



SOUTH FLORIDA ECOSYSTEM RESTORATION TASK FORCE

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2022 BIENNIAL REPORT



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Restoring America's Everglades

South Florida Ecosystem Restoration Task Force: 2022 Biennial Report

Report Purpose

The Biennial Report satisfies the requirements of the Water Resources Development Act of 1996 to report biennially on South Florida Ecosystem Restoration Task Force activities and progress made toward restoration. The reporting period for this edition is July 1, 2020 – June 30, 2022.

The Biennial Report is intended for four principal audiences:

- United States Congress
- Florida Legislature
- Seminole Tribe of Florida
- Miccosukee Tribe of Indians of Florida

The information included in this report will also be broadly shared with the State of Florida and federal agencies, local governments, and stakeholders interested in the restoration of the South Florida Ecosystem.

The Biennial Report is part of a suite of Everglades restoration documents prepared by the Office of Everglades Restoration Initiatives on behalf of the Task Force, all of which can be found at:

[EvergladesRestoration.gov](https://www.EvergladesRestoration.gov)

EXECUTIVE SUMMARY

Everglades Restoration and the South Florida Ecosystem Restoration Task Force:

The South Florida Ecosystem is a unique natural treasure. An 18,000-square-mile region of subtropical uplands, wetlands, estuaries, and coral reefs, the ecosystem extends from the Kissimmee Chain of Lakes south of Orlando to Florida Bay and the reefs southwest of the Florida Keys. A century of changes to the ecosystem, including an extensive network of canals and levees to drain land for agricultural and residential development, is being re-examined and reworked to restore this water-based system. Everglades restoration is key to both a healthy ecosystem and a vibrant economy. The environment and the economy are inextricably linked in south Florida where unique habitats and species, agricultural and tourism economies, and 9 million residents all depend upon plentiful, clean, fresh water.

Authorized by Congress in the Water Resources Development Act (WRDA) of 1996, the **South Florida Ecosystem Restoration Task Force (Task Force)** brings together the federal, state, Tribal, and local agencies involved in restoring and protecting America's Everglades. The role of the intergovernmental Task Force is to facilitate the coordination of the myriad conservation and restoration efforts being planned and implemented. It also provides a forum for the participating agencies to share information about their restoration projects, resolve conflicts, and report on progress. The Task Force's coordination and conflict resolution role is essential to restoring and protecting America's Everglades.

The U.S. Department of the Interior's (DOI) Office of Everglades Restoration Initiatives (OERI), on behalf of the Task Force, has developed a suite of documents to report on restoration goals and progress. This **Biennial Report** satisfies the requirements of the WRDA 1996 to report biennially on Task Force activities and progress made toward restoration. The **Cross-Cut Budget** satisfies WRDA 1996 by reporting on coordinated budget requests for Everglades restoration efforts with information provided by the federal and state agencies represented on the Task Force. Details on individual restoration projects can be found within the **Integrated Financial Plan (IFP)**. The **Strategy** organizes the complex restoration effort by three strategic goals relating to water, habitats/species, and the built environment (see below). Ecosystem health and response to restoration is described by the **System-wide Ecological Indicators** (see Appendix A for a summary). All these documents can be found at EvergladesRestoration.gov.

The Task Force's strategic ecosystem restoration goals are:

Goal 1. Get the Water Right

Goal 2. Restore, Preserve & Protect Natural Habitats and Species

Goal 3. Foster Compatibility of the Built and Natural Systems

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The restoration programs and projects described in this report are organized by sections that nest within the Task Force’s three strategic restoration goals as follows:

<u>Goal 1:</u> Get the Water Right	<u>Goal 2:</u> Restore, Preserve & Protect Natural Habitats & Species	<u>Goal 3:</u> Foster Compatibility of the Built & Natural Systems
Comprehensive Everglades Restoration Plan (CERP)	Habitat Protection and Restoration	Water Management
Non-CERP and Foundation Projects	Invasive Exotic Species	<ul style="list-style-type: none"> • Water supply planning • Water conservation • Flood protection
Water Quality		
RESTORATION SCIENCE		

Restoration has moved forward in important ways over the past two years and the future promises continued progress thanks to the record levels of state and federal funding described below. The project highlights that follow illustrate some of the most significant accomplishments during the reporting period.

SUPPORT FOR RESTORATION REMAINS STRONG

Since 1993, the State of Florida and the federal government have invested substantial resources in restoration programs and projects for America's Everglades. The following are some examples of funding spent to date, including for the Comprehensive Everglades Restoration Plan (CERP). Further information on restoration funding is provided in the Cross-Cut Budget and IFP.

- As of September 2021, the federal government has allocated \$2 billion in CERP funding, \$55 million in Critical Projects funding, \$392 million in Kissimmee River Restoration funding, over \$1.4 billion to rehabilitate the Herbert Hoover Dike (HHD), and \$2.8 billion in Central and Southern Florida (C&SF) projects.
- During the reporting period, the USACE South Florida Ecosystem Restoration program received \$244.9 million for the CERP for fiscal year (FY) 2021 and \$340.05 million in the President’s Budget and Workplan for the CERP for FY 2022. The Bipartisan Investment Law (BIL), November 2021, funded the CERP at \$1.098 billion, a historic funding level that will enable significant progress in restoring Florida’s nationally significant Everglades ecosystem.
- To date, the State of Florida has obligated \$3.1 billion in CERP funding, \$54 million in Critical Projects funding, \$211 million in Kissimmee River Restoration funding, \$100 million to support the US Army Corps of Engineers (USACE) in its effort to rehabilitate the HHD, and \$2.7 billion in C&SF project funding. The state has also provided \$612 million for the Northern Everglades projects, \$2.4 billion for the Everglades Construction Project, \$130 million for construction of the Tamiami Trail Bridge, and \$333 million in Everglades Agricultural Area (EAA) Reservoir funding.
- In FY 2020/21, the State of Florida signed into law approximately \$368.6 million for Everglades restoration, including CERP, the EAA Reservoir Project, the Lake Okeechobee Watershed Restoration Project (LOWRP), Restoration Strategies, and the Northern Everglades and Estuaries Protection Program (NEEPP). In FY 2021/22, the state signed into law approximately \$469.1 million for Everglades restoration including CERP (the EAA Reservoir and LOWRP), Restoration Strategies, and NEEPP. An additional \$20 million was provided during the reporting period for the purpose of supporting the evaluation and implementation of innovative technologies and short-term solutions to combat or clean up harmful algal blooms and nutrient enrichment of Florida’s fresh waterbodies, including lakes, rivers, estuaries, and canals.

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- In 2021, the Florida Legislature passed Senate Bill 2516 to support expedited implementation of LOWRP and provided for dedicated funding. To date, the state has obligated \$150 million in funding for LOWRP. An additional \$100 million is proposed for LOWRP for FY 2022/23.
- In 2016, the Florida Legislature passed the Legacy Florida Bill, which provides a dedicated funding source for 10 years until 2026 for Everglades restoration. In 2019, Executive Order 19-12 included a proposed \$2.5 billion investment over the next four years. This funding – for Everglades restoration and protection of water resources – is the highest level of funding for restoration in Florida’s history. The proposed FY 2022/23 budget provides over \$880 million for Everglades restoration and would surpass the state’s ambitious goal with \$3.3 billion invested over four years.

GOAL 1: GET THE WATER RIGHT

COMPREHENSIVE EVERGLADES RESTORATION PLAN (CERP)

The CERP, led by the USACE and the South Florida Water Management District (SFWMD), was authorized in the WRDA 2000 to restore the quantity, quality, timing, and distribution of fresh water in the South Florida Ecosystem. It is the single largest restoration program in the Everglades. The following highlights individual CERP projects currently underway.

Restoring Natural Hydrology

The goal of the **Biscayne Bay Coastal Wetlands (BBCW) Project, Phase 1**, is to improve the ecology of Biscayne National Park (BNP) and the Biscayne Bay Aquatic Preserves, including the nearshore waters of Biscayne Bay and adjacent wetlands. The project, which is comprised of three components (Deering Estate, Cutler Wetlands, and L-31E Flow-way), will rehydrate coastal wetlands and reduce freshwater point source discharges by redistributing surface water flows through a spreader canal system. The USACE and the SFWMD have each constructed portions of the Deering Estate and the L-31E Flow-way components with the remaining features of the L-31E Flow-way scheduled for completion in November 2024. Design of the Cutler Wetlands is almost complete with construction scheduled for completion in summer 2024. Improvements in coastal vegetation and estuarine conditions downstream of the completed portions of the project are already being observed and documented, including decreased salinity and increased recruitment of freshwater tolerant sawgrass. Further restoration will occur through BBCW Phase II, which is being accomplished through the Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER) Project (see Planning highlights below).

The goal of the completed **C-111 Spreader Canal Western Project** is to reduce seepage losses from Everglades National Park (ENP) and provide increased flows to Florida Bay through Taylor Slough. The project, constructed by the SFWMD, includes an aboveground detention area, associated water management features, and operational changes in south Miami-Dade County. By restoring more natural water conditions and flows, the constructed features have already shown positive ecological benefits to the Taylor Slough area, including to the habitat and population of the endangered Cape Sable seaside sparrow. Operational changes are currently being considered that may bring additional improvements to hydroperiods in the Model Lands.

The **Picayune Strand Restoration Project** involves restoring flow to about 55,000 acres in southwest Florida that were drained in the 1960s for suburban development that never materialized. The restoration effort includes plugging 48 miles of canals, removing 260 miles of roads, and constructing three major pump stations. To date, 195 miles of road and logging trams have been removed, the three pump stations have been constructed and transferred to the SFWMD, and the analysis of the effects on the water levels of adjacent private lands has been completed. Construction of flood protection features, further road removal, and canal backfill continue with project completion anticipated in 2025. Ecological benefits are already being seen as a result of the restoration work done to date. Native plants and animals are returning to the area, including the threatened wood stork and the endangered Florida panther. By restoring the hydrology in the area, the completed project will also directly benefit the southern Gulf Coast estuaries, improving juvenile

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fish habitats and increasing fish and bird populations, as well as providing recreational opportunities in the area. The Manatee Mitigation Feature is fully operational with manatees seen using the site as refuge during the cooler winter months.

