2020 SOUTH FLORIDA Environmental Report

Water Year 2019 (May 1, 2018–April 30, 2019)

Figure 1. *Florida burrowing owls in Stormwater Treatment Area 5/6 Cell 5-3A in July 2019.*

HIGHLIGHTS

The *2020 South Florida Environmental Report* (SFER) documents a banner year of restoration, scientific and engineering accomplishments in the Kissimmee Basin, Lake Okeechobee, Everglades and South Florida coastal areas. The report also provides extensive peer reviewed research summaries, data analyses, financial updates and a searchable database of environmental projects. The report covers environmental information for Water Year 2019 (WY2019; May 1, 2018–April 30, 2019) and project/budgetary information for the South Florida Water Management District (SFWMD or District) Fiscal Year 2019 (FY2019; October 1, 2018–September 30, 2019). The full 2,611-page report is available online at www.sfwmd.gov/sfer.

EXECUTIVE ORDER 19-12: ACHIEVING MORE NOW FOR FLORIDA'S ENVIRONMENT

On January 10, 2019, Governor Ron DeSantis signed *Executive Order 19-12: Achieving More Now For Florida's Environment* implementing major reforms to ensure the protection of Florida's environment and water quality (Figure 2). The order urged immediate action and investment in water quality and Everglades restoration for Florida. In response, SFWMD is expediting critical Everglades restoration projects and expanding its water quality monitoring network.

On June 21, 2019, Governor DeSantis signed the state budget for Fiscal Year 2020 (July 1, 2019–June 30, 2020) appropriating over $625 million for this effort and in November 2019, the Governor released his "Bolder, Brighter, Better Future Budget," which includes recurring funding of $625 million per year for three years. This is the largest funding for Everglades restoration and water quality improvements in Florida's history. This proposed budget includes more than $318 million for Everglades restoration, which will put Florida on track to expedite or complete 22 additional projects over the next five years. These projects will provide 672,000 acre-feet of storage and remove almost 200,000 pounds of total phosphorus annually. These monies are also being proposed for the Everglades Agricultural Area (EAA) Reservoir Project, located on the A-2 parcel, and the final phase to raise Tamiami Trail to ensure that progress is being made on projects needed to move water south. The budget also includes $200 million for targeted water quality improvements to achieve significant, meaningful and measurable nutrient reductions in key water bodies across the State of Florida by (1) providing cost-share grant funds for septic conversions and upgrades, other wastewater improvements, and rural and urban stormwater system upgrades and (2) accelerating projects to meet scientific nutrient reduction goals called total maximum daily loads (TMDLs). Water quality funding will also support projects that will reduce nutrient pollution and harmful algal blooms in Florida's treasured waterways. Additionally, the budget provides $40 million for alternative water supply development to help communities plan for and implement vital conservation, reuse and other alternative water supply projects.

A number of projects are now under construction or have significant planning completed. Research, analyses and restoration efforts reported in the 2020 SFER aid in implementing this order. Projects included in the *Achieving More Now For Florida's Environment Executive Order* that are discussed in the 2020 SFER include the following:

Comprehensive Everglades Restoration Plan (CERP) Projects

- Everglades Agricultural Area (EAA) Reservoir Project, a Central Everglades Planning Project (CEPP) new water project (Volume II, Chapters 2 and 3)
- Caloosahatchee Reservoir Project (Volume I, Chapter 8A and Volume III, Chapter 2)
- C-44 Reservoir and Stormwater Treatment Area (STA) (Volume I, Chapter 8A and Volume III, Chapter 2)
- CEPP South S-333N Water Control Structure (Volume III, Chapter 2)
- Picayune Strand Restoration Project (Volume III, Appendix 2-1)
- Biscayne Bay Coastal Wetlands L-31E Component (Volume III, Appendix 2-3)

Northern Everglades and Estuaries Protection Program (NEEPP) Projects

- Lakeside Ranch STA (Volume I, Chapter 8A and Volume III, Appendix 4-3)
- Brighton Valley Water Farm (Volume I, Chapter 8A)
- Bluefield Grove Water Farm (Volume I, Chapter 8A)
- Scott Water Farm (Volume I, Chapter 8A)
- Nubbin Slough STA (Volume I, Chapter 8A and Volume III, Appendix 4-4)
- Lake Hicpochee Hydrologic Enhancement (Volume III, Chapter 4)

Restoration Strategies Projects

- STA-1 East Modifications (Volume I, Chapter 5A)
- STA-5/6 Internal Improvements (Volume I, Chapter 5A)
- Bolles East (L-16) Canal Conveyance Improvement (Volume I, Chapter 5A and Volume III, Chapter 3)
- STA-1 West Expansions #1 and #2 (Volume I, Chapter 5A)
- C-139 Flow Equalization Basin (FEB) (Volume I, Chapter 4)

Operational Modifications

- Lake Okeechobee System Operation Manual (LOSOM) (Volume II, Chapter 2)
- Upper Kissimmee Chain of Lakes Regulation Schedule (Volume I, Chapter 9)
- Combined Operations Plan (COP; Volume I, Chapter 6)

Foundation and Other Projects

- Kissimmee River Restoration (Volume I, Chapter 9)
- C-139 Annex Restoration (Volume III, Chapter 5)

More about the District's work to advance key priority projects can be found at www.sfwmd.gov/AchieveMoreNow.

EVERGLADES AGRICULTURAL AREA (EAA) RESERVOIR PROJECT

A component of the state-federal Comprehensive Everglades Restoration Plan (CERP), the EAA Reservoir Project will send clean water south to the Everglades while reducing damaging discharge events from Lake Okeechobee to the east and west coasts. The project includes a combination of canals, a stormwater treatment area (STA), and a storage reservoir — all intended to improve water quality in America's Everglades.

Figure 2. *Governor Ron DeSantis announces Executive Order on January 10, 2019.*

The *Achieving More Now For Florida's Environment Executive Order* directed SFWMD to expedite the important EAA Reservoir Project. The District created an expedited construction schedule and reached an agreement to get access to the project site in accordance with the new expedited schedule. SFWMD started the full design of the STA component of the project and is awaiting federal permits to begin construction on the project site. Right now, the inflow/outflow canal component is in bid process and preliminary design for the STA component is underway. For the latest information on this project, visit www.sfwmd.gov/our-work/cerp-project-planning/eaa-reservoir.

Units of Measurement Used in Analyses and Discussions of Water Quality and Quantity

Loads: The cumulative mass, weight or volume delivered to the same location. Loads are typically measured in units such as metric tons (t), kilograms (kg), or pounds (lbs).

Concentrations: The mass, weight or volume of a constituent relative to a volume (e.g., phosphorus, nitrogen, sediments, etc.). Concentrations are typically reported in units such as milligrams per liter (mg/L) and micrograms per liter (µg/L) (sometimes as parts per billion [ppb]).

Flow-weighted mean (FWM) concentrations: The total load divided by the total volume of flow for a given period of time (FWM concentration = load/flow). FWM concentrations are typically reported in units such as mg/L or µg/L (sometimes as parts per billion [ppb]).

Geometric mean: Statistical average of a set of transformed numbers, often used to represent a central tendency in highly variable data, such as water quality. This is calculated from data transformed using powers or logarithms and then transformed back to original scale after averaging.

National Geodetic Vertical Datum of 1929 (NGVD29): Reference for vertical control surveying elevation data that was established within the United States in 1929.

RESTORATION PROJECTS, CONSTRUCTION AND OPERATION STATUS

Volume III of the 2020 SFER provides an annual update on environmental restoration projects to comply with permits issued by the Florida Department of Environmental Protection (FDEP) under the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA), Everglades Forever Act (EFA), Northern Everglades and Estuaries Protection Program (NEEPP), and Environmental Resource Permit (ERP) state statutes. Currently, annual updates are provided for these projects: 7 projects under construction, 18 projects operating, and 3 projects operating that also had a phase or component under construction during the water year. Many of these projects are included in the priority project list that was developed as part of implementing the *Achieving More Now For Florida's Environment Executive Order*. WY2019 updates on most of these projects are provided below. Figure 4 on the next page shows the location of these projects. Restoration Strategies projects are discussed in more detail on page 12. Note that Volume III only provides information on projects that are under construction and operational projects. Projects in the planning stages, such as the EAA Reservoir on the A-2 parcel, do not require the submittal of annual reports.

Comprehensive Everglades Restoration Plan (CERP) Progress

Caloosahatchee (C-43) Reservoir

Once complete, the 10,700-acre reservoir with an average water depth of 17 feet (deepest 25 feet) will have the capacity to store 170,000 acre-feet (ac-ft) of water from Lake Okeechobee and runoff from the basin that is currently discharged to the river. The water will then be released when needed so the Caloosahatchee River and Estuary will have a more stable salinity regime. Recent progress follows:

- Construction of small 195 cubic feet per second (cfs) pump station S-476 began in June 2016 and was completed in fall 2018.
- Remediation of copper in soils commenced in August 2017 with a 5-acre pilot test and was followed by remediation of 200 acres during WY2019.
- Construction of the 1,500-cfs S-470 inflow pump station, microwave tower, Townsend Canal improvements, and State Road 80 bridge armoring is underway, with completion planned for March 2022.
- Construction of the Package 4 Civil Works contract for the embankment, control structures, and perimeter canal is underway with final completion planned for July 2024.

C-44 Reservoir and Stormwater Treatment Area (STA)

Part of the Indian River Lagoon-South project, the C-44 Reservoir and STA will capture, store, and treat runoff from the C-44/S-153 basin prior to discharge to the St. Lucie Estuary, reducing damaging freshwater discharges, decreasing nutrient load, and maintaining desirable salinity regimes. The 3,400-acre reservoir with an average water depth of 15 feet will have the capacity to store 50,600 ac-ft of water. The STA will be approximately 6,300 acres. Status of the project follows:

- Construction of the STA component continued and is expected to be complete in the latter part of 2020.
- Pump station work commenced in April 2015 and was completed on November 28, 2018 (Figure 3).
- Cells 1–3 of the STA activated on November 8, 2019 by Governor Ron DeSantis.

Figure 3. *Governor Ron DeSantis activates cells 1– 3 of the C-44 STA on November 8, 2019.*

Central Everglades Planning Project S-333N Gated Spillway

Part of the Central Everglades Planning Project (CEPP), the S-333N gated spillway will provide emergency, high water relief to Water Conservation Area (WCA) 3A. The fully automated, electrically operated, two-gate spillway has a design capacity of 1,150 cfs and is built adjacent to the existing S-333 gated spillway at the intersection of the L-67A and L-29 canals, in Miami-Dade County. Recent progress on the project follows:

- Construction commenced immediately after authorization was issued on September 17, 2018, and was 30% complete by the end of WY2019.
- Final completion of the project is scheduled for June 2020.

