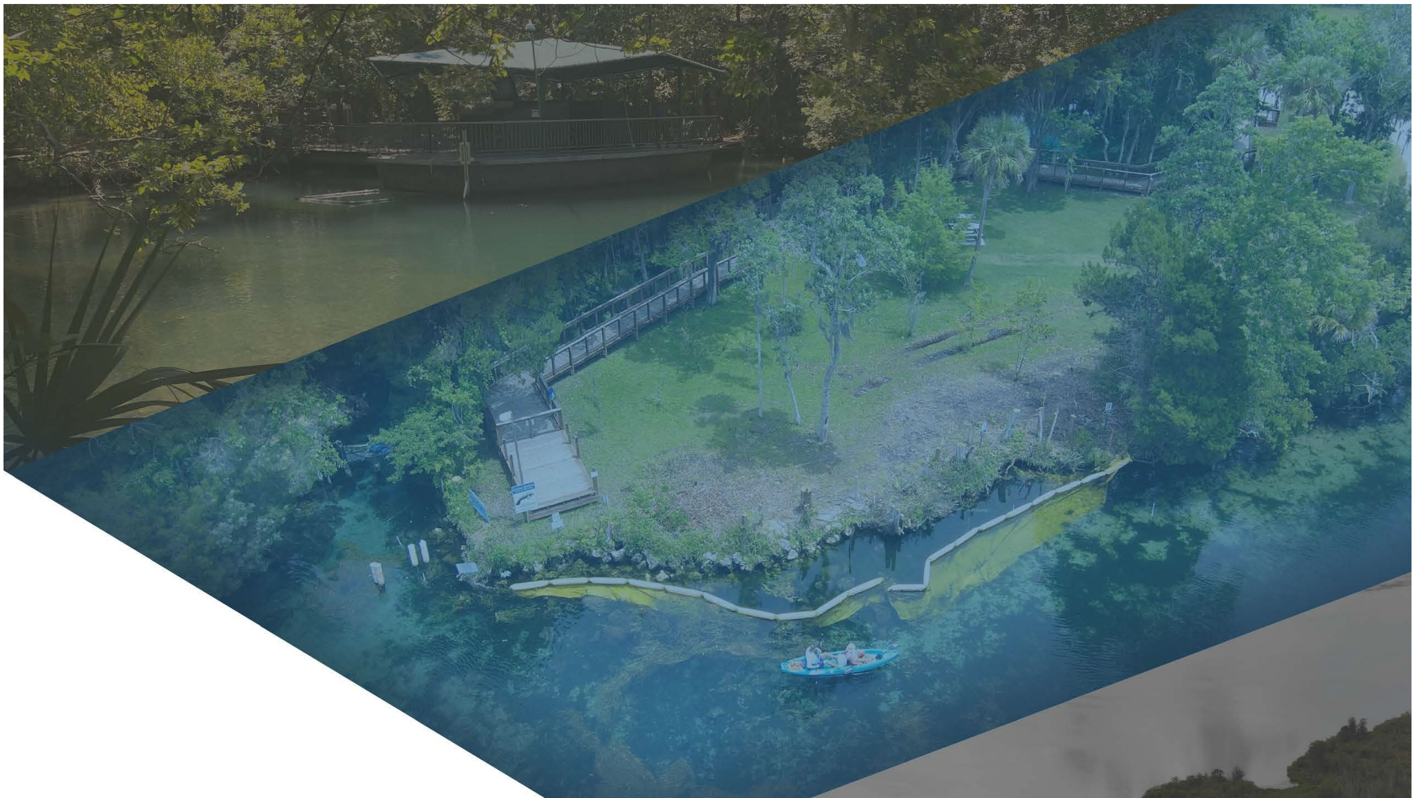

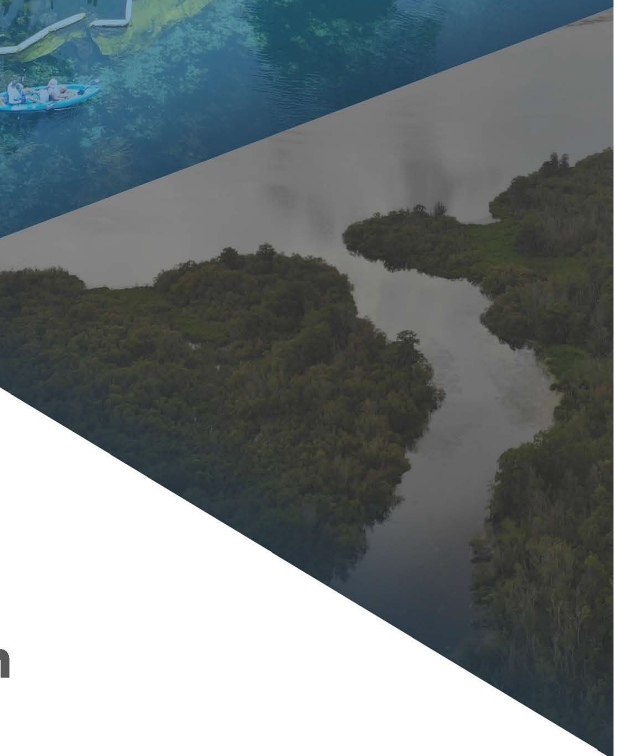

2025 Regional Water Supply Plan

Northern Planning Region

June 2025

Public Draft

Southwest Florida Water Management District

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2025 Regional Water Supply Plan
Northern Planning Region

Public Draft

June 2025

For further information regarding this plan, please contact the Water Supply Section at:

2379 Broad Street
Brooksville, FL 34604-6899
(352) 796-7211 or
(800) 423-1476 (Florida Only)

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Southwest Florida Water Management District

2025 Regional Water Supply Plan

This report is produced by the Southwest Florida Water Management District

June 2025

District Project Manager: Cassidy Hampton

District Contributors

Carrieann Adkins, APR
Steve Clardy
Corey Denninger, GISP
Patrick Doty, AICP, CFM
Carole Estes, P.G.
John Ferguson, P.G.
Yonas Ghile, Ph.D., PG
Jim Golden, AICP
Mike Hancock, P.E.
Gabe Herrick, Ph.D.
Jay Hoecker, PMP
Bruno Kapacinskas
Jason LaRoche, P.G.
Doug Leeper
Josh Madden, PMP
Lydia Manos
Cara Martin, APR
Tamera McBride, P.G.
Jaysa Moléy
Seung Park, P.E.
Ryan Pearson
Terese Power
Reed Putnall
Jill Qi, Ph.D., PG
Joseph Quinn, AICP
Hannah Rahman, GIT, M.S.
Patricia Robertshaw
Cindy Rodriguez
Danielle Rogers, PWS, PMP
Emeli Sandoval, M.S.
Andrea Shamblin
Virginia Singer
Amber Smith
Sammy Smith, P.G., M.S.
Paige Tara
Susanna Martinez Tarokh
Madison Trowbridge, Ph.D.
Chris Tumminia, Esq.
Devon Villareal
Adrienne Vining, Esq.
Andrea Villari
Kevin Vought
Jeff Whealton, P.W.S.
Brent White
Catherine Wolden
Lei Yang, Ph.D., P.E.
Allen Yarbrough
Quanghee Yi, PhD, P.E.
Chris Zajac
Hua Zhang, PhD, P.G.

Other Contributors
Wade Trim, Inc.
Brad Cornelius, AICP, CPM, CFM
Connor Baird
Jeffrey Jenkins, AICP, CFM
Sarah Mastison, AICP
Amanda Warner, AICP

This report is available online at: WaterMatters.org/RWSP
You may send a request for a printed copy to RWSP@WaterMatters.org

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List of Abbreviations

AG	Agriculture
AMO	Atlantic Multidecadal Oscillations
AR	Aquifer Recharge
ASR	Aquifer Storage and Recovery
AWEP	Agriculture Water Enhancement Program
AWE	Alliance for Water Efficiency
AWS	Alternative Water Supply
AWWA	American Water Works Association
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
CGWQMN	Coastal Groundwater Quality Monitoring Network
CSM	Central Springs Model
CWCFGWB	Central West-Central Florida Groundwater Basin
DO	Dissolved Oxygen
DPCWUCA	Dover/Plant City Water Use Caution Area
DPR	Direct Potable Reuse
DSS	Domestic Self-Supply
DWRM	Districtwide Regulation Model
ECFTX	East-Central Florida Transient Expanded
EDR	Electro-Dialysis Reversal
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ENSO	El Niño Southern Oscillations
ET	Evapotranspiration
ETBWUCA	Eastern Tampa Bay Water Use Caution Area
F	Fahrenheit
F.A.C.	Florida Administrative Code
FARMS	Facilitating Agricultural Resource Management Systems
FAS	Floridan Aquifer System
FAWN	Florida Automated Weather Network
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FF	Florida Forever
FFL	Florida-Friendly Landscaping
FIRM	Flood Insurance Rate Maps
F.S.	Florida Statutes
FSAID	Florida Statewide Agricultural Irrigation Demand
FTMR	Focus Telescopic Mesh Refinement
FWS	Florida Water Star℠
FY	Fiscal Year

GIS	Geographic Information System
GOES	Geostationary Operational Environmental Satellites
GPD	Gallons Per Day
GPF	Gallons Per Flush
GPM	Gallons Per Minute
GSSG	Gum Slough Spring Group
HET	High-Efficiency Toilets
HPR	Heartland Planning Region
HRWUCA	Highlands Ridge Water Use Caution Area
I/C	Industrial/Commercial
ICU	Intermediate Confining Unit
IFAS	Institute of Food and Agricultural Sciences
IFASMN	Inland Floridan Aquifer System Monitoring Network
INTB	Integrated Northern Tampa Bay
IPCC	Intergovernmental Panel on Climate Change
IPR	Indirect Potable Reuse
LiDAR	Light Detection and Ranging
L/R	Landscape/Recreation
LFA	Lower Floridan Aquifer
LHR	Lower Hillsborough River
MCU	Middle Confining Unit
M/D	Mining/Dewatering
MFL	Minimum Flows and Levels
MGD	Million Gallons Per Day
MG/L	Milligrams per Liter
MIA	Most Impacted Area
MIL	Mobile Irrigation Lab
MSF	Multi-stage Flash Distillation
NDM	Northern District Model
NHARP	North Hillsborough Aquifer Recharge Program
NOAA	National Oceanic and Atmospheric Administration
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
OFW	Outstanding Florida Water
OPPAGA	Office of Program Policy Analysis and Governmental Accountability
PG	Power Generation
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

SFWMD	South Florida Water Management District
SHARP	South Hillsborough Aquifer Recharge Program
SJRWMD	St. Johns River Water Management District
SLIP	Sea-Level Impact Projection
SLR	Sea Level Rise
SMS	Soil Moisture Sensor
SPR	Southern Planning Region
STAG	State and Tribal Assistance Grants
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
TBPR	Tampa Bay Planning Region
TBW	Tampa Bay Water
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
UMRW	Upper Myakka River Watershed
UF	University of Florida
UFA	Upper Floridan Aquifer
UFANMN	Upper Floridan Aquifer Nutrient Monitoring Network
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
WISE	Water Incentives Supporting Efficiency
WISKI	Kister's Water Information System
WMD	Water Management District
WMP	Watershed Management Plan
WPSPTF	Water Protection and Sustainability Program Trust Fund
WRAP	Water Resource Assessment Project
WRD	Water Resource Development
WRWSA	Withlacoochee Regional Water Supply Authority
WSD	Water Supply Development
WTF	Water Treatment Facility
WTP	Water Treatment Plant
WUCA	Water Use Caution Area
WUE	Water Use Efficiency
WUP	Water Use Permit
WUWPD	Water Use Well Package Database
WWTP	Wastewater Treatment Plant

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Chapter 1. Introduction

The Regional Water Supply Plan (RWSP) for the Southwest Florida Water Management District (SWFWMD or District) is an assessment of projected water demands and potential sources of water to meet these demands for the period from 2025 through 2045. 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 2025 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. The District previously completed three RWSPs since 2010 that included the Northern Planning Region (SWFWMD, 2011, 2015, 2020).

The purpose of the RWSP is to provide a framework for future water management decisions in the District. The RWSP for the Northern Planning Region shows that demands for water through 2045 may continue to be met with traditional groundwater sources on a regional scale; however, alternative sources may be needed to supplement traditional sources and meet demands in specific high-growth areas. Regionally, the need for groundwater supplies can be reduced through the use of available reclaimed water and implementation of comprehensive water conservation measures.

The RWSP also identifies potential options and associated costs for developing fresh groundwater and alternative sources. These options are not intended to represent the District's most preferable for water supply development (WSD); however, they are provided as reasonable concepts that water users in the planning region may pursue to meet their water supply needs. Water users can select a water supply option as presented in the RWSP or combine elements of different options that suit their water supply needs, provided such options are consistent with the intent and direction of the RWSP. Additionally, the RWSP provides information to assist water users in developing funding strategies to 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 with 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 communication among water planners, local government planners, and local utilities. Local governments are now permitted to develop their own water supply assessments, which the water management districts (WMDs) are required to consider when developing their RWSPs. Finally, a trust fund was created to provide WMDs with state matching funds to support the development of alternative water supplies (AWS) 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 where 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 development of alternative sources.

The Northern Planning Region was excluded from the RWSP until 2010. The region was added to the RWSP 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, preventative 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 District's Strategic Plan includes a priority in the Northern Planning Region to "ensure long-term sustainable water supply." The three objectives outlined for this priority are to increase water conservation; increase the use of reclaimed water for potable, recharge, and environmental enhancement projects; and to continue to partner with the Withlacoochee Regional Water Supply Authority (WRWSA) to promote regional water supply planning and development. The goal is to implement the strategy in advance of significant water resource impacts that have occurred in the Tampa Bay, Heartland and Southern planning regions.

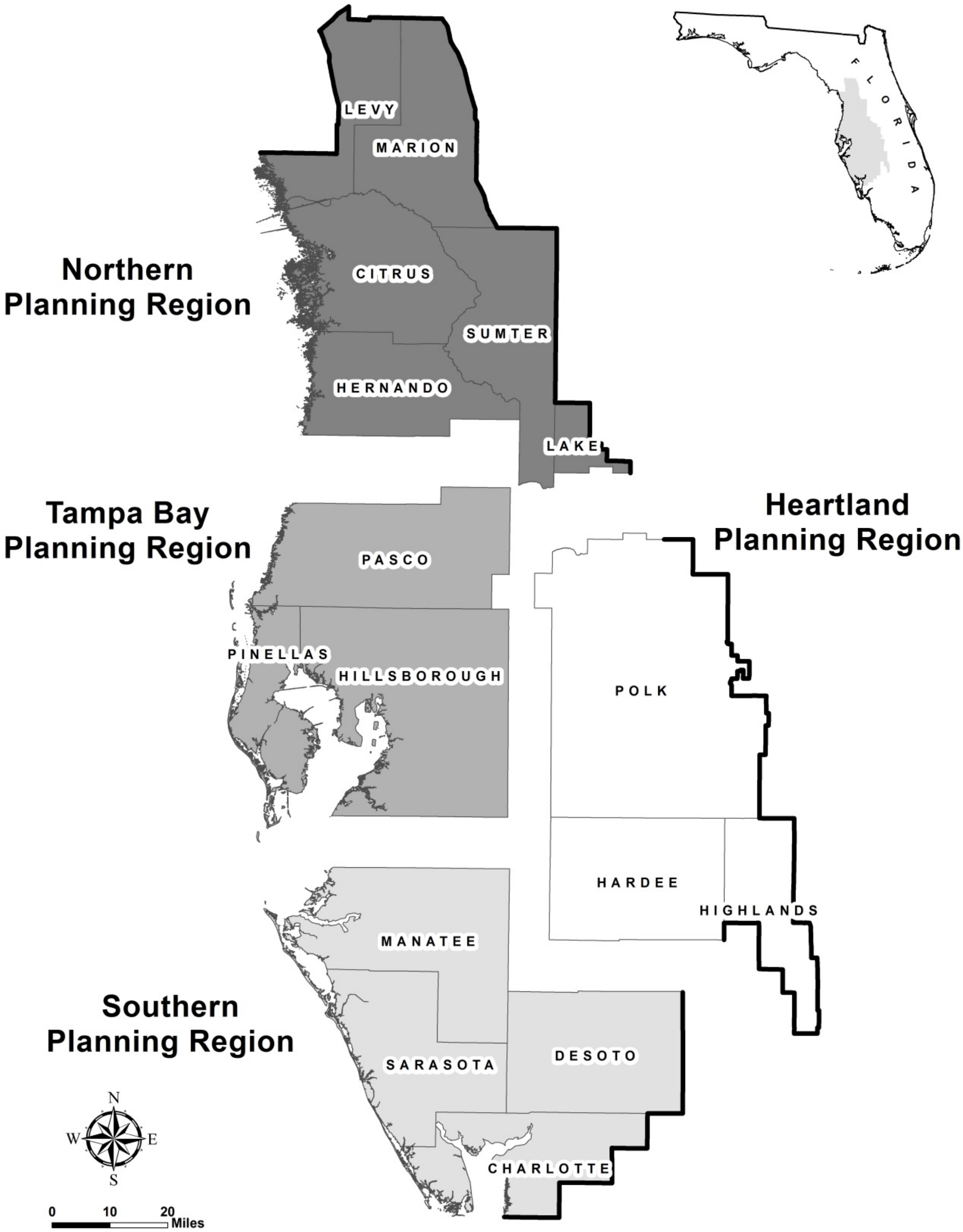


Figure 1-1. *Location of the District's four water supply planning regions*

Part A. Introduction to the Northern Planning Region RWSP

The RWSP for the Northern Planning Region contains:

- Chapter 1, Introduction, provides an overview of water supply planning accomplishments in the planning region prior to 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, quantifies existing and reasonably projected water supply demand through the year 2045 for the public supply (PS), agricultural (AG), industrial/commercial (I/C), mining/dewatering (M/D), power generation (PG), and landscape/recreation (L/R) water use sectors.
- Chapter 4, Evaluation of Water Sources, evaluates the future water supply potential of traditional and alternative sources.
- Chapter 5, Overview of Water Supply Development Options, presents a list of WSD options for local governments and utilities, including surface and stormwater, reclaimed water, and water conservation.
- Chapter 6, Water Supply Projects Under Development, provides an overview of WSD projects that are recently completed or in progress and have received District funding assistance.
- Chapter 7, Water Resource Development Component, inventories the District's ongoing data collection and analysis activities and water resource projects that are classified as water resource development (WRD).
- Chapter 8, Overview of Funding Mechanisms, provides an estimate of the capital cost of water supply and WRD projects proposed by the District and its cooperators to meet the water supply demand projected through 2045 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 2020 RWSP

This section summarizes the District's major accomplishments in implementing the planning region's RWSP objectives since the Governing Board approved the 2020 update in November 2020.

Section 1. Conservation and Reuse 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 (FYs) 2020 to 2024, this includes cooperatively-funded projects for toilet rebates, rain sensors, water-efficient landscape and irrigation evaluations, and evapotranspiration-based smart irrigation controllers. In the Northern Planning Region, the District has co-funded conservation projects undertaken by Citrus County, the WRWSA, the Bay Laurel Community Development District, and the City of Crystal River.

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 (BMPs) to reduce groundwater use and improve water quality. To date, more than 215 operational projects Districtwide are providing a groundwater offset of more than 29 million gallons per day (mgd). An additional three projects in the planning, design or construction phase are expected to yield another 0.28 mgd of offset. Within the Northern Planning Region, FARMS has funded ten projects. Four of these projects are operational, providing about 0.12 mgd of offset. Six projects have been retired, meaning they have come to the end of their operational life or the property has been sold for a non-agricultural purpose.

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 FY1987 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 resulted in the 2020 Districtwide utilization of reclaimed water of more than 197 mgd and a water resource benefit of more than 147 mgd. 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 2020, utilities within the Northern Planning Region were utilizing approximately 78 percent, or 16 mgd of the over 20 mgd, of available wastewater treatment plant (WWTP) flows resulting in an estimated 12 mgd of water resource benefit. There are two reclaimed water projects recently completed or under development and another three projected to experience additional future supply growth. These projects will supply approximately 3.1 mgd of additional reclaimed water that will result in 2.5 mgd of potable quality water benefits at a total cost of approximately $15.9 million.

Section 2. Support for Water Supply Planning

In FY2023, the District co-funded an update to the WRWSA RWSP, which is currently under way. This plan is a 20-year assessment of water demands and potential water sources for meeting these demands 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 draft update has been incorporated in this RWSP for the Northern Planning Region.

The District provides technical support to local governments as they prepare statutorily required Water Supply Facilities Work Plans and related updates as part of their comprehensive plans. Staff also provides ad hoc assistance to local governments and 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) reevaluated or established in the planning region during or since 2020 include those for five lakes, three first-magnitude springs (Chassahowitzka, Homossassa, Rainbow), one second-magnitude spring (Blind), and three river segments, which are listed in Table 1-1 and Appendix 2-1. The District continues to reevaluate and establish MFLs per its annually updated Priority List and Schedule for the Establishment of Minimum Flows, Minimum Water Levels, and Reservations (Chapter 2, Part B and Appendices 2.1 and 2.2).

Table 1-1. *Minimum flows and levels (MFLs) established or reevaluated in the Northern Planning Region since 2020.*

MFL Lakes	MFL Rivers	MFL Springs
Hunters	Chassahowitzka River	Blind Spring
Lindsey	Homosassa River	Chassahowitzka Spring Group (Outstanding Florida Spring [OFS])
Marion	Rainbow River	Homosassa Spring Group (OFS)
Mountain		Rainbow Spring Group (OFS)
Neff		

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 Northern Tampa Bay Water Use Caution Area (NTBWUCA) Recovery Strategy, which was repealed in November 2021, and reduced PS water demand 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

The District continues to work with public water supply utilities, the SJRWMD, South Florida Water Management District (SFWMD), FDEP, FDACS, and multiple stakeholders on the Central Florida Water Initiative (CFWI), which was established in 2011. The CFWI Planning Area includes Orange, Osceola, Polk, Seminole, and southern Lake counties (Figure 2-3). The WMDs previously determined through water supply planning efforts and real-time monitoring that groundwater availability is limited in the CFWI Planning Area. The CFWI aims to 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 composed of 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 working groups and oversight/management committees that are developing and refining information on central Florida's water resources. This work has included development of and subsequent updates to the CFWI RWSP, which was first published in 2015 and most recently updated in 2025 (CFWI, 2015, 2020, 2025). In addition, the FDEP in coordination with the SWFWMD, SJRWMD, and SFWMD adopted uniform rules for application within the CFWI Planning Area (Rules 62-41.300 through 62-41.305), as set forth by the Florida Legislature in Section 373.0465(2)(d), F.S. These rules were completed in 2021 and are currently being implemented by the three WMDs as outlined in the CFWI Supplemental Applicant's Handbook (CFWI, 2022). More detailed information about these efforts is available on the CFWI website at https://cfwiwater.com/.

Part C. Description of the Northern Planning Region

Section 1. Land Use and Population

The Northern Planning Region is characterized by diverse land use types (Table 1-2). The region 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. Field crops account for the largest share of agricultural water use in the region followed by ornamentals (greenhouse/nursery). 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 685,695 in 2020 to 1,033,945 in 2045 (Appendix 3-3). This is an increase of approximately 348,250 new residents, a 51 percent increase over the base year population. Marion, Lake, and Sumter counties include sections of The Villages retirement communities, the largest residential development in central Florida. In Citrus County, the Suncoast Parkway extension from SR 44 to U.S. 19 north of Crystal River is currently under design and development. This may result in increased 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.

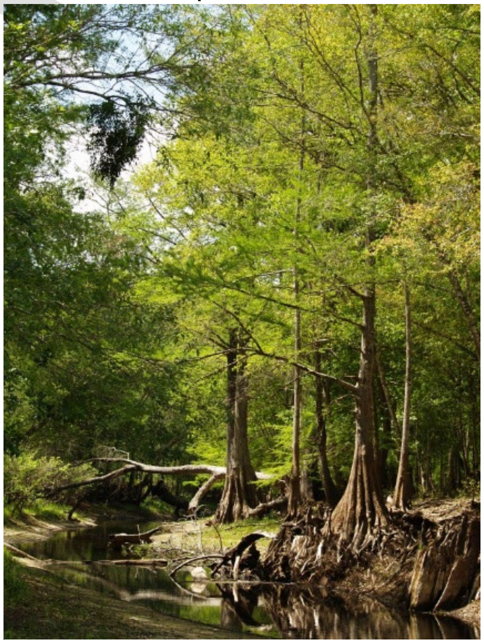
Table 1-2. *Land use/land cover in the Northern Planning Region (2023)*

Land Use/Land Cover Types	Acres	Percent
Urban and Built-up	436,332.53	25.55%
Agriculture	376,363.58	22.04%
Rangeland	30,103.95	1.76%
Upland Forest	445,151.61	26.07%
Water	23,401.10	1.37%
Wetlands	340,591.29	19.95%
Barren Land	3,895.45	0.23%
Transportation, Communication and Utilities	25,558.46	1.50%
Industrial and Mining	26,207.44	1.53%
Total	**1,707,605.42**	**100.00%**

Summation and/or percentage calculation differences may occur due to rounding
Source: Southwest Florida Water Management District (SWFWMD) 2023 Land-Use Land-Cover GIS layer (SWFWMD, 2025).

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 America. 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, which is the second largest in the District, encompasses parts of Marion, Levy, Citrus, and Hernando counties and all of Sumter County, as well as 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

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 America. The Green Swamp is also the source of the Hillsborough, Peace, and Ocklawaha rivers. Figure 1-2 shows the major hydrologic features in the Northern Planning Region.

2.0 Lakes

Major lakes in the planning region include Lake Panasoffkee in Sumter County (3,500 acres), Lake Rousseau in Levy County (4,160 acres), and the Tsala-Apopka Chain of Lakes in Citrus County (20,000 acres). The Tsala-Apopka chain consists of interconnected ponds, marshes, and the open-water portions of primary pools at Floral City (5,900 acres), Inverness (5,950 acres), and Hernando (8,100 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, Chassahowitzka, and Homosassa Spring groups in Citrus County, and the Weeki Wachee Spring Group in Hernando County.

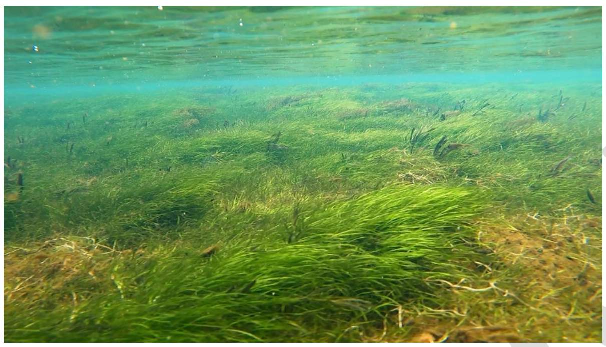
The Rainbow Spring Group discharges into the Rainbow River, which flows 5.7 miles from its headsprings to empty into the Withlacoochee River upstream of Lake Rousseau. Based on United States Geological Survey (USGS) data, the river had a median discharge of 661 cfs from 1965 through December 31, 2023, including provisional data (USGS, 2025).