The **Indian River Lagoon-South (IRL-S) Project** will help restore the St. Lucie Estuary and the southern portion of the Indian River Lagoon by storing, cleaning, and redistributing water to these ecologically and economically important water bodies. A ribbon cutting was held in November 2021 to celebrate the construction completion of the C-44 Reservoir and Stormwater Treatment Area (STA). The operational testing and monitoring phase was initiated in late 2021 and, once it is complete, the 3,000-acre reservoir and the 6,300-acre STA will be put into full operation. Progress also continued on other IRL-S components. The USACE executed a contract for the construction of the C-23/24 STA in October 2021 and is continuing design of the remaining C-23/24 components (north and south reservoirs), with the north reservoir expected to go to construction in mid-2023. The SFWMD is continuing the design for the C-23 to C-44 Interconnect Canal and expects to go to construction in late 2022. The SFWMD has also acquired the land for the C-25 Reservoir and STA and has initiated the design effort for those features.

The **Caloosahatchee River (C-43) Western Basin Storage Reservoir Project** will provide 170,000 acre-feet of storage, capturing excess flows from the basin during the wet season and then releasing the stored water to the estuary during the dry season. This will improve the timing and quantity of water delivered to the Caloosahatchee Estuary, especially during the dry season, and maintain the salinity gradient of estuarine habitat. The project was authorized in the Water Resources Reform and Development Act (WRRDA 2014) and is being implemented at an accelerated pace by the SFWMD. During the reporting period, construction of the S-476 irrigation pump station was completed. Construction of the larger S-470 pump station, capable of moving 1,500 cubic feet per second (cfs) for filling the reservoir, was awarded in 2018 and is expected to be completed in 2022.

The **Loxahatchee River Watershed Restoration Project (LRWRP)** was authorized in WRDA 2020. The project aims to restore and sustain the overall quantity, quality, timing, and distribution of freshwater to the federally designated “National Wild and Scenic” Northwest Fork of the Loxahatchee River. The project will also restore the hydrologic conditions and connectivity of wetlands and watersheds that form the historic headwaters of the river. Restoration efforts will deliver 98% of the restoration flow target and 91% of the dry season restoration flow target to the northwest fork via three major flow-ways and improve or maintain connectivity for 78,000 acres of natural lands within the project area. Currently, the design of Flow-way 3 project features is underway with construction anticipated to begin in FY 2023.

Restoring the River of Grass

The **Central Everglades Planning Project (CEPP)** was authorized in 2016. The goals of CEPP are to improve the quantity, timing, and distribution of water in the Northern Estuaries, central Everglades, Water Conservation Areas (WCAs), and Everglades National Park (ENP) to restore habitats and ecological function in the natural system. The CEPP is a combination of several key CERP components and includes conveyance, decompartmentalization (the removal of levees and canals), and seepage management projects to deliver and distribute water to WCA-3B and ENP, while moving additional water south, storing it, and treating it before going to the Everglades. The FY 2020/22 federal and state budgets increased significantly and resulted in acceleration of several CEPP features. The CEPP is broken into four project components: CEPP South; CEPP North; CEPP New Water; and CEPP EAA. Combined, these four components will increase flows south and help manage seepage from ENP.

The **CEPP South** Project Partnership Agreement (PPA) was executed in 2020. During the reporting period, the SFWMD completed construction on two crucial CEPP South components, the removal of Old Tamiami Trail, and construction of the S-333N water control structure. The USACE completed design of the L-67A culverts and awarded the contract in 2020 and started construction.

The SFWMD has also started design of two **CEPP North** components, the S-620 culvert and associated L-6 Canal improvements, which are anticipated to be awarded for construction in late 2022, and the L-5 canal improvements. These improvements are needed to restore northern WCA-3A and move additional

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water south to the Everglades. **CEPP New Water** consists of an approximately 5-mile seepage barrier wall along the L-357 levee surrounding the 8.5 Square Mile Area.

The **EAA Project**, which was authorized in America's Water Infrastructure Act (AWIA) 2018 and re-authorized in WRDA 2020 as a modification of CEPP, includes the A-2 Reservoir (also known as the EAA Reservoir) and the A-2 STA and will divert, store, and treat Lake Okeechobee and watershed regulatory releases. The project also includes canal conveyance improvements to the Miami and North New River canals, which will convey water to the project. The PPA was executed in April 2021. Since the SFWMD began site preparation activities for the STA in April of 2020, significant construction progress has been made. The STA is scheduled to be substantially completed and ready for initial filling in September 2023. The USACE initiated design of the A-2 Reservoir and pump station in March 2020.

Planning for Future Restoration Projects

During the reporting period, the USACE and the SFWMD continued to update the **Integrated Delivery Schedule (IDS)**. The IDS provides an overall strategy for project planning, design, and construction based upon ecosystem needs, benefits, costs, and available funding. The schedule helps restoration planners, stakeholders, and the public focus on priorities, opportunities, and challenges and provides a path forward to complete construction on previously authorized projects while outlining the next projects to undergo planning and design. The October 2021 IDS is currently being updated to reflect the significant increase in the federal budget received in FY 2022 from the Administration and Congress. The IDS will continue to show the scheduling of the projects based on actual budgets received and notional future budgets. The IDS does not represent a commitment by the federal or state governments to include amounts reflected on the IDS in the federal or state budgets.

The **Lake Okeechobee Watershed Restoration Project (LOWRP)** focuses on the major tributary systems that deliver water to Lake Okeechobee. This study will focus on increased water storage capacity in the watershed, resulting in improved Lake Okeechobee water levels; improved quantity and timing of regulatory releases to the St. Lucie and Caloosahatchee estuaries; restored wetland habitat along the Kissimmee River; and improved water supply for existing legal water users of the Lake Okeechobee service area. In 2022, the SFWMD submitted the revised State Compliance Report for LOWRP and the USACE, in partnership with the SFWMD, prepared the Draft Revised Integrated Project Implementation Report (PIR) and Environmental Impact Statement (EIS). Revised drafts were posted for public review in February 2022.

Planning efforts continued for the **Western Everglades Restoration Project (WERP)**. The overarching purpose of the WERP is to reestablish surface water sheetflow from the northern portion of the study area, across the Seminole Tribe of Florida Big Cypress Reservation and into the Big Cypress National Preserve, while maintaining flood protection. The preliminary project objectives are to: (1) improve the quantity, quality, timing, and distribution of flows in the western Everglades; (2) re-establish sheetflow south of the West Feeder Canal on the Big Cypress Seminole Indian Reservation into the Preserve; (3) restore water levels to reduce wildfires associated with altered hydrology; and (4) re-establish ecological connectivity. Although suspended from December 2020 to January 2022, the USACE reinitiated planning on this project in February 2022 with the approval of a second exception to the USACE's Specific, Measurable, Attainable, Risk-informed, and Timely (SMART) 3-year/\$3-million study limit.

The **Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER)** planning study began in September 2020. The study includes components of the C-111 Spreader Canal Eastern Project and Phase II of the BBCW Project. The purpose of BBSEER is to restore nearshore conditions in Biscayne Bay, BNP, Card Sound, Barnes Sound, and Manatee Bay; to improve freshwater wetlands in the Model Lands, Southern Glades, and the southeastern panhandle of ENP; and to improve the resilience of these coastal wetlands and habitats to sea level rise. The study includes 6 of the 68 components identified in the CERP. Alternative plans are intended to store and convey large quantities of freshwater from the northeastern part of Miami-Dade County and convey water south and east via canals and pumps for redistribution of freshwater flows over land and into wetland and nearshore ecosystems. Over 75 management measures were compiled by the interagency project delivery team and combined into over a dozen alternatives. Analysis of the alternative plans will include the hydraulic and hydrological modeling using the Regional Simulation Model and two salinity models: Biscayne Bay Simulation Model developed

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by the NPS, and the Biscayne and Southern Everglades Coastal Transport model developed by the USGS. On April 11, 2022, the Assistant Secretary of the Army (Civil Works) approved an exception to the SMART study limit due to the technical complexity of the BBSEER planning study. This exception authorized an additional \$2.25 million and 28 months for the study.

Combatting Invasive Species

In 2012, the USACE published the CERP Guidance Memorandum 062.00 – Invasive and Native Nuisance Species Management (CGM 62). It ensures that invasive species management is included in the planning process and throughout all phases of the projects. This guidance has been applied to all CERP projects since it was published and the CEPP is the first project to go to the construction phase (July 2020) that has an invasive species management plan. This is an important milestone that represents a shift in the ability of the USACE to proactively address invasive species rather than reacting once a species is impacting a project.

FOUNDATION PROJECTS

A Partnership to Restore Flow through the River of Grass

The **Modified Water Deliveries to Everglades National Park (Mod Waters) project**, modifies the existing C&SF project and improves the natural water flows to Shark River Slough, the lifeline of ENP. The project enables restoration of more natural hydrologic conditions using three dimensions: timing, location, and volume of water. The project is composed of four major components: 1) 8.5 Square Mile Area Flood Mitigation Plan; 2) Conveyance and Seepage Control Features; 3) Tamiami Trail Modifications; and 4) Project Implementation Support including hydrological stream gauge monitoring, incremental testing, and the Combined Operational Plan (COP).

All Mod Waters features were completed by June 2018 and the development of the COP was completed in September 2020. The COP takes advantage of the newly completed Mod Waters and C-111 South Dade project features to convey existing water from WCA-3 to ENP to improve hydrologic conditions in both natural areas. The hydrologic modeling for the predicted COP increased average annual flows into the Northeast Shark River Slough portion of ENP by 162,000 ac-ft per year on average annually, an increase of 28 percent. This will allow the rehydration of downstream ENP wetlands, relieve some of the adverse high water impacts upstream in WCA-3A, and create positive change for the area's substrate, flora, and fauna, Taylor Slough, and eastern Florida Bay. Rehydration will also increase the abundance of marsh fish and macro-invertebrates that support the historic wading bird colonies.