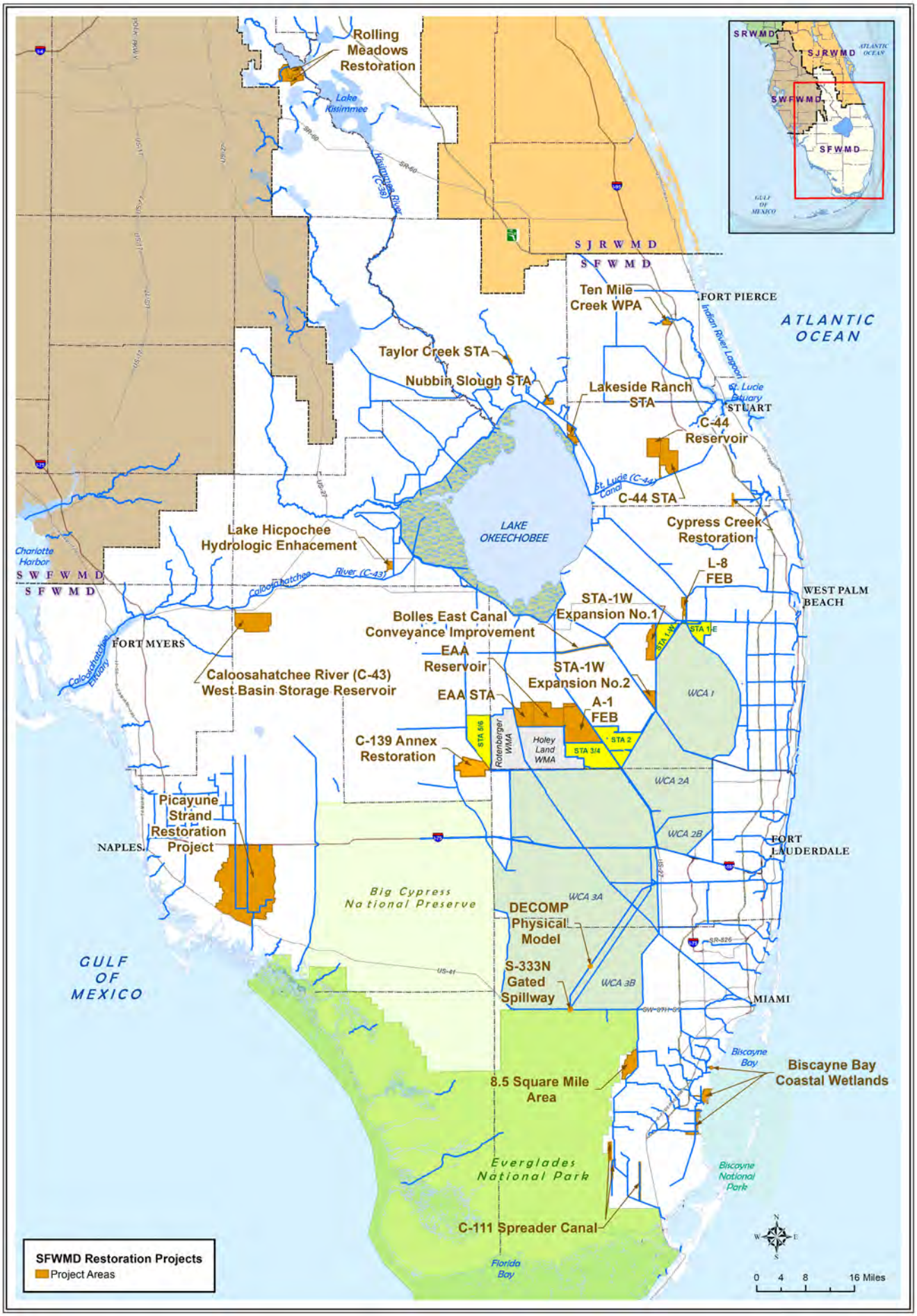

Figure 4. *Restoration projects map.*

Picayune Strand Restoration Project

This project includes the restoration of 55,000 acres of native Florida wetlands and uplands located between Alligator Alley (Interstate 75) and Tamiami Trail (U.S. 41) in the southwestern corner of Florida. Restoration is being achieved by plugging 45 miles of canals (Figure 5), removing and degrading 260 miles of roads, construction and operation of three pump stations, and management of non-native species. In WY2019, the following was accomplished:

- Plugging of the Stair-Step Canal began in late March 2019 and, by the end of WY2019, the first mile had been plugged and an additional 0.75 miles of woody vegetation were cleared from spoil along the next mile of the canal. The remaining mile of road along the canal was also completely degraded.
- Work continued on hydrologic modeling of the Southwestern Protection Features' project area to provide the basis for construction.
- Vegetation management activities have continued controlling the invasion of most exotic vegetation and allowing natural vegetation to become established.
- Monitoring of aquatic animals and surveying of vegetation were conducted during the water year.

Figure 5. *A filled-in canal in the Picayune Strand Restoration Project area.*

Biscayne Bay Coastal Wetlands

The purpose of this project is to rehydrate coastal wetlands and reduce abrupt point source freshwater discharge to Biscayne Bay and Biscayne National Park that are physiologically stressful to fish and benthic invertebrates in the bay near canal outlets. Recent progress includes the following:

- Interim pump operation that began in August 2017 continued through March 2019, maintaining the L-31E canal stage at an optimal level, allowing fresh water to be diverted and delivered via sheetflow and rehydrated historical tidal creeks to the coastal wetlands.
- Construction of Culverts 706A, 706B, 706C, and 708 in the L-31 Canal was completed in October 2018 to begin providing additional freshwater flow to remnant tidal creeks and coastal wetlands in Biscayne National Park.
- Adaptive management implemented at the Deering Estate Pump Station (S-700) in WY2019 changed the rate of freshwater releases from pulsed to continuous, keeping the Deering Estate wetlands hydrated.
- Wetland stage and inundation increased in Deering Estate freshwater and coastal wetlands, and the distribution of available water improved for the area.
- Comparison of monitoring data collected during the last eight years with previous baseline data indicates the project is trending towards success. Point source freshwater discharges have been reduced and monitoring results clearly demonstrate improved hydrologic conditions in response to operation of the Deering Estate pump station (S-700) and the L-31E interim electric pump (S-709).
- During the reporting period, sawgrass recruitment was observed east and west of the L-31E Canal within the coastal wetlands.
- An increased abundance of various bird species, amphibians, invertebrates, and fish was observed within the project in WY2019.

C-111 Spreader Canal

This project, located in southern Miami-Dade County, will restore the quantity, timing, and distribution of water delivered to Florida Bay through Taylor Slough, optimize flow to support vegetation, restore flow patterns to historical sloughs and associated tributaries, and return coastal salinities in western Florida Bay as close as possible to historic levels by restoring upstream water levels in eastern Everglades National Park (ENP). The project includes pump stations, detention areas, culverts, conveyance canals, and 10 plugs or water control structures. Progress of the project follows:

- Installation of two additional 75-cfs electric pumps (one each at S-199 and S-200) was deemed substantially complete in July 2018.
- In response to the high water conditions in South Florida caused by heavy rainfall in May 2018, SFWMD began discharging excess stormwater via the Frog Pond Detention Area's S-203A emergency overflow weir.

L-8 Flow Equalization Basin (FEB)

This Restoration Strategies feature is a deep below-ground reservoir capable of storing approximately 45,000 ac-ft of water (Figure 6 on the next page). It attenuates peak stormwater runoff flows, temporarily stores stormwater runoff, and improves delivery rates to STA-1 East and STA-1 West. This enhances the operation and phosphorus treatment performance of the STAs. While this is no longer considered a CERP project, it is still permitted under the CERPRA authority, hence, it appears in the CERPRA chapter within Volume III. Progress of the project follows:

- During the water year, 42,178 ac-ft of water was conveyed into and 56,688 ac-ft of water was conveyed out of the L-8 FEB to the L-8 canal.

Figure 6. *L-8 Flow Equalization Basin with very low water levels.*

Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement (DECOMP) Physical Model (DPM)
The model is a large-scale field test located in Miami-Dade County along the southern end of the L-67A and L-67C canals within WCA-3 in a region referred to as the "pocket." DPM is designed to address uncertainties with depth, hydroperiod, sheetflow, and canal backfilling associated with the full-scale CERP DECOMP project. Information gathered from the DPM test will be used in the planning and design associated with the DECOMP Project. Features include10 controllable gated culverts adjacent to the L-67A canal (S-152) in the L-67A levee, the degraded 3,000 linear feet of the L-67C levee, and three 1,000-ft treatment areas in the L-67C canal (no backfill, partial backfill, and complete backfill). The status of the project is as follows:

- The District now operates and maintains the existing S-152 structure in accordance with FDEP permit 0369865-001, issued on February 8, 2019, and the approved operational strategy.
- The District will continue to perform field testing and monitoring for the scientific investigation with a final report submittal in 2022.

Ten Mile Creek Water Preserve Area (WPA)
This is a remediation project for water storage to improve the quantity and timing of water deliveries to the North Fork of the St. Lucie River by capturing and storing storm water originating in the Ten Mile Creek Basin. The project is also anticipated to help moderate salinity levels and reduce sediment loads in the St. Lucie River and Estuary. Progress of the project follows:

- During the water year, the project had a net inflow of 3,800 ac-ft of water via inflow pump station S-382 (5,833 ac-ft offset by 2,033 ac-ft released back into Ten Mile Creek through the S-382 return bay) and an outflow of 5,351 ac-ft conveyed through gated outflow structure S-384. The return bay at S-382 was used to keep stage below the maximum capacity of the reservoir prior to forecasted rain events and to accommodate planting in the polishing cell and reservoir.
- The project reduced phosphorus in water passing through the project by almost 80%.

8.5 Square Mile Area and S-356 Pump Station
The purpose of this project is for interim operations and maintenance of the S-356 and S-357 pump stations and associated features to provide flood mitigation to the Las Palmas Community (also known as the 8.5 Square Mile Area) within the interior of the outer levee (L-357W) resulting from increased flows to ENP as future phases of the Modified Water Deliveries to the ENP project are implemented. Status of the project in WY2019 follows:

- The project is successfully performing as designed even though the extreme rainfall in May 2018 caused high water conditions in South Florida. From June to November 2018, FDEP authorized emergency operations to mitigate the high water conditions; during this time, S-356 discharged a total of 43,000 ac-ft of water to Northeast Shark River Slough and S-357 was used up to its full capacity of 575 cfs to provide flood mitigation to the Las Palmas Community.
- The operational scenario employed through August 2018 was known as the Construction Transition Plan to Increment 2, a transition plan that limited the use of S-357 due to United States Army Corps of Engineers (USACE) construction work in the North Detention Area. During the construction period, S-357 was constrained to two units for most conditions and S-331 was used at a lower range to assist in providing flood mitigation to the Las Palmas Community. After USACE completed construction of the downstream North Detention Area in August 2018, pumping constraints at S-357 were lifted and the pump station was operated following the criteria described in the Increment 2 Operational Strategy Plan, which increased the reliance on S-357 and helped mitigate observed seepage increases at the southwestern corner of the Las Palmas Community.
- Pumping at the S-357 pump station was also constrained between February 18 and March 31, 2019, to facilitate maintenance repairs on L-360E and L-360W and removal of remnant segments of L-359 between L-360E and L-360W.

Everglades Forever Act (EFA) Progress

A-1 Flow Equalization Basin (FEB)
This Restoration Strategies feature is a 15,000-acre above-ground impoundment capable of storing approximately 60,000 ac-ft of water (Figure 7). It attenuates peak stormwater runoff flows, temporarily stores stormwater runoff, and improves delivery rates to STA-2 and STA-3/4. This enhances the operation and phosphorus treatment performance of the STAs. Progress during WY2019 is as follows:

Figure 7. *A-1 Flow Equalization Basin.*

- The project transitioned to routine operations in June 2018, and 380,849 ac-ft of water was conveyed into and 282,908 ac-ft of water was conveyed out of the FEB.
- Based on the review of available stage, flow, and water quality data, the FEB has operated as intended and performed in a manner consistent with its design objectives.
- Although it was not designed to be a water quality treatment facility, it retained 90% of the inflow total phosphorus (TP) load (equivalent to 45.2 metric tons).

Bolles East (L-16) Canal Conveyance Improvement

This project will increase the conveyance of water between the Hillsboro and North New River canals to improve operational flexibility of the Everglades STAs and help reduce flooding and improve water supply. The following is a status update for the project:

- In September 2018, the District obtained authorization to replace the Jett Farms Bridge in Segment 3 (Figure 8). The bridge replacement, accompanied with dredging activities, will improve canal conveyance.
- Construction of Segment 3 was substantially complete in July 2019.

Figure 8. *Jett Farms Bridge crossing Segment 3 of the Bolles East (L-16) Canal.*

Northern Everglades and Estuaries Protection Program (NEEPP) Construction Projects Progress

Lake Hicpochee Hydrologic Enhancement

Located in the East Caloosahatchee Basin, Phase I of the project will provide shallow water storage, rehydrate a portion of the lakebed to promote habitat restoration, and increase capacity for ancillary water quality enhancements. Progress during WY2019 is as follows:

- Construction commenced in April 2017 and substantial completion was achieved in April 2019. Final completion occurred in August 2019.

Lakeside Ranch STA

Located in western Martin County on lands adjacent to Lake Okeechobee, this STA currently has an effective treatment area of 1,707 acres. Progress in WY2019 includes the following:

- Phase I remained in the stabilization phase; however, lack of available inflow that began in WY2017 continued throughout WY2019. Because of this, Phase I of the project encountered treatment cell dryout, vegetation decline, and performance issues that resulted in restricted operations from May until September 12, 2018, when it was taken offline through the end of the water year to facilitate construction of Phase II.
- Phase II project construction was finalized on January 14, 2019, and transitioned to the initial operational testing and monitoring phase for the remainder of WY2019. Following construction completion, Phase II treatment cells were hydrated with 3,628 ac-ft of water from the L-47 canal by the use of temporary pumps (Figure 9). During the water year, vegetation recruitment progressed successfully in Phase II.
- There was no outflow from either Phase I or II during WY2019.

Figure 9. *Temporary pumps moving water from the L-47 canal into Lakeside Ranch STA.*

Nubbin Slough STA

This is the second pilot-scale STA located north of Lake Okeechobee, designed to reduce phosphorus loading to the lake by capturing and treating runoff from Nubbin Slough. The STA is designed for an annual average TP load reduction of 3 to 5 metric tons per year. Status of the project in WY2019 is as follows:

- Due to limited availability of inflow water as well as ongoing levee repairs, the STA experienced dryout for most of the water year. As a result, the project was not operational for most of this period and only discharged for 48 days from May 31 to July 17, 2018.