Three Sisters Springs is within the Kings Bay Spring Group

The Kings Bay Spring Group is the northernmost of the four coastal, first-magnitude spring groups in the District, located on Citrus County's gulf coast. The Kings Bay Spring Group includes more than 70 springs discharging into the tidally influenced, 600-acre Kings Bay. The newly relocated USGS gage near Crystal River (no. 02310750) reported a median flow of 670 cfs from December 04, 2020 through December 31, 2023, which included provisional data (USGS, 2025). The water discharging from the springs is brackish.

The Homosassa Spring Group is south of Kings Bay and north of Chassahowitzka on the gulf coast of Citrus County. The USGS gage near Homosassa (no. 02310700) reported a median discharge of 192 cfs from May 18, 2004 through December 31, 2023, which included provisional data (USGS, 2025). The water discharging from the main spring at the head of the Homosassa River is brackish.

The Chassahowitzka Spring Group is located south of Homosassa and north of Weeki Wachee on the gulf coast of Citrus County. The USGS Gage near Chassahowitzka (no. 02310663) reported a median discharge of 122 cfs from May 2, 2003 through December 31, 2023, which included provisional data (USGS, 2025). The springs are the primary source of water for the Chassahowitzka River. The water discharging from the largest spring at the head of the river is also brackish.



The Chassahowitzka River is primarily spring fed.

The Weeki Wachee Spring Group is the southernmost first-magnitude spring in the region, located on the gulf coast of Hernando County. The USGS Gage located about a mile downstream from the headspring (no. 02310525) reported a median flow of 156 cfs from October 1, 1993 through December 31, 2023, which included provisional data (USGS, 2025). Water discharging from the spring is fresh, as it is located further inland than the other springs discussed here. Several smaller springs discharge brackish water into the Weeki Wachee River downstream of the main spring (Jones et al., 1997).

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, such as those in the Lake Panasoffkee area. 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 Northern Planning Region can be grouped into saltwater and freshwater systems. Saltwater wetlands occur in estuaries and are a mix 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 also occur along the western portions of Hernando and Citrus counties.

Freshwater wetlands occur in low-lying areas near lakes, in isolated, shallow depressions, and along freshwater river corridors. Hardwood-cypress swamps and marshes are two common freshwater wetland types that occur throughout the region. Hardwood-cypress swamps are forested systems with water typically 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, which also occur in the planning region, are vegetated by a variety 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 extends over the entire southern end of Sumter County and includes a rich mosaic of hardwood-cypress swamps, herbaceous wetlands, pine flatwoods and other uplands. 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.

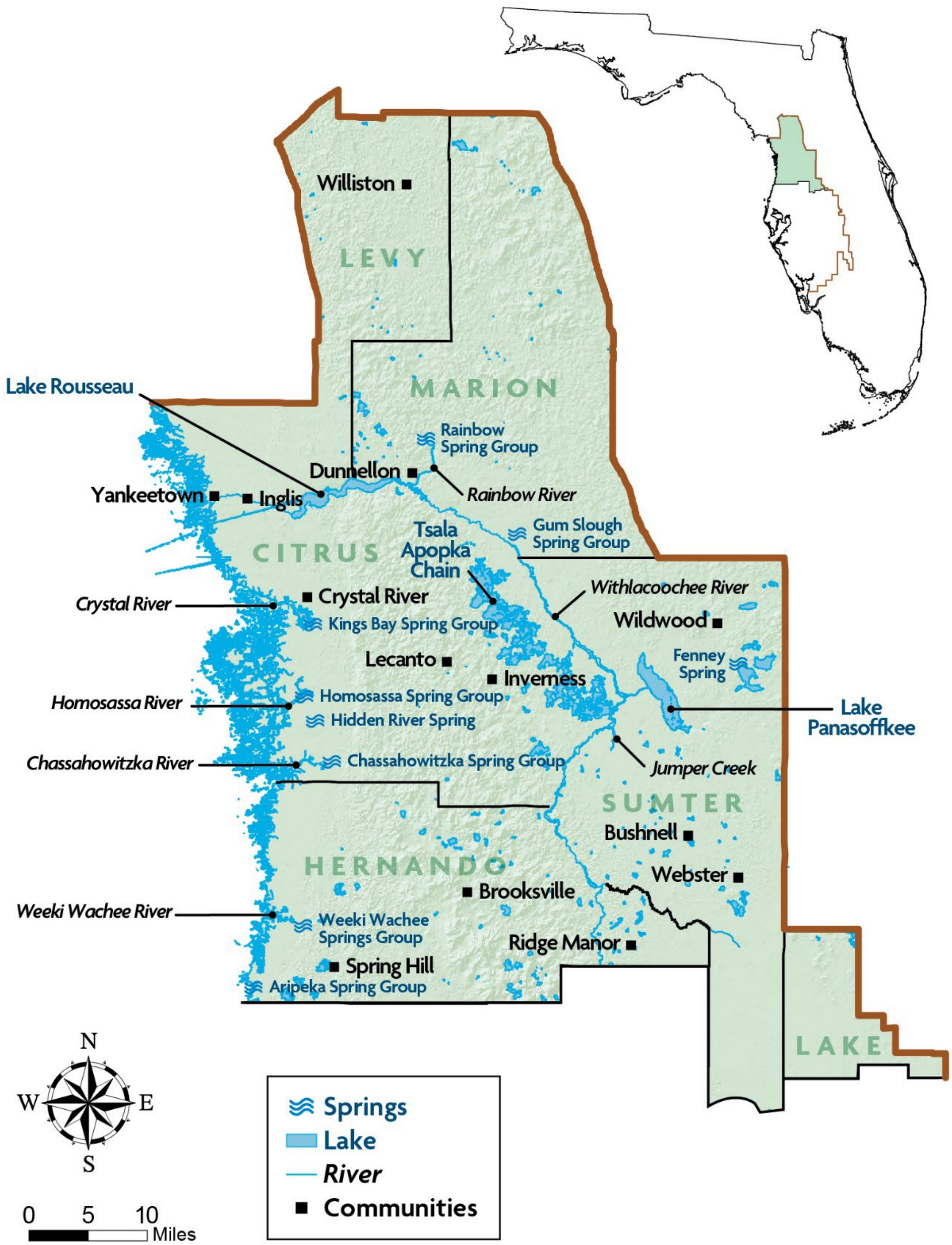


Figure 1-2. *Major hydrologic features in the Northern Planning Region*

Section 4. Geology/Hydrogeology

Intensive karst development characterizes much of the Northern 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).

The UFA is the principal source of groundwater and water supply in the planning region. An undifferentiated surficial aquifer is absent in most of the planning region because the basal clay above the UFA is absent, discontinuous, or breached by karst features. The lack of hydraulic continuity precludes characterization as a laterally extensive and functional surficial aquifer, though small locally perched water tables may be present in some areas (Arthur et al., 2008).

Figures 1-3 and 1-4 are north-south cross sections through the western and eastern portions of the District showing the generalized hydrogeology. Figure 1-5 shows the west-central Florida groundwater basins. 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 Hawthorn aquifer system (formerly 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. This unit becomes discontinuous and disappears entirely in the Northern Planning Region, causing the UFA to become regionally unconfined over most of the planning region (LaRoche and Horstman, 2024).

The UFA is composed of a thick, stratified sequence of limestone and dolomite units that include (in order of increasing geologic age and depth) the Suwanee Limestone, Ocala Limestone, and part of the Avon Park Formation. A relatively thin sequence of sands, silts, and clays overlay the carbonate deposits. The upper several hundred feet of limestone and dolostone comprise the most productive and utilized portion of the UFA.

The Suwannee Limestone occurs in Hernando County at or near land surface and is up to 100 feet thick (Arthur et. al., 2008). The Ocala Limestone is the uppermost unit for much of the remainder of the planning region and is typically between 50 to 150 feet thick. Extensive karst features can be observed in the surface outcrops and karst plains associated with both the Suwannee and Ocala Limestone. These rocks comprise the upper part of the UFA in this region and contain many solution channels, which is the source for most of the spring discharge observed in the region (SWFWMD, 1987).The Ocala low-permeability zone mapped throughout the southern part of the District is mostly absent in this planning region where active and relict karst processes dramatically increase the permeability of the Ocala Limestone (LaRoche and Horstman, 2024).

The Avon Park Formation is approximately 1,000 feet thick in the planning region and is composed of interbedded limestones and dolostones with gypsum beds that occur in the middle to lower portions of the formation for much of the planning region. The formation underlies the entire planning region and outcrops in some 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 part of the UFA across the planning region. The highly transmissive Avon Park high-permeability zone is distinguished by fractures and cavities throughout the southern part of the District but is mostly absent in this planning region where carbonates are not as dense and brittle for fractures to form (LaRoche and Horstman, 2024).

The middle confining unit (MCU) II occurs in the lower portion of the Avon Park Formation and forms the base of the UFA for large parts of the District (Miller, 1986). It contains evaporite minerals such as gypsum and anhydrite, which occur as thin beds or as nodules within dolomitic limestone that overall have very low permeability. The MCU II is generally considered to be the lower limit of freshwater production in the planning region. Water quality near and below MCU II is typically brackish due to mineral contact. The lower Floridan aquifer (LFA) below MCU II (LFA II) may be productive, but it has not been used or extensively tested in the region due to the availability of fresh water. Deeper exploration in recent decades shows another MCU to be present in central and southern Florida, MCU VIII (Miller, 1986). The permeable rock below MCU VIII is LFA VIII, which is the deepest aquifer of the Floridan aquifer system (FAS) and commonly contains fractures. Groundwater in this aquifer is often non-potable but less than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS) in some areas.

In northeast Sumter County and eastern Marion County, MCU II is absent and a shallower MCU I (Miller, 1986) is present in the upper Avon Park Formation. This unit consists of a fine-grained, dense, carbonate lithology that is more leaky than MCU II. The MCU II is overlapped and separated from MCU I by a few hundred feet of permeable rock in a northwest trending band along the eastern edge of the planning region from Levy County through Lake County. Where this overlap occurs, the base of the UFA is the top of MCU I and the LFA below MCU I (LFA I) is present. The LFA I contains fresh groundwater and is currently being used for water supply in eastern parts of the planning region, where present. Both MCU I and LFA I extend eastward from Sumter and Marion counties across the SJRWMD. For more information on the FAS within the District, please refer to LaRoche and Horstman, 2023.

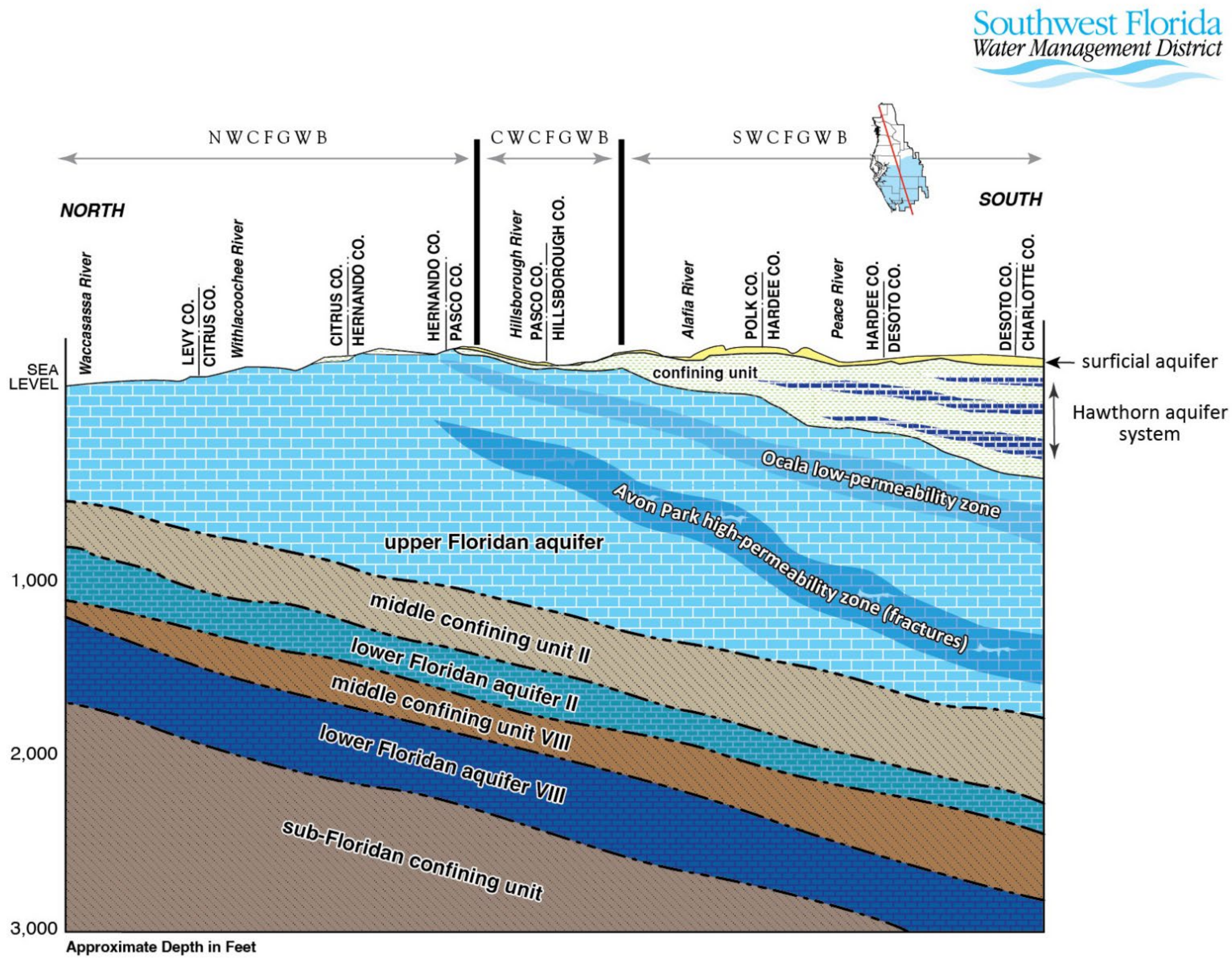


Figure 1-3. *Generalized north-south hydrogeologic cross section through the western District*

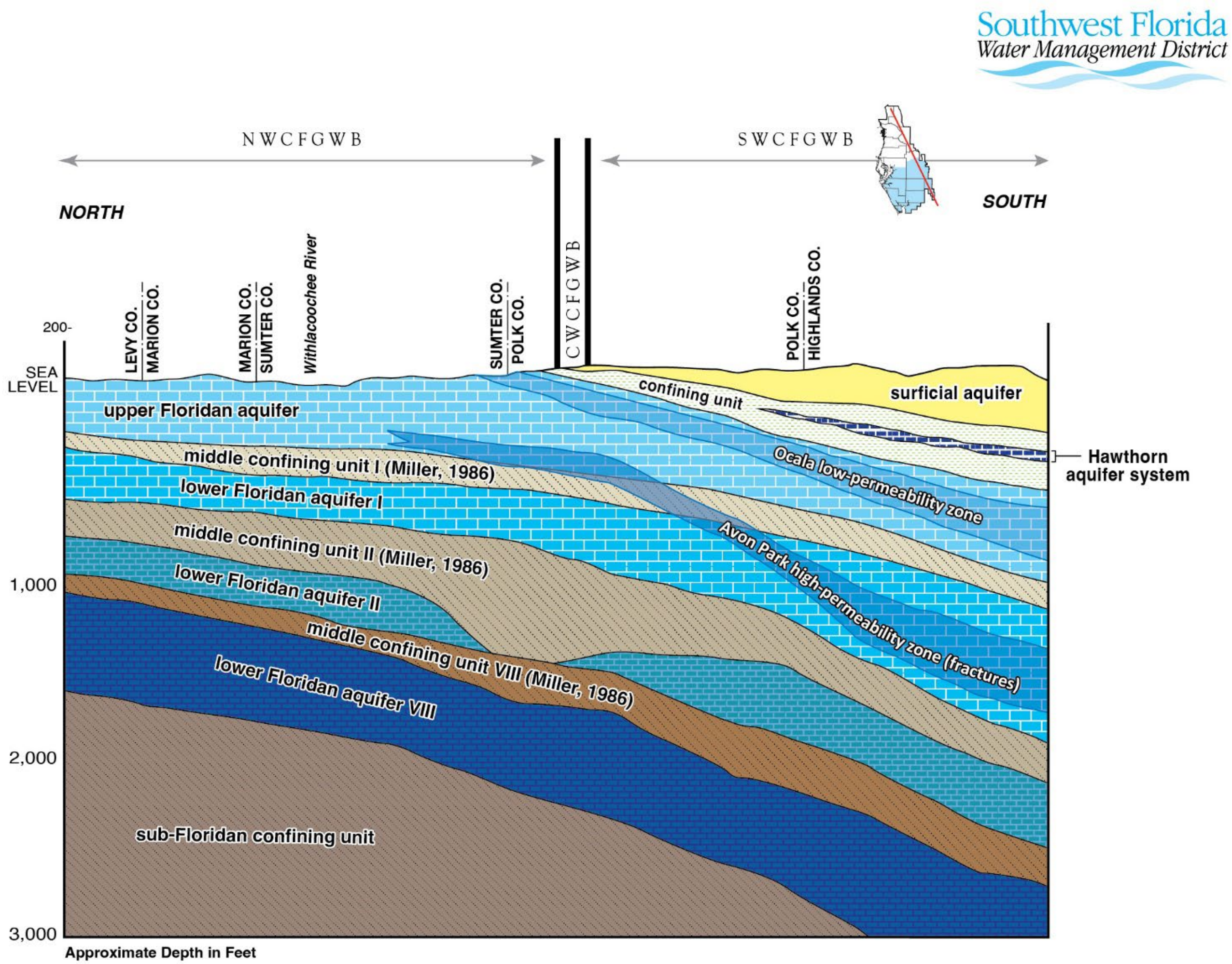


Figure 1-4. *Generalized north-south hydrogeologic cross section through the eastern District*

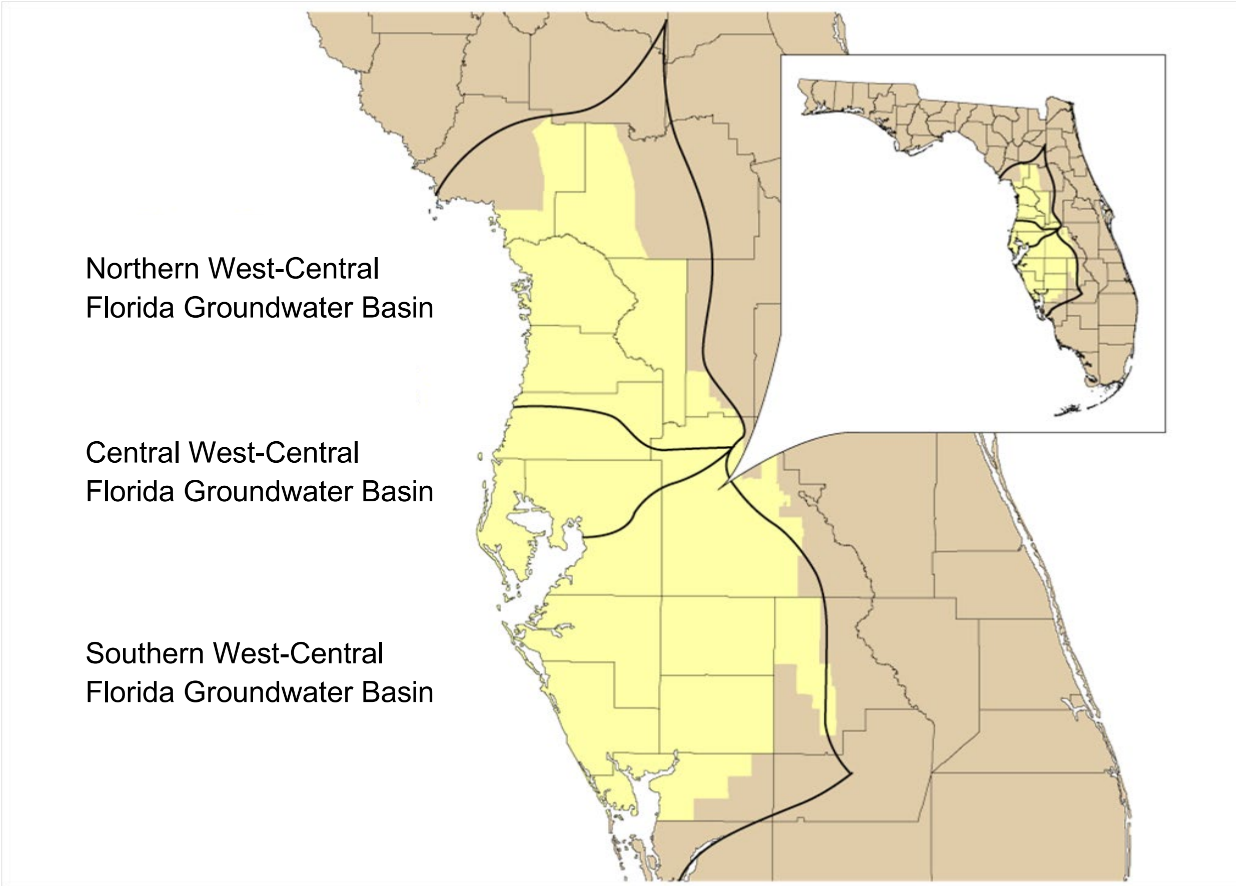


Figure 1-5. *The District and the West-Central Florida Groundwater Basins*

Part D. Previous Technical Investigations

The 2025 RWSP builds upon a series of cornerstone technical investigations undertaken by the District and the USGS beginning in the 1970s. These investigations enhanced the District's understanding of the complex relationships between human activities (i.e., surface and groundwater usage and large-scale land-use alterations), climatic cycles, aquifer and surface water hydrology/interactions, and water quality. Investigations conducted in the Northern Planning Region and adjacent areas are grouped by category and briefly summarized below.

Section 1. Water Resource Investigations

Following passage of the Florida Water Resources Act of 1972 (Chapter 373, F.S.), numerous water resource investigations were initiated by the District to collect and evaluate critical information on Districtwide water resources. As a result, the District's Regional Observation and Monitor-well Program (ROMP) was established in 1974 to construct monitor wells and perform aquifer testing to better characterize groundwater resources and surface and groundwater interactions. Approximately a dozen wells were drilled annually, and by the 1980s, data collected from these wells began to be used in hydrologic assessments that clearly identified regional resource concerns.

In the late 1980s, the District initiated a water resource assessment project (WRAP) for the Northern Tampa Bay (NTB) area to address water supply availability and determine the causes of water level declines in lakes and wetlands. Based on the preliminary findings of the WRAP study and continued concern about water resource impacts, the NTBWUCA was established in 1989 (Chapter 2, Part A). The District implemented a strategy to address the resource concerns and facilitated public work group meetings to develop management plans for the NTBWUCA (SWFWMD, 1990a, 1990b). These deliberations led to major revisions of the District's water use permitting rules to add special conditions specific to the NTB and other WUCAs.

A WRAP is currently being conducted for the Northern Planning Region to improve understanding of water resource issues from Pasco County north to Levy County. Data are being collected from exploratory core drilling, monitor-well construction, aquifer pump testing, and long-term water level and water quality regional monitoring networks. These data are intended to enhance understanding of the aquifer framework and groundwater flow systems, 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 water supply planning effort to identify sustainable quantities of traditional groundwater sources available in the area and develop management strategies for meeting water demands. The CFWI Planning Area includes Orange, Osceola, Polk, Seminole, and southern Lake counties. It is a multi-district effort that includes the St. Johns River, South Florida, and Southwest Florida WMDs. Additional stakeholders such as the FDEP, FDACS, and regional public water supply utilities are participating in this collaborative effort that builds on work started for a prior effort called the Central Florida Coordination Area. The 2025 CFWI RWSP details current work within the CFWI Planning Area focused on development of water resources, water supply projects, and regulatory components necessary to meet projected water demands through 2045 (CFWI, 2025).

The Northern Planning Region is home to 5 first-magnitude springs.

The District has designated the Chassahowitzka, Crystal River/Kings Bay, Homosassa, Rainbow, and Weeki Wachee river systems as Surface Water Improvement and Management (SWIM) priority water bodies. The District, in partnership with the Springs Coast Committees, have developed management plans called SWIM Plans tailored for each spring system to identify issues, solutions, costs, and responsibilities. This process ensures that projects are focused on improvements to these spring systems. The main issues facing these spring systems include elevated nitrate concentrations, reduced volume and streamflow, reduced water clarity, and altered aquatic vegetation communities. These documents use an adaptive management approach and are therefore revised periodically to assess overall progress.

Section 2. U.S. Geologic Survey Hydrologic Investigations

The District maintains a long-term cooperative program with the USGS to conduct hydrogeologic investigations intended to supplement work conducted by District staff. The projects focus 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 Northern Planning Region. In addition, some projects and data collection activities are in progress. Completed and ongoing cooperative District/USGS investigations and data collection activities are listed in Table 1-3.

Table 1-3. *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 Streamflow 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
Data Collection	Statewide LiDAR Mapping
	Mapping Actual ET Over Florida Model Support
Ongoing Investigations/Data Collection Activities	
Data Collection	Minimum Flows and Levels Data Collection
	Surface Water Flow, Level and Water Quality Data Collection
	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 United States 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 use excess surface 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-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 (WUE), 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 time frame (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), which was updated in 2006. It 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 AWS.

Beginning with the 2010 RWSP update through this 2025 5-year update, the District included four regional volumes covering all of the District. For this 2025 RWSP, demands within the Northern Planning Region may continue to be met with traditional groundwater sources on a regional scale; however, alternative sources may be needed to supplement traditional sources and meet demands in specific high-growth areas. Regionally, the need for groundwater supplies can be reduced through the use of available reclaimed water and implementation of comprehensive water conservation measures.

Section 4. Minimum Flows and Levels Investigations

Extensive field-data collection and analysis is typically required to support MFLs development. This includes 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. While most of this work is completed by the District, some data collection is conducted with key cooperators such as the USGS. 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 water 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 past and future saltwater intrusion. In recent years, the District has begun to support the use of integrated hydrologic models that simulate the entire hydrologic cycle and include information on both the surface water and groundwater flow systems. These models are 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 included more details about the hydrologic system. The end results of the modeling process are tools that can be used to assess the 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 NTB 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 the 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 (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 was first completed in 2008 and was updated for the fifth time in 2016. 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 intermediate confining unit (ICU), Suwannee Limestone, Ocala Limestone, Avon Park Formation, MCU, and the LFA. The NDM has served as an important tool to examine potential impacts to wetlands, lakes, springs, and the Withlacoochee River from regional groundwater withdrawals, with the results of these predictions used by the District to support water supply planning assessments and establishment of MFLs. However, the NDM5 will be replaced by the more recently developed Central Springs Model (CSM).

The CSM is a groundwater flow model developed collaboratively by a technical team of groundwater modelers and professionals at the SWFWMD and SJRWMD. It was designed to quantify the effects of current and future groundwater withdrawals on the water resources within the model domain (SJRWMD and SWFWMD, 2024). The CSM technical team achieved its objective to develop a technically defensible groundwater model using sound science and generally accepted standards for groundwater model development. The CSM effectively represents regional hydrologic conditions within the model domain and is capable of simulating the spatial and temporal variations of aquifer levels, spring flows, and river baseflows in north-central Florida. Like NDM, CSM represents the aquifer system as fully three-dimensional and contains seven active layers: the surficial aquifer (unsaturated zone), the ICU, Suwannee Limestone, Ocala Limestone, Avon Park Formation, MCU I, and the LFA I.