The Return of a River

A major restoration milestone was reached during this reporting period: construction of the **Kissimmee River Restoration Project (KRRP)** is complete. The final two construction contracts were completed in July 2021 and included the removal of the S-65C water control structure, backfilling 3.5-miles of the C-38 canal, and installing the S-69 u-shaped weir at the downstream terminus of the project to maintain optimal water levels in the historic river and wetlands. These contracts marked the physical completion of this Foundation Project. The KRRP has reestablished flow to over 40 miles of historic river channel and intermittent inundation of almost 25,000 acres of the river's floodplain following more than 20 years of large-scale construction.

Early positive ecological responses in the river channel include elimination of organic deposits on the river bottom and replacement of undesirable floating and mat-forming plants by native emergent species. Sandbars have reformed, creating new habitat for shorebirds and invertebrates. Dissolved oxygen, critical for the long-term survival of fish and other aquatic organisms, has increased, although challenges remain to avoid short-term declines that can dramatically affect the recovery of native sunfish populations. On the floodplain, wading bird foraging expectations are being met in some years when conditions are suitable, and snail kites nested in a newly flooded section with good success rates. Long-legged wading bird populations, including white ibis, great egrets, snowy egrets, and little blue herons, have increased. Ducks

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have returned to the river, including American widgeons, northern pintails, northern shovelers, ring-necked ducks, and black-bellied whistling ducks. Ecological responses, especially on the floodplain, are expected to be more pronounced after implementation of the HRS.

The Heart of the Everglades – Lake Okeechobee

Lake Okeechobee is known as the heart of the Everglades and as such how it's operated has an influence on the entire water resource system. The Lake Okeechobee System Operating Manual (LOSOM) effort was initiated in 2019 to re-evaluate the lake operations in conjunction with the completion of HHD rehabilitation (for more on the HHD rehabilitation, see the Water Management section of this executive summary). The USACE began the collaborative work to develop a modern vision of balance for the management of water in Lake Okeechobee early with the goal to incorporate flexibility in Lake Okeechobee operations while balancing congressionally authorized project purposes (flood control, water supply, navigation, recreation, and enhancement of fish and wildlife). The LOSOM plan, developed and identified through a transparent and interactive process with stakeholders over the last three years focusing on system benefits, looking at the system holistically, and utilizing real time knowledge of climate conditions, weather data, climate projections, and system needs to make educated decisions about how releases are made.

WATER QUALITY

Continuing to Invest in Water Quality Restoration

During the reporting period, the State of Florida made significant progress implementing the **Restoration Strategies** water quality plan, building on its existing multi-billion-dollar investment in water quality improvements in the Everglades. The Restoration Strategies plan includes more than 6,500 acres of new STAs and 110,000 acre-feet of additional water storage through construction of Flow Equalization Basins (FEBs). To date, 8 projects are complete, 5 others are ongoing, and 63 of the 74 consent order milestones have been achieved, 58 of them ahead of their deadlines. The Restoration Strategies project works in conjunction with existing STAs to achieve compliance with State of Florida water quality standards.

The state is responsible for meeting state water quality standards and during the reporting period, the SFWMD completed construction of the C-44 Reservoir and STA and the initial hydration of the 6-STA cells. The C-44 Reservoir and STA will capture local runoff from the C-44 basin, reduce average annual total nutrient loads, and improve salinity in the St. Lucie Estuary and the southern portion of the IRL. Current efforts are focused on the Operational Testing and Monitoring of the C-44 Reservoir and STA, the construction of the C-23/24 STA, and the design effort for the C-23/24 reservoirs. The SFWMD has initiated the design effort for the C-25 Reservoir and STA. Also, based on an expedited schedule set forth by the state, the SFWMD will complete the CEPP EAA A-2 STA in 2022.

GOAL 2: RESTORE, PRESERVE, AND PROTECT NATURAL HABITATS AND SPECIES

HABITAT PROTECTION AND RESTORATION

Restoring Wetlands

The U.S. Department of Agriculture (USDA) supports the restoration of the Everglades by providing financial and technical assistance to private landowners and Tribes. The **Agricultural Conservation Easement Program (ACEP)**, implemented through the USDA's Natural Resources Conservation Service (NRCS), provides agricultural and wetland easements to landowners.

During the reporting period, the NRCS invested over \$28 million in ACEP funds for the acquisition and restoration of 9,502 acres of land in Florida. Over 80% of this investment was within the Northern Everglades Initiative area.

Estuary and Coral Reef Protection

Florida's Coral Reef represents the downstream extent of the South Florida Ecosystem. The State of Florida manages Florida's Coral Reef cooperatively with local, state, and federal agencies including the National Oceanic and Atmospheric Administration (NOAA), the NPS, and Monroe, Miami-Dade, Broward, Palm Beach, and Martin counties. Regulatory coordination with additional agencies including the U.S. Environmental Protection Agency (USEPA), the U.S. Coast Guard, the USACE and others supports the environmental conservation goals and interests of both the state and nation. The Florida Department of Environmental Protection (FDEP) is the lead government agency in the State of Florida for environmental management and stewardship of Florida's Coral Reef while the Florida Fish and Wildlife Conservation Commission (FWC) is the lead state agency for the conservation of coral reef habitat and wildlife, the recovery of listed species, and the management of reef-associated fisheries.

In addition to traditional conservation activities such as developing management plans, monitoring, and conducting debris cleanups, NOAA, the State of Florida, and numerous partners continue to engage in an unprecedented coral disease response and have initiated a bold new coral restoration initiative. While these activities are ongoing, parallel efforts to ensure the presence of environmental conditions required for coral survival, such as local water quality improvement efforts through the Florida Keys National Marine Sanctuary Water Quality Protection Program and Southeast Florida Coral Reef Initiative, and regional water quality enhancements through the CERP, are critical to ensure the long-term survival and recovery of these ecologically and economically important natural resources. NOAA also participates in and funds Harmful Algal Bloom (HAB) research throughout south Florida. This includes researching the Fisheries impacts of Red Tide, the connection between red tide and hypoxia, and numerous other HAB related issues.

INVASIVE SPECIES

In 2019, Congress recognized the importance of invasive species management for restoration to succeed and new legislation referred to as the Suppressing Looming Invasive Threats Harming Everglades Restoration (SLITHER) Act, was developed and included in the WRDA 2020, (Section 504). This legislation amended Section 528 of the WRDA 1996 and added specific duties to the Task Force related to invasive species. In the WRDA 2020, the Congress directs the Task Force to develop a priority list of invasive species that significantly impact the structure and function of ecological communities, native species, or habitats within the South Florida Ecosystem. The Task Force member agencies are directed to manage those species through coordination and collaboration to develop innovative strategies and tools, guide applied research, facilitate improved management, and to prevent future introductions of nonnative species. The Task Force accepted recommendations from the Working Group (WG), Science Coordination Group (SCG), and OERI to begin developing the priority list of species at their May 3, 2022, meeting. This work is

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currently being conducted through a team of invasive species experts, facilitated by the OERI. A progress update on the list development will be provided to the Task Force at its Fall 2022 meeting.

Combatting Invasive Species

The South Florida Ecosystem is one of the most highly vulnerable regions to the threat of invasive species in the entire United States. The Task Force has developed an **Invasive Species Strategic Action Framework (Framework)** that is organized along the four phases of invasion/response: Prevention, Eradication through Early Detection and Rapid Response (EDRR), Containment, and Long-term Management/Resource Protection. The 2020 Framework and its companion documents are available at EvergladesRestoration.gov. Although continued progress is being made in areas such as EDRR, adequate and consistent funding year-to-year is needed to effectively combat invasive species and minimize their impact on the ecosystem. Additionally, natural resource managers often lack effective tools to detect and control invasive species in remote, sensitive natural areas. Sustained research support to develop or refine detection and control technologies is needed to improve outcomes of invasive species management programs. Highlights of progress made over the past two years are listed below.

Prevention: The first opportunity to combat an invasion is to prevent it from starting. Prevention strategies include regulation, border protection, and public engagement. On February 25, 2021, FWC Commissioners unanimously approved rule changes to Chapter 68-5, F.A.C., regarding high-risk nonnative reptiles. The rule changes added 16 species of nonnative reptiles to Florida's prohibited list and went into effect April 29, 2021. Prohibited species can only be possessed or acquired by qualifying entities for the purposes of research, public exhibition, or eradication/control with some limited exceptions for people in possession of these animals prior to their listing. The newly added prohibited reptiles include several species of pythons, tegus, and other constrictors and lizards.

Eradication: If prevention is not possible or the opportunity to prevent an invasion is missed, the next approach is eradication through EDRR. Eradication requires that the species be detected early in the invasion process, that the risk it poses is assessed quickly, and that sufficient tools and resources are available to respond rapidly to control the invasion. The FWC operates the Exotic Species Hotline (1-888-IVEGOT1), a public reporting option for observations of nonnative fish and wildlife and receives additional reports from online and other reporting tools. The hotline received over 2,000 calls from July 1, 2020, through June 30, 2021. During this same timeframe, the FWC coordinated successful rapid response efforts for 106 high priority nonnative species including multiple monitor lizard species. From July 1, 2021 through April 2021, the hotline has received over 1,500 calls from the public, most of which pertain to nonnative reptiles.

The need for an EDRR decision support tool for invasive animal species was identified in the Task Force's 2015 Framework. The decision support tool, subsequently developed through the USGS Priority Ecosystem Studies program, provides a standardized and transparent process for ranking those nonnative animal species that warrant a rapid response after their detection within the ecosystem. This tool was adapted by the FWC for statewide use during the reporting period and will continue to be updated and enhanced. More than a dozen species have been run through this screening tool to date. The University of Florida (UF) developed and uses a similar predictive tool for plant risk screening. This weed risk assessment tool uses a series of questions to assess the threat of invasiveness for recently introduced plants or those proposed for sale in Florida. Both these tools guide decisions and assist in eradication only when the novel species is discovered immediately. Systematic early detection surveys are done by the SFWMD, FWC, UF and others, but they are limited in their geographic and taxonomic scope. To increase the likelihood that new invasive species are discovered and acted upon before they become established, Florida needs a state-wide, systematic early detection monitoring and response program that operates nimbly across jurisdictions and leverages existing invasive species monitoring and control programs.