Rolling Meadows Restoration Project

This project will restore the natural habitat of an area known as Parcel B by establishing connectivity between the parcel and Lake Hatchineha and by the diversion of some of the flows from Catfish Creek into the parcel. During WY2019 the following occurred:

- The project was in routine operations during the water year and is performing as designed.

Taylor Creek STA

This STA (Figure 10 on the next page), one of two pilot-scale STAs being implemented north of Lake Okeechobee, has an effective treatment area of 118 acres and is predicted to remove up to 2 metric tons of TP from the Taylor Creek drainage basin per year. Following is the WY2019 status of the project:

- The project reduced TP load by 39% during WY2019.
- Operational challenges were encountered during the water year, including the lack of availability of inflow water from Taylor Creek during the dry season; there were over four months with no flow through the STA during WY2019.

Figure 10. *Cell 1 of the Taylor Creek STA.*

Environmental Resource Permit (ERP) Progress

C-139 Annex Restoration

The C-139 Annex is an approximately 15,000-acre former citrus grove in southeastern Hendry County that will be restored to its historic condition as a wet prairie system with depression marshes, cypress domes, and hardwood hammocks. The project will provide benefits to groundwater, surface water, and water supply, and complement other comprehensive efforts to improve water quality for the Everglades. The following progress was made during WY2019:

- Construction activities within the Phase I restoration area during WY2019 included backfilling 2.9 miles of lateral Canal 15E; this construction commenced in September 2018 and substantial completion was achieved on March 6, 2019.

Cypress Creek Restoration Project

Cypress Creek (Figure 11) is a major tributary to the Northwest Fork of the Loxahatchee River, a federally-designated National Wild and Scenic River. This collaborative effort between Martin County and SFWMD will enhance the historic native biological community typical of the Loxahatchee River system by restoring wetland hydroperiods and improving natural storage, thus improving the timing of surface water discharges and base flow to the Northwest Fork of the Loxahatchee River. Progress in WY2019 includes the following:

- Although construction of the project has not been completed, initial data indicate the project is providing storage and hydrating wetlands to the west on the Culpepper Ranch property.

Holey Land Wildlife Management Area (WMA)

Part of the northernmost extent of remaining Everglades sawgrass marsh, the WMA consists of approximately 35,000 acres of degraded Everglades landscape, characterized by a marsh of dense sawgrass with scattered shrubs, isolated tree islands, cattails, and freshwater sloughs located in the southwestern corner of Palm Beach County. The status of the project follows:

- During the reporting period, 1,091 ac-ft of water entered the WMA through G-200 and 49,570 ac-ft of G-372S water entered through G-372HL. In the same period, 4,236 ac-ft of water was conveyed from the WMA to the STA-3/4 discharge canal (L-5 canal) at flow monitoring station G204 and 846 ac-ft of water was conveyed from the WMA to the canal at station G206.

Figure 11. *Wetlands along Cypress Creek.*

FIVE-YEAR CAPITAL IMPROVEMENT PLAN

Over the next five years, SFWMD estimates spending $2.4 billion on projects contained in its Five-Year Capital Improvements Plan. The plan reflects the Governing Board's commitment to expediting Everglades restoration and preparing for the impacts of sea level rise and climate change. The plan also supports the Governor's strong commitment to the Everglades and the environment. The five-year plan includes funding dedicated by the Governor to implement the EAA Reservoir Project with associated STA and canal conveyance components, the Caloosahatchee Reservoir and Water Quality Study, completion of the C-44 Stormwater Treatment Area (STA), and ongoing Restoration Strategies projects.

The remaining funds address priorities related to flood control and stormwater/water supply throughout the water management system. The Fiscal Year 2020 adopted budget included a planned capital improvements project budget of $588 million. Based on revised estimated project schedules, the District's Five-Year Capital Improvement Plan was adjusted to a total of $382 million for Fiscal Year 2020. The difference of $206 million is largely attributed to Everglades Restoration projects multi-year cash flow requirements.

The SFWMD Five-Year Capital Improvements Plan supports implementing priority projects in support of Governor DeSantis' *Achieving More Now For Florida's Environment Executive Order*.

To keep the public informed of these important projects, the District created a special webpage at www.sfwmd.gov/AchieveMoreNow where the public can monitor the progress of these important projects. Additional information can also be found in Volume II, Chapter 4.

EVERGLADES RESEARCH AND EVALUATION

Progress and findings from Everglades research and evaluation is summarized in the following subsections. For more information, see Chapter 6 of Volume I.

Everglades Hydrology

Across most of the Everglades, as WY2019 began (June 2018), water depths were climbing due to late WY2018 above average rainfall. This meant that water depths peaked earlier than normal and fell below average during the WY2019 dry season, and along with late season reversals led to a hydropattern not conducive for wading bird foraging. In Florida Bay salinities, low rainfall through the WY2019 wet season led to salinity increases that continued through the dry season, setting the stage for eastern and central Florida Bay to end WY2019 with above average salinities. Western Florida Bay salinities, on the other hand, did not rise as quickly in the dry season as eastern and central Florida Bay. This resulted in salinities slightly below average in western Florida Bay at the end of WY2019.

Wading Birds

Dry season depths and recession rates in the Everglades Water Conservation Areas (WCAs) were not conducive for wading bird foraging. As a result, only 32,165 wading bird nests were initiated, and federally threatened wood stork nesting was not successful (no chicks fledged from 970 nests). All other indicator species, with the exception of the snowy egret, exhibited decreased nesting effort during 2019.

A two-year study (2017–2018) of prey use by nesting ibis in coastal colonies of ENP found the 2018 ibis nesting activity to be more than 25-fold higher than in 2017 and was the highest reported for the region in at least 80 years. An analysis of the gut content (boluses) of the chicks indicated that freshwater prey, especially crayfish from local short hydroperiod marl prairies, provided the key trigger for high nesting activity.

Plant Ecology

In the Loxahatchee Impoundment Landscape Assessment (LILA) research facility, trunk diameters of three woody native tree island species were monitored to evaluate the hydrologic conditions suitable for growth and inform how best to proceed for tree island restoration planning. Seasonality in growth, peaking during the driest periods, confirms the importance of water management policies that promote strong wet and dry cycles throughout the Everglades ecosystem.

Continued recovery from the 2015 seagrass die-off event in Florida Bay has been occurring, but recent water quality (e.g., turbidity) conditions as a result of disturbances, particularly Hurricane Irma, may be slowing the recovery of the seagrass community.

Ecosystem Ecology

The Upper Taylor Slough area is a unique short hydroperiod marsh that may experience shifts in community composition with increased westward flow through the S-332s and S-200 structures. A collaboration with Everglades National Park (ENP) to examine food webs, aquatic organisms, vegetation and water quality was initiated in 2017 and now this baseline database can be used to compare and contrast the ecological impacts associated with current and future structural and operational changes to water deliveries to Taylor Slough.

Landscape Ecology

The Decomp Physical Model (DPM) is using vegetation management techniques to reconnect historic sloughs and restore flow direction and velocities in degraded areas of WCA-3B.

Despite low inflow TP concentrations (< 10 parts per billion [ppb]; equivilant to micrograms per litler [µg/L]) at the DPM inflow structure, increased flow is generating locally high TP loads (10 to 25 grams per meter per day) leading to phosphorus enrichment of periphyton and floc above 500 milligrams per kilogram. These loads are within the range of enriched cattail habitats in northern WCA-2A. Future DPM science will try to establish envelopes of flow and loading conditions that avoid this negative impact while maximizing ecosystem benefits.

The enrichment of sediments downstream of the L-67C levee gap in DPM, particularly the unfilled canal treatment, suggests that sediment dynamics in canals that are not backfilled may contribute to the process of sediment phosphorus enrichment. Furthermore, the data indicate that the regular placement of hydrologic plugs in the L67-C canal will enhance wetland-to-wetland connectivity, a Comprehensive Everglades Restoration Plan (CERP) goal.

Photo by Mark Cook.

EVERGLADES TOTAL PHOSPHORUS IMPROVEMENTS

For WY2019, 90% of the Everglades Protection Area (EPA) marsh is below an annual geometric mean TP concentration of 10 parts per billion (ppb, equivalent to micrograms per liter, µg/L). Approximately 94% of the EPA marsh is below an annual geometric mean TP concentration of 15 ppb. Figures 13 and 14 on page 11 depict the changes in annual TP concentration entering the EPA.

TP load in surface water flows into and between WCAs and ENP totaled 86.6 metric tons (t) in WY2019. This represents a decrease of approximately 52% compared to WY2018 (180.8 t) and is largely the result of significant decreases in flow and TP load from upstream areas through the Everglades Stormwater Treatment Areas (STAs). These STAs also received 469,500 ac-ft of water from Lake Okeechobee, the second highest annual water year volume in history. The overall TP concentration in surface water flows into and between WCAs and ENP decreased from 24 ppb in WY2018 to 18 ppb in WY2019.

In WY2019, inflow geometric mean TP concentrations for the EPA ranged from 9.0 ppb for ENP to 26.1 ppb for WCA-1. TP concentrations for interior WCA regions ranged from 5.2 ppb in WCA-3 to 8.9 ppb in WCA-2, and at individual marsh monitoring stations ranged from 3.0 ppb in some unimpacted portions of the marsh to 27.8 ppb at sites that are currently or were historically highly influenced by canal inputs. See Chapter 3A and the related appendices in Volume I for more information on phosphorus in the Everglades.

Photo by Mark Cook.

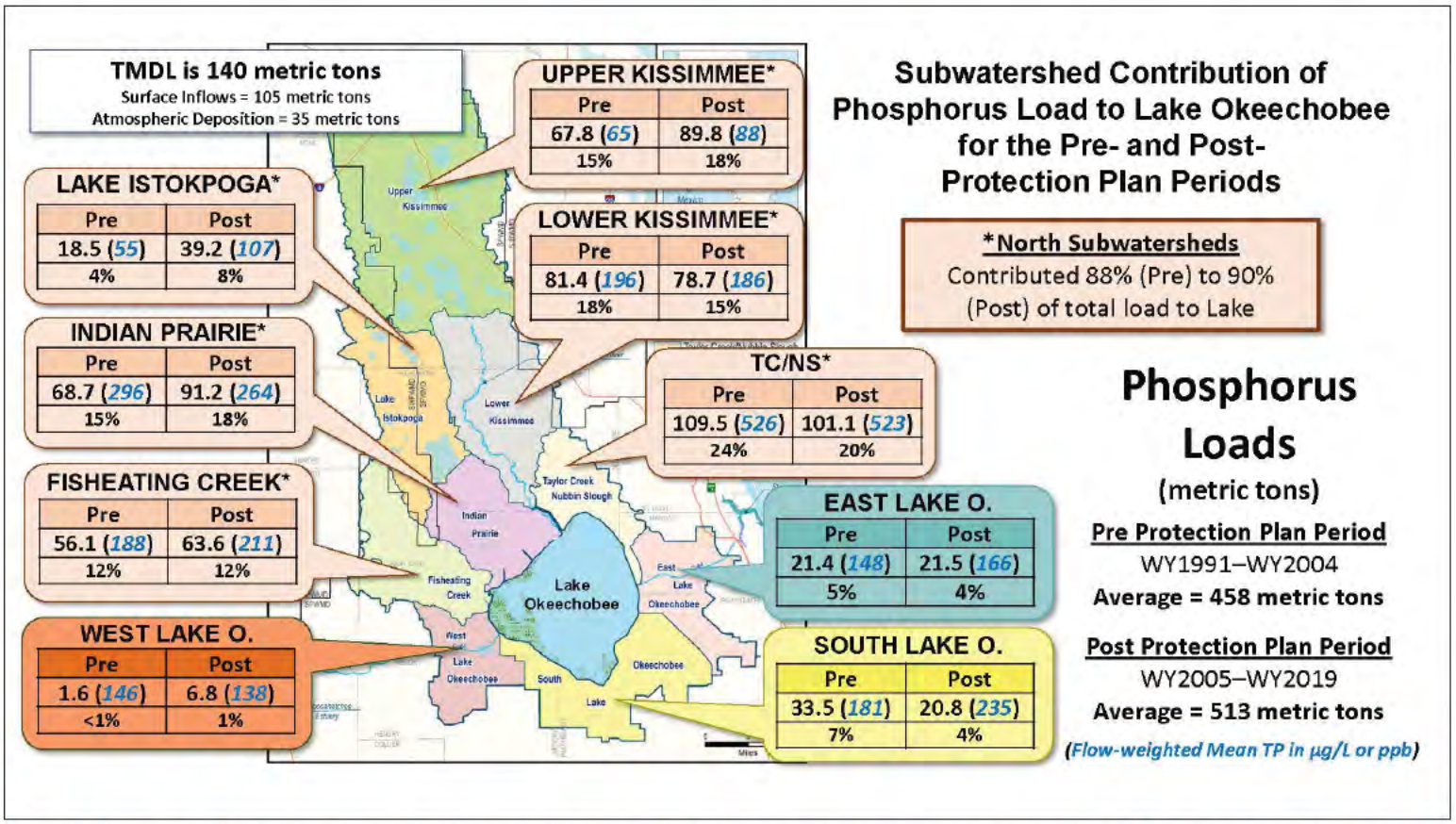

Figure 12. *Contribution of phosphorus loads to Lake Okeechobee by subwatershed for the pre- and post-protection plan periods. (Note: Lake O. – Lake Okeechobee and TC/NS – Taylor Creek/Nubbin Slough.)*

