

Executive Summary

The South Florida Water Management District's (SFWMD or District) strategic goal for its water supply plans is to identify sufficient water supply sources and projects to meet existing and future reasonable-beneficial uses during 1-in-10-year drought conditions while sustaining water resources and related natural systems. This *2023–2024 Lower East Coast Water Supply Plan Update* (2023–2024 LEC Plan Update) is the fourth update to the *2000 Lower East Coast Regional Water Supply Plan* (2000 LEC Plan), which previously was updated in 2006, 2013, and 2018. This plan update is consistent with the water supply planning requirements of Chapter 373, Florida Statutes (F.S.), and presents population and water demand projections through 2045, a review of water supply issues and evaluations, and a list of water source options. It also examines local and regional water supply efforts and describes water resource and water supply development projects completed since the 2018 update.

This 2023–2024 LEC Plan Update was developed in an open, public forum (**Chapter 1**). Meetings and workshops were held with water users, local and tribal governments, utilities, as well as agricultural industry and environmental representatives to solicit input, provide information about planning results, and receive comments on draft sections of the plan update. The SFWMD held three virtual public workshops for this water supply plan update.

The LEC Planning Area covers more than 6,500 square miles of southeastern Florida, including all of Palm Beach, Broward, and Miami-Dade counties, most of Monroe County, and the eastern portions of Hendry and Collier counties. The LEC Planning Area includes unique and critical ecosystems, such as the Everglades, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Keys, Loxahatchee River, and Lake Worth Lagoon. These ecosystems coexist with large agricultural areas around Lake Okeechobee and in southern Miami-Dade County, and with expansive urban areas that comprises 30% of the state's population.

Typically, the LEC Planning Area receives abundant rainfall seasonally, with volumes exceeding human and natural system needs during wet periods. Annual precipitation averages 57 inches, with three-quarters of rainfall occurring between May and October. Water availability varies annually with periodic drought years. There is an extensive network of canals and waterworks used for water supply and flood control in the LEC Planning Area. The regional water management system plays a critical role in capturing wet season stormwater for use during dry times, moving water between natural systems, delivering water to agricultural areas and urban coastal communities, and moving excess water to tide to provide flood protection. Fresh groundwater from the surficial aquifer system (SAS) and surface water from Lake Okeechobee are the primary water sources for urban, agricultural, and industrial uses in the LEC Planning Area.

Climate change and sea level rise are issues of concern, especially in coastal regions. South Florida is particularly vulnerable to potential changes in climate and sea level because of its location, regional variability in climate, hydrology, geology, low topography, natural resources, and dense population in coastal areas. To plan and prepare for regional climate change and sea level rise, the SFWMD is conducting research and computer modeling to better predict and reduce uncertainties, analyzing vulnerabilities in the current water

management system, and developing effective adaptation strategies for the future. Coordination with other resource management entities and governments is vital to ensuring a common approach and shared information moving forward.

DEMAND ESTIMATES AND PROJECTIONS

As described in **Chapter 2** and **Appendix A**, the LEC Planning Area has one of the fastest growing populations in the country. The region is home to approximately 6.2 million people and supports a large seasonal population, tourism and golf, and a substantial agricultural industry. The permanent population is projected to reach approximately 7.3 million people by 2045, a 17% increase from the 2021 base year estimate for this plan update. Details about Public Supply (PS) utilities, including the populations within their service areas, are provided in **Appendix B**.

Current and future water demands are heavily influenced by the existing and projected population. Population growth will lead to increases in water demands for public supply, landscape irrigation, power generation, and mining operations in the region. Irrigated agricultural acres are projected to remain relatively stable, declining 3% over the planning horizon.

Total water demands under average rainfall conditions for all water use categories are projected to increase 11%, from a total water use of approximately 1,854.52 million gallons per day (mgd) in 2021 to 2,063.36 mgd in 2045 (**Table ES-1**). Projected demands under 1-in-10-year drought conditions are 348 mgd (17%) higher than the average demands in 2045.