The Districtwide Regulation Model (DWRM) was initially developed in 2003 (Environmental Simulations, Inc., 2004) to produce a regulatory modeling platform that is technically sound, efficient, reliable, and capable of addressing cumulative impacts. It is mainly used to evaluate whether requested groundwater withdrawal quantities in 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, 3, and 4 (Environmental Simulations, Inc., 2004, 2007, 2011, 2014, 2022) incorporate Focused Telescopic Mesh Refinement (FTMR), which enables 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. The DWRM supports current regulatory functions as a core business process addressed in the District's Strategic Plan. The DWRM Version 4 simulates groundwater flow of the entire District using a fully three-dimensional geologic model coupled with a new version of MODFLOW called MODFLOW-USG, which is the USGS's modular hydrologic model. The DWRM Version 4 simulates groundwater flow in the surficial aquifer, Hawthorn aquifer system, UFA and LFAs with 13 vertical layers and a lateral grid spacing of 2,500 feet. It has been calibrated to 2005 steady-state conditions and a monthly transient period from 1996 to 2015 (Environmental Simulations, Inc., 2022).

2.0 Saltwater Intrusion Models

Although regional saltwater intrusion in the NTB and Northern Planning Region 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), and HydroGeoLogic, Inc. (1992). 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 NDM. 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 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 and updated in 2013 (Geurink and Basso, 2013). The model 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 1998 TBW Partnership Agreement.

Chapter 2. Resource Protection Criteria

This chapter addresses the primary strategies the District employs to protect water resources, including WUCA, MFLs, prevention and recovery strategies, reservations, consideration of the potential effects of climate change, and the 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 or may cause adverse impacts to the water and related natural resources or the public interest (Rule Chapter 40D-2.801, Florida Administrative Code [F.A.C.]). Currently established WUCA locations are shown in Figure 2-1. The District has not declared a WUCA in the Northern Planning Region; however, the 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 for ensuring water resource sustainability in WUCAs. Florida Statutes (F.S.) 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, F.S., identify the limit (i.e., surface or groundwater level) 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 projected to fall below the applicable minimum flow or level within 20 years, a recovery or prevention strategy must be implemented.

As outlined in Section 40D-2.801(2), F.A.C., to determine whether an area should be declared a WUCA, the Governing Board must consider the following:

- The quantity of water available for use from groundwater sources, surface water sources, or both.
- The 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 by the Governing Board.

In the late 1980s, the District determined that certain interim resource management initiatives could be implemented to help prevent worsening of existing problems in WRAP areas prior to WRAP completion (Chapter 1, Part D, Section 1). As a result, in 1989, the District established three WUCAs: 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: (1) immediate, short-term actions, (2) mid-term actions that could be implemented concurrent with the ongoing WRAPs, and (3) long-term actions based upon the results of the WRAPs. 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. This included development of conservation plans, cumulative impact analysis-based permitting, and requiring withdrawals from stressed lakes to cease within three years.

Implementation of the management plans led to the designation of the most impacted area (MIA) within the ETBWUCA. The MIA consists of the coastal portion of the SWUCA in southern Hillsborough, Manatee, and northern Sarasota counties. A Saltwater Intrusion Minimum Aquifer Level (SWIMAL) was established to stabilize regional water level declines so that long-term management efforts could slow the rate of saltwater intrusion in the MIA. Within this area, no increases in permitted groundwater withdrawals from the 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 (DPCWUCA) in eastern Hillsborough and western Polk counties following impacts from intense frost/freeze protection withdrawals.

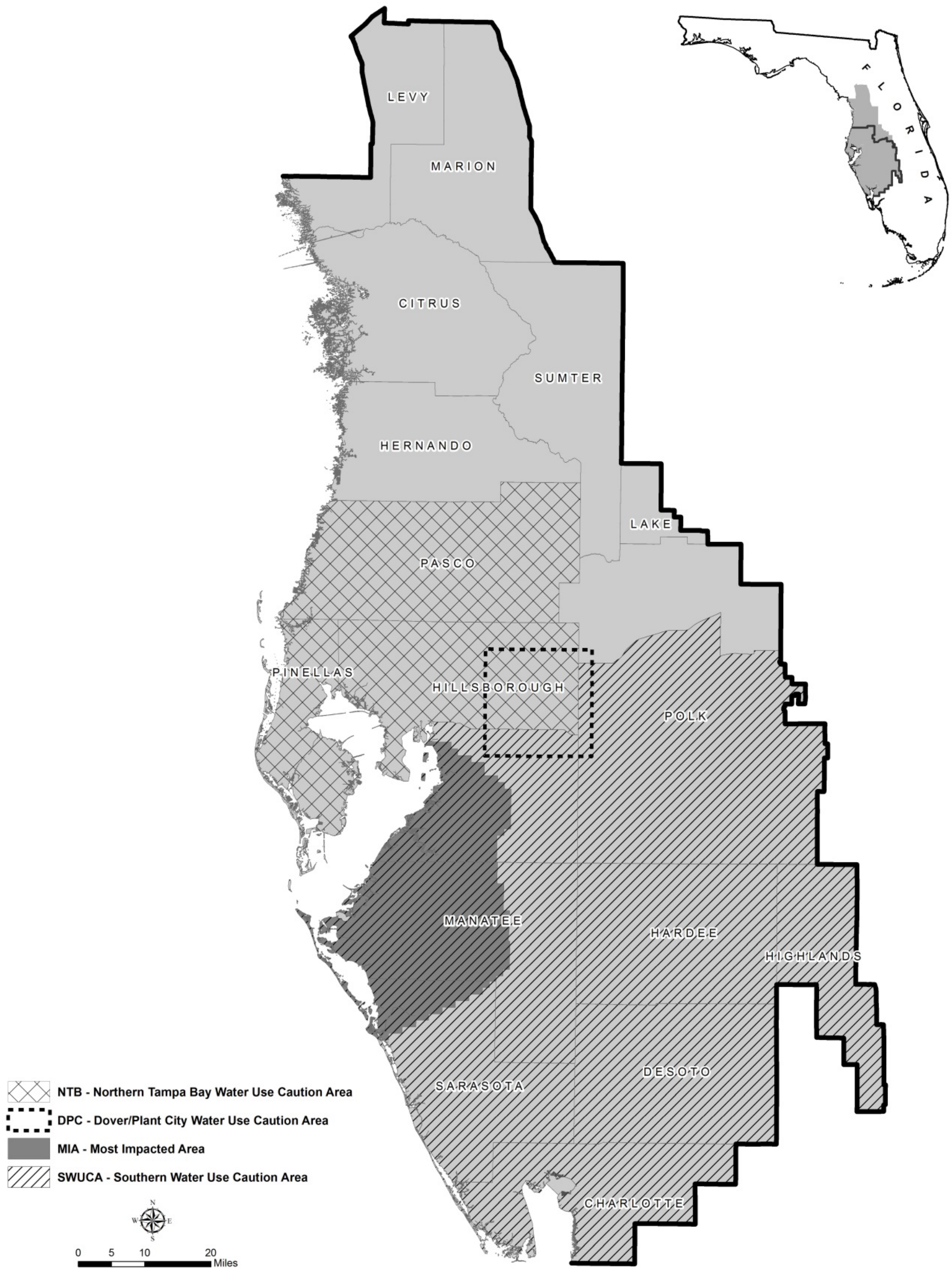


Figure 2-1. *Location of the District's water use caution areas and the Most Impacted Area of the Southern Water Use Caution Area*

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 FDEP or the WMDs to establish 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 water body 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.

Section 373.0421, F.S., provides that if, at the time an MFL is initially established or revised for a water body, the existing flow or water level in the water body is below or is projected to fall below the applicable MFL within 20 years, the FDEP or the WMDs shall concurrently adopt or modify and implement a recovery or prevention strategy as part of the RWSP. However, if an MFL is in the process of being established or revised when the RWSP is developed, then any necessary recovery or prevention strategy will be adopted or modified with the established or revised MFL.

Minimum flows and levels (MFLs) are established and used by the District for water resource planning; for evaluating 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 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, the Water Resource Implementation Rule (Chapter 62-40, F.A.C.), and the Central Florida Water Initiative Area Uniform Process for Setting Minimum Flows and Minimum Water Levels and Water Reservations Rule 62-41.304 within the FDEP's Regulation of the Consumptive Use Rules (Chapter 62-41, F.A.C.). A brief history of the District's MFLs program is provided by Hancock and Leeper (2023).

Section 2. Priority Setting Process

In accordance with Sections 373.036(7) and 373.042(2), F.S., the District annually updates its Priority List and Schedule for the Establishment of Minimum Flows, Minimum Water Levels and Reservations. As part of determining 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 MFLs 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 (CAR). The District's current priority list and schedule is also posted on the District's 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. Additional details regarding MFLs methods are provided in District rules (Chapter 40D-8, F.A.C.) and within MFLs reports developed for individual priority water bodies and posted on the District's 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 surface or groundwater 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 or 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. Minimum flows and levels (MFLs) established based on such a threshold 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

There are nine river segments, 22 lakes, five first-magnitude spring groups, and two second-magnitude springs groups with established or proposed MFLs within the Northern Planning Region. This includes MFLs established for the Chassahowitzka, Crystal, Homosassa, Rainbow, and Weeki Wachee Rivers and their associated springs. Additionally, MFLs for four segments of the Withlacoochee River, Crystal River/Kings Bay, and Gum Slough Spring Run are scheduled to be set or reevaluated by 2027. Figure 2-2 depicts the priority MFLs water resources that are in or partially within the planning region. A complete list of water resources with established MFLs in the District is provided in Appendix 2-1.

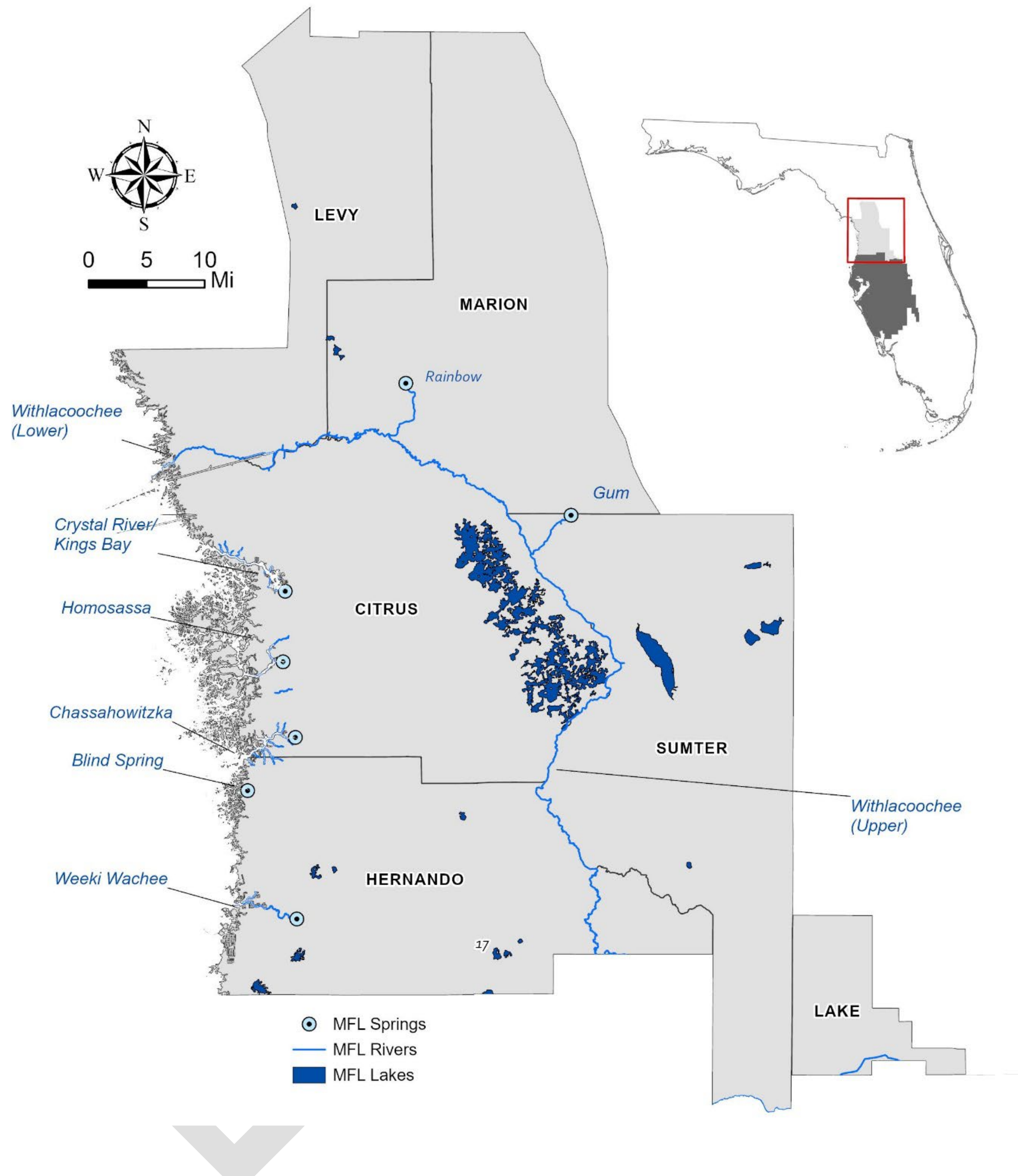


Figure 2-2. *Minimum flows and levels priority water resources in the Northern Planning Region*

Part C. Prevention and Recovery Strategies

Section 1. Prevention Activities

Section 373.0421(2), F.S., requires that a prevention strategy be adopted or modified, and implemented if within 20 years the flow or level in a water body is projected to fall below an applicable MFL. Adoption of a prevention strategy has not been necessary for any MFLs established within the District. However, to promote continued achievement of established MFLs, the District continues to implement a three-point approach that includes: (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 development of a RWSP for the Northern Planning Region, the District and other entities in the region are engaged in planning efforts that are coordinated with and complement those of the District. A shared 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 focused on minimizing current and future water use through BMPs, including conservation, so that use of groundwater as a supply source can be extended as long as possible prior to development of AWS. The strategy was implemented to prevent significant water resource impacts, such as those that have occurred in the Tampa Bay, Heartland, and Southern planning regions.

These efforts are now captured within the District's Strategic Plan, with a Northern Planning Region priority to ensure long-term sustainable water supply. Objectives to achieve this include:

- Increase water conservation
- Increase the use of reclaimed water for potable, recharge, and environmental enhancement projects
- Continue to partner with the WRWSA to promote regional water supply planning and development.

In 2014, the District adopted rules to expand PS permittee per capita water use requirements that existed in the WUCAs to the rest of the District. These requirements include calculation of per capita water use according to adopted SWUCA rules and service area population estimation methodology, submission of an annual per capita water use report and associated data via the annual Public Supply Annual Report survey, refined service area delineation requirements and reporting, calculation of reclaimed water and stormwater credits, and a utility per capita compliance of 150 gallons per person per day.

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.

2.0 Withlacoochee Regional Water Supply Authority Master Regional Water Supply Planning

The District is cooperating with the WRWSA to update the WRWSA RWSP for 2025. The plan reviews potential water supply project options based on 2045 population projections and possible member partnerships. The update will address 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 is being conducted for the planning period using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE Tool). Additionally, the plan will include water supply project options for meeting projected demands. Draft information for the WRWSA's RWSP have been incorporated into the District's 2025 RWSP.

3.0 Springs Management

There are more than 200 documented springs within the District and five first-magnitude spring groups. These spring groups are located in the Northern Region and include Chassahowitzka Springs, Crystal River/Kings Bay, Homosassa Springs, Rainbow Springs, and Weeki Wachee Springs. During the past century, these natural treasures have become threatened by human activities, climate change, and other factors.

The District has designated the Chassahowitzka, Crystal River/Kings Bay, Homosassa, Rainbow, and Weeki Wachee river systems as SWIM priority water bodies. The District, in partnership with the Springs Coast Committees, have developed management plans called SWIM Plans tailored for each spring system to identify issues, solutions, costs, and responsibilities. This process ensures that projects are focused on improvements to these spring systems. The main issues facing these spring systems include elevated nitrate concentrations, reduced volume and streamflow, reduced water clarity, and altered aquatic vegetation communities. These documents use an adaptive management approach and are therefore revised periodically to assess overall progress.

Head spring at Weeki Wachee

The ecological integrity of springs may be based on three attributes: water quality, water quantity, and natural systems. District management actions are intended to maintain these attributes for springs that are healthy and restore attributes that have been degraded. Priority issues are addressed in the SWIM plans. An adaptive management strategy allows for the plan to be refined as more information becomes available 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. 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 adopted or modified, and implemented 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:

- Developing AWS.
- Implementing structural controls and/or augmentation systems to raise levels or increase flows in water bodies.
- Reducing water use permitting allocations (e.g., through water conservation).

District water resource assessments and MFL investigations completed to-date have not identified the need for recovery strategies in the Northern Planning Region.

Part D. Reservations

Reservations of water are established by rule and authorized 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…” (Section 373.223(4), F.S.). There are currently no plans to establish a reservation in the Northern Planning Region.

Part E. Climate Change

Section 1. Overview

Climate variations have been a growing global concern for several decades. Such variations are driving a slow but persistent increase in sea levels and are altering precipitation regimes. These conditions will likely result in 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.

The FDEP's Office of Resilience and Coastal Protection has provided direction for climate adaptation in recent years. Quarterly resilience forums hosted by the FDEP since 2018 have improved communication among government entities, utilities, academia, and other organizations and stakeholders. The FDEP Resilient Florida Program was established in 2021 to develop a statewide, coordinated approach to coastal and inland resilience planning. The program provides funding to counties, municipalities, and certain special districts for efforts to mitigate risks to water supplies and resources. The FDEP has also standardized a sea-level impact projection (SLIP) study to assess the risk of infrastructure projects to flooding, inundation, and wave damage. The SLIP studies became required in 2024 for certain State-financed projects in coastal zones.

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 a changing climate in three primary ways: sea level rise (SLR), air temperature rise, and changes in precipitation regimes.

1.0 Sea Level Rise

Trends and magnitude of SLR are variable throughout the world and our region. Data from the National Oceanic and Atmospheric Administration (NOAA) tide gauge in St. Petersburg shows that mean water levels have increased on average 1.22 inches per decade since 1946 and accelerated in recent decades. The NOAA intermediate-high projection for this gauge, which is the standard for SLIP studies, suggests an increase of 12.2 inches from 2020 to 2050. (USACE, 2024).

Sea level rise may stress the District's water resources in a variety of ways. The inundation or upward migration of coastal wetlands could affect their ability to improve the quality of stormwater runoff and provide natural habitats. Estuarine water encroachment in coastal rivers could 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 freshwater demands.

Sea level rise (SLR) occurs relatively slowly, although persistently. This allows time to evaluate impacts to natural resources and public infrastructure, plan and implement adaptation strategies, and continue using most existing coastal infrastructure through planned lifespans. The cost of initiating SLR planning or incorporating it into cyclical renewal/replacement efforts is relatively low compared to disaster recovery efforts.

2.0 Air Temperature Rise

The Intergovernmental Panel on Climate Change (IPCC) estimates that current green-house emission levels will cause mean global air temperatures to reach or stabilize at approximately 2.7 degrees Fahrenheit (°F) above pre-industrial levels (1850-1900) by the end of this century, with greatest warming at inland and polar regions (IPCC, 2023). The impacts to Southwest Florida will likely be more hot days and fewer cold days seasonally. Evaporation increases 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 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 Niño 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 has been in a warm phase since the mid-1990s and currently appears to be decreasing.

Warming temperatures in the Atlantic Ocean and Gulf of America 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 water resource management which will also aid in planning and preparing 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, 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 WUP networks are the largest and longest ongoing well sampling networks of their kind at the District. The networks currently have a combined total of more than 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. Although the entire coastal region of the District is included in the monitoring effort, much emphasis is placed on the SWUCA. District staff are currently working with outside consultants on the development of a saltwater intrusion and solute transport model to support reevaluation of the SWUCA SWIMAL.

Development of the model is also aimed at improving our ability to predict density and water-level driven changes to aquifers used for water supply.

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 to ensure adequate supplies from dispersed sources and redundancy for emergencies. The District also helps 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 their municipalities or other significant users. Community adaptation strategies for SLR and surges 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, stormwater backflow prevention, and dewatering systems to protect existing infrastructure. Armament may be preferred for dense urban and commercial areas since it can maintain a community’s existing water supply infrastructure and demand centers. Downsides to armament are maintenance expenses, creation of a tipping point for inundation that requires risk management, and that structures may limit the transition of natural habitats.
- Accommodation. An accommodation strategy uses 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 ensure longevity. Accommodation can be encouraged through floodplain mitigation plans for vulnerable areas and building codes applied during storm recovery phases. The District’s water supply planning efforts may involve AWS technology including AR systems, direct and indirect reuse, and desalination 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.

Climate change may affect water supply sources through saltwater inundation and seasonal precipitation; therefore, it should be factored into evaluations of the adequacy of supplies to meet future demand. It also has the potential to change centers of population, which in turn may impact demand projections. The District accounts for adaptive management strategies through its five-year RWSP updates. These updates allow sufficient time to anticipate transitional changes to population centers in the water demand projections and to develop appropriate water supply options for the next 20 years. Continued development of regionally interconnected water systems also allows large-scale water treatment facilities to adjust distribution to new demand locations. The routine assessments of MFLs and other natural resource protections also use a monitor and adapt approach toward protection from climate change.

Part F. Central Florida Water Initiative

Section 1. Formation

The CFWI provides a coordinated approach to 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 CFWI focuses on Orange, Osceola, Polk, Seminole, and southern Lake counties, collectively known as the CFWI Planning Area (Figure 2-3). The District, along with SJRWMD, SFWMD, FDEP, FDACS, regional public water supply utilities, and other stakeholders are collaborating on this initiative to address current and long-term water supply needs in central Florida.

Section 2. Central Florida Water Initiative Regional Water Supply Plan

The first ever multi-District RWSP was developed for the CFWI Planning Area in 2015 and updated in both 2020 and 2025 (CFWI, 2015, 2020, 2025). The CFWI RWSP and its updates focus on water demand estimates and projections, water resource assessments (based in part on groundwater modeling), and development of feasible water supply and WRD options that would meet future water supply needs in a manner that sustains water resources and related natural systems. Modeling results and groundwater availability assessments concluded that fresh groundwater resources alone could not meet future water demands in the CFWI Planning Area without resulting in unacceptable impacts to water resources and related natural systems. The assessments showed that the Wekiva Springs/River System, western Seminole and Orange counties, southern Lake County, the Lake Wales Ridge, and the portion of the SWUCA within Polk County appear to be more susceptible to the effects of groundwater withdrawals. The evaluations also indicated that expansion of withdrawals associated with projected demands through the planning horizon could increase existing areas of water resource stress within the CFWI Planning Area. The 2025 CFWI RWSP identified 126 potential WSD and WRD project options that could potentially treat, store, or produce 497 mgd of net additional water, 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. An additional 24 water conservation project options not captured in this total were also identified. Development of the 2025 CFWI RWSP and District's RWSP was concurrent; therefore, coordination to ensure consistency between the plans was maintained. Because Lake County is part of the CFWI Planning Area, the demands and many of the projects listed in the 2025 CFWI RWSP are also reflected in this 2025 RWSP.

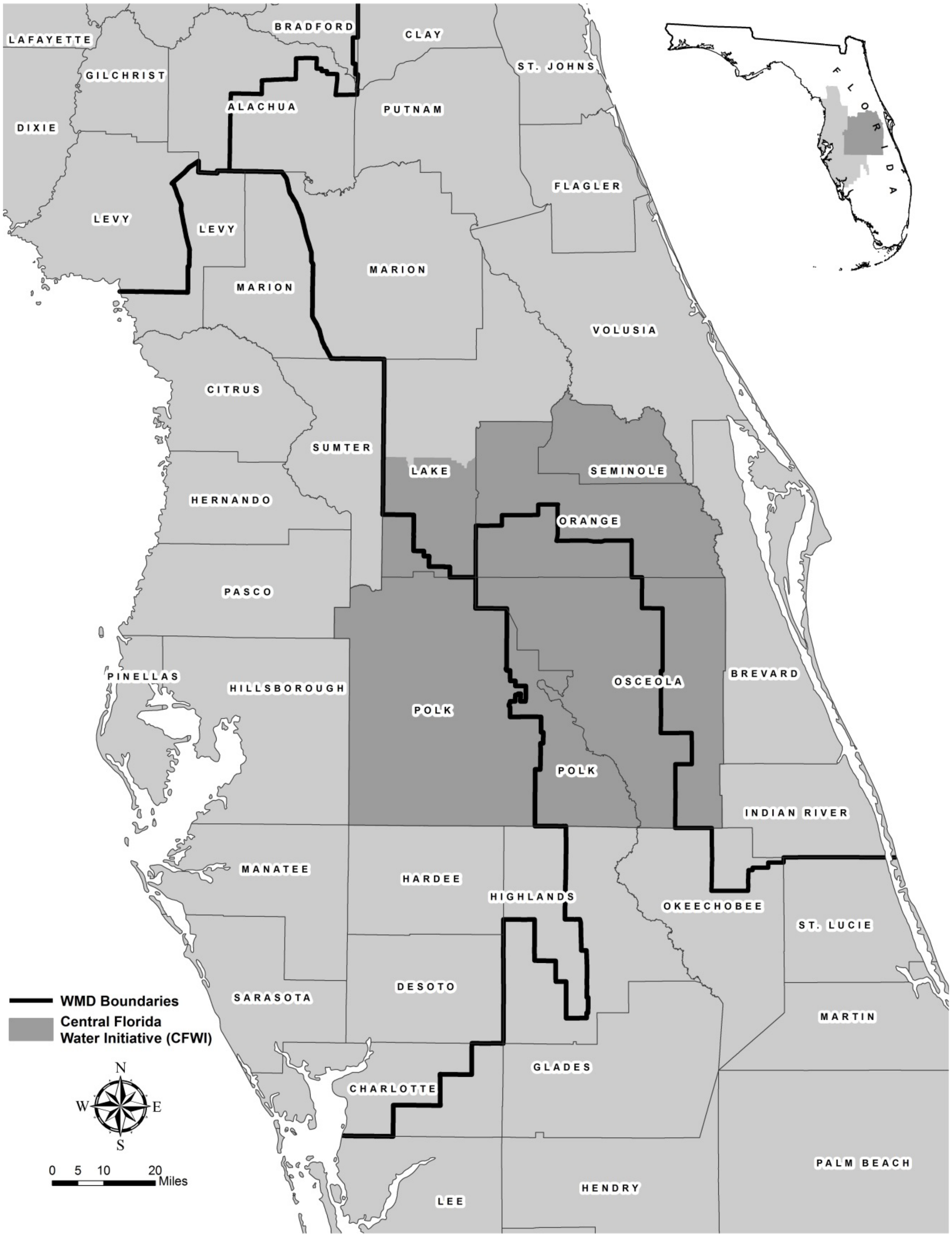


Figure 2-3. *Location of the Central Florida Water Initiative Planning Area*

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Chapter 3. Demand Estimates and Projections

This chapter is a comprehensive analysis of water demands for all use categories in the Northern Planning Region for the 2020 to 2045 planning period. This includes the methods and assumptions used to project water demand for each county, the demand projections in five-year increments, and an analysis of important trends in the data. The District projected water demand for the PS, AG, I/C, M/D, PG, and L/R sectors for each county in the planning region. The methodologies described below are presented in greater detail in the Chapter 3 appendices.