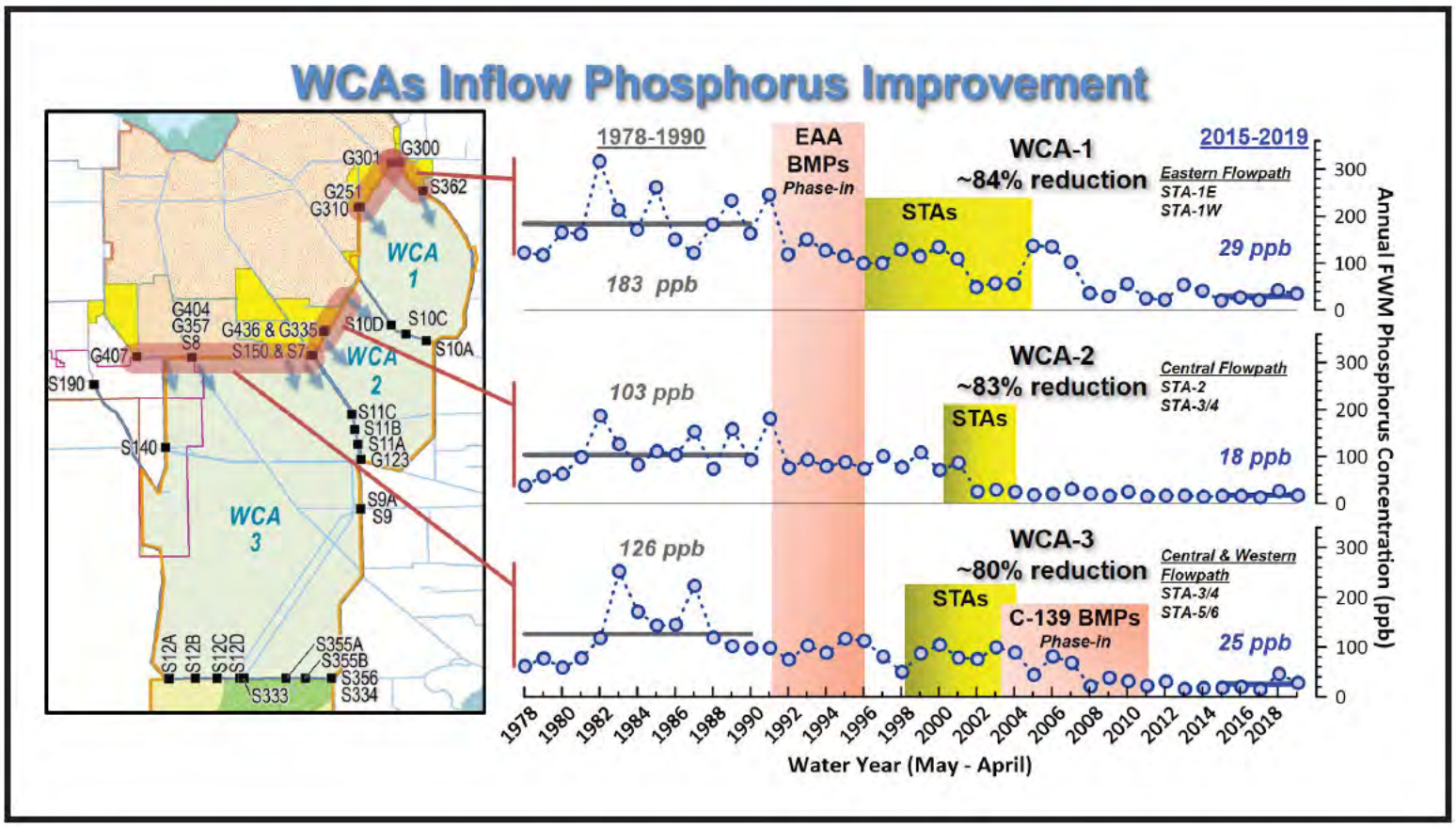

Figure 13. *Phosphorus flows into the Everglades Stormwater Treatment Areas (STAs) from upstream Everglades Agricultural Area (EAA) Basin, C-139 Basin, and Lake Okeechobee. Total phosphorus (TP) concentrations in this path have greatly reduced over time as best management practices (BMPs) and STAs were implemented.*

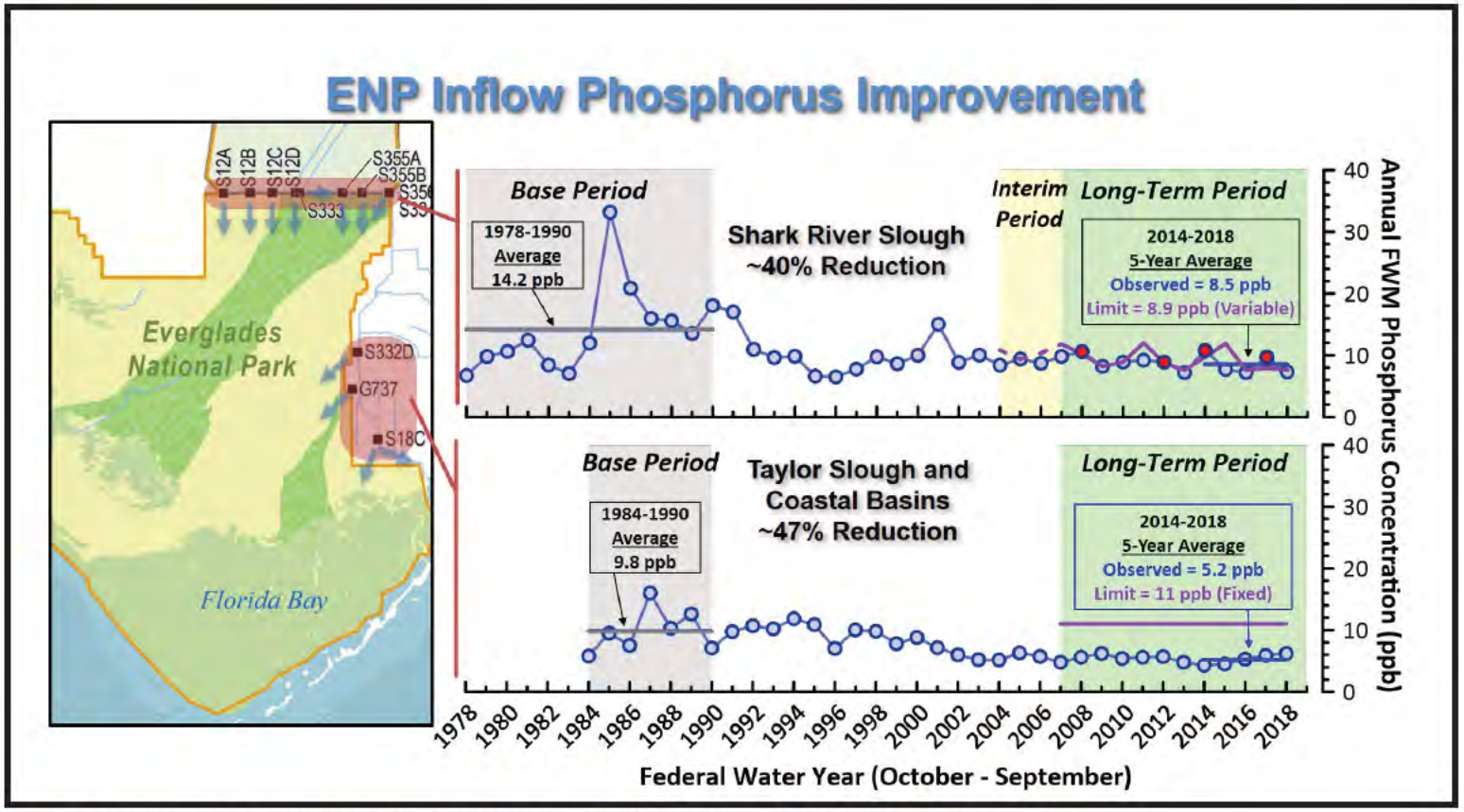

Figure 14. *Phosphorus flows in to Shark River Slough and Taylor Slough and Coastal Basins within Everglades National Park (ENP).*

RESTORATION STRATEGIES

Design and Construction Status of Water Quality Improvement Projects

Restoration Strategies projects completed prior to WY2019 include A-1 and L-8 flow equalization basins (FEBs), L-8 Divide Structure, S-5AS Modifications, and S-375 Expansion (Figure 15). Status of Restoration Strategies design and construction of water quality improvement projects for WY2019 is provided below. See Chapter 5A of Volume I for additional information on these projects.

Eastern Flow Path Accomplishments in WY2019

- As part of the G-341 Related Conveyance Improvements project, construction of Bolles East Canal Segment 3 began and the design of Segment 4 continued.
- Initiated design to regrade Cells 5 and 7 for effective treatment area improvements under the STA-1E Repairs and Modifications project.
- Construction of STA-1W Expansion #1 was completed and initial flooding and start-up water quality monitoring began.
- Design was initiated for STA-1W Expansion #2.

Western Flow Path Accomplishments in WY2019

- Initiated construction of STA-5/6 Internal Improvements to increase the effective treatment area of Cells 2A and 3A.

Restoration Strategies Source Control Projects

This effort builds on the SFWMD regulatory program and (1) features strategic on-site locations or subregional source control projects in series with on-site best management practices (BMPs); (2) focuses on areas and projects with the greatest potential to improve water quality; and (3) are designed to increase retention or detention of TP above what is currently required.

Science Plan

The scientific studies under this plan investigate ways for improving operation and maintenance of the STAs to optimize treatment performance and help achieve the water quality based effluent limitation (WQBEL) for TP. The following findings resulted from studies conducted in WY2019. More information on Science Plan projects can be found in Chapter 5C and Appendix 5C-1 of Volume I.

- **Fauna Study:** Fish and large invertebrates can influence phosphorus reduction in STA surface waters. This study estimated that fish in STA-2 recycled the equivalent of 53% of the phosphorus that enters the STAs per day.

- **Floating Tussock Study:** Floating tussocks affect the performance of STAs by increased resuspension of sediment, destruction of the surrounding aquatic vegetation communities and clogging discharge points. This study developed a nomenclature of the various types of floating wetland communities based on size, substrate type, composition of plants, and attachment to shore or soils. This study used imagery from an unmanned aerial vehicle to find floating cattail areas that were not apparent from satellite imagery.