Containment: Once invasive species populations increase and become distributed over a large area, eradication is far less feasible. At this point, the management strategy shifts to containment, with the purpose of preventing the spread to new areas. Containment strategies typically involve a combination of aggressive control populations and EDRR activities outside the known infestation areas to prevent further spread. The Argentine black and white tegu is an invasive reptile with an established breeding population

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in southern Miami-Dade County. Their high reproductive capacity, lack of potential predators, and adaptability make this tegu a threat to Florida's wildlife and environment. Despite increases in management, research, and coordination efforts, the population in southern Miami-Dade County continues to expand and has reached the ENP boundary. There were 34 and 49 Tegu captures in '20 and '21, respectively just inside the park prompting federal and state agencies to substantially increase the number of traps near the park boundary in efforts to keep the reproducing population outside the park.

Another important aspect of containment is understanding the life history, dispersal pathways, and habitat preferences of invasive species so managers can more effectively contain and control them. Utilizing the invasive species management budgets that were developed under the CERP CGM 62, the USACE entered into a 5-year agreement with UF Croc Docs in 2020 to perform research and removals on a variety of invasive reptiles and amphibians on CERP project lands. The USACE entered into another agreement with the USGS to address invasive fish, focusing on the current extent of populations, dispersal pathways, life history and the effectiveness of passive control measures. This Economy Act five-year agreement was initiated in May 2021.

Resource Protection and Long-term Maintenance: Once invasive species are widespread and abundant, efforts shift to population suppression at lowest feasible levels (i.e., maintenance control) and removal from priority areas to mitigate the impacts of the invader on critical natural resources, economic interests, and human health. A limiting factor in achieving maintenance control of invasive species is consistent, long-term funding. Gains made in one year can be lost if funding levels decrease for the necessary long-term management of invasive species.

The CERP Biological Control Implementation Project continues to rear, and release approved biological control agents for several priority invasive plant species in south Florida. During the reporting period, the USDA's Agricultural Research Service (ARS), in collaboration with the USACE and SFWMD, strategically released agents for the suppression of Old World climbing fern, Brazilian pepper, and other invasive plant species. As a key component of integrated pest management, biological controls have already contributed to a 90% reduction in land cover of some priority invasive plants within the Everglades and south Florida.

The Burmese python is an established threat to native wildlife in the Everglades. During the reporting period, python removal contractors working for the FWC and SFWMD collectively removed over 4,700 pythons. These programs have expanded coverage during the reporting period and now cover ENP, Big Cypress National Preserve, BNP, Arthur R. Marshall Loxahatchee National Wildlife Refuge (LNWR), several state parks, and most other state-managed lands where pythons exist. Other efforts in development include landscape-level python scout snake tracking using telemetry and USGS eDNA surveys to monitor the presence of the Burmese python and Northern African python in areas of interest.

Additionally, Florida's first Python Control Plan was finalized in 2021. Fifteen land-managing agencies and organizations collaborated on the development of this comprehensive document that provides land managers with goals and strategies to optimize efforts to reduce impacts from Burmese pythons.

Lionfish, a popular aquarium fish native to the Indo-Pacific, can now be found from Venezuela to North Carolina. Lionfish have few predators and represent a threat to native fish species, many of which have economic importance (sportfishing) or ecological importance for the health of Florida's Coral Reef. NPS' long-term management efforts for lionfish, having been sustained at appreciable levels for the past 10 years, have helped identify areas frequented by lionfish for targeted removal efforts and helped develop best available control tools. The FWC has also engaged the public with lionfish events and outreach meant to inform the public of ways to help slow down the lionfish invasion. During the reporting period, almost 100,000 lionfish were removed through these events and outreach efforts (for details, please see the Invasive Species/Long-term Management section of this document).

GOAL 3: FOSTER COMPATIBILITY OF THE BUILT AND NATURAL SYSTEMS

Flood Protection

During the reporting period, the Corps continued to work on the HHD, the 143-mile structure surrounding Lake Okeechobee. Since 2001, the Corps has made a significant investment, over \$1.5 billion, in projects designed to rehabilitate the structure. The HHD Rehabilitation Project has achieved 90 percent completion of all construction contracts meaning communities around Lake Okeechobee are safer due to the dike rehabilitation progress and that the USACE is on track to complete its work by late 2022.

Water Supply Planning

The SFWMD conducts water supply planning for five regions: Upper Kissimmee Basin, Lower Kissimmee Basin, Upper East Coast, Lower East Coast, and Lower West Coast. These long-range plans project water demands for at least a 20-year period and identify potential sources of water for each region and help local governments and utilities in their facility and comprehensive planning efforts. Water supply plans are updated every five years. During the reporting period, two plans were updated (Upper Kissimmee and Upper East Coast) with the Lower West Coast update currently underway with completion anticipated in November 2022.

CURRENT CONDITIONS AND EXPECTED IMPROVEMENTS IN THE EVERGLADES ECOSYSTEM

To restore the everglades to a more historic condition, continued implementation of CERP projects are needed to improve the quantity, quality, timing, and distribution of fresh water throughout the ecosystem. These hydrological and water quality efforts are complemented by projects and programs that focus on the restoration and protection of native habitats and species.

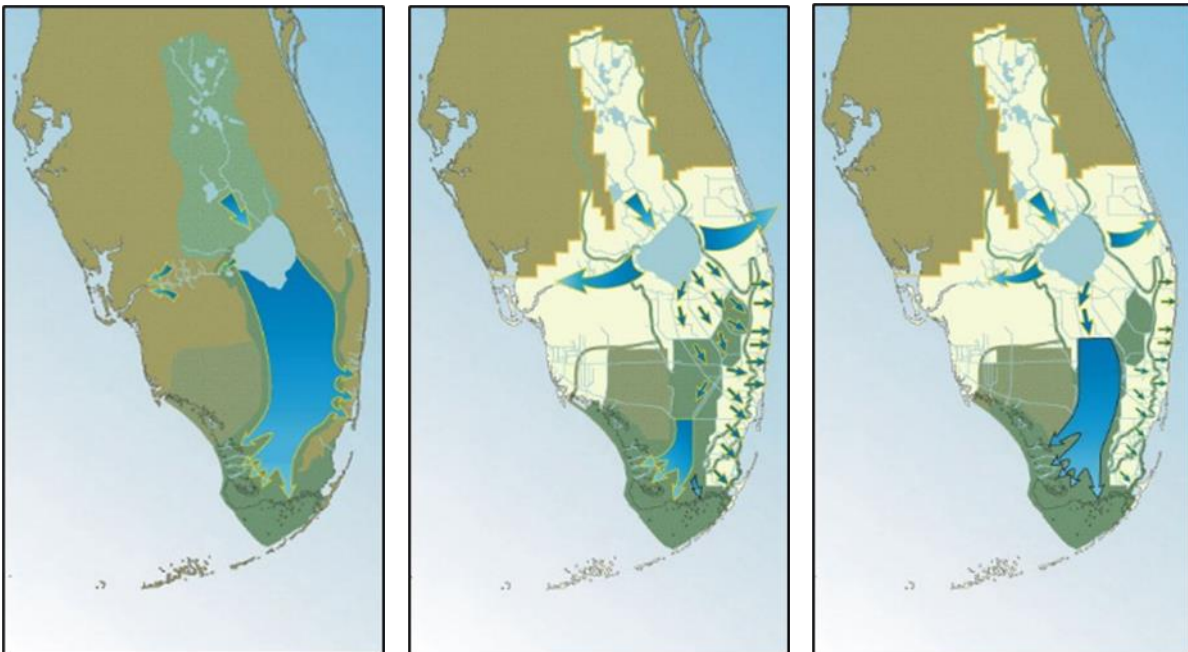


Figure 1: Historic Everglades Flow, Current Flow, and Future Flow

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Current Conditions and Expected Improvements in the Everglades Ecosystem

The pre-drainage Everglades ecosystem was much wetter overall, and the mosaic of hydrologically interconnected lakes and wetlands allowed wet season runoff to persist into the dry season (see Figure 1, first panel). Water flowed slowly into Lake Okeechobee and overflowed southward to the Everglades. By the 1930s, six major canals were constructed between Lake Okeechobee and the east and west coasts, redirecting water away from the central and southern Everglades. By the 1940s, levees were constructed around Lake Okeechobee, and the natural flow connection between Lake Okeechobee and the Everglades was severed. By the 1970's the Kissimmee River was channelized, and Lake Okeechobee outflows were primarily sent to the northern estuaries, via the C-43 and C-44 canals (see Figure 1, second panel). Correcting these problems requires reconnecting Lake Okeechobee and the Everglades. The CERP will redirect excess flows away from the northern estuaries and back into the historic Everglades flow-way, which will achieve landscape-scale ecological benefits (see Figure 1, third panel). To accomplish this existing water management constraints, such as seepage management, water storage, and water quality need to be addressed before this water can be sent southward into the Everglades. Incremental implementation of CERP components/projects is expected to improve the timing, volume, and distribution of water throughout the Everglades ecosystem, primarily by increasing regional storage capacity, removing barriers to flow, and carefully redistributing water to better match natural flow patterns and seasonal cycles. The following briefly describes the current conditions by geographic region shown in Figure 2 below.