The demand projections represent reasonable-beneficial uses of water that are anticipated to occur through the year 2045. The District determined 5-in-10 (average condition) and 1-in-10 (drought condition) demands for each five-year increment from 2020 to 2045 for each sector. Demand projections for counties located partially in other WMDs (Lake, Levy, and Marion) reflect anticipated demands for those portions located within the District's boundaries.

Key demand estimates and projection parameters include:

- Establishment of a base year: The year 2020 was used as a base year for the purpose of developing and reporting water demand projections. Base year data consists of reported and estimated usage for 2020, whereas data for the years 2025 through 2045 are projected demands.
- Water use reporting thresholds: Minimum thresholds of water use within each water use category were used as the basis for projection.
- 5-in-10 versus 1-in-10: For reporting demand in average versus drought conditions, specific parameters were prescribed for at least a portion of the demand related to all water supply categories except 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 2045. 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. This 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 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 and 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 is 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

Projections were determined using 2020 as the base year. The District calculated the 2020 population by extrapolating back from GIS Associates, Inc.'s 2021 population estimate, where available (GIS Associates, Inc. 2022). Utilities with permitted quantities less than 0.1 mgd are not required to report population or submit service area information; subsequently, population was obtained from the last issued permit for these utilities.

2.2 Methodology for Projecting Population

The population projections developed by the University of Florida's Bureau of Economic and Business Research (UF/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. Therefore, 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 each county. 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.

Potable water pumping station

3.0 2020 Base Year Water Use and Per Capita Rate

3.1 Base Year Water Use

The 2020 PS base year water use for each large utility was derived by multiplying the average 2016 to 2020 unadjusted gross per capita rate by the 2020 estimated population for each individual utility. For small utilities, per capita information was found in the last issued permit. If no per capita information was available, the per capita was assumed to equal the average county per capita. Base year water use for small utilities was obtained by multiplying the per capita from the current permit by the 2020 estimated population from the last issued permit. The DSS base year was calculated by multiplying the 2020 DSS population for each county by the average 2016-2020 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 2025 to 2045. To develop the projections, the District used the 2016-2020 average per capita rate multiplied by the projected population for that increment. An additional component of PS water 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. The District estimates that approximately 332 gallons per day (gpd) are used for each well (Dukes and Boyer, 2018).

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 utilities. For counties 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 water demand for the planning period. The table shows that PS demand is projected to increase by 35.92 mgd for the 5-in-10 condition, or about 37 percent. These projections are slightly lower than those in the District's 2020 RWSP. The differences can be attributed to more accurate utility level population projections using a Geographic Information System (GIS) model which accounts for growth and build-out at the parcel level.

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

County	2020 Base		2025		2030		2035		2040		2045		Change 2020-2045		% 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	21.68	22.98	22.90	24.27	23.86	25.29	24.68	26.16	25.34	26.86	25.92	27.48	4.24	4.50	19.57%	19.57%
Hernando	26.14	27.71	28.02	29.70	29.51	31.28	30.71	32.56	31.70	33.60	32.54	34.49	6.40	6.78	24.48%	24.48%
Lake[1]	0.14	0.15	0.21	0.22	0.29	0.31	0.36	0.38	0.42	0.45	0.47	0.50	0.33	0.35	16.62%	16.62%
Levy	1.99	2.11	2.08	2.21	2.16	2.29	2.22	2.35	2.28	2.41	2.33	2.46	0.34	0.36	1.78%	1.78%
Marion	19.09	20.24	21.22	22.50	22.98	24.36	24.46	25.92	25.70	27.24	26.80	28.41	7.70	8.17	40.35%	40.35%
Sumter	28.08	29.77	29.70	31.49	34.33	36.39	39.66	42.04	43.04	45.62	44.99	47.69	16.90	17.92	60.19%	60.19%
Total	**97.12**	**102.95**	**104.14**	**110.39**	**113.13**	**119.92**	**122.09**	**129.41**	**128.48**	**136.19**	**133.04**	**141.02**	**35.92**	**38.07**	**36.98%**	**36.98%**

[1]Demand projections for the District's portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

Note: Summation and/or percentage calculation differences may occur due to rounding. See Appendix 3-3 for source values. Additional Irrigation Demand was excluded from Levy County water demands for consistency with CFWI methodology.

6.0 Stakeholder Review

Population and water demand projection methodologies, results, and analyses were provided to the public water use stakeholders for review. Changes suggested by stakeholders were incorporated only if supported by sufficient documentation.

Section 2. Agriculture

1.0 Description of the Agricultural Water Use Sector

Agriculture (AG) represents the second largest sector of water use in the District after PS. This category includes irrigated crops and other miscellaneous water uses associated with agricultural commodity production within the District. Irrigation demand was determined 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. Some of these crop categories include several crops which are grouped together for reporting purposes by the FDACS. The fruits category includes several prominent crops in the District, such as strawberries, and blueberries, and the fresh market vegetables category includes tomato production along with cucumbers, peppers, and other vegetables and row crops. Water demands associated with non-irrigated AG such as aquaculture and livestock were also estimated and projected.

Non-irrigated agricultural demand includes water use for livestock.

2.0 Water Demand Projection Methodology

The FDACS developed acreage and agricultural water demand projections through 2045 as part of the Florida Statewide Agricultural Irrigation Demand (FSAID) 10 (The Balmoral Group, 2023). For the 2025 RWSP, the District modified the published FSAID 10 data to calculate agricultural demand projections based on historical pumpage data. Acreage projections were maintained from the FSAID 10 report. To calculate a 2020 base year from which to project demands, the District used a 5-year average of metered water use data from 2017 to 2021. Projections were then calculated using the FSAID 10 growth rates, by county and crop type. For non-irrigation demand (e.g., aquaculture and livestock), the FSAID 10 and therefore this 2025 RWSP projected steady demand throughout the planning period.

The District elected to use its modified FSAID 10 approach to meet the statutory directive to use the best available data in developing AG water use projections. The District has extensive metered data on agricultural water use at the permit level, which provides a more accurate assessment of local water use than modeled water use. This allows the District projections to capture permit-level and regional variations in agricultural irrigation practices. The projections are also reflective of progress made in agricultural conservation through the District's FARMS Program and other regional efforts such as the SWUCA Recovery Strategy.

The District also participated in the development of the 2025 CFWI RWSP. In this joint planning effort, the FSAID 9 water use projections were used (The Balmoral Group, 2022). Thus, the acreage and agricultural water use projections for Lake County are taken directly from the FSAID 9 rather than using the method described above. The methodologies and data are provided in more detail in Appendix 3-1.

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 other planning regions; however, FDACS projects that irrigated acreage in the planning region is expected to increase from 2021 to 2045. Irrigated acreage is expected to increase by about 3.3 percent, from 23,018 acres in 2021 to over 23,767 acres in 2045. This indicates that the Northern Planning Region is expected to be the only planning region within the District to experience agricultural growth over the planning horizon. Total agricultural water use in this region has been relatively steady since the 1990s, hovering between 20 mgd and 30 mgd from 2001 to 2024 depending on rainfall patterns. More recently, there was a slight decrease in water use, with average water use at about 20.53 mgd in 2021.

The District estimates that, despite the projected increase in irrigated acreage, there will be an approximately 0.3 percent decrease in water demands to 22.38 mgd over the planning period. Most of the increase in acreage will be in fresh market vegetables and hay, with a smaller increase in citrus. Field crops are expected to continue to make up the majority of irrigated acres. The FDACS forecasts that the District's portion of Levy County will gain nearly 2,024 acres of irrigated land, while Sumter County is expected to have a 16.7 percent decrease in irrigated acreage of about 605 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 more field crop production and minimal citrus acreage. Additionally, the Northern Planning Region is located further 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 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

The adjusted FSAID methodology developed by the District was supported by the Agricultural and Green Industry Advisory Committee as part of the 2020 RWSP stakeholder review process. This methodology was carried forward for use in this 2025 RWSP. District staff solicited feedback on the draft AG demand projections from the District's Agricultural and Green Industry Advisory Committee and FDACS staff.

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

County	2020 Base		2025		2030		2035		2040		2045		Change 2020-2045		% 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	1.66	2.16	1.80	2.15	1.80	2.15	1.80	2.16	1.80	2.16	1.80	2.17	0.15	0.01	8.80%	0.29%
Hernando	1.69	2.21	1.68	2.20	1.75	2.20	1.75	2.20	1.76	2.21	1.76	2.21	0.07	-0.01	4.13%	-0.39%
Lake[1]	0.57	0.79	0.58	0.79	0.59	0.79	0.60	0.81	0.49	0.65	0.43	0.57	-0.14	-0.22	-24.64%	-27.91%
Levy	8.73	10.96	8.89	11.47	9.03	11.85	9.25	12.24	9.81	13.15	10.27	14.16	1.54	3.20	17.62%	29.16%
Marion	3.16	3.97	3.13	3.92	2.94	3.68	2.76	3.56	2.71	3.47	2.71	3.47	-0.45	-0.50	-14.21%	-12.56%
Sumter	6.65	7.75	6.29	7.30	5.96	6.92	5.89	6.88	5.76	6.71	5.41	6.29	-1.24	-1.46	-18.65%	-18.86%
Total	**22.46**	**27.84**	**22.37**	**27.84**	**22.07**	**27.59**	**22.05**	**27.86**	**22.33**	**28.34**	**22.38**	**28.86**	**-0.07**	**1.01**	**-0.33%**	**3.64%**

[1] Lake County projections are derived from the 2025 CFWI RWSP (cfwiwater.com).

Note: Summation and/or percentage calculation differences may 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

The I/C and M/D uses within the District include chemical manufacturing, food processing and miscellaneous I/C 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. The 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 were developed by multiplying the 2020 amount of water used for each I/C and M/D facility by growth factors based on Woods & Poole Economics' gross regional product forecasts by county in five-year increments (Woods and Poole Economics, Inc., 2022). For example, if an I/C facility used 0.30 mgd in 2020 and the county calculated growth factor from 2020 to 2025 was three percent, the 2025 projection for that facility would be 0.31 mgd. Similarly, if the 2025 to 2030 growth factor was four percent, the 2030 projection would be 0.32 mgd. Projected use for 2025 and 2030 were calculated as follows:

2025 projected use = 0.30 times 1.03 = 0.31 mgd

2030 projected use = 0.31 times 1.04 = 0.32 mgd

Water use for 2020 is derived from the District's 2021 Water Use Well Package Database (WUWPD) (SWFWMD, 2022). This database includes metered use for individual/general permits and estimated use for small general permits. These quantities are for consumptive use of groundwater and fresh surface water. Please see Appendix 3-2 for more details.

3.0 Water Demand Projections

Table 3-3 shows the projected I/C and M/D water demand for the planning period, with an increase in demand of 0.77 mgd, or approximately 17 percent. The projections for the District's portion of Lake County is zero for this water demand category based on projections from the 2025 CFWI RWSP. This projection is quite reasonable given that the District's portion of Lake County is very small and rural.

For several years, the permitted quantity in the I/C and M/D sectors has been declining in large part due to revisions how M/D permitted quantities are allocated by the District. Non-consumptive dewatering uses are no longer included in permitted quantities. Starting with the 2010 RWSP, M/D demand projections have been made for all 16 counties; whereas, earlier RWSPs included demand projections for only the 10 southern counties. Additionally, since 2010, mining quantities permitted for product entrainment have not been included in the demand projections because the District considers such quantities incidental to the mining process and not part of actual water demand (i.e., the 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 industrial/commercial and mining/dewatering demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

County	2020 Base	2025	2030	2035	2040	2045	Change 2020-2045	% Change
Citrus	0.40	0.39	0.40	0.40	0.41	0.42	0.01	3.68%
Hernando	3.33	3.44	3.56	3.68	3.79	3.92	0.59	17.57%
Lake[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Levy	0.01	0.02	0.02	0.02	0.02	0.02	0.00	5.74%
Marion	0.05	0.03	0.03	0.03	0.03	0.03	-0.02	-38.37%
Sumter	0.84	0.87	0.91	0.94	0.98	1.02	0.19	22.24%
Total	**4.63**	**4.74**	**4.90**	**5.07**	**5.23**	**5.40**	**0.77**	**16.59%**

[1] Demand projections for the District's portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

Note: Summation and/or percentage calculation differences may 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. Source values are available in Appendix 3-2.

4.0 Stakeholder Review

The demand projection methodology, results, and analyses were presented to the District's Industrial Advisory Committee for review and comment.

Section 4. Power Generation

1.0 Description of the Power Generation Water Use Sector

The PG uses within the District include water 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 PG were developed using a combination of historic water use and the 2023 10-year site plans for each PG facility. These plans include historic number of customers and megawatt production, as well as projections of future customers and megawatts produced through 2032. Using data for 2016 to2020, a 5-year average water use per megawatt was calculated. This value was then applied to the projection of future megawatts by PG facility. The 20-year (2013-2032) average customer growth rate was used to extend the projections of customers through 2045. A calculation of megawatt use per customer was then applied to the projection of customers to arrive at a projection of megawatts by PG facility. Future groundwater demand for 2025 to 2045 was calculated by applying the 2016 to 2020 average water use per megawatt to the projected megawatts specific to each PG facility.

3.0 Water Demand Projections

Table 3-4 shows the projected PG water demand for the planning period, with an increase in demand of 1.35 mgd, or about 96 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., 2019).

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

County	2020 Base	2025	2030	2035	2040	2045	Change 2020-2045	% Change
Citrus	1.41	2.06	2.15	2.33	2.53	2.76	1.35	95.69%
Hernando	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Lake[1]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Levy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Marion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Sumter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Total	**1.41**	**2.06**	**2.15**	**2.33**	**2.53**	**2.76**	**1.35**	**95.69%**

[1] Demand projections for the District’s portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

Note: Summation and/or percentage calculation differences may 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. Source values are available in Appendix 3-2.

4.0 Stakeholder Review

The demand projection methodology, results, and analyses were presented to the District’s Industrial Advisory Committee for review and comment.

Section 5. Landscape/Recreation

1.0 Description of the Landscape/Recreation Water Use Sector

The L/R sector includes self-supplied water use associated with irrigation of golf courses, cemeteries, parks, medians, attractions and other large self-supplied green areas. Golf courses are the major users within this category.

2.0 Demand Projection Methodology

Landscape/Recreation (L/R) base line use data is from the WUWPD (SWFWMD, 2022). 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 L/R demand. A more detailed description of the methodologies used is in Appendix 3-4.

Water demand from L/R is positively correlated with population growth. However, golf course water demands are tied to facility closures, conservation, and reclaimed water use, as well as changing future demographics. Therefore, golf and other L/R are forecasted separately.

The District reviewed historic (2000-2021) metered and estimated golf course water use to identify trends. District golf course water use followed a decreasing trend over the 22-year period, from approximately 50 mgd in 2000 to 28 mgd in 2021. County-level golf course water use was analyzed further to identify if each county followed a similar downward trend. In all but one county golf course water use was found to be following a decreasing trend. Sumter County was identified to have an increasing trend in golf course water use. For Sumter County, the projected future demands were developed by increasing the base line water use by the BEBR county-level population growth rate. For the remaining 15 District counties, the projected future golf course demands were developed by holding the base line water use constant. For all counties, excluding Polk and Lake, the base line water use was developed as a 5-year average of metered and estimated golf course water use from 2016 to 2020. Base line water use for Polk and Lake counties is based on 2020 water use, consistent with the 2025 CFWI RWSP.

Demands for 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 percentage change in population. The five-year population percentage changes were calculated and then applied to the previous five-year period's pumpage, beginning with the base line pumpage.

3.0 Water Demand Projections

Table 3-5 provides total L/R water demands for the planning period for both golf and other L/R demand. The table indicates an increase in demand of 10.66 mgd for the 5-in-10 condition, an increase of approximately 86 percent from the base line 2020 demand.

Reclaimed water has positively impacted water use, and this trend should continue. Most L/R water use occurs near major population centers, which is also where large quantities of reclaimed water are located that can be used to offset potable water use for this category. Large developments tend to have higher demands for L/R uses such as landscape and golf course irrigation. Many utilities in the region offset L/R demand by providing reclaimed water for irrigation of parks, playing fields, and school grounds.

4.0 Stakeholder Review

The demand projection methodology, results, and analyses were presented to the Agricultural and Green Industry Advisory Committee for review and comment.

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

County	2020 Base		2025		2030		2035		2040		2045		Change 2020-2045		% 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	3.24	4.20	3.26	4.22	3.27	4.24	3.28	4.25	3.29	4.26	3.29	4.27	0.05	0.06	1.59%	1.54%
Hernando	3.41	4.39	3.46	4.47	3.51	4.53	3.55	4.58	3.58	4.62	3.61	4.65	0.21	0.26	6.05%	5.91%
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	0.00%	0.00%
Levy	0.17	0.22	0.17	0.22	0.17	0.22	0.18	0.23	0.18	0.23	0.18	0.23	0.01	0.01	3.78%	3.69%
Marion	2.73	3.53	2.79	3.60	2.83	3.66	2.87	3.71	2.91	3.75	2.94	3.79	0.20	0.26	7.46%	7.28%
Sumter	2.82	3.65	3.43	4.43	6.88	8.85	10.46	13.43	11.99	15.39	13.01	16.71	10.19	13.06	360.97%	357.80%
Total	**12.37**	**16.00**	**13.11**	**16.95**	**16.67**	**21.50**	**20.34**	**26.19**	**21.94**	**28.25**	**23.03**	**29.65**	**10.66**	**13.65**	**86.14%**	**85.33%**

[1] Demand projections for the District's portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

Notes: Summation and/or percentage calculation differences may occur due to rounding. See Appendix 3-4 for source values. Quantities do not include reclaimed water, re-pumped groundwater from ponds, or stormwater.

Section 6. Summary of Projected Change in Demand

Table 3-6 summarizes the projected change in demand for the 5-in-10 and 1-in-10 conditions for all use categories in the planning region. Decreases in demand represent a reduction in groundwater use, which can be available for mitigation of new groundwater permits and/or permanently retired to help meet future environmental restoration requirements.

Table 3-6 shows that 48.62 mgd of additional water supply is needed from existing sources or will need to be developed to meet demand in the planning region through 2045. Public supply (PS) water use will increase by 35.92 mgd over the planning period. Agricultural (AG), I/C, M/D, and PG water use will increase by a combined 2.04 mgd. Meanwhile, L/R water use will increase by 10.66 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 projected demand in the Northern Planning Region (5-in-10 and 1-in-10) (mgd)*

Water Use Category	2020 Base		2025		2030		2035		2040		2045		Change 2020-2045		% 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	97.12	102.95	104.14	110.39	113.13	119.92	122.09	129.41	128.48	136.19	133.04	141.02	35.92	38.07	36.98%	36.98%
AG	22.46	27.84	22.37	27.84	22.07	27.59	22.05	27.86	22.33	28.34	22.38	28.86	-0.07	1.01	-0.33%	3.64%
I/C & M/D	4.63	4.63	4.74	4.74	4.90	4.90	5.07	5.07	5.23	5.23	5.40	5.40	0.77	0.77	16.59%	16.59%
PG	1.41	1.41	2.06	2.06	2.15	2.15	2.33	2.33	2.53	2.53	2.76	2.76	1.35	1.35	95.69%	95.69%
L/R	12.37	16.00	13.11	16.95	16.67	21.50	20.34	26.19	21.94	28.25	23.03	29.65	10.66	13.65	86.14%	85.33%
Total	**137.99**	**152.83**	**146.42**	**161.97**	**158.92**	**176.06**	**171.87**	**190.85**	**180.52**	**200.55**	**186.61**	**207.69**	**48.62**	**54.86**	**35.23%**	**35.89%**

Notes: Summation and/or percentage calculation differences may 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. Demand projections for the District's portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

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

Water Use Category	Planning Period						Change 2020-2045	
	2020	2025	2030	2035	2040	2045	mgd	%
Citrus								
PS	21.68	22.90	23.86	24.68	25.34	25.92	4.24	19.57%
AG	1.66	1.80	1.80	1.80	1.80	1.80	0.15	8.80%
I/C & M/D	0.40	0.39	0.40	0.40	0.41	0.42	0.01	3.68%
PG	1.41	2.06	2.15	2.33	2.53	2.76	1.35	95.69%
L/R	3.24	3.26	3.27	3.28	3.29	3.29	0.05	1.59%
Cumulative Total	**28.40**	**30.40**	**31.47**	**32.49**	**33.38**	**34.20**	**5.80**	**20.44%**
Hernando								
PS	26.14	28.02	29.51	30.71	31.70	32.54	6.40	24.48%
AG	1.69	1.68	1.75	1.75	1.76	1.76	0.07	4.13%
I/C & M/D	3.33	3.44	3.56	3.68	3.79	3.92	0.59	17.57%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00%
L/R	3.41	3.46	3.51	3.55	3.58	3.61	0.21	6.05%
Cumulative Total	**34.56**	**36.61**	**38.33**	**39.69**	**40.83**	**41.82**	**7.26**	**21.01%**
Lake								
PS	0.14	0.21	0.29	0.36	0.42	0.47	0.33	235.71%
AG	0.57	0.58	0.59	0.60	0.49	0.43	-0.14	-24.64%
I/C & M/D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
L/R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
Cumulative Total	**0.71**	**0.79**	**0.88**	**0.96**	**0.91**	**0.90**	**0.19**	**26.83%**
Levy								
PS	1.99	2.08	2.16	2.22	2.28	2.33	0.34	17.10%
AG	8.73	8.89	9.03	9.25	9.81	10.27	1.54	17.62%
I/C & M/D	0.01	0.02	0.02	0.02	0.02	0.02	0.00	5.74%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
L/R	0.17	0.17	0.17	0.18	0.18	0.18	0.01	3.78%
Cumulative Total	**10.91**	**11.16**	**11.38**	**11.66**	**12.28**	**12.79**	**1.89**	**17.29%**
Marion								
PS	19.09	21.22	22.98	24.46	25.70	26.80	7.70	40.35%
AG	3.16	3.13	2.94	2.76	2.71	2.71	-0.45	-14.21%
I/C & M/D	0.05	0.03	0.03	0.03	0.03	0.03	-0.02	-38.37%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
L/R	2.73	2.79	2.83	2.87	2.91	2.94	0.20	7.46%
Cumulative Total	**25.03**	**27.17**	**28.79**	**30.12**	**31.35**	**32.47**	**7.44**	**29.73%**
Sumter								
PS	28.08	29.70	34.33	39.66	43.04	44.99	16.90	60.19%
AG	6.65	6.29	5.96	5.89	5.76	5.41	-1.24	-18.65%
I/C & M/D	0.84	0.87	0.91	0.94	0.98	1.02	0.19	22.24%
PG	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00%
L/R	2.82	3.43	6.88	10.46	11.99	13.01	10.19	360.97%
Cumulative Total	**38.39**	**40.29**	**48.08**	**56.96**	**61.77**	**64.43**	**26.04**	**67.83%**
Region Total	**137.99**	**146.42**	**158.92**	**171.87**	**180.52**	**186.61**	**48.62**	**35.23%**

Note: Summation and/or percentage calculation differences may 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. Demand projections for the District’s portion of Lake County are from the 2025 CFWI RWSP cfwiwater.com.

Section 7. Comparison of Demands between the 2020 Regional Water Supply Plan and the 2025 Regional Water Supply Plan

There are several notable differences between the 2020 and 2025 RWSP demand projections. Regarding the PS sector, the 2020 RWSP projected an increase of 36.78 mgd for the 2015–2040 planning period, while the 2025 RWSP projects an increase of 35.92 mgd for 2020–2045 planning period. For AG, the 2020 RWSP projected an increase of 8.27 mgd for the 2015–2040 planning period, while the 2025 RWSP projects a decrease of 0.07 mgd for the planning period. Differences in I/C and M/D demand projections included a 2020 RWSP projected increase of 0.84 mgd for this category, while the 2025 RWSP projects a 0.77 mgd increase. There was a 0.73 mgd decrease in PG demand for the 2020 RWSP, whereas the 2025 RWSP projects a 1.35 mgd increase. For L/R demand, the 2020 RWSP projected an increase of 5.27 mgd, while the 2025 RWSP projects a 10.66 mgd increase.

Chapter 4. Evaluation of Water Sources

This chapter presents the results of investigations by the District to quantify the amount of water that is potentially available from all sources of water within the planning region to meet demands through 2045. Sources of water evaluated include surface water, stormwater, reclaimed water, seawater desalination, brackish groundwater desalination, fresh groundwater, and conservation. The amount of water 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 2045.

Part A. Evaluation of Water Sources

Fresh groundwater from the UFA is currently the primary source of supply for all use categories in the planning region and will likely be the principal source to meet projected demands during the planning period. 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 enable water supply systems to support more users with the same quantity of water. Although it’s likely to be beyond the 2045 planning period, the region’s continued growth will eventually require development of alternative sources such as brackish groundwater and seasonal surface water. Efficient use of available groundwater quantities while meeting established MFLs will postpone the eventual need for more costly alternative sources. The following discussion summarizes the evaluation of various water supply sources and the potential for those sources to be used to meet projected water demand 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. In 2022, approximately 126.8 mgd of groundwater (including DSS) was used in the planning region. Approximately 53 percent (68.1 mgd) of the fresh groundwater was used for PS. The following is an assessment of the availability of fresh groundwater in the UFA and LFAs in the planning region.

1.0 Upper Floridan Aquifer

As described in Chapter 1, the UFA is a productive aquifer, several hundred feet thick, and is the main source for water supply within the planning region. The UFA is mostly unconfined over the planning region (LaRoche and Horstman, 2024). Minimum flows and levels (MFLs) have been established for the Weeki Wachee, Chassahowitzka, Homosassa, Gum Slough, Rainbow, and Kings Bay spring groups as well as several lakes in the planning region. New upper segments of the Withlacoochee River are scheduled for adoption in 2025, while the lower segment is scheduled for 2026. The Gum Slough Spring Group is scheduled for reevaluation in 2026.

Currently, all established MFLs are being met and all spring MFLs are projected to be met through 2045, with the exception of Gum Slough Spring Group (GSSG). Scenario results from the CSM version 1.1 indicate that the MFL allowable spring flow reduction (6 percent) for Gum Slough Springs might be exceeded under the projected 2045 demand (Table 4-1). The MFL of GSSG is currently under reevaluation, with completion anticipated in 2026. Additional modeling efforts using the CSM will be incorporated into the MFL reevaluation, taking into account factors including historical water use, reclaimed water use, and recharge variations. The current MFL was established in 2011 using simulation results from the NDM, which relied on limited hydrologic data available, at the time, for calibration in the surrounding area. The improved CSM model is expected to provide a more accurate evaluation of allowable flow reduction for the spring system.