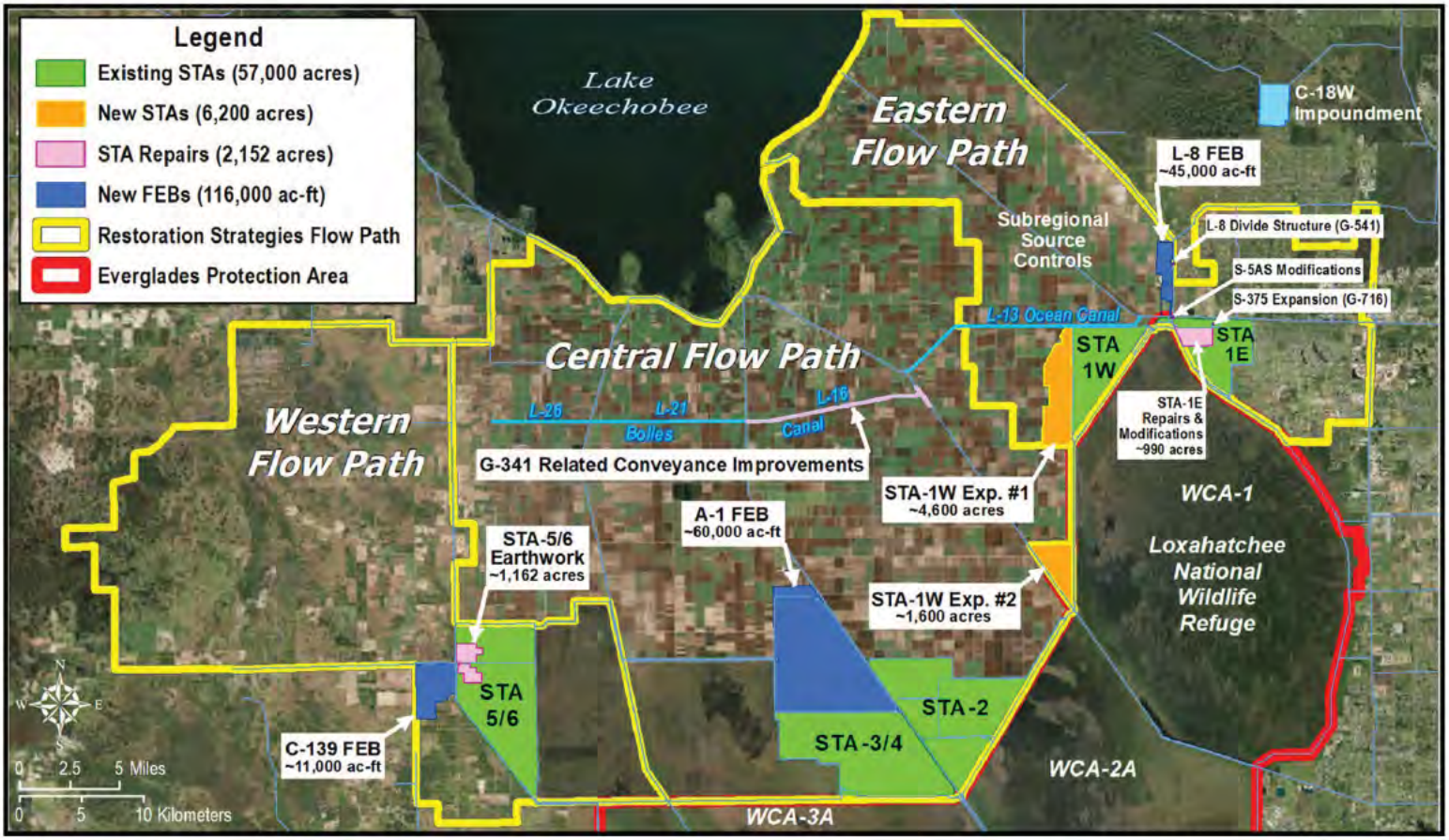

Figure 15. Map of Restoration Strategies flow paths and projects.

- **Periphyton Stormwater Treatment Area (PSTA) Study:** This 100-acre, periphyton-assisted STA (cell within STA-3/4) provides high phosphorus removal results and was studied to determine the mechanisms of this performance. The study is complete but continued operation and monitoring in WY2019 of inflow and outflow TP concentrations show that, for the twelfth consecutive year, the PSTA cell outflow concentration was 13 µg/L or less meeting the WQBEL.

- **Phosphorus Flux Study:** Internal phosphorus sources and sinks within STAs define the overall STA effectiveness at removing phosphorus. This study evaluated components contributing to this phosphorus removal processes in well performing STA cells. Ten flow events were studied. The major findings were that gradients from inflow (high TP) to outflow (low TP) were observed in the water column, floc, recently accreted soils, and vegetation. TP at the outflow region was primarily dissolved organic phosphorus and particulate phosphorus. TP concentrations near outflow submerged aquatic vegetation (SAV) regions increased during stagnant water periods, and internal loading from STA soils likely affects TP.

- **SAV Resilience Study:** SAV, an important component of well performing STAs, can exist as very dense healthy stands at one time point followed by a rapid decline. This study investigates the effects of operational and natural environmental conditions on SAV health. A survey of historical SAV data within the STAs found standing crop biomass and tissue phosphorus concentrations in general decreased with distance along a flow-way.

NORTHERN EVERGLADES AND ESTUARIES PROTECTION PROGRAM (NEEPP)

The coordinating agencies – South Florida Water Management District (SFWMD), Florida Department of Environmental Protection (FDEP), and the Florida Department of Agriculture and Consumer Services (FDACS) – continued implementation of NEEPP during WY2019. Overall, the program goal is to protect and restore surface water resources in the Northern Everglades region, including the Lake Okeechobee, St. Lucie River, and Caloosahatchee River watersheds, through a phased, comprehensive, and innovative approach that includes long-term solutions based upon total maximum daily loads (TMDLs). More information on NEEPP can be found in Chapters 8A, 8B, and 8C in Volume I.

FDEP Basin Management Action Plans (BMAPs)

Over the past year, progress continued on FDEP BMAPs designed to implement nutrient reductions established by TMDLs for the Northern Everglades watersheds. The *2018 Statewide Annual Report on Total Maximum Daily Loads, Basin Management Action Plans, Minimum Flows or Minimum Water Levels, and Recovery or Prevention Strategies* (STAR, FDEP 2019) details the progress made through December 31, 2018. In accordance with the *Achieving More Now For Florida's Environment Executive Order* Section 1-C, FDEP has updated each of the NEEPP BMAPs. Further details on these updates are available in Chapter 8A of Volume I and at www.floridadep.gov/dear/water-quality-restoration/content/basin-management-action-plans-bmaps.

SFWMD Watershed Protection Plans

Lake Okeechobee Watershed Protection Plan Update

Beginning March 1, 2020, and every five years after, NEEPP requires SFWMD to update the Lake Okeechobee Watershed Protection Plan (LOWPP) to ensure consistency with the state's *Basin Management Action Plan for the Implementation of Total Maximum Daily Loads for Total Phosphorus by the Florida Department of Environmental Protection in Lake Okeechobee* (FDEP 2014). As part of this update, SFWMD identified modifications to the Lake Okeechobee Watershed Construction Project to be incorporated in the 5-year BMAP update. Also, the update includes reporting on the research, monitoring, and modeling work conducted over the past five years (WY2014–WY2018) under the Lake Okeechobee Research and Water Quality Monitoring Program. More information

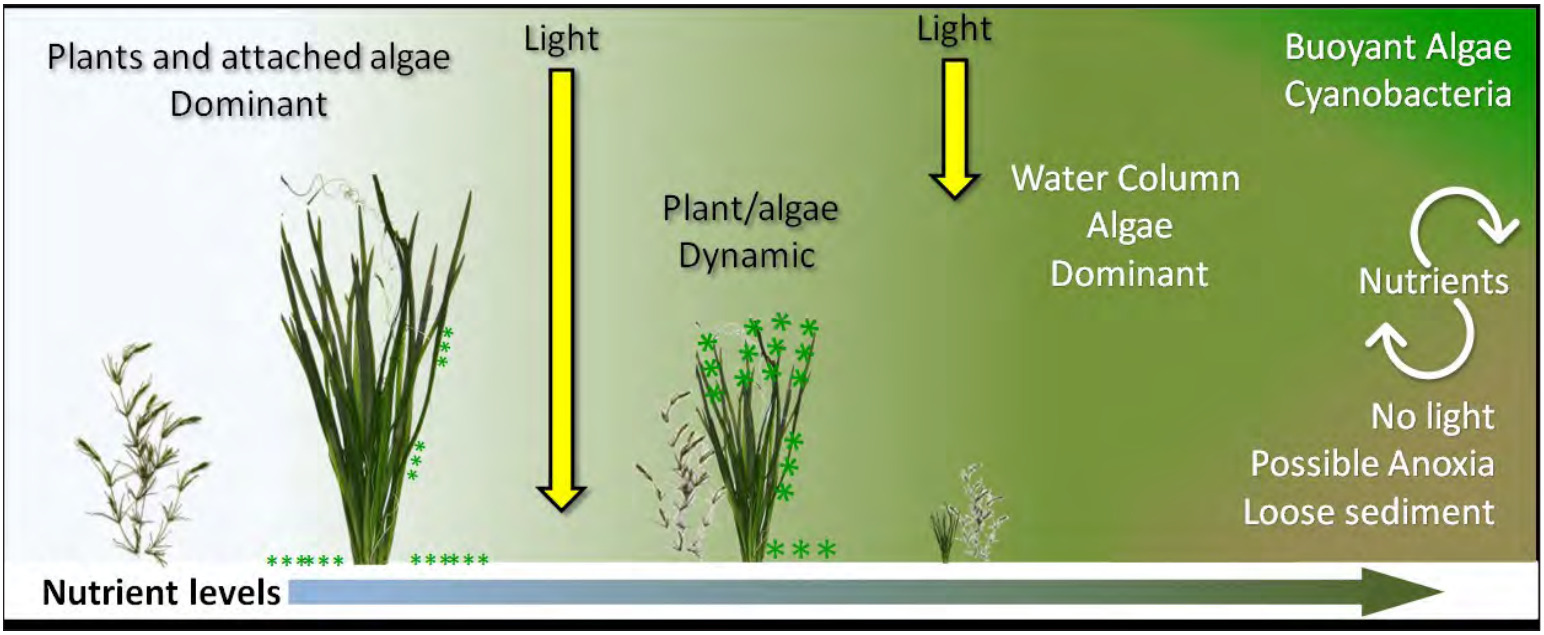

Figure 16. *The process of nutrient enrichment leading to algal blooms on Lake Okeechobee.*

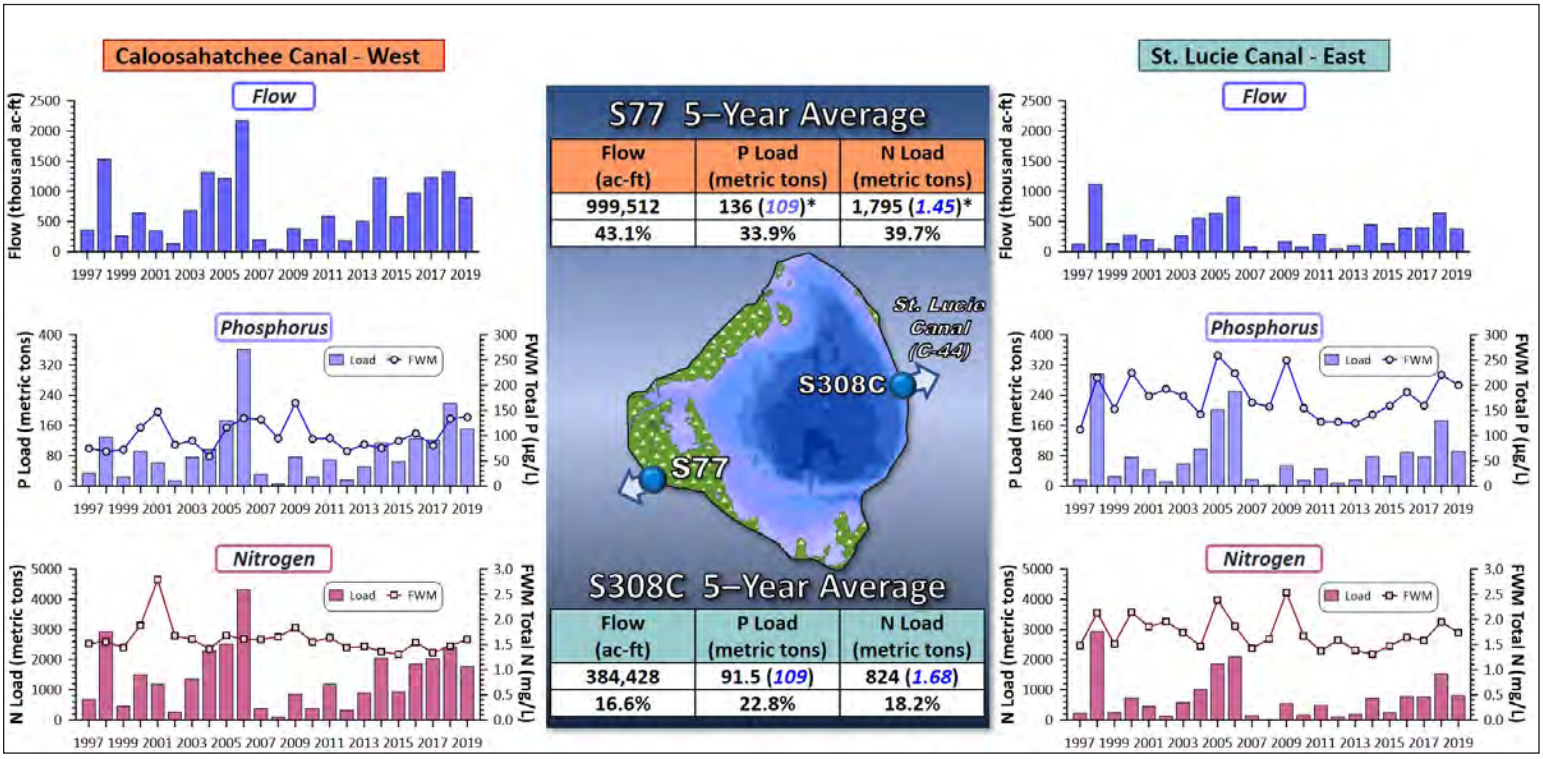

Figure 17. *Water and nutrients released from Lake Okeechobee west into the Caloosahatchee Canal and east into the St. Lucie Canal.*

about the LOWPP 2020 Update can be found at www.sfwmd.gov/lowpp and in Appendix 8A-1 of Volume I.

