditions may similarly affect future water demand increases.

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