Scenario modeling results using the CSM version 1.1 show that groundwater from the UFA is available to meet demand through 2045 by utilizing conservation and reuse initiatives, with the exception of the area surrounding Gum Slough Spring Group (Table 4-1). Conservation initiatives incorporated in the CSM scenarios include demand reductions of 10 percent for both PS and AG uses, and 20 percent for L/R uses. The simulations analyzed the change in UFA water levels from no-pumping conditions to adjusted 2045 water demand. Under the 2045 scenario, spring flow and Withlacoochee River base flow change due to groundwater withdrawals were 10 percent or less (Tables 4-1 and 4-2). All springs with established minimum flows, except for Gum Slough Spring Group, were also projected to be met. In most of the planning region, predicted drawdown within the UFA (where it is unconfined) is less than one foot, except in northeast Sumter and western Hernando counties, where concentrated groundwater withdrawals for PS occur. 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 2045 conditions based on the Central Springs Model*

Spring Name	No Pumping Flow (cfs)	Predicted 2045 Flows (cfs)	2045 Percent Change	MFL Allowable Percent Flow Reduction (%)
Weeki Wachee Spring Group	226.7	213.7	5.7	10.0
Chassahowitzka Spring Group	189.3	184.9	2.3	8.0
Homosassa Spring Group	312.7	307.9	1.5	5.0
Gum Slough[1]	98.8	89.4	9.4	6.0
Kings Bay Springs	482.8	475.3	1.5	11.0
Rainbow Springs and River	683.4	672.8	1.5	5.0

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

Table 4-2. *Predicted changes in base flow contribution to rivers from non-pumping to 2045 conditions based on the Central Springs Model*

River Segment	No Pumping Flow (cfs)	Predicted 2045 Flow (cfs)	2045 Percent Flow Change
Withlacoochee River at Croom	54.4	53.5	1.7
Withlacoochee River near Holder	340.8	314.6	7.7

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 WUPs, approximately 19 mgd of additional groundwater quantities are available to PS utilities from the UFA. This amount includes some permit allocations for community developments under construction. To ensure that environmental impacts from groundwater withdrawals are minimized, it is the District's intent that 2045 demands to be met by groundwater will be significantly reduced by maximizing the efficient use of reclaimed water and implementation of conservation measures.

2.0 Lower Floridan Aquifers

As described in Chapter 1, the LFA I is present in northeast Sumter County and portions of Marion County and contains fresh groundwater. Beyond the eastern extent of MCU II, the base of the LFA I is estimated near 1,300 feet below land surface at the approximate depth of MCU VIII. The MCU I and the LFA I extend eastward from Sumter County into the SJRWMD. The LFA I is currently used for supply by The Villages, the cities of Wildwood and Ocala, and an agricultural permittee.

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

The LFA below MCU I has demonstrated good quality groundwater and high productivity. However, the degree of confinement in the MCU I appears to be regionally variable, and potential impacts to the overlying UFA should be further assessed. If additional testing finds sufficient confinement from the UFA, then LFA I 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. In those areas where it is demonstrated that development of groundwater quantities from the LFA I can be done without exceeding any established MFLs and will otherwise avoid harm caused by withdrawals, such LFA I quantities may be viable water 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 BMPs 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 following benefits:

- Infrastructure and Operating Costs. Water conservation allows utilities to defer expensive expansions of potable water and wastewater systems while limiting operation and maintenance costs at existing treatment plants (e.g., use of electricity for pumping and treatment, expensive water treatment chemicals).
- Fiscal Responsibility. Most water conservation measures are more cost-effective than other 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 measure's lifetime.
- Environmental Stewardship. Proper irrigation designs and practices, including Florida-Friendly Landscaping™ (FFL), can provide natural habitat for native wildlife and reduce unnecessary runoff from properties into water bodies. This can reduce nonpoint-source pollution, particularly from operations that use fertilizers, pesticides, or fungicides which, in turn, may assist with meeting total maximum daily load (TMDL) restrictions within local water bodies and maintaining spring water quality health.

Since the 1990s, the District has provided financial and technical assistance to water users and suppliers in the Northern 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 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, WMDs in Florida issue water shortage orders that require short-term mandatory water conservation through situational 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.

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 PS water conservation and improve both local utility system efficiency and regional water resource benefits. Among the services provided upon request are leak detection surveys, and water audit guidance and evaluation. Since the program's inception, 164 leak detection surveys have been conducted throughout the District, locating 1,645 leaks of various sizes and totaling an estimated 5.96 mgd. In the Northern Planning Region, 63 leak detection surveys have been conducted, locating 724 leaks totaling an estimated 2.65 mgd.

The District's Utilities Services Group performs leak detection surveys to help reduce water loss.

The District also promotes conservation through a variety of education and outreach programs. While quantifiable water savings are not always available, education and outreach greatly increase the success of conservation programs by raising awareness and changing attitudes and behaviors regarding water use. Public education is a necessary facet of every water conservation program, and, when accompanied by other conservation measures, can be an effective supplement to a long-term water conservation strategy.

The District administers the statewide Florida Water Star℠ (FWS) program, which is a water conservation certification program for new residential and commercial construction and existing home renovation. The program encourages water efficiency in appliances, plumbing fixtures, irrigation systems, and landscapes. On average, a FWS homeowner with outdoor irrigation can save up to 48,000 gallons per year. District staff have also had great success working with local governments and utilities to incorporate FWS certification or criteria into local building codes through ordinance or mandate. As of July 2024, there are 14 municipalities, two counties, and one water utility requiring FWS standards in the District. This is anticipated to result in more than 7.4 mgd of water saved at projected build out. In addition, FWS offers installation and BMPs training for landscapers and irrigation contractors, providing an opportunity to become FWS accredited professionals.

In FY2020, the District launched the Conservation Education Program, which partners with utilities, UF Institute of Food and Agricultural Sciences (IFAS) Extension offices, and homeowners associations to support educational projects that enhance existing efforts to reduce residential water use. The District also shares water conservation messaging through both traditional news media and social media. This includes several campaigns, such as "Water 101," "Skip a Week," "Water Conservation Month," and "Watch the Weather, Wait to Water." Additionally, free water conservation publications are available on the District's website for residents within the District's boundaries, and District staff are available for water conservation speaking engagements. The District also provides funding to school districts to support water conservation through field trips, teacher trainings, project materials, and Splash! school grant program. Small grants are also provided for water schools, which are attended by elected officials, community leaders, and other decision-makers and often include water conservation content.

In addition to education and outreach, the District provides cost-share funding to entities in support of water conservation projects, as described in Chapter 8. On a Districtwide scale, water conservation efforts have contributed to relatively steady unadjusted gross per capita use rates from 2010 to 2020, despite increasing population growth (Figure 4-1). The per capita use rate for the District is the lowest of all five WMDs.

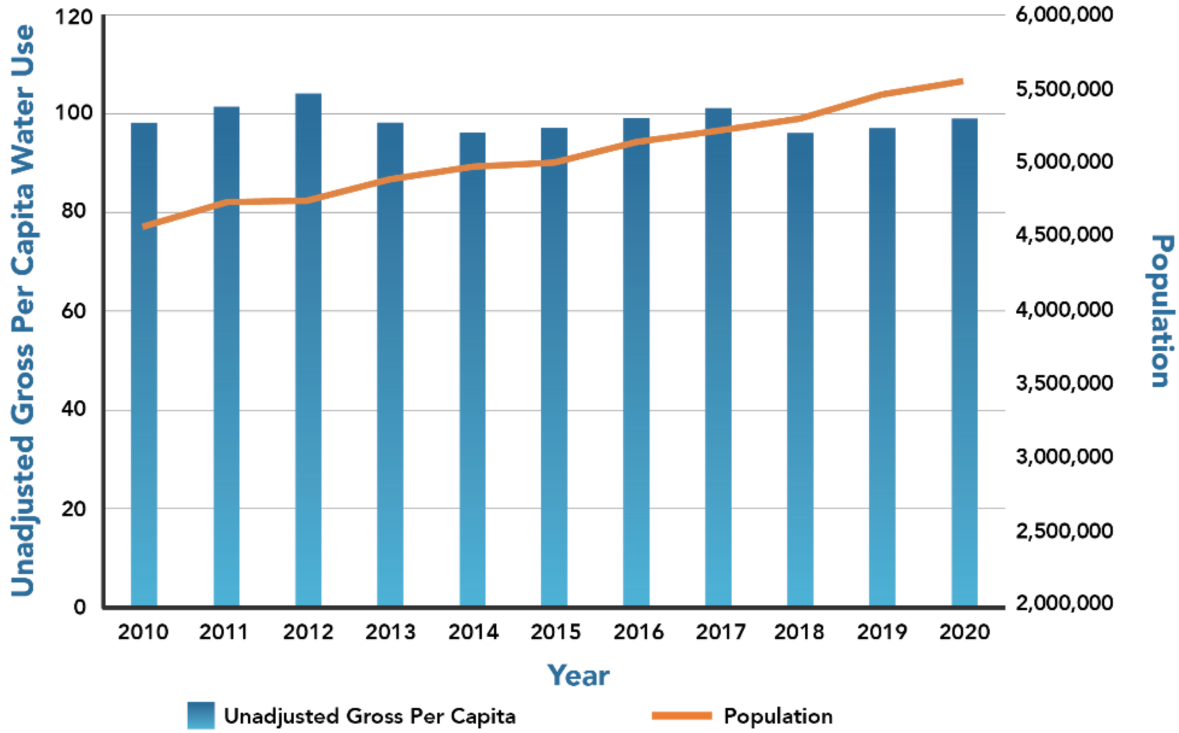


Figure 4-1. *Districtwide unadjusted gross per capita water use versus population, 2010-2020*

1.1 Water Conservation Potential for Public Supply

The PS sector includes all water users that receive water from public or private water systems and utilities and may include non-residential customers that are connected to a utility potable distribution system. Public supply (PS) water conservation 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 each customer's water use is measured, allowing for focus, evaluation, and adjustment of the program to maximize savings potential. The success of the District's water conservation programs for PS systems to date is demonstrated by the 16.6 mgd in Districtwide savings that has been achieved since programs began in 1991. Within the region, it is estimated that savings for the PS sector could be 9.10 mgd by 2045 if all water conservation programs presented below are implemented (Table 4-3).

Estimated conservation potential for the planning region is based in part on 2024 draft data for the WRWSA RWSP. This plan uses the 2025 to 2045 planning horizon and the AWE Tool to calculate the savings and costs of both passive and active conservation for five benchmark utilities. The savings for these five benchmark utilities were then projected onto the additional utilities of the region.

1.1.1 Public Supply Assessment Methodology

The WRWSA includes four counties (Citrus, Hernando, Marion, and Sumter) that lie primarily within the District, with a portion of Marion County within the SJRWMD. To assess the entire planning region's conservation potential (excluding SJRWMD demands and including utilities not analyzed by the WRWSA), the District applied the WRWSA's percentage savings estimates to the District's demands for the planning region. However, the District's portion of Lake County is not addressed as a part of this 2025 RWSP. This is because the projected 2045 demand for the District's portion of Lake County is considered de minimis for both PS and DSS compared to 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 1 and Tier 2 savings plus conservation that could occur through the implementation of additional conservation activities. To be consistent with the calculations for the District's other planning regions within the 2025 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.

<u>Passive Conservation</u>

Passive water conservation savings are those that result from 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 is a major contributor to decreasing per capita water use across the country.

The percent of savings due to passive conservation was derived from the October 2024 Draft WRWSA 2024 RWSP for each of the modeled utilities. The average percentage savings shown in the Draft WRWSA 2024 RWSP was applied to the District's 2045 PS and DSS demand for each county to estimate the water savings expected over the planning period.

<u>Active Conservation</u>

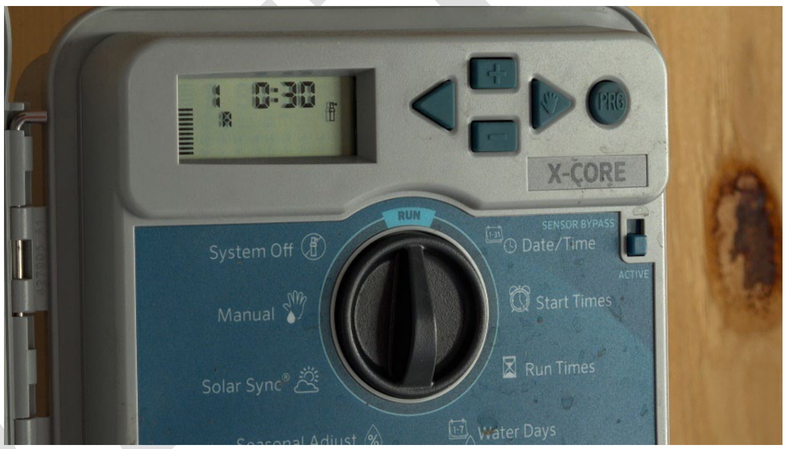
Active water conservation encompasses measures, practices, and programs sponsored or encouraged by utilities and municipal governments which result in water use reductions. By their nature, active water conservation programs are typically funded and administered by PS utilities or other regional entities. 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.

The percent of savings due to active conservation was taken from the October 2024 Draft WRWSA 2024 RWSP for each of the modeled utilities. The average percentage savings shown in the Draft 2024 WRWSA RWSP data was applied to the District PS 2045 demand to estimate the expected water savings over the planning period. The newly calculated savings were proportioned out to each conservation activity with the same ratio as those found in the Draft 2024 WRWSA RWSP data. For example, rain sensor replacements accounted for three percent of the active savings in the Draft 2024 WRWSA RWSP data; therefore, rain sensor replacements also account for three percent of the District's Northern Planning Region active savings. Costs for the various activities were estimated based on the cost per million gallons saved from the Draft WRWSA 2024 RWSP and applied to the newly calculated active savings for the District's Northern Planning Region as a whole.

1.1.2 Results

It is estimated that approximately 9.10 mgd of combined passive and active PS savings could be achieved in the planning region by 2045 (Table 4-3). This equates to a 9.8 percent reduction in projected 2045 PS sector demand. This includes I/C entities that are connected to PS utilities.

The bulk of savings are attributable to passive conservation. The most impactful active conservation activity identified was WaterSense® labeled irrigation controllers. The drop in regional demand over time associated with both passive and active savings is shown in Figure 4-2.



WaterSense labeled irrigation controllers were identified as a potential major source of water conservation for the Northern Planning Region.

Per the Draft WRWSA 2024 RWSP, the cost-effectiveness of the active conservation activities evaluated ranged from $0.23 to $16.12 per thousand gallons saved. The weighted average cost-effectiveness of the 16 conservation activities was $0.58 per thousand gallons saved. The regionwide total cost for active programs across the planning horizon is estimated at $18.25 million.

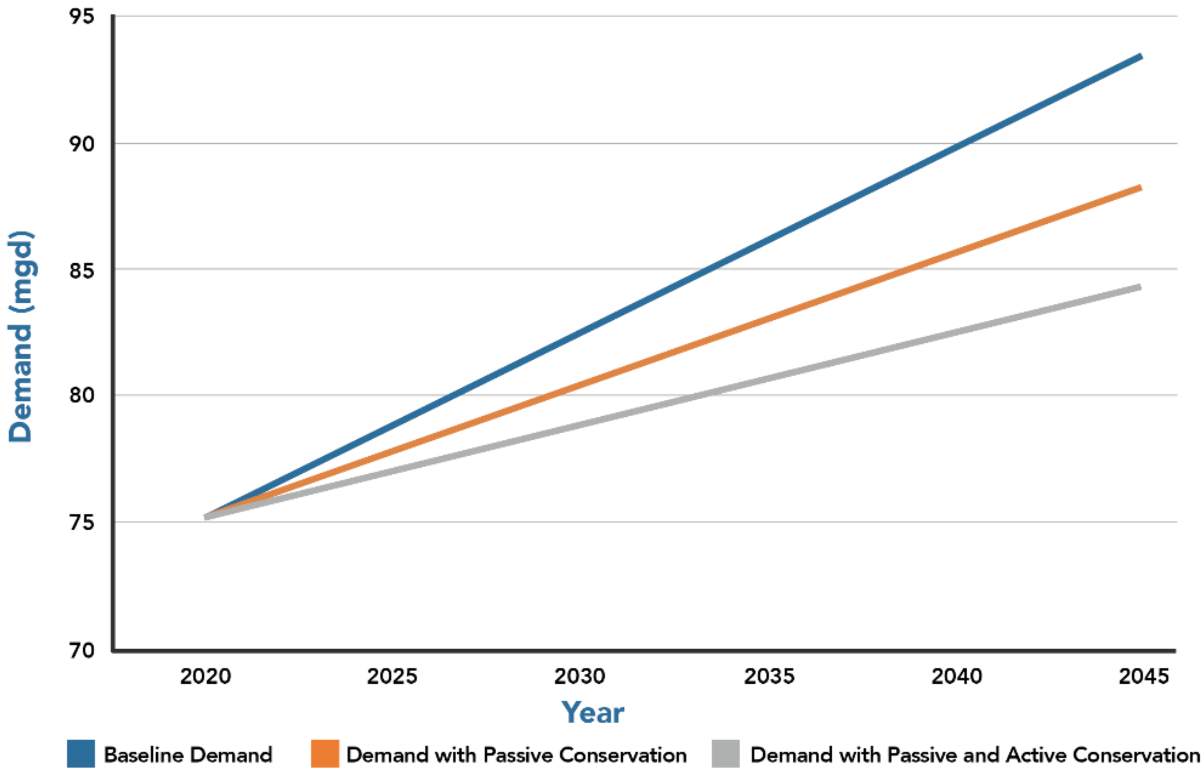


Figure 4-2. *Potential effects of conservation on projected public supply demand*

1.1.3 Additional Considerations

The active conservation analysis builds on the passive analysis as it considers only the inefficient stock not already replaced passively. However, this is a conservative analysis as there are many other activities that could result in substantial water savings. Over time, new technologies will emerge and fixtures will gain additional efficiencies. Additionally, for those activities that were modeled, higher participation rates could be achieved. It should also be noted that for those items with short life expectancies (e.g., rain sensors), repetitive implementations and reoccurring costs are required to maintain savings. Finally, more conservation can also be achieved through replacement of 1.6 gallons per flush (gpf) toilets with 0.8 gpf toilets, which is not currently captured in these projections.

1.2 Water Conservation Potential for Domestic Self-Supply

The DSS sector is a subset of PS and includes individual private homes and businesses that are not utility customers but instead receive water from a well or surface water for uses such as irrigation. Domestic self-supply (DSS) wells do not require a WUP and are commonly not metered; therefore, changes in water use patterns are less measurable than in the remainder of the PS sector. Only passive conservation was estimated for DSS systems in this 2025 RWSP. Within the region, it is estimated that passive savings for the DSS sector could be 1.55 mgd by 2045 (Table 4-3).

1.2.1 Domestic Self-Supply Assessment Methodology

To calculate DSS passive savings, it was assumed that the DSS sector will experience the same percentage of passive savings as PS over the planning horizon. The percentage of PS passive savings calculated was therefore applied to the District's 2045 DSS demand projection for the Northern Planning Region, excluding Lake County. In other words, the DSS 2045 demand (27.9 mgd) was multiplied by the PS passive savings rate (5.6 percent) to yield the DSS passive savings estimate (1.55 mgd).

1.3 Water Conservation Potential for Industrial/Commercial Self-Supply

The I/C 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 fixtures, such as spray valves and high-efficiency toilets. The industrial processes used in this category present unique opportunities for water savings and are best identified through site-specific assessments of water use at each (or a similar) facility. It is estimated that I/C sector savings could be 0.12 mgd by 2045 (Table 4-3).

1.3.1 Industrial/Commercial Assessment Methodology

The I/C savings estimate used the same methodology as the 2020 RWSP and did not include M/D quantities. 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 RWSP was also assumed. Therefore, the self-supplied I/C 2045 demand (5.33 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 (0.12 mgd).

1.4 Water Conservation Potential for Landscape/Recreation Self-Supply

The L/R water use sector includes golf courses and large landscapes (e.g. cemeteries, parks, playgrounds) that obtain water directly from surface and groundwater rather than from a PS system. The use of efficient irrigation practices and technology has achieved some water savings in this use sector. Within the region, it is estimated that L/R savings could be 1.33 mgd by 2045 (Table 4-3).

1.4.1 Landscape/Recreation Assessment Methodology

As with the self-supplied I/C sector, the water conservation potential for the L/R sector was derived using the same methodology as the 2020 RWSP. Conservation in this sector primarily comes from updating inefficient sprinkler heads and installing smart irrigation controller technology, such as soil moisture sensors or weather-based controllers. Based on two studies by UF, it was determined that 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 RWSP to estimate self-supplied L/R water conservation. In other words, the

2045 L/R demand (29.65) 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 (0.44 mgd and 0.89 mgd) equates to the total L/R savings over the planning horizon (1.33 mgd). The 1-in-10 2045 demand projections were used instead of the 5-in-10 projections in an effort to be more conservative.

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

Table 4-3 summarizes potential non-agricultural water conservation savings in the Northern Planning Region. This table shows that, through implementation of all conservation measures listed above for the PS, DSS, I/C, and L/R water use sectors, approximately 12.10 mgd could be saved by 2045 at a total projected cost of $12.8 million. This is a 7.7 percent reduction in total demand.

Table 4-3. *Potential non-agricultural water conservation savings in the Northern Planning Region*

Sector	2045 Demand (mgd)	Savings (mgd)	Potential Reduction in Demand (%)	Average Cost-Effectiveness (Cost per 1,000 gallons saved)
PS Total	93.37	9.10	9.75%	-
PS Passive	-	*5.20*	*5.57%*	-
PS Active	-	*3.90*	*4.18%*	*$0.58*[1]
DSS	27.9	1.55	5.57%	-
I/C	5.33	0.12	2.25%	-
L/R	29.65	1.33	4.48%	-
Total	**156.25**	**12.10**	**7.74%**	**-**

Summation and/or percentage calculation differences may occur due to rounding
[1]Total cost effectiveness is weighted by each activity's percent share of total savings in relation to the cost.

2.0 Agricultural Water Conservation

The FDACS develops conservation projections as part of the FSAID projections. Future savings could come from developing new technology, sensor-based automation, and scheduling changes.

With the exception of Lake County, the county-level savings percentages derived from FSAID 10 were applied to the 2045 agricultural irrigated crop demands shown in Appendix 3-1, which are District-specific demand projections.

The 2025 CFWI RWSP estimates agricultural conservation within a range of 4.19 mgd on the low end and 7.17 mgd on the high end for the entire CFWI Planning Area. For consistency with the 2025 CFWI RWSP, the portion of these savings that could occur within the District's jurisdiction of Lake County was estimated. Specifically, the District's portion of Lake County AG demands out of total 2045 AG demands in the 2025 CFWI RWSP (0.4 percent) was multiplied by each of the savings estimates to yield District conservation savings of 0.02 mgd to 0.03 mgd. These Lake County results were added to the estimates for the remainder of the planning region to yield total agricultural conservation savings for the Northern Planning Region (Table 4-4).

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

County	Projected 2045 Irrigated Crop Demand (mgd)	Conservation Savings (%)[1]	Agricultural Conservation Potential by 2045 (mgd)
Citrus	1.80	12.75%	0.23
Hernando	1.67	18.48%	0.31
Lake[2]	0.41	NA	0.02-0.03
Levy	10.27	13.95%	1.43
Marion	2.68	10.68%	0.29
Sumter	3.63	12.32%	0.45
Total	**20.46**	**13.29%-13.35%**	**2.73-2.74**

Summation and/or percentage calculation differences may occur due to rounding
[1]Derived from FSAID 10.
[2]Lake County methodology is consistent with the 2025 CFWI RWSP.

These should be considered potential conservation estimates 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 from the FDACS and Natural Resources Conservation Service (NRCS) could accelerate the rate at which these savings occur. Water resource benefits from the FARMS Program can be categorized as WRD or water conservation. Additional information on the FARMS Program and its potential impact on water resources is within Chapter 5 and 7.

Section 3. Reclaimed Water

Reclaimed water is defined by the FDEP as water that is beneficially reused after being treated to at least secondary wastewater treatment standards by a domestic 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. Appendix 4-1 provides information on 2020 actual and 2045 projected reclaimed water utilization. Additional information and resources related to reclaimed water use within the District, including a map viewer of reclaimed lines and facilities, is available at https://www.swfwmd.state.fl.us/projects/reclaimed-water.

Benefits that can be obtained from the use of reclaimed water are governed by the concepts of utilization and water resource benefit. Utilization rate is the percent of treated wastewater from a WWTP that is used in a reclaimed water system. The utilization rate of a reclaimed water system varies by utility. Typically, only 50 to 70 percent of treated wastewater flows go to reclaimed water customers. The highest utilization rates occur in utilities in urban areas where large industries and numerous residential customers can be supplied. Utilization is also limited by seasonal supply and storage. A utility cannot expand its reuse system beyond peak flow demand, which occurs during dry periods when demand is highest, without experiencing shortages. For example, a reclaimed water system with a 1.0 mgd 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 potable reuse, seasonal storage, system interconnects, an interruptible customer base, environmental enhancement/recharge, and supplementing reclaimed water supplies with other sources.

- Potable reuse involves purifying reclaimed water to a quality for it to be used as a water source for potable supplies. In February 2025, the FDEP published Rules for Potable reuse in Chapter 62-565, F.A.C.
- Seasonal storage is the storage of excess reclaimed water in surface reservoirs or ASR systems during the wet season when demand is low. This stored reclaimed water can be used to augment daily reclaimed water flows to meet peak demand in the dry season.
- System interconnects involve the transfer of reclaimed water from areas of excess supply to areas of high demand. This transferred reclaimed water can be used to augment daily reclaimed water flows to meet peak demand in the dry season.
- An interruptible customer base is where a utility has golf course, recreational, commercial, agricultural, industrial, and other bulk customers that have multiple sources of irrigation or process water. Reclaimed water is supplied to these customers during certain times of the day and during certain seasons, but they may be requested to go "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.
- 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. 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 storage, water-conserving rates, efficient irrigation design, and irrigation restrictions.

Reclaimed water is an important alternative source for meeting demands.

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.

1.0 Potential for Water Supply from Reclaimed Water

Table 4-5 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 2045. In 2020, WWTPs in Levy, Citrus, Sumter, Marion, Hernando, and Lake counties collectively produced 20.16 mgd of wastewater. Of that quantity, 15.66 mgd was reused to benefit traditional water supplies. This represents approximately 78 percent of the available reclaimed wastewater produced in the region being used for irrigation, cooling, or other beneficial purposes. By 2045, it is projected that 25.92 mgd of the 27.38 mgd of wastewater produced in the planning region will be beneficially reused.

Table 4-5. *2020 actual versus 2045 projected reclaimed water availability and utilization (mgd) in the Northern Planning Region*

County	2020 Actual		2045 Potential		Total Utilization Increase
	Wastewater Treatment Plant Flows	Reclaimed Utilization	Wastewater Treatment Plant Flows	Reclaimed Utilization	
Citrus	3.47	2.05	4.25	2.83	0.79
Hernando	5.55	2.33	6.80	3.57	1.24
Lake	0.00	0.00	0.00	0.00	0.00
Levy	0.22	0.00	0.29	0.07	0.07
Marion	4.25	3.39	6.02	5.16	1.77
Sumter	6.67	7.89	10.02	14.29	6.40
Total	**20.16**	**15.66**	**27.38**	**25.92**	**10.27**

Summation differences may occur due to rounding

Section 4. Surface Water

The Withlacoochee River is the only major river system in the Northern Planning Region. The potential yield for this river will ultimately be determined by its MFL once it's established.