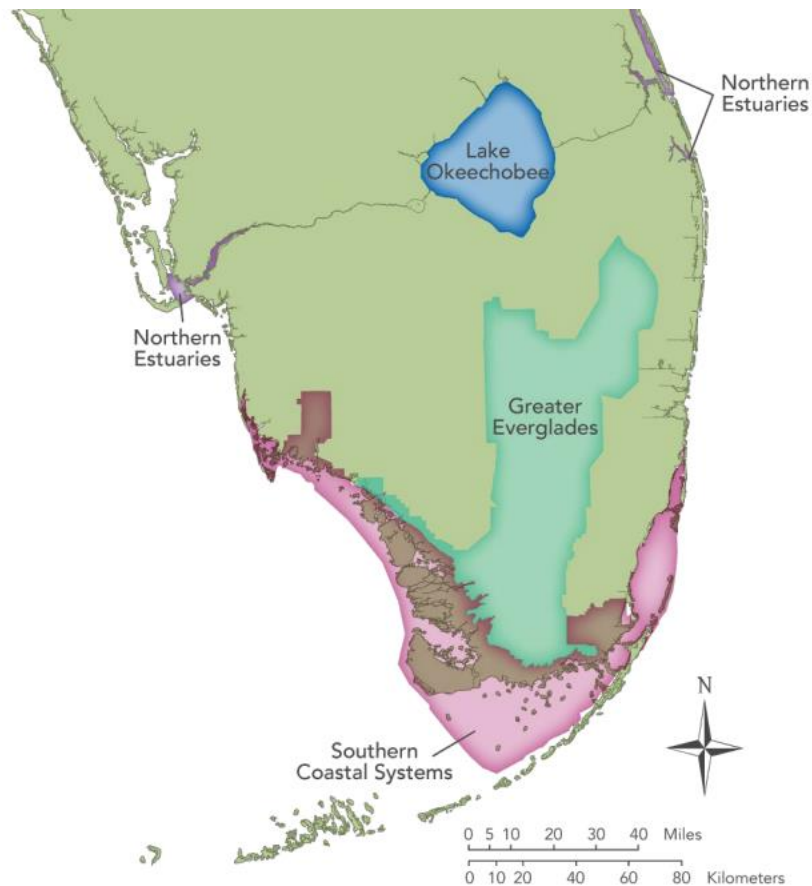


Figure 2: Four geographic regions: Northern Estuaries, Lake Okeechobee, Greater Everglades, and the Southern Coastal Systems.

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Lake Okeechobee

Lake Okeechobee has been significantly impacted by upstream drainage to support agricultural and residential development, increasing water supply demands, and channelization of the Kissimmee River. These hydrologic and land-use alterations have resulted in wide fluctuations in lake water levels, excessive nutrients, and proliferation of invasive exotic plants. The result is an increase in the frequency and duration of algal blooms, changes in marsh vegetation composition within the lake, and the loss of important littoral and nearshore submersed aquatic vegetation (SAV), which provide critical habitat for fish and wildlife.

The Kissimmee River restoration project (completed in 2021) has made initial improvements to the volume and timing of flows into Lake Okeechobee. CERP projects through 2032 (particularly the LOWRP) are expected to increase water storage north of the lake, which will improve Lake Okeechobee ecology by increasing the amount of time the lake operates within the Lake Okeechobee ecologically preferred stage envelope.

Restoration Projects Benefitting Lake Okeechobee	
Kissimmee River Restoration Construction was completed 2021	Operational Transition Plan (2021-2025) Evaluation Monitoring (2025-2030)
Herbert Hoover Dike Rehabilitation Construction scheduled to be completed in 2022	Lake Okeechobee System Operating Manual Planned Completion Summer 2023
Lake Okeechobee Watershed Restoration Plan	PIR/Final EIS & Draft Project Operating Manual expected in late 2022

Northern Estuaries

The Northern Estuary region (the St. Lucie Estuary, Loxahatchee River Estuary, and the Caloosahatchee River Estuary) has been significantly impacted by alterations in the timing, volume, and distribution of water flows. These hydrologic alterations resulted in the northern estuaries frequently receiving too much freshwater via large pulses, or conversely, with the Caloosahatchee River and Estuary, periods of too little freshwater inflows, altering the natural salinity regimes.

The Northern Estuary region will see initial improvements in estuarine salinities by 2023-2025, through implementation of the LOSOM and increased water storage and water quality treatment associated with the C-43 and C-44 reservoirs. Additional beneficial changes in salinity regimes in the St. Lucie Estuary will occur by 2027, from improvements in the C-23, C-24, and C-25 basins.

Restoration Projects Benefitting the Northern Estuary Region (July 2020 – June 2022)	
Indian River Lagoon – South C-44 Construction completed 2021	Project Operating Manual Update 2023-24
Caloosahatchee River (C-43) West Basin Storage Construction	Project Operating Manual Update 2023-24
Indian River Lagoon – South C-23/C-24/C-25 Basins	Design Phases and Project Operating Manual Update (2021-2024)

Greater Everglades

The Greater Everglades region (the WCAs and ENP) has experienced a decline in ecosystem health due to the redirection of Lake Okeechobee flows, construction of internal levees and canals that compartmentalized the wetlands and disrupted sheetflow, and other anthropogenic activities in upstream developed areas that degraded water quality. The Greater Everglades region receives too little water overall, with changes in the location of inflows, creating areas that are too deep in the downstream portion of the WCA compartments while upstream areas dry out because they do not receive enough water. The volume of flows into ENP, specifically Shark River Slough and Taylor Slough, have been greatly diminished

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compared with historical estimates. The drier wetland areas of the Greater Everglades have experienced severe wildfires that consume peat soils and drive undesirable shifts in the vegetation patterns. The wetter areas have experienced a loss of tree islands, the loss of the ridge and slough patterning, and alterations of hydroperiods in higher marl prairies and in the deeper sloughs. These are all consequential adverse impacts on alligators, fish, wading birds, and endangered species.

Early restoration improvements have resulted from completion of the Mod Waters, C-111 South Dade, and C-111 West Spreader Canal projects, and implementation of the COP in 2021. Water quality in this region is generally improving, but there are still localized problems and uncertainties in achieving the expected water quality goals of Restoration Strategies by 2025-2027. Improved water flows using existing water sources will begin to come on-line as the CEPP North, South, and New Water components are completed. A much larger incremental flow improvement is expected to occur once the EAA Reservoir components come on-line and the final CEPP features are in place. Full benefits from the CEPP/EAA Reservoir components will likely occur in increments because increased flows from Lake Okeechobee to the Everglades will need to meet all state and federal water quality treatment requirements. Once all the CEPP/EAA Reservoir components are fully operational and water quality standards are achieved by the State, these features will substantially increase the volume, and improve the distribution and timing of water deliveries, throughout the Greater Everglades region.

Restoration Projects Benefitting the Greater Everglades Region (July 2020 – June 2022)
Modified Water Deliveries, C-111 South Dade, and C-111 West Spreader Canal completed 2019
Restoration Strategies Construction underway
Central Everglades – South Construction underway
Central Everglades – North Design Phase underway
Central Everglades – New Water Seepage Barrier Design/Construction underway
Central Everglades – EAA Reservoir/A-2 STA Design Phase underway

Southern Coastal Systems

The Southern Coastal Systems region (Biscayne Bay, Florida Bay, and the Southwest Coast) relies on freshwater entering the southern estuaries to maintain beneficial salinity conditions for SAV and associated estuarine species. Construction of drainage canals, long-term changes in water management, and other anthropogenic activities have disrupted the availability, timing, distribution, and quality of freshwater in the region, which has significantly altered the structure and function of these coastal ecosystems. Florida Bay, in particular, has experienced extended periods of hypersalinity, algal blooms, and seagrass die-offs.

Overall, ecological conditions in this region are not expected to improve substantially in the near-term, as there is only a modest increase in freshwater flows to the Southern Coastal Systems region following completion of the CEPP. The BBSEER Study is currently in underway. This study's focus is to develop new sources of water through capturing and storing groundwater seepage, redirecting excess flows from the northern Miami-Dade County canal system into central/southern Biscayne Bay, and evaluating options for wastewater re-use. Additional opportunities to increase freshwater flows into Taylor Slough and Florida Bay will be evaluated in a new CERP project, the Southern Everglades Study (SES). This project is scheduled to enter the planning phase in 2023.

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Restoration Projects Benefitting the Southern Coastal Systems Region (July 2020 – June 2022)
Picayune Strand Restoration Construction underway
Biscayne Bay Coastal Wetlands Phase 1 Design and Construction underway
Biscayne Bay Southeastern Everglades Restoration Project Planning (2021-2025)
Southern Everglades Study Anticipated Planning Phase 2023

CONCLUSION

Restoration efforts for the Everglades continued during the reporting period on many fronts.

Project Completions and Construction Underway to Improve Water Quantity, Quality, Timing, and Distribution: The final construction contracts for the Kissimmee River Restoration Project are complete. The Corps has achieved 90 percent completion of all HHD Rehabilitation Project construction contracts and is on track to complete all major construction work by late 2022, an important achievement for the protection of communities around Lake Okeechobee, as well as for water supply and for the future of Everglades restoration. All three pump stations are operational and restoring historic sheetflow in the Picayune Strand Restoration Project, road removal is almost complete, and the southwest protection features are scheduled for completion next year. In addition, construction led by SFWMD on the C-43 reservoir and the C-44 STA continues. Combined, these two reservoirs will provide much needed relief to the Caloosahatchee and St. Lucie estuaries. In the central Everglades, design and construction continued for CEPP South and EAA features. The CEPP EAA A-2 STA is anticipated to be substantially complete and ready for initial filling in September 2023. Construction also continued on the BBCW Phase 1 project to expand the rehydration of coastal wetlands bordering Biscayne Bay.

Operational Changes to the System: Completion of the Mod Waters project coupled with the completion of the C-111 South Dade Project allowed for the implementation of a new operational plan for bringing more water into the eastern portion of ENP. The new COP for the Mod Waters and C-111 projects incorporated lessons learned during a four-year incremental testing program. The new Tamiami Trail Flow Formula is being utilized by the USACE and SFWMD water managers to convey water from the central Everglades (WCA-3) to the ENP and the South Miami-Dade agricultural areas. The LOSOM effort completed the collaborative work to develop a modern vision of balance for the management of water in the lake.

Water Quality: The State of Florida continued its progress and momentum on the construction of the Restoration Strategies Program to improve the quality of water entering the Everglades. The CEPP EAA A-2 STA is nearing completion in 2023 based on an expedited schedule set forth by the state.

New Project Construction on the Horizon: Major planning studies are currently being evaluated, designed, and conducted including the LOWRP, the WERP, and the BBSEER project.

Enhancing our Collective Ability to Combat Invasive Species: Efforts continued during this period in the battle against the invasion and expansion of nonnative species in south Florida. Significant efforts to control large infestations of priority invasive plant species at the LNWR and within the Picayune Strand restoration project continue. New programs were launched and/or expanded to deal with the Burmese python, Argentine black and white tegu, and numerous invasive plant species that increased removal of these species, while research, tool development, educational programs, and public outreach continued to assist in the fight against invasive species.