The PS water use category is projected to remain the largest in the LEC Planning Area accounting for approximately 51% of the total 2045 projected demand. Agriculture (AG) is the second largest water use category, representing 31% of the total 2045 projected demand. Landscape/Recreational (L/R) is the third largest water use category representing approximately 10% of the total 2045 projected demand. Domestic Self-Supply (DSS), Commercial/Industrial/Institutional (CII), and Power Generation (PG) collectively account for approximately 8% of the total 2045 projected demand.

Table ES-1. Estimated (2021) and projected (2045) gross water demands under average rainfall conditions in the LEC Planning Area.

Water Use Category	2021 Estimated Use (mgd)	2045 Projected Demand (mgd)	Percent Change	Percent of Projected 2045 Total*
Public Supply	890.57	1,047.19	18%	51%
Domestic Self-Supply	10.55	14.45	37%	<1%
Agriculture	645.20	637.65	-1%	31%
Commercial/Industrial/Institutional	87.35	102.56	17%	5%
Landscape/Recreational	178.65	199.18	11%	10%
Power Generation	42.20	62.33	48%	3%
LEC Planning Area Total	1,854.52	2,063.36	11%	100%

LEC = Lower East Coast; mgd = million gallons per day.

*May not equal 100% due to rounding.

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation by all water use categories continues to be a priority to help meet future water needs. Conservation programs often are among the lowest-cost solutions to meet future demands and can reduce costs over the long term if properly planned and implemented (**Chapter 3**). Conservation efforts in the LEC Planning Area have effectively lowered the net (finished) water per capita use rate for PS over the past two decades, from 176 gallons per capita per day (gpcd) in 2000 to approximately 131 gpcd per day in 2021. Analyses suggest that Palm Beach, Broward, Miami-Dade, Hendry, and Monroe counties collectively can save an additional 62.13 mgd by 2045 if various urban and agricultural conservation options are implemented.

NATURAL SYSTEMS AND RESOURCE PROTECTION

The LEC Planning Area encompasses extensive natural systems, including the Everglades, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Keys, Loxahatchee River, and Lake Worth Lagoon (**Chapter 5**). The region has two national parks and five national wildlife refuges. Natural systems are protected and addressed through regulatory mechanisms, restoration efforts, and water resource development projects.

In the LEC Planning Area, minimum flows and minimum water levels (MFLs) with their associated recovery strategies have been previously adopted for Lake Okeechobee, the Everglades, and the Northwest Fork of the Loxahatchee River. The Lake Okeechobee MFL recovery strategy has been revised as part of this plan with consideration of the Herbert Hoover Dike repairs, new lake regulation schedule, and additional storage projects (**Appendix C**). MFLs with prevention strategies have been adopted for Florida Bay, the Biscayne aquifer, and the Lower West Coast aquifers. A re-evaluation of the adopted MFL criteria for Florida Bay was completed in 2014. A water reservation, another resource protection regulatory mechanism, was established for Nearshore Central Biscayne Bay in 2013 and for the proposed Everglades Agricultural Area (EAA) Reservoir in 2021. Restricted allocation areas (RAAs), another resource protection regulatory mechanism, were established for the L-1, L-2, and L-3 canal system in 1981; the North Palm Beach County/Loxahatchee River Watershed Waterbodies and LEC Everglades Waterbodies in 2007 (amended in 2022); the Lake Okeechobee Service Area (LOSA) in 2008; and the water stored via aquifer storage and recovery (ASR) wells at the C-18W Reservoir site in 2022.

There are numerous large ecosystem restoration projects under way in the LEC Planning Area (**Table ES-2, Chapter 7**) that are vital to improving and maintaining the viability of the region's natural systems and water resources, including elements identified in MFL recovery and prevention strategies. The Comprehensive Everglades Restoration Plan (CERP), a partnership between the United States Army Corps of Engineers (USACE) and the SFWMD, is a critical component of ecosystem restoration and water supply. CERP includes numerous capital projects needed to protect and restore natural systems and increase water availability. An Integrated Delivery Schedule organizes the implementation of capital projects and is updated every year.