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 included: (1) estimation of unimpacted (adjusted) flow, (2) selection of period used to quantify available yield, (3) application of minimum flow or planning level criteria, (4) consideration of existing legal users, and (5) application of engineering limitations. The amount of water that can be developed in the future will depend on adopted minimum flows and the permitting process. The methodology is further detailed in 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 America 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.

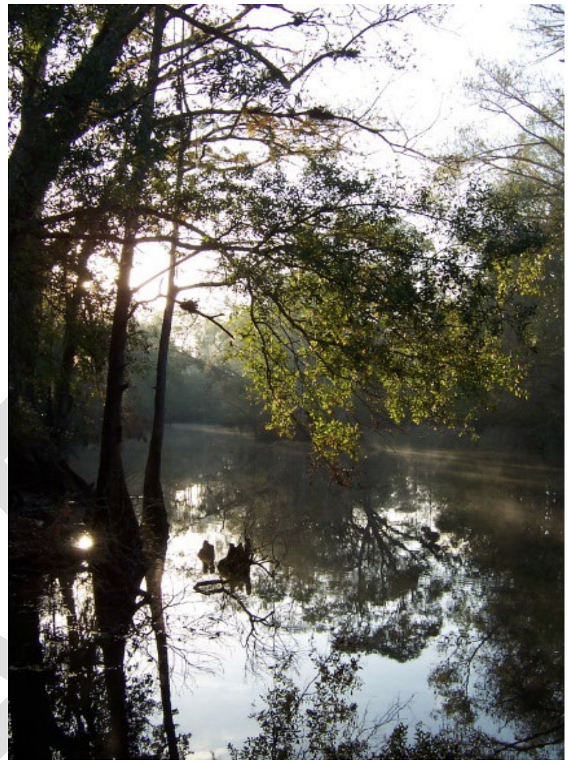
The upper reaches of the Withlacoochee River in the Green Swamp consist mostly of agricultural lands and wetlands. The river corridor is more developed near Dade City in Pasco County but, for the most part, it remains relatively rural in character. From the Lake Tsala Apopka area downstream to Dunnellon, 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.

Lake Rousseau

West of Lake Rousseau, the Withlacoochee River flows to the Gulf of America 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 a generally 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.

In 2019, 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 (WRWSA, 2019). In this update, a draft minimum flow was used because the District had not yet established a minimum flow for the river. The draft minimum flow was developed using data from the Croom, Wysong, and Holder 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. Minimum flows are scheduled for completion in 2025. Once minimum flows are established for the Withlacoochee River, water supply availability estimates will be refined. The average annual discharge at the gage near Holder is approximately 511.10 mgd (791 cfs) for the period 1965 to 2023. 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 49.68 mgd of water supply is potentially available from the Withlacoochee River.

3.0 Potential for Water Supply from Surface Water

Table 4-6 summarizes potential surface water availability from the Withlacoochee River in the planning region, which is approximately 49.68 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.

Table 4-6. *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	Current Withdrawal	Unpermitted Potentially Available Withdrawals	Days/Year New Water Available[3]		
							Avg	Min	Max
Withlacoochee River near Holder	Yes	511.10	49.68	0.00	0.00	49.68	310	26	366
Total		**511.10**	**49.68**	**0.00**	**0.00**	**49.68**			

Summation and/or percentage calculation differences may occur due to rounding
[1] Mean flow based on recorded USGS flow. Period of record used is 1965–20123.
[2] Based on 10 percent of mean flow.
[3] 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.

Section 5. Brackish Groundwater

Brackish groundwater is defined as groundwater having impurity concentrations greater than drinking water standards (i.e., TDS concentration greater than 500 mg/L), but less than seawater, which has a TDS concentration of approximately 35,000 mg/L (SWFWMD, 2001). Brackish groundwater suitable for water supply is available from three general sources within the District: (1) the UFA and along coastal areas, (2) the Hawthorn aquifer system located above the UFA, and (3) inland at greater depths within the LFA II and LFA VIII. For a more detailed description of the Northern Planning Region's geology and hydrogeology, please see Chapter 1, Part C, Section 4.

Coastal brackish groundwater is found in a depth-variable chloride transition between fresh and saline waters. Figure 4-3 depicts the generalized location of the freshwater/saltwater interface, as defined by the 1,000 mg/L isochlor in the Avon Park portion of the UFA. Generally, water quality declines to the south and west within the District. Groundwater also becomes saline at greater depths in all locations, so withdrawals require management to prevent upwelling that may deteriorate water quality over time.

Brackish water sources exist in the LFAs from mixing with relic seawater or contact with evaporitic and organic-rich strata common within the MCU II. Recent hydrogeologic investigations in Polk County have found MCU II to be reasonably confined from the UFA, suggesting withdrawals from LFA II would have limited impacts. Since the UFA is regionally unconfined in much of the Northern Planning Region, it could be more sensitive to deeper withdrawals than other parts of the District. Further evaluation is needed to assess potential withdrawal impacts. The quality of LFA II water is typically sulfide-rich, which can pose treatment challenges. The LFA VIII has been identified in the planning region below LFA II, with potentially more productivity and greater separation from the UFA. The water quality in LFA VIII may be more brackish or saline.

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 preferred for treatment due to recovery efficiency and energy costs. Groundwater with TDS greater than 10,000 mg/L generally requires 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 consistent raw water quality for efficient operation. Pure RO permeate has a very low mineralization that can corrode pipe metals and prior mineral deposits, so bypass blending of some raw water into the RO permeate is common for buffering, while also increasing total yield.

While RO is the most common brackish desalination technology, electro-dialysis reversal (EDR) systems may also be viable. The T. Mabry Carlton Water Treatment Facility (WTF) in Sarasota County is an EDR system. 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. It is recommended that both RO and EDR systems be considered in brackish water supply project 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 constrained by TMDL limitations. Some brackish water treatment facilities have been required to run below their potential treatment efficiencies to reduce the strength of the concentrate being discharged to surface waters. Due to these environmental considerations, deep-well injection is prevalent. Deep-wells are expensive to construct, and injection may not be permittable in some areas with unsuitable geologic conditions.

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 consistent with applicable rules, regulations, and District water use management strategies. Factors affecting the permitting of supplies include the hydrologic properties and water quality of the aquifer, rates of groundwater withdrawal, and well configurations. The groundwater models used in permitting have recently been updated to include conceptual layers of the LFAs, factor more calibration points based on LFA drilling investigations, and consider the denser properties of brackish and saline water.

In 2007, the District revised its Cooperative Funding Initiative (CFI) policy to recognize brackish groundwater as an AWS, allowing for assistance with construction projects. Since then, the District has assisted in funding seven completed and ongoing brackish groundwater treatment projects. The funding is intended to incentivize the development of integrated, robust, multijurisdictional systems that are reliable, sustainable, and use diverse water sources.

While the District's primary objective for regional WSD has traditionally been to meet increasing water demand, brackish groundwater projects have also been supported for other utility needs, such as to blend RO permeate with treated surface water to meet finished water quality standards, to maintain viability of existing wellfields with deteriorating source water quality, and to provide a seasonal source substitution to meet MFLs. Future projects may incorporate potable reuse, as the treatment processes are similar. The District recognizes the importance of maintaining the viability of existing supplies but also encourages the consideration of alternative 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 economic and permitting feasibility, and construction procured through a competitive bidding process.

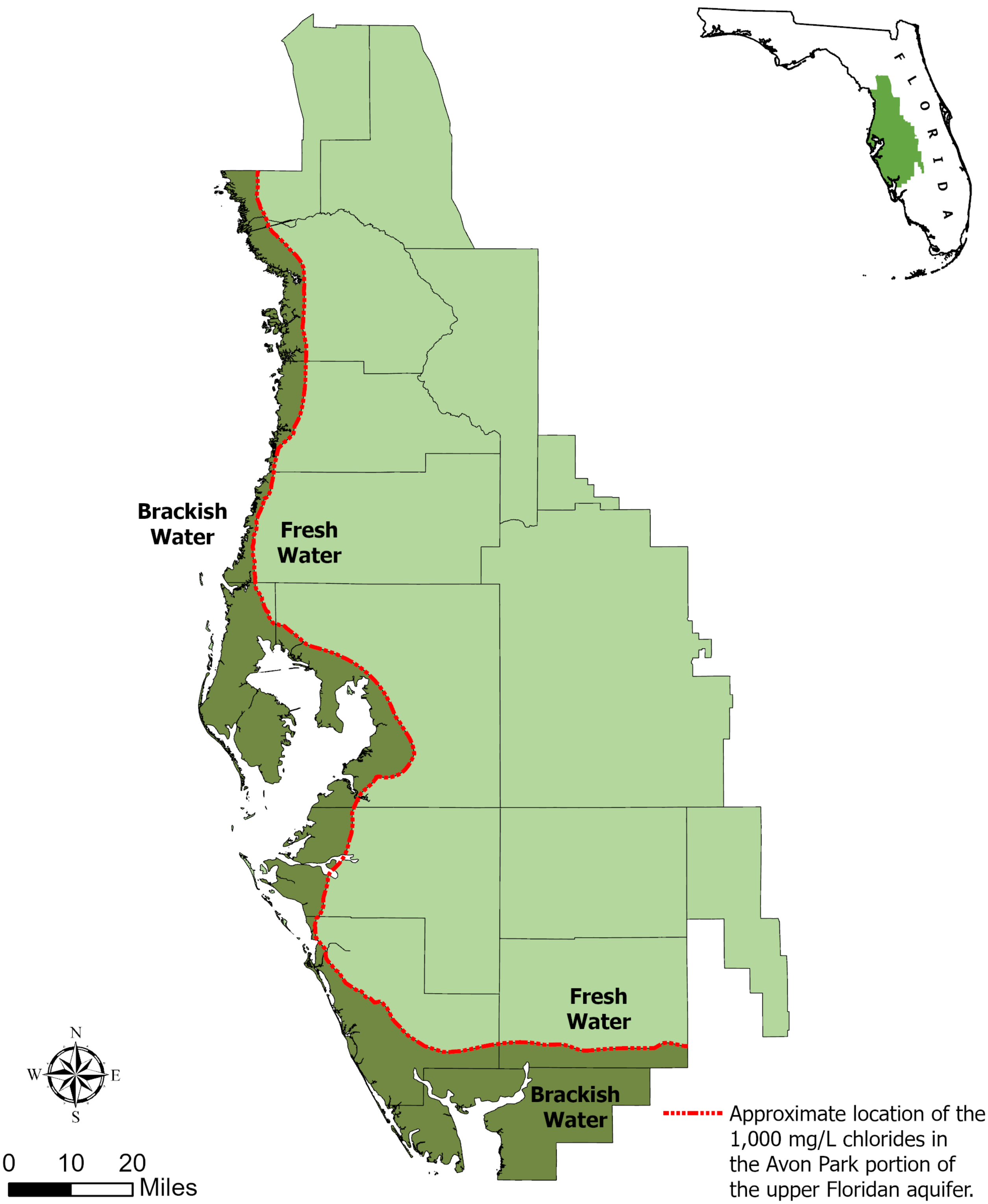


Figure 4-3. *Generalized location of the freshwater/saltwater interface in the District*

1.0 Potential for Water Supply from Brackish Groundwater

In the coastal portions of the planning region, saltwater is close to the surface and exists as a wedge beneath a relatively thin freshwater lens in the UFA. Since the UFA in these areas is also unconfined and highly transmissive, there is significant potential for induced saltwater intrusion from brackish groundwater withdrawals. Extensive analysis and modeling will be required to determine whether sustainable brackish groundwater withdrawals from the UFA in coastal areas are permittable. In some inland areas, the freshwater portion of the UFA is only a few hundred feet thick and water becomes increasingly more mineralized with depth due to the presence of sulfate near the MCU II. Sulfate concentrations vary across the planning region and is lower in the easternmost portion of the planning region where the MCU II thins or is not present. For example, sulfate concentrations in groundwater pumped from LFA I at 600 to 1,000 feet depths at The Villages in northeast Sumter County are well within potable water standards. The Villages uses higher-sulfate water without advanced treatment for landscape irrigation to offset demand for lower-sulfate groundwater from the UFA.

The District is conducting exploratory drilling tests to determine the water quality and map the thickness and location of LFAs I, II, and VIII 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.

Specific project options for brackish groundwater supply have not been thoroughly assessed in the region because fresh groundwater has historically been available and is much cheaper to develop. Therefore, the availability of brackish groundwater has not been quantified for this RWSP. 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 through regional partnerships with the WRWSA or other entities.

Section 6. Aquifer Recharge

Aquifer levels are primarily maintained by natural recharge via rainfall infiltration to the surficial aquifer and underlying aquifers. Aquifer recharge (AR) is the process of beneficially using excess water to directly or indirectly recharge aquifers, and this may be accomplished using wells or rapid infiltration basins (RIBs). To maximize environmental and water supply benefits, AR projects will often target freshwater portions of the aquifer.

Successful AR projects improve groundwater levels, which in turn may (1) improve local groundwater quality, (2) mitigate or offset existing drawdown impacts due to withdrawals, (3) providing storage of seasonally available waters, thereby augmenting water supplies, and (4) potentially allow 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, 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. A total volume of 884 mgd of reclaimed water was used statewide in 2020 (FDEP, 2021), with approximately 80 mgd used for groundwater recharge. Each individual AR project will have 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 to the design, operation, and maintenance of a direct AR system. Understanding permeability and the degree of aquifer confinement above and below the injection interval is critical to project success. Also important is characterization of the differences in water quality between the injection source water, ambient groundwater in the injection interval and adjacent intervals, or aquifers above and below. 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 injection water reacts with the aquifer. Properly designed projects can avoid or manage these reactions through adjustment of injection water chemistry, such as removal of dissolved oxygen (DO).

Recent operational ASR projects that incorporate oxygen degasification systems and post treatment stabilization have proven that metals mobilization can be minimized and controlled by reducing DO content in the injection source water and maintaining a negative oxygen reduction potential. Aquifer Recharge (AR) projects need to function in the same manner. Groundwater flow resulting from injection combined with the natural groundwater flow pattern has the potential to move dissolved metals down gradient. For this reason, it is 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 occurs when water is applied to land surface where it can infiltrate and recharge the aquifer. Indirect AR can be accomplished 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, and the locations of nearby wetlands and lakes are all important to identify, test, and characterize 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 aquifer levels. The District estimates that 17 mgd of available reclaimed water Districtwide was being applied through RIBs for indirect AR as of 2020 (FDEP, 2021).

Section 7. Seawater

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 desalination is a costly water supply source but may merit consideration as availability of other sources diminish and advances in technology and efficiency improve. There are five elements to a seawater desalination system that require design considerations: (1) source water intake structure, (2) pretreatment to remove organic matter and suspended solids, (3) desalination by high-pressure RO or distillation, (4) post-treatment to stabilize and buffer product water and prepare it for transmission, and (5) concentrate disposal management (National Research Council, 2008). Each of these elements is discussed below.

Intake structures must be designed to withdraw large amounts of source water while minimizing environmental impacts. The volume of water withdrawn may significantly exceed the amount treated if dilution is necessary for concentrate discharges. Intake design and operation must address ecological concerns, such as risk of impingement and entrainment of aquatic life at the intake, entrainment of sediments and oils, and perturbation to seagrasses and hard-bottom communities. Much of the District's near-shore areas have been designated as either OFWs or aquatic preserves. Globally, many seawater plants have long offshore intakes in deep water, but the local gulf coast is relatively shallow. Industrialized harbors and existing seawater cooling intakes may provide permittable locations at the expense of raw water quality.

Pretreatment of source water is imperative for protection of sensitive RO membranes from premature fouling due to organic carbon and particulates. Local near-shore waters have relatively high levels of organic matter, especially during the summer. Pretreatment systems may require coagulation and/or microfiltration technology similar to treatment of fresh surface water to maintain long-tern viability of the facility.

High-pressure RO membrane treatment is the most common seawater desalination technology in Florida, Texas, and California. These RO systems pressurize saline water above the osmotic pressure of the solutes and then pass it 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. This pressurization step is energy intensive, as seawater treatment requires pressures ranging from 600 to 1,000 pounds per square inch (psi), compared to brackish groundwater systems operating at 30 to 250 psi (FDEP, 2010). Large-capacity RO facilities have energy recovery systems that use turbines or pressure exchange devices 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.

Internationally, the largest desalination systems use multi-stage flash distillation (MSF). The MSF process involves the evaporation and condensation of water by heating and cooling in 20 or more stages, with each stage occurring at a successively lower vacuum to enhance vaporization (Prajapati et al., 2021). This process is widely used in the Middle East where heating fuels are accessible and is usually coupled with power plants that use the steam produced in the process to drive electrical turbines. Existing MSF facilities produce more than 200 mgd of fresh water, but greater economies of scale may be required to increase their feasibility compared to that of RO facilities.

Post-treatment of RO product water is necessary to protect infrastructure from corrosion and liberation of metals in distribution piping. Reverse osmosis (RO) permeate has low hardness and alkalinity, so chemical post-treatment using lime or caustic soda is needed for buffering and pH adjustment. A settling system may be necessary to reduce turbidity generated by chemical treatment, and degassing systems are used to remove hydrogen sulfide.

Most seawater desalination facilities worldwide dispose of concentrate by surface water discharge, which entails significant environmental considerations. The salinity of 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 concentrate into surface waters. Technological approaches to avoid impacts to aquatic organisms may include diffusion using widely dispersed multiple outlets and pumping large volumes of additional water to dilute the concentrate to safe levels prior to discharge.

Co-location of desalination facilities with coastal electric power stations enhances their financial feasibility. Co-location produces cost and environmental compliance benefits by using existing intake structures and blending concentrate with the power station’s high-volume cooling water discharge. Additionally, the complex infrastructure for the intake and outflow is already in place. However, many coastal power stations are reducing or retiring their once-through seawater outlets and switching to more efficient closed-recirculation cooling systems. Future desalination systems might still use existing intakes, but the large outflow volumes won’t be available for concentrate dilution, so deep well injection may be more feasible.

1.0 Potential for Water Supply from Seawater Desalination

A seawater desalination project co-located with the Crystal River power station complex in Citrus County was proposed in previous versions of the RWSP. Since then, more feasible and cost-effective project options have been selected to meet regional demands. Therefore, seawater desalination has not been reassessed for this 2025 RWSP. The locations of existing and proposed seawater and brackish groundwater desalination facilities in the District are shown in Figure 4-4.

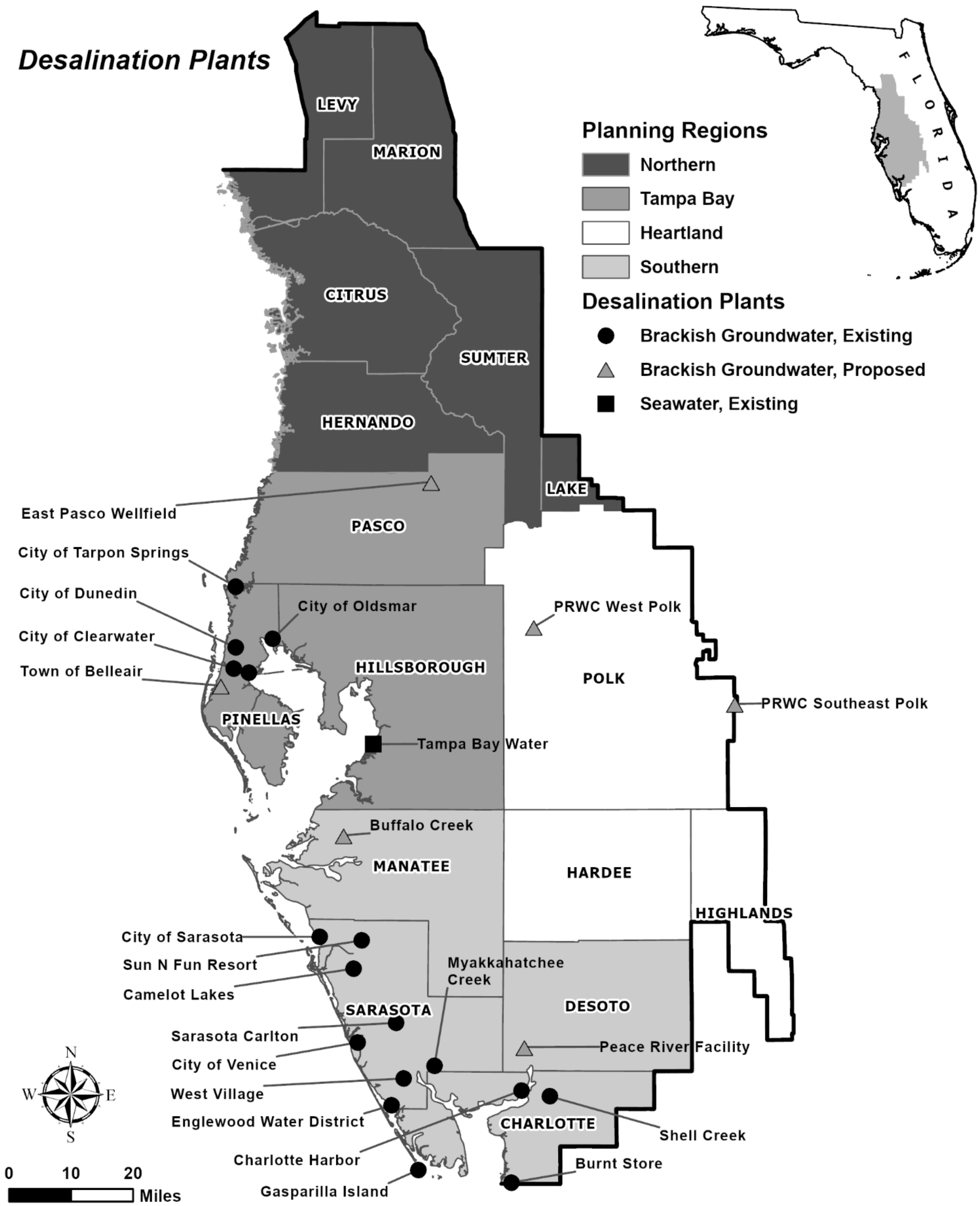


Figure 4-4. *Location of existing and potential seawater and brackish groundwater desalination facilities in the District*

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, F.A.C., 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 using stormwater as an AWS source often relies on the ability to use it in conjunction with another source (or sources) to decrease operational vulnerability to climatic variability (i.e., conjunctive use). Stormwater represents a potentially viable AWS at the local level, particularly for reclaimed water supplementation and irrigation.

In the Northern Planning Region, the Villages has had 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 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 phase, FDOT uses Environmental Look Arounds to proactively look for cooperative and regional stormwater management opportunities. Environmental Look Arounds can assist the WMDs local utilities, and other agencies with identifying sources of stormwater for activities such as reclaimed water augmentation and MFL recovery.

Section 9. Summary of Potentially Available Water Supply

Table 4-7 is a summary of the additional quantity of water that will potentially be available from all sources of water in each county in the planning region from 2020 through 2045. The table shows that the total additional quantity available is 92.35 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 2045 and demands calculated for the 2020 base year (Table 3-6). The projected additional water demand in the planning region for the 2020–2045 planning period is approximately 50.43 mgd. As shown in Table 4-7, up to 92.35 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 2045.

Table 4-7. *Potential additional water availability in the Northern Planning Region through 2045 (mgd)*

County	Surface Water[1]		Reclaimed Water	Desalination		Fresh Groundwater	Water Conservation		Total
	Permitted Unused	Available Unpermitted	Reuse	Seawater	Brackish Groundwater	Permitted Unused[2]	Public Supply and Domestic Self-Supply	Agricultural	
Citrus	-	-	0.79	-	-	0.84	2.13	0.23	3.99
Hernando	-	-	1.24	-	-	2.77	2.58	0.31	6.90
Lake	-	-	0.00	-	-	0.00	0.00	0.02-0.03	0.02-0.03
Levy	-	-	0.07	-	-	0.11	0.17	1.43	1.78
Marion	-	49.68	1.77	-	-	3.00	2.18	0.29	56.92
Sumter	-	-	6.40	-	-	12.29	3.59	0.45	22.73
Total	**-**	**49.68**	**10.27**	**-**	**TBD**	**19.01**	**10.65**	**2.73-2.74**	**92.34-92.35**

Summation differences may occur due to rounding
[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 Public Supply. Based on the 2022 Estimated Water Use Report (Ferguson & Hampton, 2023).

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Chapter 5. Overview of Water Supply Development Options

The WSD component of the RWSP requires the District to identify water supply options from which water users in the planning region can choose to meet their individual needs. In addition, the District is to determine the associated costs of developing these options. As discussed in Chapter 4, the sources of water potentially available to meet projected water demand in the planning region include fresh groundwater, water conservation, reclaimed water, surface and stormwater, and brackish groundwater. Reasonable options for developing each of the sources have been and continue to be identified, including planning level analyses and costs. The RWSP Executive Summary presents statutory guidance on how water supply entities are to incorporate WSD options from the District's RWSP into their water supply planning and comprehensive plan development

Part A. Water Supply Development Options

This section identifies WSD project options, including reasonable estimates of the quantity of water that could be developed and the associated costs, where available. Some of the options included in the 2020 RWSP that continue to be viable are presented in this chapter and updated accordingly. These options are not necessarily the District's preferred options but are provided as reasonable concepts that water users in the region may pursue in their water supply planning. A number of the options are of such a scale that they would likely be implemented by the WRWSA. Other options, such as those involving reclaimed water and conservation, could be implemented by individual utilities or a group of users. It is anticipated that users will choose an option or combine elements of different options that best fit their needs for WSD, provided they are consistent with the RWSP. Following a decision to pursue an option identified in the RWSP, it will be necessary for the parties involved to conduct more detailed engineering, hydrologic, and biologic assessments to provide the necessary technical support for developing the option and to obtain all applicable permits.

Section 1. Fresh Groundwater Options

Future requests for groundwater from the UFA will be evaluated based on the projected impacts of the withdrawals to existing legal users and water resources, including those with established MFLs. Additionally, as described in Chapter 4, in those areas where it is demonstrated that development of groundwater quantities from the LFA I can be done without exceeding any established MFLs and will otherwise avoid harm caused by withdrawals, such LFA I quantities may be viable water sources. Demonstration of meeting these requirements must be done on a case-by-case basis. To ensure that environmental impacts from groundwater withdrawals are minimized, it is the District's intent that 2045 demands to be met by groundwater will be significantly reduced by maximizing the efficient use of reclaimed water and implementation of conservation measures.

Currently, the WRWSA has conceptualized a 10 mgd LFA I wellfield, distribution system, and interconnection to serve growing demands in central Marion and northeastern Sumter counties. This wellfield may include withdrawal and treatment of predominantly fresh groundwater, with conceptual costs estimated at $250,000,000.

Section 2. Water Conservation Options

1.0 Non-Agricultural Water Conservation

The WRWSA identified potential conservation activities 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 DSS, I/C, and L/R water use sectors. A complete description of the criteria used in selecting these activities and the methodology for determining their water savings potential are described in Chapter 4.

Some readily applicable and effective conservation activities are not addressed in this RWSP due to the wide variance in implementation costs and the site-specific nature of their implementation (e.g., water-conserving rate structures). 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 required as part of WUP applications or renewals.

Below is a description of various non-agricultural water conservation options. Savings and costs for each are summarized in Table 5-1. It is understood that over time the breakout will change, but this is considered the best available information. The conservation activities implemented in this planning region are expected to be similar to the WRWSA, as most PS demands in the region are part of the WRWSA.