SFWMD Watershed Construction Projects

Construction and operation of many NEEPP projects progressed in WY2019. Notably, construction was substantially completed on the Lakeside Ranch STA – Phase II Project, and the Lake Hicpochee Hydrologic Enhancement – North Project. Operational dispersed water management (DWM) projects provided an estimated water quantity benefit of approximately 68,150 ac-ft. Of note, Brighton Valley DWM began construction in October 2018; once operational, this project is estimated to store, on average, 39,765 acre-feet (ac-ft) per year, resulting in an estimated annual TP and total nitrogen (TN) reduction of 3.2 and 27.3 metric tons (t), respectively. More information on the NEEPP construction projects can be found in Chapter 8A of Volume I.

The *Achieving More Now For Florida's Environment Executive Order* focuses on accelerating key Everglades restoration projects, including several directives that will assist in meeting NEEPP goals. As a result, SFWMD has initiated several actions, including expediting two Comprehensive Everglades Restoration Plan (CERP) projects: the C-44 Reservoir and Stormwater Treatment Area and the Caloosahatchee Reservoir.

SFWMD Research and Water Quality Monitoring Programs

Lake Okeechobee Conditions

Figure 12 on page 10 shows the phosphorus loads to lake for the pre- and post-protection plan periods for each subwatershed that drains into Lake Okeechobee.

Surface water inflow to Lake Okeechobee was 1.99 million ac-ft in WY2019, nearly a 42% decrease from WY2018 inflows of 3.42 million ac-ft. TP loads to the lake from atmospheric deposition and tributaries totaled 442 t in WY2019, less than half the WY2018 TP load (1,081 t). This year's load reduction can generally be attributed to drier conditions and decreased flow volumes. In-lake TP concentration was 156 ppb, 23% lower than the WY2018 value of 203 ppb. TN load to the lake was estimated to be 5,188 t, a 41% decrease from the previous water year TN load of 8,745 t. In-lake TN concentration decreased by 20% from the previous water year to 1.35 milligrams per liter (mg/L). Overall, water quality conditions improved in Lake Okeechobee from WY2018, when it was impacted by Hurricane Irma, which passed over Lake Okeechobee in early September 2017.

Low lake stages had mixed effects in WY2019. Beds of newly sprouted eelgrass sprouted across areas wiped clean by Hurricane Irma in 2017. Lower lake stages promoted reduced nutrient levels and clearer water in nearshore zones towards the end of the water year, aiding in vegetation recovery. Wading birds and Everglade snail kites (Figure 18 on page 16) had the lowest nest totals since WY2009 (1,575 nests and 0, respectively) while wading bird foraging numbers were the highest recorded (15,954 birds in late April 2019) since surveys began in WY2010.

Hurricane Irma caused dramatic increases in suspended solids and uprooted emergent vegetation. Despite the time elapsed since Hurricane Irma, lake water quality and aquatic habitat continued degrading into WY2019. Submerged aquatic vegetation (SAV) recovery was not observed until spring 2019. In WY2019, the total areal coverage of SAV reached approximately 5,200 acres, the lowest in 12 years.

Algal blooms (Figure 16 on page 13) were intense and widespread in July 2018, with satellite imagery showing roughly 90% probability of coverage. WY2019 had the highest occurrence of detectable microcystin (almost half the samples), and the mean concentration was 1.05 ppb; the highest among the previous five years.

The amount of water and nutrient pollution released from Lake Okeechobee west to the Caloosahatchee Canal and east to the St. Lucie Canal since 1997 is shown in Figure 17 on page 14. More information on the status of the Lake Okeechobee Watershed can be found in Chapter 8B of Volume I.

St. Lucie River Watershed and Estuary Conditions
Total freshwater inflow into the St. Lucie River and Estuary in WY2019 was 0.87 million ac-ft, of which 43% was from the St. Lucie Basin, 37% from Lake Okeechobee, and 20% from the Tidal Basin. The total freshwater inflow is comparable to long-term averages but approximately 50% less than WY2018, a very wet year due in part to Hurricane Irma.

In WY2019, the TN load to the estuary was 1,206 t (45% from Lake Okeechobee, 40% from the St. Lucie Basin, and 15% from the Tidal Basin), while the TP load was 216 t (58% from the St. Lucie Basin, 34% was from Lake Okeechobee, and 8% from the Tidal Basin). Salinity fell in the preferred envelope for adult eastern oysters more frequently (63%) than in the last two water years. As a result, oyster density showed a significant recovery from the first sampling event following Hurricane Irma. In WY2019, dry season sampling averaged 510 live oysters per square meter.

Additional information on the status of the St. Lucie River Watershed and Estuary can be found in Chapter 8C of Volume I.

Caloosahatchee River Watershed and Estuary Conditions
Total freshwater inflow to the Caloosahatchee River and Estuary in WY2019 was 2.23 million ac-ft, of which 45% was from the C-43 Basin, 34% from Lake Okeechobee, and 21% from the Tidal Basin. The total freshwater inflow is slightly higher than the long-term average (1.90 million ac-ft) but 38% less than WY2018.

In WY2019, the TN load to the estuary was 3,811 metric tons (t; 49% was from the C-43 Basin, 36% from Lake Okeechobee, and 15% from the Tidal Basin) while the TP load was 413 t (53% from the C-43 Basin, 32% from Lake Okeechobee, and 16% from the Tidal Basin).

Salinity observations at the Ft. Myers monitoring station met the target (30-day average < 10) 94% of the time, which is higher than the long-term average. Additionally, the WY2019 oyster density observations indicate an impactful recovery from Hurricane Irma effects. For example, the Iona Cove sampling location averaged 406 live oysters per square meter in the dry season.

Additional information on the status of the Caloosahatchee River Watershed and Estuary can be found in Chapter 8C of Volume I.

FDACS Agricultural Non-Point BMP Update

As of March 31, 2019, the Florida Department of Agriculture and Consumer Services (FDACS) enrolled 1,293,796 agricultural acres in the Lake Okeechobee Watershed; 228,859 agricultural acres in the St. Lucie River Watershed; and 416,495 agricultural acres in the Caloosahatchee River Watershed. Details on best management practices (BMPs) implementation for each watershed can be found in the FDACS' report, *Status of Implementation of Agricultural Nonpoint Source Best Management Practices* (FDACS 2019) at www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy.

FLORIDA BAY WATER QUALITY

A spatial analysis of Florida Bay water quality has revealed that despite large-scale disturbances from algal blooms and tropical storms, most of the bay is very resilient. Algal blooms that began in October 2017 (WY2018) subsided across the bay by June 2018 (WY2019). Elevated chlorophyll *a* (Chla) and TP returned in October following Tropical Storm Gordon and Hurricane Michael, forming algal bloom hot spots. However, Chla concentrations were lower than those following Hurricane Irma and dissipated within 4 months. Total nitrogen (TN) has been slightly elevated in most of the bay since WY2016.

Water management in the southern Everglades area that feeds Florida Bay is focused on operational changes to the South Dade Conveyance System. These changes are designed to increase freshwater flows to the bay and to lessen the frequency, duration, and extent of elevated salinity levels. The implementation of the C-111 South Dade Project, Modified Water Deliveries to Everglades National Park (ENP), C-111 Spreader Canal Western Project, and the newly implemented Florida Bay Improvement Project in the upper Taylor Slough area are expected to improve freshwater flow patterns in the southern Everglades and Florida Bay. However, water management in these areas is dependent on the availability of fresh water in the system and the ability to move that water south towards Florida Bay. The localized drought in the area during 2014 and 2015 likely led to the submerged aquatic vegetation (SAV) die-off event in July 2015. The newly implemented Florida Bay Improvement Project was developed in direct response to this event and is intended to send additional fresh water into Taylor Slough and ultimately Florida Bay. See Chapter 6 in Volume I for additional information on Florida Bay water quality.

OTHER WATER QUALITY ANALYSES

In addition to TP, the following parameters are measured and analyzed for each region: TN, dissolved oxygen, alkalinity, pH, specific conductance, total ammonia nitrogen, pesticides, orthophosphate, dissolved inorganic nitrogen, mercury, and sulfate. The last two parameters listed are discussed in detail in Chapter 3B of Volume I. Chapter 3A of Volume I contains results for the remaining parameters and TP. Also, water quality measurements and analyses must be conducted for all restoration projects and these results are presented in the appendices of Volume III. Parameters measured vary between projects. TP reductions achieved by regional nutrient source control programs and Everglades Stormwater Treatment Areas (STAs) are discussed in Chapters 4 and 5B, respectively, in Volume I.

Figure 18. *Everglade snail kite.*

KISSIMMEE RIVER RESTORATION

Construction of the S-69 weir and backfill for the Kissimmee River Restoration Project began in 2019. The S-69 weir will serve as the southern terminus of the C-38 backfill, maximizing the area of wetland to be rehydrated in the Kissimmee River floodplain. This is the final phase of construction and is scheduled for completion in 2020.

During the 2018 wet season, successful implementation of the preferred discharge plan for the S-65/S-65A water control structures, referred to as the IS-14-50.0 discharge plan, produced a single 105-day period with bankfull discharge or greater to the Kissimmee River Restoration Project. Although this is far short of the 210-day restoration target, implementation of the Headwaters Regulation Schedule in 2020–2021 is expected to provide additional storage to help support adequate periods of above-bankfull flow to the Kissimmee River.

During WY2019, there was positive performance of the restoration project. All four components of the dissolved oxygen expectation were met in the Kissimmee River. Small fish and aquatic invertebrate density, abundance, richness, and diversity are greater now than during the baseline (pre-channelization) period on the Kissimmee River floodplain. The long-term annual three-year running mean abundance (2002–2019) of wading birds in the Kissimmee River is 40.9 +/- 3.4 birds per square kilometer (birds/km^2), significantly greater than the restoration expectation of 30.6 birds/km^2.

Everglade snail kite (Figure 18) nesting on Lake Tohopekaliga and East Lake Tohopekaliga, part of the Kissimmee Chain of Lakes, continued to decline in 2018. However, Lake Kissimmee had the most nests since 2006, many on floating islands covered in woody vegetation, which may have appeared in the lake due to disturbance from Hurricane Irma in 2017. Also, alligator populations on Lakes Tohopekaliga, Kissimmee, and Hatchineha followed an increasing trend.

Additional information on the Kissimmee River, its restoration, and the Kissimmee Chain of Lakes can be found in Chapter 9 and the related appendix in Volume I.

STATE-MANDATED WATER MANAGEMENT REPORTS

Volume II of the SFER contains SFWMD's state-mandated reports that Florida's five water management districts are each required to prepare annually for each fiscal year per Section 373.036(7), Florida Statutes. Combined, the chapters and appendices of Volume II fulfill most of the requirements for this consolidated reporting. The exception is required reporting described in Section 373.036(7)(e) that are provided within Volume I chapters and appendices. The chapters and appendices of Volume II, document SFWMD's progress in implementing plans developed to address areas of responsibility on a regional or district-wide basis. The reports provided in Volume II are as follows:

- Fiscal and Performance Accountability Report (Chapter 2).
- Priority Waterbodies List and Schedule (Chapter 3), which contains information on minimum flows and minimum water levels (MFL) criteria, water reservations, and restricted allocation areas. See the next section for a progress report on MFLs and water reservations.
- Five-Year Capital Improvements Plan (Chapter 4). See the section on page 16.
- Five-Year Water Resource Development Work Program (Chapter 5A), which also contains required reporting on alternative water supply.
- Projects in the Five-Year Work Program with Grading for Each Watershed, Water Body, or Water Segment (Chapter 5B)
- Projects Associated with a Basin Management Action Plan for the Next 5 Fiscal Years (Appendix 5A-1)
- Florida Forever Work Plan Annual Update (Chapter 6A)
- Land Stewardship Annual Report (Chapter 6B)
- Mitigation Donation Annual Report (Chapter 7)

MFL AND WATER RESERVATION PROGRESS

Caloosahatchee River MFL

In 2019, SFWMD completed a reevaluation and revision of the minimum flow and minimum water level (MFL) criteria and recovery strategy for the Caloosahatchee River in Chapter 40E-8, Florida Administrative Code (F.A.C.). The reevaluation and revision were accomplished through a public process and based on public input, monitoring, modeling, and other technical evaluations. On October 10, 2019, the SFWMD Governing Board adopted amendments to the MFL rule increasing the flow criterion at the S-79 water control structure from 300 cubic feet per second (cfs) to 457 cfs; eliminating the salinity criterion; revising the duration and return frequency components; and adding a biological component and monitoring requirement for mobile and immobile indicator species in the river. The recovery strategy was also amended and incorporated by final order into Appendix C of the *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017). These revisions are expected to provide protection from significant harm for the river and its biota. More information concerning the Caloosahatchee MFL is available in Chapter 3 of Volume II and at www.sfwmd.gov/our-work/mfl.