Table ES-2. Water resource development projects within the LEC Planning Area by region.

Region	Project	Status
Lake Okeechobee	CERP Lake Okeechobee Watershed Restoration Project (LOWRP)	Planning/Construction
	USACE Herbert Hoover Dike Major Rehabilitation	Construction Complete
	Lake Okeechobee Component A Storage Reservoir (LOCAR)	Planning
	Central Everglades Planning Project (CEPP) A-2 Reservoir and Stormwater Treatment Area (STA)	Planning/Construction
Everglades	Restoration Strategies Regional Water Quality Plan	Construction
	Modified Water Deliveries to Everglades National Park	Operational
	CERP Water Conservation Area 3A Decompartmentalization Physical Model	Operational
	CERP Central Everglades Planning Project (CEPP)	Construction
	C-111 South Dade Project	Construction
	CERP C-111 Spreader Canal Western Project	Planning
Western Basins	CERP Western Everglades Restoration Project	Planning
	C-139 Annex Restoration	Construction
LEC Service Areas	Restoration Plan for the Northwest Fork of the Loxahatchee River	Planning
	CERP Loxahatchee River Watershed Restoration Project	Planning/Design
	CERP Environmental Preserve at the Marjorie Stoneman Douglas Everglades Habitat	Operational
	CERP Fran Reich Preserve Reservoir Levee	Operational
	CERP Broward County Water Preserve Areas	Planning/Design
	CERP Biscayne Bay Coastal Wetlands Project	Planning/Construction
	CERP Biscayne Bay and Southern Everglades Ecosystem Restoration	Planning

WATER SOURCE OPTIONS

Water users in the LEC Planning Area rely on surface water, groundwater (fresh and brackish), and reclaimed water (**Chapter 5**) to meet urban and agricultural demands. Surface water from canals and lakes, and fresh groundwater from the SAS are considered traditional water sources. Alternative water supply sources include brackish groundwater from the Floridan aquifer system (FAS), reclaimed water, seawater, and excess surface water and groundwater captured and stored in ASR wells, reservoirs, and other storage features. Use of alternative water supplies is an integral part of the current and future water supply strategy.

PS utilities within the LEC Planning Area primarily rely on fresh groundwater from the SAS, with limited use of the FAS, and one utility uses surface water. Groundwater sources can meet 2045 PS demands; however, increases in fresh groundwater allocations are limited to comply with resource protection criteria. Of the 54 PS utilities in the LEC Planning Area, 11 will need to construct new projects to meet their projected 2045 demands. These new projects include expanded use of the FAS and use of the C-51 Reservoir, both of which are alternative water sources; SAS aquifer recharge offsets; and interconnections with nearby utilities for bulk water purchases.

Fresh groundwater from the SAS supplies 100% of the estimated demand for DSS in the LEC Planning Area. Although DSS demand is expected to increase by 37% over the planning horizon, groundwater from the SAS can continue to meet the 2045 DSS demands in most areas.

Approximately three-quarters of the total agricultural acreage in the LEC Planning Area is in the EAA, which relies exclusively on surface water. There are two other agricultural areas in the LEC Planning Area that rely on fresh groundwater: southern Miami-Dade County and the eastern portion of Hendry County. In those areas, groundwater sources can meet 2045 AG demands; however, increases in fresh groundwater allocations are limited by resource protection criteria.

L/R irrigation users, including golf courses, rely primarily on surface water, fresh groundwater, and reclaimed water in nearly equal amounts. In addition, eight L/R users meet their demands with treated brackish groundwater from the FAS for golf course irrigation. Increases in L/R demands are expected to be met primarily through the expansion of reclaimed water systems in Palm Beach and Broward counties and with fresh groundwater in Miami-Dade County.