Table 5-1. *Conservation activity options for public supply*

Conservation Activity	2045 Public Supply Savings (mgd)[1]	Average Cost Effectiveness (Cost per 1,000 gallons saved)	Total Cost
Single-Family Residential High-Efficiency Toilet Replacement	0.1	$0.39	$494,550
High-User Irrigation Evaluation	0.15	$1.29	$1,477,362
High-User Irrigation Evaluation with Enhancement	0.13	$1.25	$1,269,679
High-User Irrigation Evaluation with WaterSense-labeled Controller	0.48	$0.58	$2,110,414
High-User WaterSense-Labeled Irrigation Controller	0.79	$0.32	$1,943,706
Average-User WaterSense-Labeled Irrigation Controller	0.92	$0.23	$1,588,850
Single-Family Residential Irrigation Nozzle Replacement	0.33	$0.86	$2,179,165
Rain Sensor Replacement	0.11	$1.30	$1,071,668
Single-Family Residential Rain Barrel (< 200 gal) Rebate	0.0	$16.12	$44,024
Single-Family Residential Washer Rebate (Water Factor ≤4)	0.03	$1.67	$406,217
Florida Friendly Yard Incentive Program	0.18	$0.60	$1,001,035
Workshops	0.01	$5.48	$444,638
WaterSense-Labeled Showerhead	0.01	$1.14	$105,056
WaterSense-Labeled Faucet Aerator	0.01	$1.13	$77,672
SFR HET+ Replacement	0.65	$0.68	$4,033,989
Total Public Supply	**3.90**	**$0.58[1]**	**$18,248,025**

Summation differences may occur due to rounding
[1]Total cost effectiveness is weighted by each activity's percent share of total savings in relation to the cost and is from October 2024 draft data for the 2024 WRWSA RWSP.

1.1 Description of Non-Agricultural Water Conservation Options

1.1.1 High-Efficiency Toilet Rebates (Residential)

High-efficiency toilet installation can yield substantial water savings.

High-Efficiency Toilet (HET) rebate programs offer financial incentives for replacement of inefficient high-flow toilets with more water-efficient models. High-Efficiency toilets (HETs) use 1.28 gpf or less, as opposed to older, less efficient models that use 3.5 gpf or more, depending on the age of the fixture. High-efficiency toilets (HETs) are WaterSense labeled by the EPA. Also, 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. Potential conservation savings were also calculated for offering rebates to homeowners to switch out 1.6 gpf toilets with models that use 1.1 gpf or less. The October draft data for the 2024 WRWSA RWSP refers to these as SFR HET+ replacements.

1.1.2 High-Efficiency Showerheads

This practice involves installing EPA WaterSense labeled, high-efficiency showerheads. This is an easy to implement, low-cost conservation option 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. Additional savings could be achieved through installation of more efficient showerheads using as low as 1.25 gpm.

1.1.3 High User Irrigation Evaluations

Irrigation evaluations generate water savings by assessing individual irrigation systems to provide expert guidance on opportunities to increase WUE. Such guidance may include optimization of run times and suggested repair of broken heads and leaks. An enhanced evaluation includes implementation of those changes, such as replacing broken or mixed sprinkler heads, capping unnecessary heads, and raising low irrigation heads. These evaluations can be further enhanced through installation of a WaterSense labeled irrigation controller. Irrigation evaluations are usually only available to high-use accounts that have inground irrigation systems and are likely over-watering. The Draft WRWSA 2024 RWSP estimates that approximately 20 percent of water customers are overwatering.

1.1.4 Rain Sensors

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

1.1.5 WaterSense-Labeled Smart Irrigation Controllers

WaterSense-Labeled smart irrigation controllers go a step further than rain sensors by automatically adjusting irrigation runtimes according to local landscape needs. Adjustments are often based on temperature, climate, rainfall, soil moisture, wind, slope, soil, plant type, and other factors. This data is obtained by an on-site evapotranspiration (ET) sensor or through the internet. Some units can be operated by smartphone 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. The Draft WRWSA 2024 RWSP includes two versions of this activity, one for high water users and one for average water users.

1.1.6 High-efficiency Residential Clothes Washers

Clothes washer conservation programs involve the replacement of old, inefficient clothes washers with EPA ENERGY STAR® rated ones. Conventional washers are estimated to use up to 15 gallons per cubic foot of laundry. This washer rebate program replaces conventional washers using more than 8 gallons per cubic foot of laundry with high-efficiency, ENERGY STAR clothes washers that use 4 gallons per cubic foot of laundry or less.

1.1.7 Faucet Aerators

These programs install or provide high-efficiency bathroom faucet aerators. Efficient aerator flow rates are a maximum of 1.5 gpm but can be as low as 0.5 gpm. This is a low-cost conservation option that can be easily implemented.

1.1.8 Single-Family Residential Rain Barrel Rebate

This program provides utility water customers with $50 toward the purchase of a rain barrel (less than 200 gallons) or a small rain cistern (200 to 500 gallons) to capture rainwater for lawn and landscape irrigation.

1.1.9 Florida-Friendly Yard Incentive Program

Florida-Friendly Landscaping™ (FFL) is a set of nine principles developed by UF that detail landscaping practices for protecting Florida's natural resources, including water. The Draft WRWSA 2024 RWSP includes a program for providing incentives for FFL landscape conversion projects. It is available to all utility customers using potable water for inground irrigation.

1.1.10 Workshops

Per the Draft WRWSA 2024 RWSP, workshops provide actionable information on ways to use water at home more efficiently and include a focus on water-efficient technologies and techniques for reducing outdoor water use. Savings are assumed to be 30 gpd per workshop, based on an assumed 10 households saving 3 gpd per workshop.

1.1.11 Single-Family Residential Irrigation Nozzle Replacement

Irrigation nozzles that use new designs and technology have been shown to use less water than conventional equipment. These new nozzles, which are often paired with pressure regulation, have slower application rates, better distribution uniformity, and reduced windblown overspray. A utility can offer rebates for these items or offer direct installation.

2.0 Agricultural Water Conservation Options

The District has a comprehensive strategy to significantly increase agricultural WUE 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 WUE. For more than 20 years, the District has administered programs that have provided millions of dollars to fund 255 projects that have helped farmers increase their WUE and improve water quality. Water conservation options for which the District will provide assistance are described below.

2.1 Facilitating Agricultural Resource Management Systems

The District, in cooperation with the FDACS, initiated the FARMS Program in 2003. The FARMS Program provides cost-share reimbursement for implementation of agricultural BMPs that involve both water quantity and water quality aspects. It is intended to expedite the implementation of production-scale agricultural BMPs that will help farmers become more efficient in their water use, improve water quality, and restore and augment natural systems. 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, with resource benefits achieved through either AWS or conservation (e.g., precision irrigation). These types of projects are discussed below. The goal for the FARMS Program is to offset 40 mgd of agricultural groundwater use in the SWUCA.

2.2 Facilitating Agricultural Resource Management Systems Conservation Potential

Districtwide, FARMS has funded 255 projects with agricultural cooperators, for a total estimated reduction in groundwater use of more than 32 mgd. In the Northern Planning Region, FARMS has funded 10 projects with an estimated reduction in groundwater use of about 0.33 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 have generally decreased participation. Historical funded project information (2004 to 2024) was used to develop a long-term trend line for estimating potential future program activity. Despite decreasing participation, if current trends in agriculture and District cooperation continue, the FARMS Program has the potential to reduce groundwater use by approximately 2 mgd over the planning period through development of precision irrigation projects. The projected cost of these projects is nearly $1.8 million. There is not enough data to detect a trend in AWS projects in the Northern Planning Region.

<u>**Tailwater Recovery**</u>

Tailwater recovery has proven to achieve both water quality improvements and groundwater conservation. Tailwater ponds are typically excavated below ground level at the low end of a farm to collect excess irrigation water and stormwater runoff. 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 0.14 mgd of groundwater to irrigate 53 acres of blueberries. The goal of the project is to reduce groundwater withdrawals using two tailwater recovery/surface water collection reservoirs. The project was implemented in two phases with two reservoirs, including 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 of its permitted quantities, or 0.07 mgd. Actual groundwater offset is approximately 0.12 gpd.

<u>**Precision Irrigation Systems**</u>

Precision irrigation systems allow for automatic remote control of irrigation pumps using soil moisture sensors that measure and monitor discrete sub-surface moisture levels. The system enables the grower to maintain soil moisture within optimized ranges, thus reducing the potential for overwatering and preventing under-watering to avoid reduction in crop yields. Irrigation efficiencies can also be achieved through the use of automatic valves and on-off timers. These devices can be programmed to start and stop irrigation pumps to achieve maximum efficient irrigation durations. Without automatic valves and timers, the pumps must be manually turned off, which may not occur at the most optimum time. Several different types of electronic systems that increase irrigation system efficiency have been implemented through the FARMS Program.

An example of precision irrigation in the Northern Planning Region is Marshall Tree Farm, Inc. They are a 181-acre field nursery just south of Williston in Levy County, within the Rainbow River springshed and permitted for approximately 1.80 mgd for supplemental irrigation. The FARMS Program funded a precision irrigation project that included automated pump control. It is estimated that this project will reduce groundwater use by approximately five percent (0.09 mgd).

Because the District classifies FARMS projects as WRD, 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 (MIL) program is a cooperative initiative between the District and the United States Department of Agriculture (USDA) 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 has 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 FDACS in cooperation with a wide spectrum of stakeholders within the community specific to that crop. Best management practice (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 RIBs and spray fields and using it beneficially and/or increasing reclaimed water quality. Listed below are 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, or groundwater) into the reclaimed water system to expand available supply
- **AR:** injection of reclaimed water into an aquifer for beneficial use of excess water to directly or indirectly recharge aquifers
- **Indirect Potable Reuse (IPR):** introduction of reclaimed water to create/restore natural systems and enhance aquifer levels, otherwise known as natural system enhancement/recharge
- **Direct Potable Reuse (DPR):** purification of reclaimed water to meet drinking water standards prior to introduction into a potable raw water source or distribution system.
- **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 on water quality and future uses
- **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/Interconnects:** construction of multiple components (transmission, distribution, and storage) necessary to deliver reclaimed water to more customers and system interconnections to enhance supply and better use the resource.

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

Reclaimed water is being investigated as a potable water source as a result of more frequent drought and long-term water shortages occurring within other states and countries. The unintentional use of reclaimed water as an indirect potable source is not new, as many surface water sources used for potable raw water supplies have upstream wastewater/reclaimed water discharges. 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 treating reclaimed water to state and federal drinking water standards so 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. Direct potable reuse is currently being investigated by several utilities within the District, as there is increasing interest in the concept, and it is recognized as a viable future water supply option in this RWSP.

Table 5-2 includes one reclaimed water project option for the planning region. The quantity of reclaimed water available for this option is based on wastewater flows anticipated to be available in 2045 at a utilization rate of 75 percent (Chapter 4 Appendix, Table 4.2).

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

Option Name and Entity	County	Type	Supply (mgd)	Benefit (mgd)	Capital Cost (Millions)
City of Brooksville - Hernando Oaks Golf Reuse	Hernando	System Expansion	0.25	0.20	$0.60
Total			**0.25**	**0.20**	**$0.60**

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 option identified below is based on the Withlacoochee River System's flow characteristics, future demand for water supply in the region, and associated environmental resource data.

WRWSA Regional Surface Water Treatment Plant on the Upper Withlacoochee River

- Entity Responsible for Implementation: WRWSA

This option is for development of a surface water supply facility with a capacity of 10 mgd to serve WRWSA customers. Water would be withdrawn from the Withlacoochee River and would require an off-stream reservoir to achieve the desired supply reliability. Project components would also include a river intake and pumping station, a transfer pump station, a WTF, finished water storage tanks, a finished water pumping station, and finished water transmission mains. Table 5-3 contains project details.

Table 5-3. *Regional Surface Water Treatment Plant on the Upper Withlacoochee River*

Quantity Produced (mgd)	Capital Cost	Capital Cost per mgd
10	$650,000,000	$65,000,000

Considerations:

- 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 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.

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. Requests for brackish groundwater withdrawals would be evaluated similarly to requests for fresh groundwater withdrawals.

Section 6. Seawater Desalination Options

There are currently no proposed seawater desalination options for the planning region.

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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 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 2020 and are included to report on the status of implementation since the previous RWSP.

The demand projections presented in Chapter 3 show that approximately 48.62 mgd of new water supply will need to be developed during the 2025 to 2045 planning period to meet demand for all use sectors in the planning region. As of 2019, it is estimated that approximately six percent of that demand (2.91 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 Projects

1.0 Non-Agricultural Water Conservation

1.1 Cooperatively-Funded Water Conservation Projects

Since 2020, the District has cooperatively-funded multiple outdoor and indoor water conservation projects in the Northern Planning Region. These projects include toilet rebates, irrigation evaluations, and comprehensive conservation programs including a variety of indoor and outdoor BMPs. These programs are expected to cost the District and cooperating local governments a combined $1,291,022 and yield a potable water savings of approximately 266,429 gallons per day.

1.2 Water Incentives Supporting Efficiency (WISE) Conservation Projects

The Water Incentives Supporting Efficiency (WISE) Program was created in 2019 to provide funding for incentivizing conservation for nonagricultural users. Projects may include both indoor and outdoor conservation in various sectors including multifamily, I/C, and L/R. In the Northern Planning Region, a total of 18 projects have been funded saving an estimated 57,682 gpd with total project costs of $373,344. Table 6-1 details water conservation projects recently completed or under development in the planning region.

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

Cooperator	Project Number	General Description	Savings (gpd)	Total Cost[1]	District Cost	$/1,000 gal Saved
Cooperative Funding Initiative (CFI) Water Conservation Projects						
Marion County	N999	Toilet Rebate	10,190	$64,000	$32,000	$1.75
Citrus County	Q070	Irrigation Controller	60,668	$87,242	$43,621	$0.59
Citrus County	Q137	Irrigation Controller	33,486	$47,720	$23,860	$0.58
WRWSA	Q138	Irrigation Evaluations	38,085	$117,277	$58,639	$2.04
Bay Laurel Center CDD	Q211	Irrigation Controller	4,842	$11,808	$5,904	$1.00
Crystal River	Q193	Toilet Rebate	7,098	$18,180	$9,090	$1.68
Citrus County	Q254	Indoor/Outdoor Conservation Program	25,013	$86,794	$43,397	$1.39
Bay Laurel Center CDD	Q255	Indoor/Outdoor Conservation Program	27,492	$329,500	$164,750	$4.89
WRWSA	Q306	Irrigation Evaluations	24,756	$102,000	$51,000	$2.83
Bay Laurel Center CDD	Q311	Indoor/Outdoor Conservation Program	28,751	$383,800	$191,900	$4.34
Citrus County	Q320	Indoor/Outdoor Conservation Program	6,048	$42,700	$21,350	$2.57
		CFI Total	266,429	$1,291,022	$645,511	
Water Incentives Supporting Efficiency (WISE) Conservation Projects[2]						
Sarina-Asha Hotels, LLC	8	Toilet Retrofit	711	$12,168	$6,084	$4.78
Jubilee Hotels LLC	9	Toilet Retrofit	606	$9,760	$4,880	$4.49
City of Crystal River	10	Toilet Retrofit	2,829	$18,180	$737	$2.21
BWO Investment LLC	11	Toilet Retrofit	1,453	$24,980	$12,481	$5.39
Hernando County School District	16	Toilet Retrofit	2,328	$32,550	$16,275	$3.90
Hernando County School Distict	19	Toilet Retrofit	1,861	$8,190	$4,095	$1.40
Hernando County School District	20	Toilet Retrofit	671	$8,141	$1,722	$1.43
Crystal River Hotel Investment Group LLC	24	Toilet Retrofit	1,602	$19,150	$9,575	$3.58
Wellington at Seven Hills	26	Irrigation Retrofit	2,528	$8,585	$4,293	$2.33

The Moorings at Point O'Woods HOA	35	Irrigation Retrofit	2,512	$23,000	$11,500	$3.74
Wellington at Seven Hills	42	Irrigation Retrofit	3,614	$9,651	$4,825	$1.83
Continental Country Club RO Inc.	49	Irrigation Retrofit	5,012	$38,450	$19,225	$2.14
Sarina-Asha Hotels LLC	51	Showerheads	883	$4,125	$2,063	$2.23
Wellington at Seven Hills HOA	52	Irrigation Retrofit	3,606	$9,853	$4,582	$1.87
Wellington Seven Hills Homeowners Association	58	Irrigation Retrofit	2,293	$8,055	$4,027	$2.41
Continental Country Club RO	61	Irrigation Retrofit	11,340	$97,822	$20,000	$2.41
Citrus County	62	Irrigation Controller Rebates	9,810	$39,700	$19,850	$1.65
Castle Pines Village HOA INC	67	Irrigation Retrofit	4,023	$985	$493	$0.10
WISE Total			**57,682**	**$373,344**	**$146,706**	
Conservation Total			**324,111**	**$1,664,366**	**$792,217**	

Summation differences may occur due to rounding
[1]The total project cost may include variable project-specific costs including marketing, education and administration.
[2]WISE project list is from program conception in 2019 through approved projects in April 2024

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 FARMS, Mini-FARMS, and well back-plugging programs are not included in this section because the District classifies them as WRD. These program details, including projects under development, are within Chapter 7, Water Resource Development.

2.1 Institute of Food and Agricultural Sciences Research and Education Projects

The District provides funding for IFAS investigations on a variety of agriculture and urban landscape irrigation issues that involve BMPs including water conservation.. These include 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. Research is conducted by IFAS, who then promotes the results to the agricultural community. The District has funded research on strawberries, citrus, tomatoes, potatoes, peaches, biofuel grasses, turfgrass, peppers, blueberries, and various landscape and nursery ornamental plants and trees. Of the 67 funded research projects, 62 have been completed. Completed projects include 14 on urban landscape issues and 48 pertaining to 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 BMPs that will conserve water Districtwide. Specific benefits to the planning region are dependent on the dominant commodities in that planning region. The five ongoing projects are listed in Table 6-2.

Table 6-2. *Water conservation research projects*

Project	Total Project Cost (District + Cooperator)	Total Project and Land Cost	Funding Source	Planning Region(s)
Compact Bed Geometries for Watermelon in Southwest Florida	$282,460	$282,460	District	All
Florida Automated Weather Network (FAWN) Data Dissemination and Education	$500,000	$500,000	District	All
Micro-irrigation for Reducing Water Use for Bare-root Strawberry Establishment and Freeze Protection	$301,629	$301,629	District	All
Water-Nutrient Smart Production Systems with Compact Bed Geometry Technology: Water, Production and Economics	$299,000	$299,000	District	All
Top Dressing Lawns for Reducing Irrigation	$58,000	$58,000	District	All
Total	**$1,441,089**	**$1,441,089**		

Section 2. Reclaimed Water Projects

1.0 Reclaimed Water Projects: 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 reclaimed water utilization. Table 6-3 lists two reclaimed water projects currently under development, as well as three existing facilities with anticipated future supply growth. 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 webpage 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.

Reclaimed water pipe

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

Entity	General Project Description	Reuse			Customer (#)		Costs	
		Produced	Benefit	Stored (Million Gallons)	Type	Total	Total	District[1]
Citrus County								
Citrus County Point O Woods	Growth of Flow to Golf Course	0.01	0.01	-	Golf Course	1	Prior	Prior
Citrus Sugarmill Woods	Transmission/Storage/ Pumping (Q105)	0.50	0.38	1	Golf Course	2	$3,918,000	$1,959,000
Hernando County								
Hernando County	Transmission (N696)	0.30	0.30	NA	Golf Course	1	$12,000,000	$9,000,000
City of Brooksville	Growth of Flow to Mine	0.36	0.36	NA	Industrial	1	Prior	NA
Sumter County								
Villages	Growth of Flow to Golf Courses	1.93	1.45	Prior	Golf Course	TBD	Prior	NA
Total		**3.10**	**2.50**	**1.00**		**5**	**$15,918,000**	**$10,959,000**

Summation differences may occur due to rounding
[1]Costs include all revenue sources budgeted by the District.

Section 3. Brackish Groundwater Desalination Projects

There are no brackish groundwater projects under development in the Northern Planning Region.

Section 4 Aquifer Recharge Projects

1.0 Indirect Recharge

Although government utilities have active projects using indirect AR in the Northern Planning Region by implementation of reclaimed water RIBs 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 UFA 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 to minimize nutrient loading. There are no direct AR projects in the planning region.

Chapter 7. Water Resource Development Component

This chapter addresses the legislatively required WRD activities and projects that are conducted primarily by the District. The intent of WRD projects is to enhance the amount of water available for reasonable-beneficial uses and for natural systems. Section 373.019, F.S., defines WRD 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 government-owned and privately owned water utilities"* (Subsection 373.019 [24], F.S.). The District is primarily responsible for implementing WRD; 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 WRD efforts into two categories: (1) data collection and analysis activities that support water supply development by local governments, utilities, regional water supply authorities, and others, and (2) regional projects designed to create an identifiable supply of water for existing and/or future reasonable-beneficial uses. Activities within each of these categories are discussed below in Section 1 and Section 2, respectively.

Section 1. Data Collection and Analysis Activities

The District budgets significant funds annually to implement WRD data collection and analysis activities to monitor natural systems and support WSD. Table 7-1 displays the FY2025 budget and anticipated five-year funding levels for Districtwide data collection and analysis activities. Approximately $24.5 million will be allocated toward these activities annually for a five-year total of approximately $117.9 million. Budgets are developed annually and are projected to be more-or-less constant; therefore, future funding estimates for activities are set equal to FY2025 funding. These activities are funded by the Governing Board's allocation of ad valorem revenue collected within the District along with additional funding from water supply authorities, local governments, and the USGS. The activities listed in Table 7-1 are described in subsections 1.0 through 5.0, as follows.

Table 7-1. *Water resource development data collection and analysis activities (Districtwide)*

	WRD Data Collection and Analysis Activities	FY2025 Funding	Anticipated 5-Year Funding	Funding Partners
1.0	**Research, Data Collection, and Analysis Activities**			
1.1	Surface Water Flows and Levels	$4,616,759	$23,083,795	SWFWMD, Local Cooperators, USGS
1.2	Geohydrologic Data (includes ROMP)	$5,682,667	$28,413,335	
1.3	Meteorological Data	$269,204	$1,346,020	
1.4	Water Quality Data	$791,634	$3,958,170	
1.5	Groundwater Levels Data	$990,812	$4,954,060	
1.6	Biologic Data	$1,051,788	$5,258,940	
1.7	Data Support	$4,683,423	$23,417,115	
2.0	**Minimum Flows and Levels Program**			
2.1	Technical Support	$931,421	$4,657,105	SWFWMD
2.2	Establishment/ Evaluation	$655,827	$3,279,135	
3.0	**Watershed Management Planning**	$3,586,610	$11,586,610	SWFWMD, Local Cooperators, FDEP
4.0	**Quality of Water Improvement Program**	$808,604	$4,043,020	SWFWMD
5.0	**Stormwater Improvements: Implementation of Storage and Conveyance BMPs**	$404,421	$3,904,421	SWFWMD
	Total	**$24,473,170**	**$117,901,726**	

1.0 Hydrologic Data Collection

The District has a comprehensive scientific data monitoring program that includes the assembly of information on key indicators such as rainfall, surface water and groundwater levels, water quality, hydrogeology, and stream flows. The program includes data collected by District staff as well as data collected as part of the District's cooperative funding program with the USGS. Data collected 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 develop programs to correct existing problems and prevent future problems from occurring. The data collection activities support District structure operations, water use and environmental resource permitting and compliance, MFLs evaluation and status assessments, the SWIM Program, the NTBWUCA, the SWUCA, the DPCWUCA, water supply planning in the District and CFWI regions, modeling of surface water and groundwater systems, cooperative and district initiative project development and monitoring, and many resource evaluations and reports.

The categories of hydrologic data that are collected and monitored by District staff are discussed below. In addition to data collection completed or contracted by the District, hydrologic data submitted by WUP holders are also considered to assess compliance with permit conditions.

1.1 Surface Water Flows and Levels

This includes data collection at approximately 798 surface water level gauging sites and cooperative funding with the USGS for discharge and water-level data collection at 131 river, stream, and canal sites. The USGS data are available to District staff and the public through the District's Environmental Data Portal and through the USGS National Water Dashboard.

1.2 Hydrogeologic Data

The Geohydrologic Data Section collects hydrogeologic data and oversees monitor well construction activities for the District. Lithologic, hydraulic, and water quality data are collected during exploratory coring and testing and during the construction of monitor wells. Projects supported by these geohydrologic activities include the CFWI, WRAPs, MFLs, sea level rise and development of AWS. The ROMP has been the District's primary source of hydrogeologic data since the program was established in 1974.

1.3 Meteorologic Data

The meteorologic data monitoring program consists of measuring rainfall totals at 171 rain gauges, all of which provide near real-time data. The 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 ET station for reference near Lake Hancock and for District participation in a cooperative effort between the USGS and all five Florida WMDs to map statewide potential and reference ET using data measured from the Geostationary Operational Environmental Satellites (GOES). Funding also includes a collaborative effort between the five WMDs to provide high-resolution gauge adjusted radar rainfall data that are used for hydrologic conditions reporting and modeling purposes.

1.4 Water Quality Data

The District collects data from water quality monitoring networks for springs, streams, lakes, wells, and coastal and inland rivers. The well monitoring networks include the Coastal Groundwater Quality Monitoring Network (CGWQMN), Inland Floridan Aquifer System Monitoring Network (IFASMN), and the Upper Floridan Aquifer Nutrient Monitoring Network (UFANMN). 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. The CGWQMN, which involves sample collection and analysis from approximately 380 wells across the District, monitors saltwater intrusion and/or the upwelling of mineralized waters into potable aquifers. The USGS collects water quality data at 17 sites, which is available from their website.

1.5 Groundwater Levels

The funding provides for the maintenance and support of about 1,655 monitor wells in the data collection network. Data may be collected in 15-minute intervals, hourly, daily, or monthly. The District also uses funding to contract with the USGS to obtain continuous and monthly water levels at 15 sites. The data are available to the public through the District and USGS websites.

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 annually and a five-year assessment of almost 400 wetlands to document changes in wetland health and assess level of recovery in impacted wetlands. Funding also supports SWIM Program efforts for mapping of seagrasses every two years along the Suncoast (Tampa Bay south to Charlotte Harbor), and every four years along the Springs Coast (Anclote Key to Waccasassa Bay).

1.7 Data Support

This item provides administrative and management staff support for the hydrologic, water quality, meteorologic and hydrogeologic data programs as well as the chemistry laboratory, surveying, and the District's LoggerNet data acquisition system and Kister's Water Information System (WISKI) and associated Environmental Data Portal used for database management, storage, and reporting.

2.0 Minimum Flows and Levels Program

Section 373.042, F.S., requires the state WMDs or the FDEP to establish MFLs for aquifers, surface watercourses, and other surface water bodies to identify the water level or limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. Minimum flows for rivers, streams, estuaries, and springs and minimum water levels for lakes, wetlands, and aquifers are adopted into District Water Levels and Rates of Flow rules, Chapter 40D-8, 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 Consumptive Use of Water 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. A publicly-noticed independent scientific peer review process is used to support establishment of MFLs for flowing systems and aquifers, for establishing MFLs for other system 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, assessing the recovery of water bodies where significant harm has occurred, and also support MFLs and reservation reevaluations.