Kissimmee River and Chain of Lakes Water Reservations

Water reservations are being developed for the Kissimmee River and Chain of Lakes that will provide water essential for the

protection of fish and wildlife and support the objectives of the Kissimmee River Restoration Project. The water reservations will be adopted in Chapter 40E-10, F.A.C. During 2019, significant progress was made on developing revised draft water reservation rules and a supporting technical document. Public review and input on the water reservations will be gained through further public workshops in 2020. The water reservation rules are scheduled for adoption in December 2020. More information concerning the Kissimmee River and Chain of Lakes water reservations is available in Chapter 3 of Volume II or at www.sfwmd.gov/our-work/water-reservations.

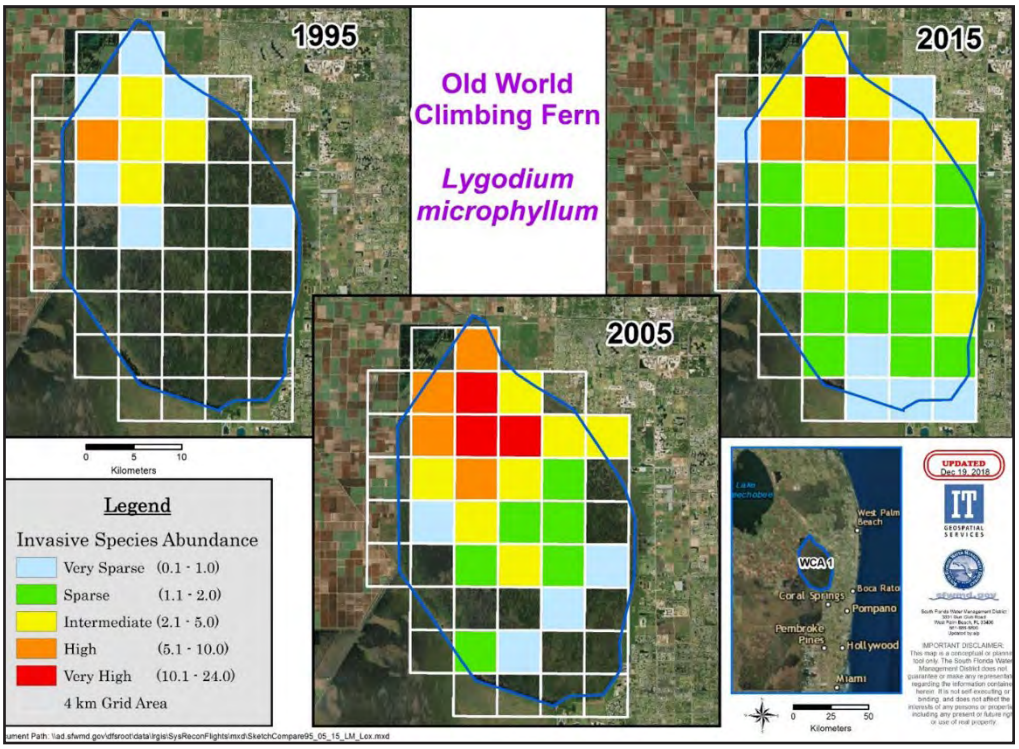

Figure 20. *Distribution and abundance of Old World climbing fern within Arthur R. Marshall Loxahatchee National Wildlife Refuge Water Conservation Area 1 between 1995 and 2015. The map shows the changing distribution and abundance of Old World climbing fern as measured using aerial reconnaissance techniques. During the 20-year period, the distribution of Old World climbing fern increased from the northern reaches of the refuge to nearly all areas. While the distribution has increased, active control measures between 2005 and 2015 decreased the number of areas with high to very high infestation levels (orange and red grid cells). Blank cells indicate the species was below the detection limit.*

INVASIVE SPECIES

SFWMD has one of the country's largest invasive species management programs, controlling aquatic and terrestrial vegetation and invasive animals systemwide. Eighty species of nonindigenous plants and 10 invasive animals are targeted for control within the SFWMD's boundary. Old World climbing fern, melaleuca, Brazilian pepper, and Australian pine are systemwide plant priorities, while aquatic plants such as hydrilla, water hyacinth, and water lettuce are priorities in the Kissimmee Basin and Lake Okeechobee. Burmese pythons and feral hogs are actively managed to suppress populations, while other animal species, such as Northern African pythons and Giant African land snails, are the focus of containment and eradication efforts.

The SFWMD and Florida Fish and Wildlife Conservation Commission (FWC) python hunter incentive programs have resulted in the removal of approximately 3,700 Burmese pythons (Figure 19). On August 7, 2019, Governor DeSantis directed the FWC and SFWMD to expand python management operations by increasing the number of agents in contractor removal programs, strengthening agency partnerships, holding annual "python challenges", and investing more in research and new technologies.

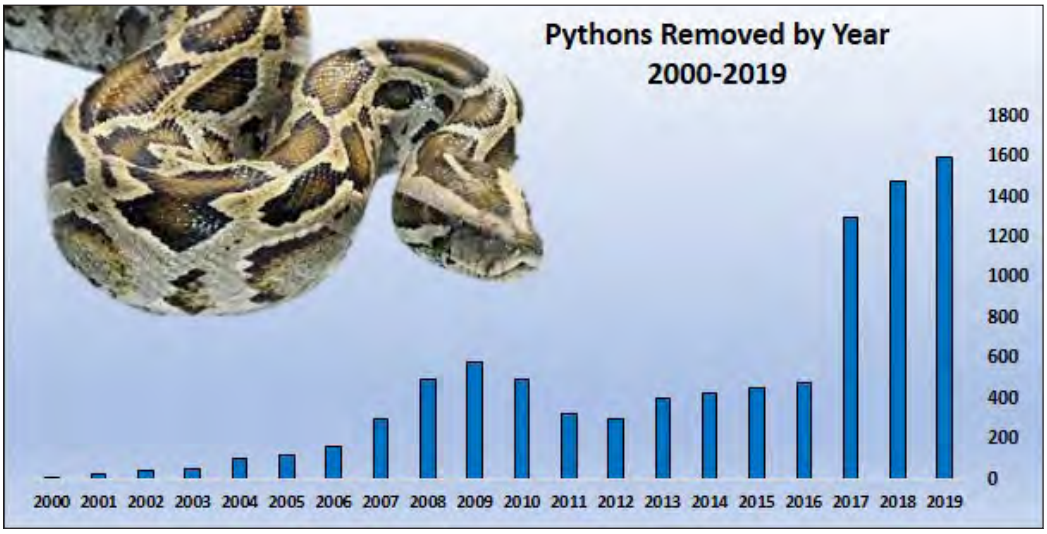

Figure 19. *Number of Burmese pythons removed from the Everglades region since 2000. Large increase in 2017 attributed to increased removal efforts from District and Florida Fish and Wildlife Conservation Commission (FWC) contractor programs.*

The Statewide Melaleuca Management Program remains a national model for successful long-term control of highly invasive species. The integrated pest management approach, adopted by SFWMD and partner agencies, employs multiple control tools including mechanical removal, prescribed fire, herbicides, and biological control. This management strategy is being employed for other priority species, including invasive aquatic weeds, and Old World climbing fern.

SFWMD manages the invasive plant management effort in the Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA-1), where melaleuca and Old World climbing fern remain problematic (Figure 20). The U.S. Fish and Wildlife Service and FWC collaborate with SFWMD, providing critical funding, logistical, and technical support.

National Park Service resource managers are collaborating with FWC and SFWMD invasive species biologists to leverage

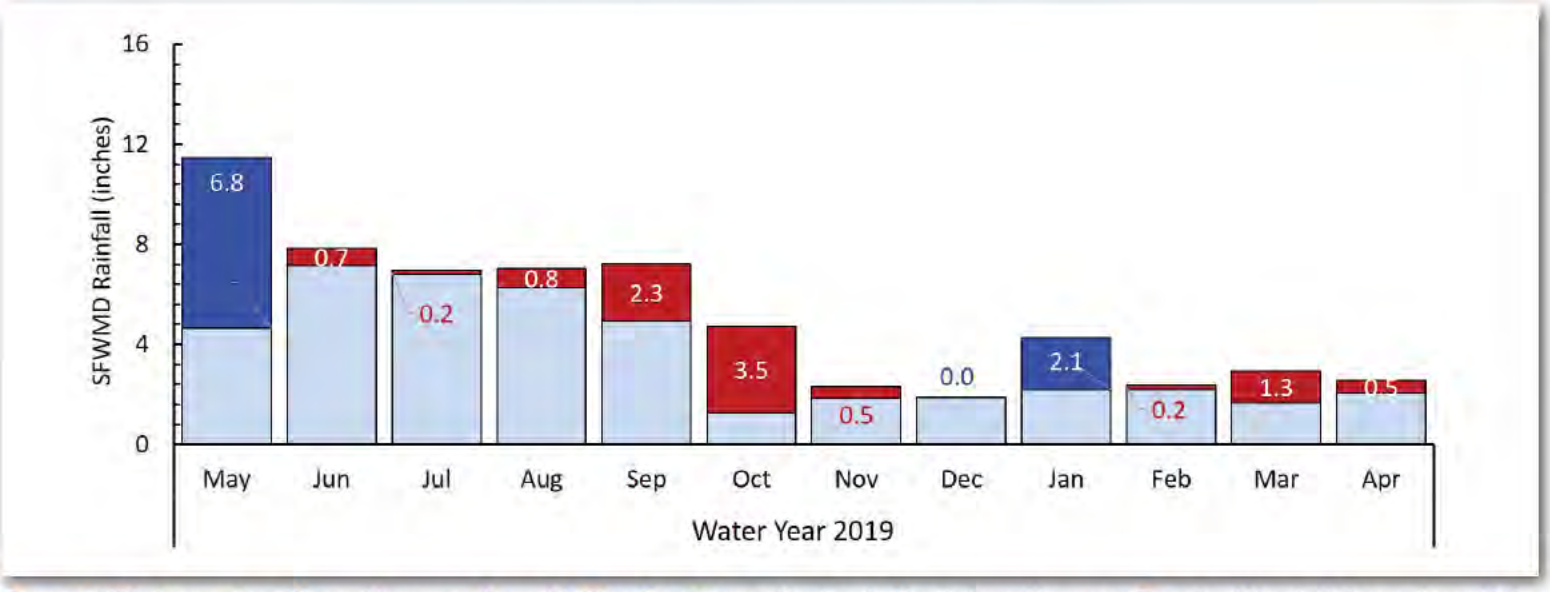

Figure 21. *With the exception of May and January, each month in Water Year 2019 was drier than the historical monthly average. The red and blue shaded areas along with the accompanying label indicate the inches of rainfall below (red) and above (dark blue) the historical monthly averages.*

resources towards achieving maintenance level control of melaleuca, Brazilian pepper, and other aggressive invaders in ENP and Big Cypress National Preserve.

WY2019 RAINFALL, FLOWS, WATER LEVELS, AND STORMS

Rainfall

WY2019 was drier than average, particularly in the typically wet June–October 2018 period (Figure 21), but the surface flows into and out from most major water bodies (Table 1 on page 19) were near average or higher than historical averages. After unusually high rainfall in May 2018, the Florida Department of Environmental Protection (FDEP) issued a high water emergency order (see below); every month afterwards had near average or below average rainfall, except for a January 2019 mild El Niño event. Water levels in major water bodies were close to their respective regulation schedule ranges with exception of the Everglades Water Conservation Areas (WCAs) in the early wet season. Overall, WY2019 wet season rainfall was 78% of the historical average.

Flows

In WY2019, surface outflows from Lake Okeechobee were 2,352,000 ac-ft. These flows were sent east to the St. Lucie River (378,000 ac-ft; 16% of surface outflow), west to the Caloosahatchee River (893,000 ac-ft; 38% of surface outflow), and south to the Everglades Agricultural Area (EAA) and Everglades Stormwater Treatment Areas (STAs) (994,000 ac-ft; 42% of surface outflow) (Figure 17 on page 14). This southern outflow from Lake Okeechobee was 343% of the historical average. Every month of the wet season had lower than average rainfall allowing greater treatment residence time in the STAs for treating Lake Okeechobee outflows. Surface flow into ENP was slightly above 1 million ac-ft, about the historical average; 78% of inflows were delivered to Shark River Slough, and 22% were sent to Taylor Slough and the Eastern Panhandle. Figure 22 shows where water from Lake Okeechobee was discharged during all water years since WY1991. Table 1 (page 19) provides the WY2019 flows and the percent of historic annual average flow for each water body. Figure 23 on page 20 shows relative flows from each region. For more information, see Chapter 2 and the related appendices in Volume I.