For CII users, the 2021 demands for the LEC Planning Area were distributed evenly with half between surface water and reclaimed water and the other half fresh groundwater. Increases in the CII category through 2045 are expected to be met by fresh groundwater and surface water. There are 12 major power generation facilities within the LEC Planning area, and 7 of them have demands met from groundwater or reclaimed water. No new power generation facilities requiring water supply are planned for construction or operation through 2045. **Table ES-3** summarizes the variety of water source options that typically are used by each water use category.

Table ES-3. Typical water source options for the water use categories in the LEC Planning Area.

Water Use Category	Fresh Surface Water	Fresh Groundwater	Brackish Groundwater	Reclaimed Water
Public Supply	✓	✓	✓	
Domestic Self-Supply		✓		
Agriculture	✓	✓		
Commercial/Industrial/Institutional	✓	✓		✓
Landscape/Recreational	✓	✓	✓	✓
Power Generation		✓	✓	✓

Surface Water

Surface water supply sources for the LEC Planning Area include Lake Okeechobee, water conservation areas, Central and Southern Florida (C&SF) Project canals, county and water control district canals, reservoirs, and on-site ponds. Water availability from Lake Okeechobee and connected surface water bodies is limited due to concerns regarding protection of existing legal users, limited storage, and environmental needs. Specific surface water volumes in eastern Hendry County are identified for the Seminole Tribe of Florida Big Cypress Reservation in addition to a secondary irrigation supply from Lake Okeechobee. As discussed earlier, use of several surface water bodies is limited by RAA rules and MFLs. The City of West Palm Beach is the only PS utility using surface water as its primary water supply; however, application has been made to the SFWMD for authorization to withdraw groundwater from the FAS, reducing the utility’s reliance on surface water. Future surface water demands are expected to decrease slightly for AG and remain relatively static for PS, CII, L/R, and PG. Additional water storage features and tailwater recovery systems could enhance water availability.

For surface water users in LOSA, additional water can be stored in Lake Okeechobee resulting from the completion of the dike repairs and the revised regulation schedule, known as the Lake Okeechobee System Operating Manual (LOSOM). The USACE made available the Final Draft LOSOM Water Control Plan in 2023. The USACE final Record of Decision is anticipated by the end of 2024. The revised LOSOM will result in minor improvements to water supply, but it does not result in a sufficient increase in storage volumes to allow the lake to return to an MFL prevention strategy at this time. As such, the Lake Okeechobee MFL recovery strategy has been revised as part of this 2023–2024 LEC Plan Update. The environmental enhancement, regulatory criteria, and water shortage components of the MFL recovery strategy will not change. The SFWMD will continue to allocate water for existing and future reasonable-beneficial uses pursuant to its regulatory rules and criteria. The capital projects component has been revised. Additional details about the MFL and updated recovery strategy are provided in **Appendix C**. For increases in surface water use other than within LOSA, water availability would have to be determined based on local conditions.

Fresh Groundwater

The SAS, including the Biscayne and Lower Tamiami aquifers, is the primary source of fresh groundwater in the LEC Planning Area and is used by all water use categories. Further development of the SAS is limited by potential impacts on the regional system, wetlands, and existing legal users as well as proximity to contamination sources and the potential for saltwater intrusion or upconing of relict seawater. Specifically, use of the SAS in coastal areas is restricted 1) by the Biscayne Aquifer MFL prevention strategy, which specifies no further inland movement of salt water, and 2) near C&SF Project canals by the LEC Regional Water Availability criteria, which prohibits increased allocations that induce increased seepage from the canals.

Available water supplies for allocation in eastern Hendry County from the Lower Tamiami aquifer are constrained by the presence of isolated wetlands and the Lower West Coast Aquifers MFL. AG water demands in the portion of Hendry County within the LEC Planning Area are expected to increase by 5% over the planning horizon; water levels will require close monitoring where they are approaching the maximum developable limit. Water availability from the SAS will be determined locally in these areas, considering the quantities required, local resource conditions, existing legal users, and viability of other supply options.