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Using Science and Monitoring to Improve Restoration Efforts: The Task Force's System-wide Ecological Indicators and the 2019 System Status Report continue to show ecosystem problems and challenges in key areas, many of which were compounded by the weather extremes experienced during the reporting period. These problems and challenges further underline the need for ecosystem restoration. Continued monitoring and assessments as projects are implemented will inform the overall restoration effort of progress made, areas of concern, and improvements in ecosystem health. The monitoring by the CERP REstoration, COordination and VERification (RECOVER) interagency/interdisciplinary team has informed several restoration efforts including water management decisions through recommendations provided by scientists during Ecosystem Based Management and Periodic Scientist calls, evaluations of CERP project and water management operations alternatives through RECOVER performance measures and RECOVER technical assessments as part of Interim Goals and Interim Targets analyses, which highlight potential areas that should be prioritized for restoration.

Looking Ahead

The intergovernmental Everglades restoration effort is well underway. Historically, the Everglades has struggled to maintain ecosystem functions that support south Florida's tourism, recreation, and economy due to anthropogenic inputs, flood control and water supply needs for a growing population base, and extreme weather disturbance events that exacerbate impacts to the natural system. Essential ecological functions have been degraded, leading to often unsuitable habitats for native plants and animals. The South Florida Ecosystem restoration efforts described in this report will help to correct these issues. The results achieved by early individual projects such as Picayune Strand, BBCW Phase 1, and the bridging of Tamiami Trail are encouraging. Within regions of the Everglades, research and restoration projects have already improved the management of hydrologic flows and increased water storage, which are key to achieving the restoration goals of improving wetland hydroperiods and flows of freshwater into coastal areas. Innovative strategies are being employed to enhance our efforts combatting the myriad invasive species that threaten the ecosystem's native and endangered species. Continued project and program implementation will build on these successful efforts for restoration of America's Everglades. The Task Force will continue to support its member agencies in their efforts, providing the intergovernmental coordination, stakeholder engagement, and conflict resolution necessary for continued progress.

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INTRODUCTION

The South Florida Ecosystem, an area twice the size of New Jersey, is a multifaceted mixture of dense forests and open prairies, sunny croplands and shady swamps, sprawling seagrass beds and complex coral reefs, rural expanses and dynamic cities. It is also the primary source of water for 9 million residents. Historically, water flowed slowly from the Kissimmee River to Florida Bay across the ecosystem's extremely flat landscape forming what became known as the "River of Grass." This natural functioning system began to be altered over a century ago in attempts to make the ecosystem more hospitable to agriculture and development.

The quality of life in south Florida and the region's economy depends on the health and vitality of the natural environment. South Florida's environment provides unique recreational opportunities that draw visitors from around the globe, from freshwater fishing in the north to snorkeling in the southern-most reaches of Florida's Coral Reef. Fertile soils support the region's agricultural industry. The Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida live in the Everglades and their culture and way of life depend on the health of this ecosystem.

A healthy ecosystem depends on reversing the unintended consequences of past changes to the region's waters and habitats. Restoring the Everglades and protecting south Florida's natural resources cannot be achieved by any single organization but depends upon a strategically coordinated set of federal, state, local, and Tribal initiatives, funding, and partnerships. These restoration programs and projects require a long-term process for addressing key technical, management, and policy issues. In 1996, the intergovernmental South Florida Ecosystem Restoration Task Force (Task Force) was created by Congress to provide this long-term strategic coordination and to facilitate the incorporation of new information and opportunities over the multi-decadal restoration initiative.

The Water Resources Development Act (WRDA) of 1996 requires the Task Force to provide a biennial update on restoration progress. This document reports on the major hydrological restoration projects (including the Comprehensive Everglades Restoration Plan [CERP], Foundation Projects, and other non-CERP projects), water quality improvement projects, habitat protection and conservation programs, invasive species efforts, water supply planning, and flood protection projects taking place within the South Florida Ecosystem. These projects are working in concert to reverse the damage the current water management system has inadvertently caused the Everglades, while continuing to serve the millions of people who reside within and visit the region. The Biennial Report also provides updates on the activities of the Task Force, Working Group, Science Coordination Group, and the Office of Everglades Restoration Initiatives (OERI).

This Biennial Report includes a summary of South Florida Ecosystem restoration activities for the current **two-year reporting period (July 1, 2020 – June 30, 2022)**. The Task Force's **2022 Integrated Financial Plan** contains detailed information on each project described within the Biennial Report. In addition, the Task Force issues a biennial **System-wide Ecological Indicators Report**. The indicator report tracks ecosystem health and response to restoration through a suite of 11 system-wide ecological indicators. A summary of the indicator report is provided in Appendix A. The **Cross-Cut Budget** satisfies the WRDA 1996 requirement to report on coordinated budget requests for Everglades ecosystem restoration efforts in south Florida (information is provided by the federal and state agencies represented on the Task Force). All these documents can be found at EvergladesRestoration.gov.

COMPREHENSIVE EVERGLADES RESTORATION PLAN (CERP)

The CERP is the single largest restoration program underway in the South Florida Ecosystem. The CERP is implemented by a federal-state partnership to restore, protect, and preserve the region's water resources by addressing the quantity, quality, timing, and distribution of water. Implementing projects that capture, store, clean, and redistribute water will restore natural water flow, enhance and protect habitats, and improve our ability to retain and utilize much needed fresh water within the ecosystem, instead of having to drain this precious resource to the Atlantic Ocean and Gulf of Mexico. The US Army Corps of Engineers (USACE), the South Florida Water Management District (SFWMD), and other partners are working together to implement the CERP.

The WRDA 2000 approved the CERP as a framework for modifications and operational changes to the Central and Southern Florida (C&SF) Project that are needed to restore, preserve, and protect the South Florida Ecosystem while providing for other water related needs of the region, including water supply and flood protection. Subsequent water resource development acts authorized specific projects within CERP. These subsequent authorizations are often referred to as "Generations" with Generation 1 projects having been authorized in WRDA 2007 and Generation 2 projects in the Water Resources Reform and Development Act (WRRDA) of 2014. The WRDA 2016 (Water Resources Infrastructure Improvements for Nation [WIIN] Act) authorized Generation 3, the Central Everglades Planning Project (CEPP). The CERP Everglades Agricultural Area (EAA) Reservoir Project was authorized in America's Water Infrastructure Act (AWIA) of 2018 and reincorporated into CEPP in WRDA 2020. The WRDA 2020 authorized one new CERP project for construction in Generation 4, the Loxahatchee River Watershed Restoration Project. The WRDA 2020 also authorized the construction of two permanent pump stations to sustain current operations of the C-111 South Dade Project and increased the project cost of the C-43 Reservoir Project.

Integrated Delivery Schedule (IDS): The IDS helps restoration planners, stakeholders, and the public focus on priorities, opportunities, and challenges and provides a path forward to complete construction on previously authorized projects while outlining the next projects to undergo planning and design. The IDS synchronizes program and project priorities with the State of Florida and achieves the CERP restoration objectives at the earliest practicable time, consistent with funding and the interdependencies between project components. The IDS is a living document that is updated as needed to reflect progress and/or program changes. During the reporting period, the IDS was updated twice (October 2020 and October 2021) utilizing the Task Force's successful public workshop model to engage the public and stakeholders and enable meaningful input towards identifying priorities for completing construction of projects underway as well as priorities for the next phase of CERP planning. An updated 2022 IDS will be released by the end of November 2022.

The October 2021 IDS reflects changes to the scheduling of the projects based upon notional budgets for FY 2022 and beyond. However, the IDS does not represent a commitment by the federal or state government to include amounts reflected on the IDS in the federal or state budget. The theme of the 2021 update was progress and momentum and highlighting Everglades science as the key to delivering CERP goals. Included in the 2021 IDS are current restoration planning efforts such as, the Loxahatchee River Watershed Restoration Project (LRWRP), Western Everglades Restoration Project (WERP), Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER), and Southern Everglades. Bipartisan Investment Law (BIL) funding supports the delivery of the 2021 IDS goals.

GENERATION 1 PROJECTS

Picayune Strand Restoration Project: This CERP project involves restoring flow across an area larger than the District of Columbia in western Collier County that was drained in the early 1960s in anticipation of development that never materialized. It will restore over 55,000 acres by removing barriers, plugging 42 miles of canals, and degrading 285 miles of roadways and 62 miles of logging trams. The project features will aid in rehydration of the wetlands and restoration of the natural flow of water in the region while maintaining flood protection for neighboring communities. Construction of the project is approximately 80% complete. Three pump stations have been constructed and transferred to the SFWMD. Analysis of the effects on the water levels of adjacent private lands is complete. During the reporting period, the upper 3.3 miles of the Faka Union Canal were plugged. To date, 195 miles of road and logging trams have been removed. Construction of flood protection features, further road removal, and canal backfill continue. A construction contract for road removal was awarded in September 2019 and is scheduled to be complete in December 2022. Construction contracts for the Southwest Protection Features (levee and conveyance features) were awarded in 2020 and are scheduled for completion in 2023. The SFWMD and USACE continue control efforts to address the significant invasive plant populations in the project footprint.

Approximately 50% of the site has been restored and ecological benefits are already being seen. During the winter months of the reporting period, manatees were seen taking advantage of the warm water refuge created by the project's Manatee Mitigation Feature. Early restoration benefits also include the reemergence of foraging wading birds and native flora that have been absent in the area for decades.

Indian River Lagoon-South Project (IRL-S) Project: This CERP project includes the C-44 Reservoir and stormwater treatment areas (STAs), the C-23/24 and C-25 reservoirs and STAs, the acquisition and implementation of 90,000 acres of natural storage areas, the removal of more than 7 million cubic yards of muck from the lagoon, North Fork St. Lucie River flood plain restoration, and the placement of artificial habitat (reef balls, etc.) in portions of the lower St. Lucie Estuary. Current efforts are focused on interim testing and operations of the C-44 Reservoir and STA (RSTA), the design effort for the C-23/24 reservoirs, and ongoing construction of the C-23/C-24 STA. The C-44 Reservoir pump station, the C-44 Intake Canal, the C-44 Reservoir, and the C-44 STA are completed and are currently in the operational testing and monitoring phase. The USACE completed and awarded a construction contract for the C-23/C-24 STA in 2021. The USACE continues design of the C-23/C-24 North and South reservoirs. The C-23/C-24 North Reservoir was fully funded in 2022 with the passage of the BIL. The SFWMD initiated design for the C-23 to C-44 Interconnect (southern diversion) in 2019 and expects to award the construction contract in late 2022.