As of June 2024, the District has planned to monitor and assess the status of 207 adopted MFLs, including MFLs for 28 river segments, 10 springs or spring groups, 126 lakes, 34 wetlands, 9 aquifer sites including seven UFA wells in the NTBWUCA, the UFA in the MIA of the SWUCA, and the UFA in the DPCWUCA. The District also plans to monitor and assess the status of 2 adopted reservations, including a reservation for water stored in Lake Hancock and released to lower Saddle Creek for recovery of MFLs adopted for the upper Peace River, and a reservation for water from Morris Bridge Sink for recovery of MFLs adopted for the lower Hillsborough River. In addition, the District is scheduling the establishment or reevaluation of 26 MFLs and one reservation through calendar year 2027.

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 published in the CAR the following March. The currently 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 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 CFI. Additionally, flood hazard information generated by the WMPs is used by the Federal Emergency Management Agency (FEMA) to revise flood insurance rate maps (FIRM). 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 QWIP was established in 1974 through Chapter 373, F.S., to restore groundwater conditions altered by well drilling activities for domestic supply, agriculture, and other uses. It's primary goal is to preserve groundwater and surface water resources by reimbursing landowners for the cost to properly plug abandoned or deteriorating artesian wells on their property. Thousands of wells constructed prior to current well construction standards were often deficient in casing, which interconnected aquifers and enabled poor-quality mineralized water to migrate into aquifers containing potable-quality water. Plugging abandoned artesian wells eliminates the waste of water at the surface and prevents mineralized groundwater from contaminating other aquifers and surface water bodies. Historically, this program has proven to be a cost-effective method to promote the plugging of such wells.

The region of emphasis for the QWIP is the SWUCA where the UFA is confined. Plugging abandoned wells, which involves filling them from the bottom to the top with cement and/or bentonite, re-establishes the natural isolation between aquifers, preventing the mixing of varying water qualities and the free flow of water at the surface. Before an abandoned well is plugged, QWIP staff collect geophysical logs that measure several hydrologic and geologic properties for inclusion in the District's database. While this is done primarily to determine the eligible reimbursement, the data can also be used to ensure the appropriate amount of material is used to properly plug the well. The QWIP benefits landowners, water well contractors, and the water resources of the District.

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, FDEP, or other state funding. As stormwater is a primary contributor of water quality degradation in older urban areas, the District seeks opportunities to work with local cooperators to retrofit or improve these systems to reduce impacts to receiving waters.

Section 2. Water Resource Development Projects

As of FY2025, the District has budgeted for 12 WRD projects that are ongoing. The projects are listed in Table 7-2, along with their funding to date, total costs, participating cooperators, estimated water quantity to be become available, and the planning region benefited by the project. District funding for a number of these projects is matched to varying degrees by local cooperators including municipalities, state agencies, private agricultural operations, and others. The total cost of these projects, including the cooperator shares, is approximately $130 million. 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. It's estimated that approximately 49.3 mgd of additional water supply will be produced or conserved. The WRD projects are organized into three groups that are detailed below: ASR Feasibility and Pilot Testing, FARMS, and Environmental Restoration and MFL Recovery Projects.

Table 7-2. *Water resource development projects, costs, and District funding*

	Water Resource Development Projects	Prior District Funding through FY2024	Total Project Cost (District + Cooperator)	Funding Source	Water to Become Available	Planning Region of Benefit
1) Aquifer Storage and Recovery Feasibility and Pilot Projects						
1.1	Southern Hillsborough Aquifer Recharge Program (SHARP) Phase 2 (N855)	$4,058,820	$8,217,640	SWFWMD, Hillsborough County	4 mgd	TBPR
1.2	Hydrogeologic Investigation of Lower Floridan Aquifer in Polk County (P280)	$12,000,000	$12,000,000	SWFWMD	NA	HPR
1.3	Optical Borehole Imaging Data Collection from LFA Wells (P925)	$100,200	$167,000	SWFWMD, USGS	NA	HPR

	Water Resource Development Projects	Prior District Funding through FY2024	Total Project Cost (District + Cooperator)	Funding Source	Water to Become Available	Planning Region of Benefit
1.4	Sources/Ages of Groundwater in LFA Wells (P926)	$368,300	$736,600	SWFWMD, USGS	NA	HPR
1.5	Direct Aquifer Recharge-North Hillsborough Aquifer Recharge Program Phase 2 (Q064)	$750,000	$1,500,000	SWFWMD, Hillsborough County	NA	TBPR
1.6	Sarasota County - Bee Ridge Water Reclamation Facility Aquifer Recharge (Q159)	$915,511	$1,831,022	SWFWMD, Sarasota County	5 mgd	SPR
2) Facilitating Agricultural Resource Management Systems (FARMS)						
2.1	FARMS Projects	$54,558,138	$92,997,636	SWFWMD, FDACS, state of Florida, private farms	32.5 mgd	All
2.2	Mini-FARMS Program	$2,128,157	$3,125,718	SWFWMD	1.88 mgd	All
3) Minimum Flows and Minimum Water Levels (MFL) Recovery						
3.1	MIA Recharge SWIMAL Recovery at Flatford Swamp (H089)	$6,635,702	$6,635,702	SWFWMD	2 mgd	SPR, HPR
3.2	Pump Stations on Tampa Bypass Canal (H404-1)	$1,174,982	$2,024,982	SWFWMD	3.9 mgd	TBPR
3.3	Third Five-Year Assessment of the Lower Hillsborough River Recovery Strategy (H400-7)	$263,944	$263,944	SWFWMD	NA	TBPR
3.4	Lower Hillsborough River Biological Data Collection (H400-13)	$0	$40,000	SWFWMD	NA	TBPR

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

1.0 Aquifer Storage and Recovery Feasibility and Pilot Testing

The following projects are research and/or pilot projects designed to further the development of the innovative AWS described in the RWSP. The projects for investigation of the LFA are primarily District-led initiatives. The ASR and AR projects may involve both technical and financial assistance from the District.

1.1 Southern Hillsborough Aquifer Recharge Program (SHARP) Phase 2 (N855)

This project is a continuation of Hillsborough County's program to develop AR of reclaimed water into the non-potable zone of the UFA along the coast in the southern portion of Hillsborough County. The goal of the project is to improve water levels within the MIA of the SWUCA and possibly slow the rate of inland movement of saltwater intrusion in the area, with future consideration of IPR. The project includes transmission mains, two reclaimed water recharge wells (2 mgd each), monitoring wells, and associated appurtenances.

1.2 Hydrogeologic Investigation of LFA in Polk County (P280)

This project explores the LFAs in Polk County to assess their viability as an AWS source and to improve understanding of LFA 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 LFAs, and determine the practicality of developing the LFAs as an AWS source in areas facing future water supply deficits. Data from this project will also add to the geologic inputs in the DWRM and East-Central Florida Transient Expanded (ECFTX) model for the LFAs to assess potential withdrawal-related impacts to water resources in the District.

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

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

1.4 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 water from the LFAs and lower portions of the UFA. This data will aid in understanding 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.

1.7 Direct Aquifer Recharge-North Hillsborough Aquifer Recharge Program Phase 2 (Q064)

This project includes completion of a direct AR feasibility study, which includes construction and testing of three exploratory wells necessary to evaluate recharge locations for the North Hillsborough Aquifer Recharge Program (NHARP). The study will aid in determining 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.

1.8 Sarasota County - Bee Ridge Water Reclamation Facility Aquifer Recharge (Q159)

This project includes the construction of two recharge and three monitor wells, pump station, interconnecting piping, and appurtenances for the recharge of reclaimed water meeting high-level disinfection standards into the UFA for SWUCA/MIA recovery.

2.0 Facilitating Agricultural Resource Management Systems (FARMS) Projects

The FARMS Program is an agricultural BMP cost-share reimbursement program. The program is a public/private partnership developed by the District and the FDACS. The program provides incentives to the agricultural community within the District to implement agricultural BMPs that will provide resource benefits including the reduction of groundwater withdrawals from the UFA, improvement of ground and surface water quality impacted by groundwater withdrawals, and improvement of natural-system functions within wetlands and priority watersheds.

The FARMS Program operates under District Governing Board Policy to fund projects that provide these benefits while assisting in the implementation of the District's RWSP. This plan identifies strategic initiatives and regional priorities to meet the District’s water management goals. These goals are based on improving and/or maintaining the water resource conditions of several regions within the District. Five primary goals for the FARMS Program are to:

- Improve surface water quality which has been impacted by groundwater withdrawals with priority given to projects in the Shell, Prairie, and Joshua Creek, or Horse Creek watersheds;
- Conserve, restore or augment the water resources and natural systems in the Upper Myakka River Watershed (UMRW);
- Reduce groundwater use in the SWUCA;
- Reduce groundwater use for frost/freeze protection within the DPCWUCA;
- Reduce UFA groundwater use and nutrient loading impacts in the Northern District.

The FARMS projects implement FDACS-approved BMPs that offset groundwater use with surface water and/or increase the overall efficiency of irrigation water use. Many projects have the added benefit of reducing agricultural impacts to surface water features. Properly implemented BMPs protect and conserve water resources and may increase crop production.

2.1 FARMS Cost-Share Projects

Facilitating Agricultural Resource Management Systems (FARMS) projects employ many of the agricultural water conservation strategies described in the RWSP to reduce groundwater withdrawals by increasing the WUE 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 WUE 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. Facilitating Agricultural Resource Management Systems (FARMS) projects not only offset groundwater use with surface water but increase the overall efficiency of irrigation water use. The District has routinely budgeted approximately $4 million annually for these projects.

A listing of cost-share projects within the planning region that have been Board-approved from FY2020 to FY2024 is provided in Table 7-3. Since FARMS Program inception and as of

September 2024, there were 255 approved FARMS projects including ten in the Northern Planning Region. These projects are projected to have a cumulative groundwater offset of 32.5 mgd Districtwide and 0.33 mgd for the planning region.

Table 7-3. *FARMS cost-share project in the Northern Planning Region funded (FY2020-FY2024)*

Project Description	District Budget FY2020 to FY2024	Benefit (mgd)
Marshall Tree Farm	$31,707	0.09
Total	**$31,707**	**0.09**

Notes: Projects were selected by funds budgeted in FY2020 to FY2024, 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 to conserve water and protect water quality within the District. Mini-FARMS assists 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 Program, 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 through FY2023 was $8,000 per agricultural operation per year. Beginning in FY2024, the maximum reimbursement was increased to $10,000; however, the maximum cost-share rate remains at 75 percent of project costs.

From FY2006 through FY2024, the District has co-funded 404 water conservation BMP projects through the Mini-FARMS Program. The total cost of these projects was $3,125,718, and the District's reimbursement was $2,128,157. The Mini-FARMS Program continues to receive a strong demand from growers within the District, and it is projected that at least $500,000 will be budgeted for projects annually.

3.0 Environmental Restoration and Minimum Levels and Flows Recovery Projects

These projects include MFL recovery projects for the Hillsborough River Recovery Strategy, the upper Peace River, and SWUCA SWIMAL in support of the SWUCA Recovery Strategy.

3.1 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 UMRW. 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/near the MIA. Construction is complete on the active AR site, and data collection on operational testing is ongoing.

3.2 Lower Hillsborough River Recovery Strategy Morris Bridge Sink (H404-1)

This project will construct a pump station and pipeline components to divert surface water from the Morris Bridge Sinkhole to the upper pool of the TBC. A second pump station will be used to transfer water to the canal's middle pool, where it can be conveyed through the reservoir to the lower Hillsborough River (LHR) during low-flow periods to help implement minimum flows. This project also includes required environmental monitoring.

3.3 Third Five-Year Assessment of the Lower Hillsborough River Recovery Strategy (H400-7)

The District established revised MFLs for the LHR in 2007. Since the MFLs were not being met, the District incorporated a recovery strategy for the river into Rule 40D-80.073, F.A.C. As part of the recovery strategy, the District must complete three five-year assessments.

3.4 Lower Hillsborough River Biological Data Collection (H400-13)

This project includes biological data collection in support of recovery strategy for the LHR. The recovery strategy specifies that salinity, biological and water quality information for the lower river will be evaluated as part of the recovery strategy.

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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 2045 and restore 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 RWSP. The table shows that approximately 215.35 mgd of new water supply is needed to meet user demands and to restore natural systems.

Table 8-1. *Total projected increases in demand (5-in-10) (mgd) by planning region (2020-2045)*

Planning Region	Projected Demand Increase
Heartland	59.61
Northern	48.62
Southern	40.89
Tampa Bay	66.23
Total	**215.35**

Note: Summation differences may occur due to rounding.

A portion of the total demand shown above will be met by existing permitted quantities; however, new regional infrastructure will be required to deliver permitted quantities to end users, and additional WSD is necessary to maintain adequate capacity for peak demand periods and continuing growth.

To estimate the capital cost for projects needed to meet demands, the District has compiled a list of large-scale WSD projects (Table 8-2). 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. The amount of funding that will likely be generated through 2045 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, F.S., describes the role of the WMDs regarding funding WSD and WRD 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 be responsible for securing necessary funding for regionally significant water resource development projects, including regionally significant projects that prevent or limit adverse water resource impacts, avoid competition among water users, or support the provision of new water supplies in order to meet a minimum flow or minimum water level or to implement a recovery or prevention strategy or water reservation.

(2)(c) Local governments, regional water supply authorities, and government-owned and privately owned water 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 role of the WMDs regarding providing funding assistance for the development of AWS:

(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 applicable statutes, direct beneficiaries of WSD projects generally bear the costs of projects from which they benefit. However, affordability and benefits to natural resources are 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 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 used, may also contribute to source development, treatment, and transmission construction cost debt service. Volume charges contribute to both source development/treatment/transmission debt service and operation and maintenance.

Community development districts 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 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 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 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, 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 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).

Section 2. Water Management District

The District's Governing Board provides significant financial assistance for conservation, planning, and AWS projects through programs including CFI and District initiatives. Financial assistance is provided primarily to governmental entities, but private entities also participate in these programs. State funding is also allocated through state appropriations for the Water Protection and Sustainability Program, Alternative Water Supply Development, the Florida Forever (FF) Program, the FARMS Program, and Springs Initiatives.

1.0 Cooperative Funding Initiative

The District's primary funding mechanism is the CFI, which includes funding for major regional and localized WSD and WRD projects throughout the District's 16-county jurisdiction. The Governing Board 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 where 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. Beginning in 2023, state and federal funds may be applied to cost increases incurred above the Governing Board approved total project cost, before equally reducing both parties' share. The CFI has been highly successful, having resulted in a combined investment (District and cooperators) of more than $4.1 billion since 1988. This investment has been for a variety of water resource projects addressing the District's four areas of responsibility: (1) water supply, (2) natural systems, (3) flood protection, and (4) water quality. From FY2021 through FY2025, the District's adopted budget included an average of $52 million in ad valorem tax dollars for the CFI, of which more than half each year was specifically for WRD and WSD assistance.

2.0 District Initiatives

Projects funded through District initiatives 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 QWIP 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, (4) the FARMS Program, and other various agricultural research projects designed to increase the WUE of agricultural operations, (5) WRD investigations and MFL recovery projects which may not have local cooperators, and (6) the WISE Program launched in 2019 to offer cost-share funding for a wide variety of water conservation projects (max of $20,000 per project) to non-agricultural entities. From FY2021 through FY2025, the District's adopted budget included an average of $22.1 million in ad valorem tax dollars for District Initiatives, of which nearly half was specifically for WRD and WSD assistance.

The average total commitment from FY2021 through FY2025 for CFI and District Initiatives was approximately $100.8 million in ad valorem taxes. The continued level of investment for these programs depends on economic conditions, resource demands, and the District's financial resources. However, the District believes its resources are sufficient to ensure long-term sustainability of the region's water resources moving forward.

Section 3. State Funding

1.0 FDEP Springs Initiative

The FDEP Springs Initiative is a special legislative appropriation that has provided revenue for protection and restoration of major spring systems. The District has allocated Springs Initiative funding to implement projects to restore aquatic habitats, reduce groundwater withdrawals and nutrient loading within first-magnitude spring sheds, and improve the water quality and quantity of spring discharges. Projects include the re-establishment of aquatic and shoreline vegetation near spring vents, construction of infrastructure necessary to convey wastewater in priority focus areas of Outstanding Florida Springs (i.e., conversion of septic systems to sewer) which may increase reclaimed water production, and implementation of other BMPs within spring shed basins.

Since FY2014, over $78.4 million from the FDEP has been allocated for springs restoration in the Northern Planning Region, including funding for reclaimed water projects providing approximately 4.5 mgd in additional reuse flows and 3 million gallons in reclaimed water storage.

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 AWS and later recreated in Chapter 373, F.S., as part of the 2009 legislative session. Legislation focused on encouraging cooperation in the development of AWS and improving the linkage between local governments' land use plans and WMD's RWSPs. The program provides matching funds to the District for alternative WSD assistance. From FY2006 through FY2009, the District was appropriated a total of $53.75 million by the Legislature through the WPSPTF for WSD projects. An additional $700,000 in appropriations were allocated to the District between FY2020 and FY2021.

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 every year. The legislation also requires that a minimum of 80 percent of the WPSPTF funding be related to projects identified in a district water supply plan. The District's RWSP is utilized in the identification of the majority of WPSPTF-eligible projects. Projects are evaluated for funding based on 14 factors described in Subsections 373.707(8)(f) and (g), F.S. and additional District evaluation factors as appropriate.

3.0 Water Supply and Water Resource Development Grant Program

Beginning in FY2020, the state appropriated funds in addition to the WPSPTF through the establishment of a Water Supply and Water Resource Development grant program to address Florida's growing population and water demands, along with the needs of the environment. By identifying and researching all viable AWS, the grant program is intended to help communities plan for and implement conservation, reuse, and other WSD and WRD projects. Projects selected for funding are prioritized by areas of greatest need and greatest benefit, including timeliness of implementation. From FY2020 through FY2024, $36 million has been awarded to the District by FDEP for development of AWS through this grant program with an additional $10 million awarded in FY2025. If the Legislature continues to fund the state's Water Supply and Water Resource Development Grant Program, it could serve as a significant source of matching funds to assist in the development of AWS and regional supply infrastructure in the region.

4.0 The Florida Forever Program

The FF Act, as originally passed by the Florida Legislature in 1999, established the 10-year FF Program. The program was extended by the Legislature during the 2008 legislative session, allowing it to continue for 10 more years. Since 1999, the District has allocated $95 million ($81.6 million for land acquisition and $13.4 million for water body restoration) of FF funding Districtwide in support of WRD.

A WRD project eligible for funding under the FF program must meet the requirements of Section 259.105, F.S. These projects increase the amount of water available to meet the needs of natural systems and the citizens of the state by enhancing or restoring AR, facilitating the capture and storage of excess flows in surface waters, or promoting reuse. Implementation of eligible projects under the program includes land acquisition, land and water body restoration, ASR facilities, surface water reservoirs, and other capital improvements. An example of how the funds were used by the District 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.

5.0 Facilitating Agricultural Resource Management Systems Program

Operating under Governing Board Policy, the District Initiative FARMS Program is an agricultural BMPs cost-share reimbursement program that involves both water quantity and water quality projects. Developed by the District and the FDACS in 2003, this public/private partnership uses state funding when available. Since the inception of the program, the District has received $7.3 million in state appropriations and $1.3 million from the FDACS. No funding was appropriated by the state for FY2021 through FY2025.

Section 4. Federal Funding

In 1994, the District began an initiative to seek federal matching funds for water resource 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.

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 TBW'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 STAG projects for several years, so future funding for individual projects through this mechanism is uncertain. 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 USACE, 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 NRCS Environmental Quality Incentives Program (EQIP) provides technical, educational, and financial assistance to eligible farmers, ranchers, and forest landowners to address soil, water, and related natural resource concerns on their lands while complying 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 (AWEP) and the Florida West Coast Resource Conservation and Development Council (RC&D) to bring additional NRCS cost-share funding to the SWUCA. 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 FY2024, 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 MIL 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: (1) competition and economies of scale enjoyed by regional or national construction/operation firms or teams that 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 (WTP) 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 operation and maintenance. The cost savings over the life cycle of the contract are 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. As an example, the PRWC began as a cooperative when they first formed in 2016 to address the development and provision of AWS sources to its member local governments. They later received regional water supply authority status from the FDEP in 2023. 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 AWS. 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 is not allowed. 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 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 programs for WRD 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 continued investment in vital projects to protect the region's water resource needs, the District's most recent long-term funding plan estimates $1.1 billion in ad valorem tax dollars will be allocated for the CFI from 2026 through 2045. Nearly half of those funds, $490.2 million, are for Board-prioritized large-scale WSD efforts with water supply authorities in the Heartland, Southern, and Tampa Bay planning regions where the District is funding less than the normal 50 percent cost-share due to cost increases since initial Board approval of total project cost, as well as potable reuse. Combined with the Cooperators' cost-share, the prioritized projects will potentially provide $1.7 billion for WRD and WSD assistance over the next 20 years.

Assuming the remaining $618.4 million in ad valorem funds estimated for smaller-scale water resource protection and development efforts will be used for projects that will be matched by a partner on an equal cost-share basis, this would result in $1.2 billion funds leveraged. Collectively with the large-scale water supply authority efforts, the CFI anticipates generating $2.8 billion from FY2026 through FY2045 with approximately 57 percent potentially utilized for water source development. The allocation of resources is typically driven by new requests submitted through the CFI program each year, which could 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 long-term funding plan, an estimated $412 million in ad valorem tax dollars would be allocated for District Initiatives from 2026 through 2045. If the funding allocation of the program remains consistent with the previous five years, approximately $154 million (37 percent) could potentially be used 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 FDEP Springs Initiative

In addition to new state appropriations, the amount of future state funding for the FDEP Springs Initiative is contingent upon eligible projects submitted to the District through the CFI. All current, on-going FDEP Springs Initiative projects are fully funded, but the District continues to solicit for viable projects to protect and restore major springs systems, including projects to reduce groundwater withdrawals and improve stormwater systems. The amount of future state funding for this program cannot be determined or reasonably estimated at this time.

4.0 Water Protection and Sustainability Trust Fund

The amount of future state funding for this program cannot be determined or reasonably estimated 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 AWS projects.

5.0 Water Supply and Water Resource Development Grant Program

In FY2020, the state appropriated funds in addition to the Water Protection and Sustainability Program through the establishment of a Water Supply and Water Resource Development grant program in order to maximize the effort of addressing the demands on Florida's water supply to meet the future needs of the state's growing population and the needs of the environment. By identifying and researching all viable alternative water supply resources, the grant program is intended to help communities plan for and implement conservation, reuse and other water supply and WRD projects. Projects selected for funding by the FDEP are prioritized by areas of greatest need and greatest benefit, including timeliness of implementation. The state has appropriated a minimum of $40 million annually since inception of the program, and projects submitted by the District have received an average of $10 million each year. Even though the amount of future state funding for this program cannot be determined or reasonably estimated at this time, the District continues to work with the FDEP to identify viable projects.

6.0 Florida Forever Trust Fund

The amount of future state funding for the FF Trust Fund cannot be determined or reasonably estimated at this time. The District has not received FF funding since FY2011, and all balances have been expended. Any future funding allocated for the District will be used for land acquisition, including land in support of WRD to meet the water supply demand through 2045 and to restore MFLs for impacted natural systems.

Section 2. Evaluation of Project Costs to Meet Projected Demand

Of the 215.35 mgd of Districtwide projected demand increases during the 2025–2045 planning period to meet the demand for all users and to restore MFLs for impacted natural systems, it is estimated that 42.59 mgd, or 20 percent of the demand, has either been met or will be met by projects that are under development, including reclaimed water and water conservation. The total District share of cost for these projects currently under development, which also include regional transmission and brackish groundwater treatment systems, is just over $697 million.

To develop an estimate of the capital cost of projects necessary to meet demand, the District compiled a list of prioritized, large-scale WSD projects proposed for completion within the 2045 planning horizon in Table 8-2 below. These projects include those proposed by the PRMRWSA, PRWC, and TBW for the development of 22.5 mgd and regional transmission of AWS. Also included is funding set aside for the development of potable reuse as outlined in the District's long-term funding plan. The table shows the estimated total cost of these water supply and transmission projects is $1.72 billion.

Aside from these projects, additional water supplies are being developed in the District outside of the District's funding programs. For example, TBW will be expanding their existing Regional Surface WTP, which is expected to provide an additional 10 to 12.5 mgd of water supply for the region. The PRMRWSA will also be expanding their Peace River Facility WTP to increase the surface water facility's max day capacity by 24 mgd. Due to funding constraints as the District co-funds the other regional prioritized AWS project options listed in Table 8-2, the District is currently unable to provide funding for these surface WTP expansions. However, they are critical projects for meeting growing demands.

For the Northern Planning Region, demands for water through 2045 may continue to be met with traditional groundwater sources on a regional scale, for which the District does not provide matching financial resources. However, alternative sources may be needed to supplement traditional sources to meet demands in specific high-growth areas. Regionally, the need for groundwater supplies can be reduced through the use of available reclaimed water and implementation of comprehensive water conservation measures, for which the District has historically provided funding assistance. In other planning regions, additional AWS, reclaimed water, and conservation projects chosen by users, aside from those listed in Table 8-2, will continue to be developed to meet new demands. Potential water supply project options are discussed in Chapter 5 for each planning region.

Table 8-2. *Proposed large-scale water supply and water resource development projects by 2045 (millions of $)*

Project	Planning Region	Entity to Implement	Quantities (mgd)	Capital Costs
Reservoir No. 3	Southern	PRMRWSA	N/A[1]	$375.08
Regional Integrated Loop System Phase 2B	Southern	PRMRWSA	N/A[2]	$87.44
Regional Integrated Loop System Phase 3C	Southern	PRMRWSA	N/A[2]	$70.80
Southeast Wellfield Implementation	Heartland	PRWC	12.5	$247.53
Regional Transmission Southeast Phase 1	Heartland	PRWC	N/A[3]	$174.10
West Polk Wellfield	Heartland	PRWC	10.0	$228.14
Southern Hillsborough County Transmission Expansion	Tampa Bay	TBW	N/A[4]	$438.71
Potable Reuse	TBD	TBD	TBD	$100.00
Total – Districtwide			**22.5**	**$1,721.80**

[1]This project will create 9 billion gallons of surface water storage capacity.
[2]This project is needed for regional transmission of AWS. Max day transmission capacity is 40 mgd.
[3]This project is needed for regional transmission of AWS. Max day transmission capacity is 30 mgd.
[4]This project is needed for regional transmission of AWS. Max day transmission capacity is 65 mgd.

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

Through current cooperative arrangements with the PRMRWSA, PRWC, and TBW, funding assistance from the District and the FDEP have begun to contribute to the estimated cost of meeting projected demand. Of the $1.7 billion in costs reflected in Table 8-2, a projected $1.6 billion remains to be funded in order to complete these efforts. The conservative estimate of $2.6 billion in cooperator and District financial resources that will be generated through 2045 for funding is sufficient to meet the projected total cost of the large-scale projects listed in Table 8-2. Additional state and federal funding sources may also assist with remaining costs for future AWS projects and water conservation measures where fresh groundwater resources are limited. 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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