In 2021, the SAS accounted for approximately 90% of PS use and 100% of DSS use in the LEC Planning Area. SAS use for PS is projected to increase from 824.41 mgd in 2021 to 939.33 mgd by 2045, as utilities maximize their permitted allocations from this source. The utilization of surface water from the C-51 Reservoir as an alternative source will allow certain PS utilities to increase withdrawals from the SAS by up to 35 mgd as an offset specified in those permits. Most PS utilities in the LEC Planning Area have been proactive in permitting and constructing water supply systems that anticipate demand increases and have proposed projects to meet future growth (**Chapter 8**).

The SFWMD is currently developing a density-dependent groundwater model for the SAS (i.e., East Coast Surficial Model [ECSM]) to evaluate the ability of this resource to sustainably meet future demands. Results of the model simulations will provide guidance for developing water management strategies, support periodic updates to the regional water supply plans, evaluate resiliency, and be used in regulatory applications. The current version of the model is being calibrated to water level and water quality (total dissolved solids observations for

transient conditions. Following completion of model calibration and verification as well as incorporation of peer review comments, the ECSM will be applied through the development of the planning demands for 2021 and 2045 model scenarios. Model results should be available in 2025, and the effects of these future demands on the SAS will be evaluated in support of this 2023–2024 LEC Plan Update.

For SAS water users, the most recent mapping of saltwater intrusion in Palm Beach, Broward, and Miami-Dade counties indicates the saltwater interface has remained relatively stable, but some inland movement has occurred. These maps are being updated based on 2024 dry season data and are scheduled to be published in fall 2024. Surface water canals and salinity control structures are operated to maintain water levels that minimize inland saltwater movement, and no regional declines in water levels have been observed. However, sea level rise is likely to accelerate the inland movement of the saltwater interface.

Brackish Groundwater

Brackish groundwater from the FAS is utilized by 24 PS utilities, 8 golf courses, and 3 power generation facilities. Additionally, seven utilities are proposing wellfield and reverse osmosis (RO) water treatment plant (WTP) projects to begin treating brackish water from the FAS to meet a portion of their 2045 projected demands. The 15 operating RO WTPs have a combined capacity of approximately 79.50 mgd. In 2021, the FAS and associated RO WTPs supplied water to meet 6% of PS demand and are expected to meet the same by 2045. Current and future FAS demands were previously simulated using the East Coast Floridan Model (ECFM), which is a peer-reviewed, calibrated regional FAS groundwater model. ECFM was used to assess the potential impacts of withdrawals on water quality and the viability of the source through the planning horizon in support of the 2018 LEC Plan Update. Since the 2045 projected FAS water demands are of a similar magnitude to the 2040 FAS water demands simulated and presented in the 2018 LEC Plan Update, it was determined that the results are still representative for 2045 in this 2023–2024 LEC Plan Update, and additional ECFM simulations were not needed. Review of historical chloride data and model results indicates properly managed FAS wellfields can meet projected demands through 2045.

Current groundwater level and quality data for the FAS are discussed in **Chapter 6** and **Appendix D**. Review and analyses of FAS water level and quality data indicate there have not been substantial regional changes; however, some local changes in water quality have been observed, which may be the result of localized pumping stresses or hydrologic conditions. FAS users may need to spread out withdrawal facilities or reduce individual well pumping rates to mitigate water quality changes. These areas should continue to be monitored through a coordinated effort with utilities and other FAS stakeholders.

Reclaimed Water

Use of reclaimed water is an important component of managing water supplies in the LEC Planning Area. In 2021, 28 of the 45 wastewater treatment facilities provided at least a portion of the treated wastewater for reuse in other areas. Including supplemental water sources, 14% (97.47 mgd) of the region's treated wastewater was reused for golf course and landscape irrigation, industrial uses, power generation facility cooling purposes, wetland hydration, and groundwater recharge. However, 601.90 mgd of potentially reusable wastewater was disposed, mainly through deep well injection and ocean outfall. Wastewater

flows are projected to increase to 849.62 mgd by 2045. Many utilities have constructed the required treatment facilities to produce reclaimed water for public access irrigation in anticipation of increased reclaimed water demand in the future. The volume of reclaimed water used for irrigation is projected to more than double by 2045 as a result of population growth and compliance with the Ocean Outfall Law pursuant to Section 403.086, F.S., requirements.