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GENERATION 2 PROJECTS

Broward County Water Preserve Areas Project: This project consists of three components, the C-11 Impoundment, the C-9 Impoundment, and the Seepage Management Area, which work together to manage seepage loss, capture stormwater, and convey water for other purposes. The two impoundments will provide over 10,000 acre-feet of storage for stormwater runoff in western Broward County. The project will contribute to the environmental restoration of south Florida by diverting stormwater that is currently sent to the WCA-3 into the aboveground reservoirs, reducing phosphorus loading in the Everglades. The water will then be released to maintain the C-11 canal levels. The project will also support hydropattern restoration by keeping clean Everglades water in the natural system via seepage control. The combined hydrologic and reduced phosphorus benefit will reduce the expansion of cattail and reduce the increase in nutrient enriched soils. This provides benefit to periphyton, prey fish, wading birds, and other ridge and slough related species. The C-11 Impoundment is the first component of the project to be designed and constructed. The Mitigation Area A Berm was completed in November 2019. Design of the C-11 Impoundment is underway. During the reporting period, the USACE awarded three contracts for the remaining L-31E Flowway features (Pump Station S-705 in September 2020; Pump Station PS-703, spreader channel, and recreational components in August 2021; and Pump Station PS-710 dissipation spreader basin, Pump Station PS-711 and spreader canal, and seepage canal C-711W in September 2021). The construction of the C-11 Impoundment is completely funded under the BIL.

Biscayne Bay Coastal Wetlands Project (BBCW), Phase 1: The goal of this CERP project is to improve the ecology of Biscayne National Park (BNP) and the Biscayne Bay Aquatic Preserves (BBAP) by rehydrating coastal wetlands and reducing direct freshwater flows by redistributing surface water flows through a spreader canal system. Phase 1 includes construction of three components (Deering Estate, Cutler Wetlands, and L-31E Flow-way) to redistribute the flow of surface water into Biscayne Bay. Construction of the Deering Estate component was completed in March 2012. Design of the Cutler Wetlands component was completed for the initial phase with SFWMD construction anticipated to commence in late 2022 and completion scheduled for summer 2025. The USACE and the SFWMD have both completed portions of the L-31E Flow-way component with the USACE currently constructing the remaining L-31E features. The project will rehydrate 190 acres of freshwater wetlands, increase hydroperiods from approximately 70 to 200 days per year, improve oyster bars, submerged aquatic vegetation (SAV), wetland vegetation, and associated biota, increase abundance of fish and abundance and diversity of seagrasses, improve habitat for alligators and juvenile crocodiles, and produce high-functioning grassy wetlands that will serve as critical habitat for prey fish and wading birds.

C-111 Spreader Canal Western Project: The goal of this completed project is to reduce seepage losses from Everglades National Park (ENP) and provide increased flows to Florida Bay through Taylor Slough. The project includes an aboveground detention area, two pump stations, canal plugging, culverts, and operational changes in south Miami-Dade County. By restoring more natural water conditions, the constructed features are already showing positive ecological benefits to the Taylor Slough area, including to the habitat and population of the endangered Cape Sable seaside sparrow. Operational changes are currently being considered that may bring additional improvements to hydroperiods in the Model Lands.

Caloosahatchee River (C-43) West Basin Storage Reservoir: This project will capture excess flows from the basin during the wet season and then release the stored water to the estuary during the dry season, improve the timing and quantity of water delivered to the Caloosahatchee Estuary, and aid in meeting the minimum dry season flows. An increase to the project cost was authorized in WRDA 2020, bringing the total project cost to \$1 billion. Construction of the 10,700-acre reservoir is underway and, when completed, will provide 170,000 acre-feet of storage.

GENERATION 3 PROJECTS: Central Everglades Planning Project (CEPP)

Authorized in the WRDA 2016, and with the EAA Reservoir reincorporated into CEPP in the WRDA 2020, the goals of the CEPP are to improve the quantity, quality, timing, and distribution of water in the Northern Estuaries, Water Conservation Areas (WCAs), and ENP to restore habitats and ecological function in the natural system. The CEPP is a combination of several conveyance and decompartmentalization (the removal of levees and canals) projects in the heart of the Everglades. These projects are grouped into: CEPP EAA, CEPP North, CEPP South, and CEPP New Water. CEPP EAA focuses on getting additional water south with additional storage in the A-2 Reservoir and canal conveyance improvements. CEPP North focuses on inflow facilities needed to restore northern WCA-3A and CEPP South focuses on providing additional outlet structures to move more water south. CEPP New Water focuses on construction of a seepage barrier to allow increased water levels and additional flows into ENP.

The **CEPP EAA Project** was originally authorized in the AWIA of 2018. The SFWMD's Section 203 Post Authorization Change Report (PACR) provided additional water storage and treatment including a 240,000 ac-ft storage reservoir, known as the EAA or A-2 Reservoir, and a 6,500-acre STA. The EAA Reservoir and STA will divert, store, and treat Lake Okeechobee and watershed regulatory releases. The project also includes canal conveyance improvements to the Miami and North New River canals, which will convey water to the project. The SFWMD began site preparation activities for the STA in April of 2020 and significant construction progress has been made during the reporting period after the PPA was executed in April 2021. The USACE initiated design of the A-2 Reservoir and Pump Station in March 2020. The **CEPP South** Validation Report for the southern features was completed in May 2019 and the PPA was signed in 2020 by the USACE and SFWMD. The validation report focused on removing water flow barriers in the southern portion of the project's footprint, which will allow flexibility to flow more water south. During the reporting period, the SFWMD completed construction of the S-333N (1,150 cfs spillway structure) in late 2021. SFWMD removal of Old Tamiami Trail began in February 2020 and was completed by 2022. The USACE initiated construction of Contract #1 (S-631, S-632, S-633, L-67A Spoil Removal, and L-67C Levee Gap) in early 2020. However, the contractor was terminated. The USACE design is underway for additional CEPP South features including the S-355W spillway structure in the L-29 Canal levee, the 1,000 cfs S-356E pump station that will replace the existing 500 cfs S-356 pump station, partial removal of L-29 Levee, and construction of the L-67D also known as the Blue Shanty Flowway.

The **CEPP North** phase Pre-Partnership Credit Agreement was executed in February 2020 by the USACE and SFWMD and the Validation Report was initiated in 2021. In general, the CEPP North phase provides conveyance improvements and increased landscape connectivity to restore WCA-3A and move additional water south to the Everglades. The SFWMD has started design of two CEPP North components. The S-620 culvert and associated L-6 Canal improvements, are anticipated to be awarded for construction in 2022. Design of the L-5 canal improvements started in February 2022 and are scheduled for construction to start in 2023.

The **CEPP New Water** Validation Report is under review and will be completed in 2022. The SFWMD has initiated design of the CEPP New Water features.

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GENERATION 4 PROJECTS

Loxahatchee River Watershed Restoration Project (LRWRP): This CERP project will restore and sustain the overall quantity, quality, timing, and distribution of fresh water to the federally designated “National Wild and Scenic” Northwest Fork of the Loxahatchee River. This project also seeks to restore, sustain, and reconnect the area’s wetlands that form the historic headwaters for the river and the northeastern Everglades. The project was authorized in the WRDA 2020 and design was initiated in 2022. The authorized plan delivers 98% of the wet season restoration flow target and 91% of the dry season restoration flow target for the Northwest Fork of the Loxahatchee River. The plan also improves wetland hydrology in the Pal-Mar natural area complex and restores 17,000 acres of various types of agricultural land that are part of the historical Greater Everglades. An additional 10,000 acres of natural areas are improved in the J.W. Corbett Wildlife Management Area, Loxahatchee Slough, and Kitching Creek. These habitats collectively include a unique mix of ridge and slough, mesic and wet flatwoods, wet prairie, cypress floodplain, cypress strand, dome swamps, depression marsh, and mesic and hydric hammock plant communities. The restoration actions will also improve connectivity for over 78,000 acres of natural areas and restored wetlands that benefit many species of flora and fauna, including endangered and recreationally important species.

CERP PLANNING EFFORTS

Western Everglades Restoration Project (WERP): The overarching purpose of the WERP study is to reestablish surface water sheetflow from the northern portion of the study area, across the Seminole Tribe of Florida Big Cypress Reservation and into the Big Cypress National Preserve (BCNP), while maintaining flood protection. The preliminary project objectives are to: (1) improve the quantity, quality, timing, and distribution of flows in the western Everglades; (2) re-establish sheetflow south of the West Feeder Canal on the Big Cypress Seminole Indian Reservation into BCNP; (3) restore water levels to reduce wildfires associated with altered hydrology; and (4) re-establish ecological connectivity. This study is aimed at re-establishing ecological connectivity of wetland and upland habitats in the western Everglades with restored freshwater flow paths, volumes and timing, seasonal hydroperiods, and historic distributions of sheetflow. The project will result in restoration of and sustainability of native flora and fauna, reduction in wildfires, and promotion of system-wide resilience considering future change, such as sea level rise and climate change. Although suspended from December 2020 to January 2022, the USACE reinitiated planning on this project in February 2022 with the approval of a second exception to WRRDA 2014 Section 1001 requirements for additional time/budget.

Lake Okeechobee Watershed Restoration Project (LOWRP): This CERP study area covers approximately 1,450,000 acres, primarily located north of Lake Okeechobee, and includes Lake Okeechobee and the Caloosahatchee and St. Lucie estuaries.

In 2021, the Florida Legislature passed Senate Bill 2516 to support expedited implementation of LOWRP and provided for dedicated funding. In 2022, the SFWMD submitted the revised State Compliance Report for LOWRP and the USACE, in partnership with the SFWMD, prepared the Third Revised Draft Integrated PIR/EIS. The draft plan was published in the Federal Register in June 2022. The Florida Legislature has provided \$150 million to date to expedite implementation of LOWRP components designed to achieve the greatest reductions in flood control releases to the Caloosahatchee and St. Lucie estuaries. An additional \$100 million is proposed in the FY 2022/23 budget.