Levels – High Water Emergency

The unusually high rainfall in May 2018 caused high water conditions and flooding in the EPA, especially WCA-3A. Heavy rainfall and flooding resulted in water levels in WCA-3A rising by more than 2 feet over 30 days, reaching 10.9 feet National Geodetic Vertical Datum of 1929 (NGVD29) by June 17, 2018. High water

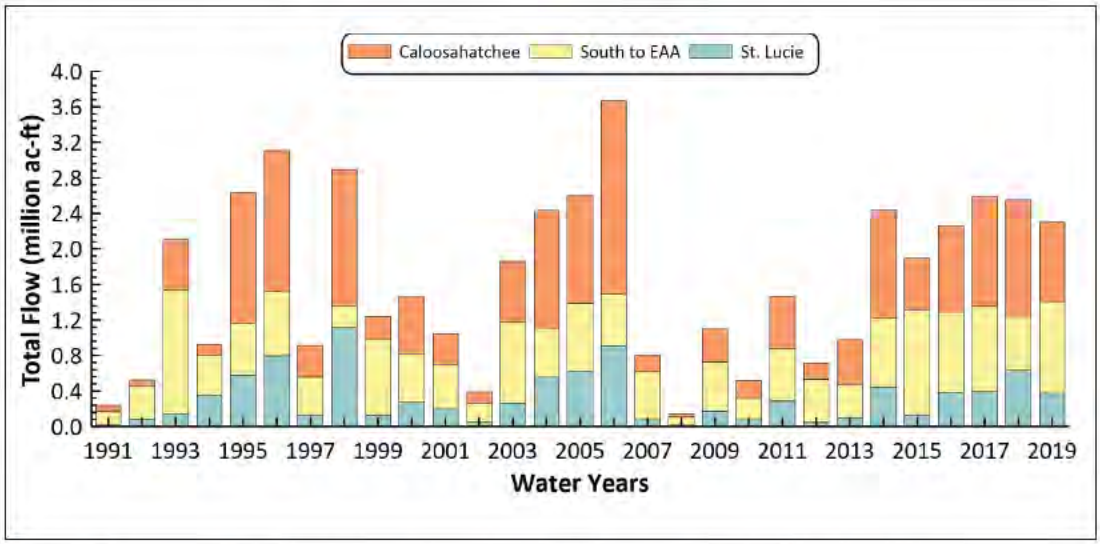

Figure 22. *Percentage of Lake Okeechobee discharges to the East, West, and South since Water Year 1991.*

Table 1. *Water Year 2019 surface inflows and outflows (in 1,000 acre-feet) of major water bodies along with the percent these flows are of the historical average. The Map ID refers to the numbered arrows in* ***Figure 23****.*

Map ID	Water Body	Subtotals	Total Flows	% of Historical Average [a, b]
1	**Lake Kissimmee outflows**		**940**	**127%**
2	**Lake Istokpoga outflows**		**307**	**124%**
3	**Lake Okeechobee total inflows**		**1,990**	**93%**
	From north	1,896		
	From east, west, and south	94		
4,5,6	**Lake Okeechobee total outflows**		**2,352**	**153%**
4	To south (S-351, S-352, and S-354)	994		
5	St. Lucie River inflow (S-308)	378		
6	Caloosahatchee River inflow (S-77)	893		
	Other outflows	87		
7	**St. Lucie River outflow (S-80)**		**429**	**132%**
	Lake Okeechobee releases to St. Lucie Estuary	308		
	St. Lucie River Basin runoff into St. Lucie Estuary	121		
8	**Caloosahatchee River outflow (S-79)**		**1,759**	**135%**
	Lake Okeechobee releases to Caloosahatchee Estuary	761		
	Caloosahatchee River Basin runoff into Caloosahatchee Estuary	998		
9	**WCA-1 inflows**		**299**	**65%**
10	**WCA-1 outflows**		**354**	**83%**
	To WCA-2 via S-10s	232		
	To east	769		
11	**WCA-2 inflows**		**1,001**	**150%**
	From WCA-1 via S-10s	232		
	From STAs	769		
12	**WCA-2 outflows**		**891**	**134%**
	To WCA-3 via S-11s	653		
	To east	238		
13	**WCA-3 inflows**		**1,496**	**123%**
	Northwestern (S-8, STA-5/6, S-140, and S-190)	553		
	From WCA-2 via S-11s	653		
	Eastern (S-150 and S-9s)	276		
14,15a	**WCA-3 outflows**		**984**	**94%**
15a	To ENP and S-334	862		
14	Other outflows	122		
15b,16	**ENP inflows**		**1,065**	**102%**
15b	Shark River Slough	827		
16	Taylor Slough and Eastern Panhandle	238		
17	**North Fork of St. Lucie Estuary inflows (S-48, S-49, and Ten Mile Creek at Gordy)**		**262**	**106%**
18	**Upper East Coast C-25 canal outflow at S-50**		**187**	**132%**

a. Historical periods are 1972–2019 for all flows, except 1996–2019 for C-23 canal and 2000–2019 for Ten Mile Creek.

b. % of Historical Averages list only total flows and major outflows from Lake Okeechobee. More information can be found in Appendix 2-4 of Volume I.

Figure 23. *WY2019 surface inflows and outflows of major water bodies. The numbers refer to those in the Map ID column in Table 1. The sizes of the arrows reflect flow volume.*

levels inundate tree islands and other wildlife habitats and, if sustained, cause stress and loss of life, particularly for birds and mammals. Following an emergency order issued by the FWC on June 11, 2018, the FDEP issued an emergency final order (EFO) on June 20, 2018 (FDEP 2018). The FDEP EFO authorized the SFWMD and USACE to deviate from permitted water management practices and immediately move substantial volumes of flood water out of the WCAs. The actions taken by USACE and SFWMD under the EFO were implemented in a manner that minimized harmful impacts, including flooding and degradation of water quality, to the environment, the public, adjacent properties, and downstream receiving waters. For more information, see Appendix 2-5 of Volume I.

Storms

In WY2019, Florida was impacted by both Tropical Storm Gordon (September 2018) and Hurricane Michael (October 2018). Both storms were close enough to Florida Bay to have potential effects on water quality within the bay due to increased precipitation, the resulting increases in freshwater flows, wind, or a combination of all.

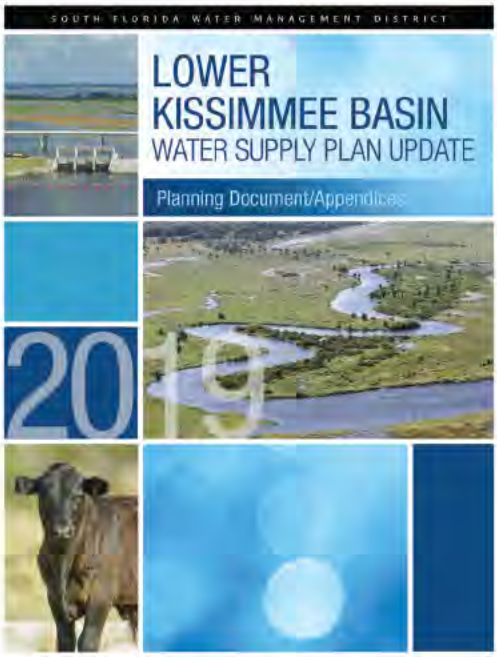

Figure 24. *The 2019 Lower Kissimmee Basin Water Supply Plan Update was approved by the SFWMD Governing Board in December 2019.*

ADDITIONAL EFFORTS

Chapter 2 in Volume II provides a summary of SFWMD efforts during FY2019 and the beginning of FY2020. Some of the efforts fall under programs and projects whose status has already been provided in this document. Here we highlight some of the other efforts; for a full list of efforts, see Chapter 2 in Volume II.

- Water quality monitoring is being expanded and laboratory equipment upgrades are planned in support of the *Achieving More Now For Florida's Environment Executive Order*
- Accomplishments associated with the Central Everglades Planning Project (CEPP) are as follows:
  - Successfully negotiated an early termination of leased land needed for the expedited construction schedule for the STA component of the EAA Reservoir Project.
  - Completed design and initiated construction for the removal of Old Tamiami Trail to reduce impediments to sheetflow.
- The SFWMD Governing Board approved the *2019 Lower Kissimmee Basin Water Supply Plan Update* in December 2019 (Figure 24). The plan is available at www.sfwmd.gov/our-work/water-supply/lower-kissimmee.
- Updates to the saltwater interface maps in SFWMD's coastal aquifers were produced. Links to the maps can be found at www.sfwmd.gov/sfer.

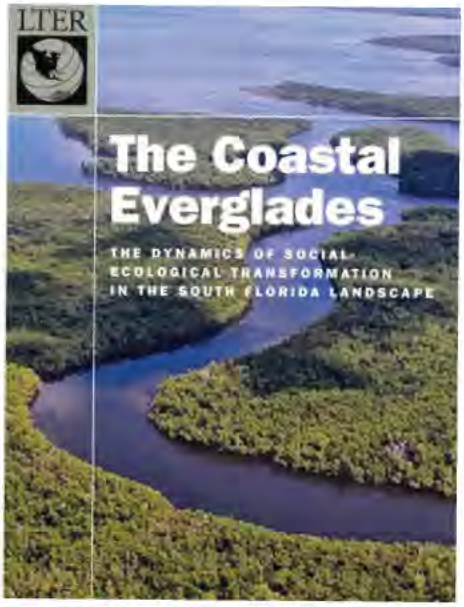

Figure 25. *District staff are co-authors on a new publication, The Coastal Everglades.*

- SFWMD hosted a Water Conservation Expo at SFWMD headquarters on March 15, 2019. This conservation themed seminar attracted participants from local governments, utilities, agriculture, manufacturers, other water users, and interested public and discussed studies, research, and experiences on the importance of conserving water.
- District staff authored sections within *The Coastal Everglades*, a nine-chapter description of the dynamics of social-ecological transformation in the South Florida landscape (Figure 25).
- Initiated the Caloosahatchee Reservoir Water Quality Feasibility Study in a public process to investigate technology options and identify three conceptual alternatives to provide additional treatment and improve water quality entering and/or leaving the Caloosahatchee Reservoir.
- As part of the effort to control exotic invasive species, SFWMD issued contracts for biological control development and implementation resulting in six releases of approximately 40,500 Old World climbing fern defoliating moths within the Kissimmee River floodplain.

CONSOLIDATED PROJECT REPORT DATABASE

The online SFER Consolidated Project Report Database at www.sfwmd.gov/sfer provides rapid data sorting, searches and retrieval for comprehensive updates on many projects referenced in the 2020 South Florida Environmental Report.

The complete *2020 South Florida Environmental Report* is available online at www.sfwmd.gov/sfer.

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What is phosphorus?

Although phosphorus is a vital nutrient in all natural systems, it is also a fertilizer component. It flows across the landscape in stormwater runoff as nutrient pollution (urban and agricultural), harming natural areas by promoting algae growth and an overabundance of non-native plants, crowding out natural vegetation and disrupting food sources and habitats used by native wildlife. The Everglades is naturally a low-nutrient system. Even small amounts of additional nutrients can upset the ecological balance needed by the native plants and animals in the historic "River of Grass." Phosphorus is normally recorded in micrograms per liter (µg/L) or parts per billion (ppb). In this document, total phosphorus (TP) is used to denote measurement when monitoring phosphorus found in water bodies or as it relates to inflows and outflows of water. Phosphorus is used when referencing all other aspects of the nutrient in general terms.

What is an STA?

Stormwater treatment areas (STAs) are large, constructed wetlands with inflow and outflow structures for controlling water movement. Aquatic plants in the STAs remove and store excess nutrients (phosphorus) found in the stormwater runoff through growth and the accumulation of dead plant material in the layers of sediment. This natural process cleanses the water before it is moved out of the STA and into the Everglades or other water bodies.

What is an FEB?

Flow equalization basins (FEBs) are constructed impoundments designed to capture stormwater runoff and provide a steadier flow of water to the Everglades STAs, helping to maintain desired water levels needed to achieve optimal water quality improvement performance and prevent dry out, which can be extremely damaging to STA vegetation.

How much is an acre-foot?

An acre-foot is the volume needed to cover 1 acre of land with 1 foot, or 325,851 gallons, of water.