Water Storage

Capturing surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. In the LEC Planning Area, water storage options include ASR and reservoirs, which are considered alternative water supplies. As of 2021, there are two active ASR wells, three idle and available for operation, and one abandoned. Several others were repurposed as FAS supply wells.

Regional reservoirs (e.g., flow equalization basins and EAA A-2, C-51, and C-18W reservoirs) will attenuate stormwater, provide water quality treatment in conjunction with stormwater treatment areas, and store seasonally available water. Local agricultural reservoirs can store recycled irrigation water or collect stormwater runoff.

Seawater

There are two RO seawater desalination treatment plants in the LEC Planning Area. Both plants are in the lower Florida Keys and operated for emergencies. The Stock Island plant—the first desalination plant built in Florida—can produce up to 2 mgd of potable water, and the Marathon plant can produce another 1 mgd. Also, three power generation facilities in the LEC Planning Area use seawater for cooling purposes.

FUTURE DIRECTION

Chapter 9 contains guidance to help focus future efforts in the region to meet projected water needs. Some of the key suggestions to regional stakeholders, including the SFWMD, utilities, other government agencies, agricultural interests, and environmental groups, are as follows:

- ◆ Continue implementation of water conservation programs throughout the LEC Planning Area to increase water use efficiency and reduce the amount of water needed to meet future demands.
- ◆ Continue implementation of MFL prevention and recovery strategies, and review and update these strategies, as appropriate, in conjunction with future water supply plan updates.
- ◆ Evaluate future versions of LOSOM with consideration of capital projects being designed and constructed, such as ASR systems and aboveground storage reservoirs to increase storage capacity.
- ◆ Continue development of alternative water supplies, including maximizing the use of reclaimed water.

- ◆ Design new FAS wellfields to maximize withdrawals while minimizing water level and quality changes. This likely will require a combination of additional wells with greater spacing between wells, lower-capacity wells, and continued refinement of wellfield operational plans.
- ◆ Develop regional and local reservoirs and other storage systems (e.g., ASR systems), where possible, to increase surface water availability for environmental, agricultural, and urban water supply needs.
- ◆ Continue supporting ecosystem restoration efforts, including the Restoration Strategies Regional Water Quality Plan and CERP.
- ◆ Identify wells critical to long-term monitoring and modeling to ensure they are constructed, maintained, or replaced, as necessary.
- ◆ Continue mapping the saltwater interface and identify areas of concern that might require enhanced monitoring or changes in wellfield operations.
- ◆ Continue characterizing, monitoring, and designing adaptation solutions in response to climate change and sea level rise and their impacts to water supply and continue participating in the Southeast Florida Regional Climate Change Compact.

CONCLUSIONS

Building on the findings and conclusions of previous LEC water supply plan updates, this 2023–2024 LEC Plan Update assesses water supply demand and available sources through 2045. This plan update concludes that future water needs of the region during average and 1-in-10-year drought conditions can be met through the 2045 planning horizon with appropriate management, conservation, and implementation of projects identified herein.

Meeting future water needs through 2045 in the LEC Planning Area depends on the following:

- ◆ Construction of potable water supply development projects by PS utilities.
- ◆ Implementation of CERP Restoration Strategies and other water resource development projects to provide additional storage.
- ◆ Implementation of LOSOM and construction of CERP capital projects identified in MFL prevention and recovery strategies.

Successful implementation of this 2023–2024 LEC Plan Update requires close collaboration with agricultural interests, local and tribal governments, utilities, and other stakeholders. Coordination efforts should ensure that water resources in the LEC Planning Area continue to be prudently managed and available to meet future demands while also protecting natural systems.