Biscayne Bay and Southeastern Everglades Ecosystem Restoration (BBSEER): This CERP planning study includes components of the C-111 Spreader Canal Eastern and BBCW Phase II projects. The purpose of BBSEER is to improve the quantity, quality, timing, and distribution of freshwater to Biscayne Bay, including Card Sound, Barnes Sound, and BNP; to improve the natural habitat quality in the Model Lands and Southern Glades; and to improve resiliency of these coastal habitats considering sea level rise.

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An objective of this project is to restore freshwater and estuarine habitat, including estuarine nursery habitat along the shoreline. The study began in September 2020. The future without project condition of the BBSEER area would see a continued trend of vital estuarine and freshwater wetland habitat loss. The current trajectory of sea level rise and over-drainage will continue to stress natural ecosystems, biodiversity, and the resilience of the developed landscape. As a result, the initial alternative plans developed in 2021 and 2022 include a combination of additional sources, storage, conveyance, and redistribution of freshwater. Infrastructure and operational changes are also components of plans intended to deliver necessary freshwater, in appropriate quantities, with appropriate timing and distribution, to reconnect the landscape to maintain and improve vital habitat and enhance coastal resilience in the region.

In April 2022, an exception to the WRRDA 2014, Section 1002 requirements (also referred to as the USACE's SMART 3-year/\$3-million study limit) was approved for additional time and budget needed to support the tools to evaluate alternatives with saltwater intrusion caused by sea level rise. This exception allowed an additional \$2.25 million in federal funding and 28 months for the study. The initial round of modeling will be completed in August 2022.

OTHER CERP AND RELATED PROJECTS

WCA-3 Decompartmentalization and Sheetflow Enhancement Physical Model (DPM): This CERP project is a design effort that provides for the temporary installation and testing of water management features to address scientific, water flow, and water management uncertainties prior to the decompartmentalization of WCA-3. Construction of the test features was completed in 2012 and operational testing has been underway to determine the effects of point-source velocity on vegetation restoration, mechanisms to restore slough hydrology, and alternative levels of canal plugging to reconnect WCA-3A with WCA-3B. Results of the testing indicate an ecological impact from unplugged canals, a need to integrate energy/water quality dispersers downstream of a culvert, and the feasibility of restoring historic slough patterns. More details can be found in the annual South Florida Environmental Reports from 2016 to 2022. Findings from the project validate the need to retain the DPM installation as permanent project features to enhance the spatial distribution of inflows into WCA-3B, effectively providing greater operational flexibility with the new structures that will be constructed as part of the CEPP South.

Melaleuca Eradication and Other Plants (Biological Control Implementation Project): This project is dedicated to the implementation of biological control agents to address the spread of invasive plants throughout the CERP area. The project included the construction of a mass rearing annex to the existing US Department of Agriculture-Agricultural Research Service (USDA-ARS) biological control facility in Davie, Florida, to rear, release, establish, and monitor approved biological control agents for melaleuca and other invasive plants in the CERP area. The USDA-ARS, in close coordination with the SFWMD and the USACE, began the operational phase of the project in 2013 and, to date, has released more than 9.2 million insects and mites on four invasive plant species. Releases are continuing along with extensive field monitoring and evaluation of the biological control agents. Current rearing and release efforts are targeting Old World climbing fern, melaleuca, and Brazilian pepper.

Integrated Biscayne Bay Ecological Assessment and Monitoring (IBBEAM): IBBEAM is part of the CERP REstoration, COordination and VERification (RECOVER) Monitoring and Assessment Plan (MAP) and is a multi-entity project of the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), the University of Miami, and the National Park Service (NPS). Salinity and biological data collected by IBBEAM in the southwestern Biscayne Bay nearshore area between Shoal Point and Turkey Point are being used in the BBSEER planning effort to develop performance measures (PMs) to screen project design alternatives for their ability to help reach BBSEER goals. For more information on IBBEAM, please see the Restoration Science section of this report.

NON-CERP AND FOUNDATION PROJECTS

The planning process for CERP assumed that a set of previously authorized projects would be completed and thus serve as a foundation for CERP implementation. Foundation Projects seek to provide improvements to the quantity, quality, timing, and distribution of water through the construction of water storage and management features and the removal of impediments to surface water flow. Additional non-CERP hydrological restoration projects are also discussed below.

C-111 South Dade Project: This Foundation Project restores the wetland sloughs and prairies along the eastern boundary of ENP and improves hydrologic conditions in Taylor Slough and other adjoining areas of the park. The project sends more fresh water through Taylor Slough towards Florida Bay, thus improving portions of the bay's health by reducing nearshore salinity. At the same time, project features maintain flood protection for development and agricultural interests located east of the project. All construction projects were completed two years ago, which enabled revision of the Combined Operating Plan (COP) in August 2020. This water control plan takes advantage of the newly completed Modified Water Deliveries to Everglades National Park (Mod Waters) and C-111 South Dade features to convey more water from WCA-3 to ENP to improve hydrologic conditions in both. The only outstanding project is replacement of the two temporary pumpstations, S-332B and S-332C, with permanent pump stations with hardened structures and concrete lined discharge channels. The SFWMD and USACE initiated design in 2020. Almost all land for the C-111 South Dade project has been acquired. Acquisition of the last few parcels is expected to be completed in 2022.

Kissimmee River Restoration: This restoration project returns the river to a more natural flow after having been channelized in the 1960s. The project involved restoring about one-third of the Kissimmee River and its floodplain by backfilling 22 miles of canal, thereby reestablishing flow to 40 miles of river channel and intermittently inundating almost 25,000 acres of river floodplain, and modifying the S-65 regulation schedule. The last major construction contracts were completed in 2020 and 2021, including canal backfilling, installation of erosion protection measures, and construction of the S-69 weir at the downstream terminus of the project.

Positive interim ecological responses are already being observed in the Reach 1 and Reach 4 areas, particularly in the river channel, where flow was reestablished in 2001 and has been maintained nearly continuously for over 20 years. Organic deposits on the river bottom have decreased by 71 percent and new habitat for shorebirds and invertebrates has been established. In the river channel, the reestablished flow eliminated organic deposits on the river bottom and undesirable floating and mat-forming plants have been replaced by native emergent plants. Sandbars reformed, creating new habitat for shorebirds and invertebrates. Dissolved oxygen (DO), critical for long-term survival of fish and other aquatic organisms, continued to be higher in the river channel in Water Year (WY) 2021 than prior to construction of the project. However, after anoxic events during summer 2020, total centrarchid and bluegill sunfish abundance in Reach 1 were reduced by 91% and largemouth bass abundance by 81%. Although challenges remain to address short-term declines in DO that can dramatically affect native species, including the recovery of native sunfish populations, DO has improved overall. Wading bird populations, including white ibis, great egrets, snowy egrets, and little blue herons, have increased and were active in 2021. Ducks have returned to the river, including American widgeons, northern pintails, northern shovelers, ring-necked ducks, and black-bellied whistling ducks. Wading bird foraging expectations are being met when floodplain conditions are suitable, and snail kites nested in a newly flooded section of the Kissimmee River floodplain in the 2018 wet season. Also on the floodplain, cover of wetland vegetation increased quickly overall after Reach 1 construction, meeting the expectation for wetlands, although the expected complement of specific plant communities has not yet reestablished. Full implementation of the HRS and appropriate water management are anticipated to provide the longer hydroperiods needed for reestablishment of broadleaf marsh communities. More details can be found in Chapter 9 of annual South Florida Environmental Reports.

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Lake Okeechobee System Operating Manual (LOSOM): The LOSOM effort was initiated in 2019 to re-evaluate the lake operations in conjunction with the completion of Herbert Hoover Dike (HHD) rehabilitation. The HHD Rehabilitation Project has achieved 90 percent completion of all construction contracts meaning communities around Lake Okeechobee are safer and the USACE is on track to complete its work by the end of 2022. The USACE began the collaborative work to develop a modern vision of balance for the management of water in Lake Okeechobee early with the goal to incorporate flexibility in Lake Okeechobee operations while balancing statutory project purposes (flood control, water supply, navigation, recreation, and enhancement of fish and wildlife). The LOSOM plan, developed and identified through a transparent and interactive process with stakeholders over the last three years, is an improvement over the current Lake Okeechobee Regulation Schedule 2008 by focusing on system benefits, looking at the system holistically, and utilizing real time knowledge of climate conditions, weather data, climate projections, and system needs to make educated decisions about how releases are made. The draft EIS and Water Control Plan are scheduled for release in July 2022.

Modified Water Deliveries to Everglades National Park (Mod Waters): The Mod Waters project modifies the existing C&SF project and improves the natural water flows to Shark River Slough, the lifeline of ENP. The project enables restoration of more natural hydrologic conditions using three dimensions: timing, location, and volume of water. The project is composed of four major components: 1) 8.5 Square Mile Area Flood Mitigation Plan; 2) Conveyance and Seepage Control Features; 3) Tamiami Trail Modifications; and 4) Project Implementation Support including hydrological stream gauge monitoring, incremental testing, and the COP.

All Mod Waters features were completed by June 2018 and development of the COP was completed in September 2020. The hydrologic modeling for the COP operational plan indicated the opportunity for an increase average annual flows into the Shark River Slough portion of ENP by 162,000 ac-ft per year on average annually, an increase of 28 percent. The COP facilitates the restoration of Northeast Shark River Slough as a functioning component of the Everglades hydrologic system by changing the spatial distribution of the water delivered into ENP across Tamiami Trail, increasing the proportion of the water that enters ENP east of S-333 by 19% (from 58% to 77%). The COP changes the schedule of water deliveries to ENP so that it fluctuates in consonance with local meteorological conditions, including providing for long term and annual variation in ecosystem conditions in the Everglades through implementation of a Tamiami Trail Flow Formula that determines the weekly target volume of flow through the S-333 and the S-12 pump stations. Furthermore, the COP maximizes progress toward restoring historic hydrologic conditions by, increasing annual inflow in Taylor Slough by approximately 6,000-acre feet per year (an increase of 7%) and in the Eastern Panhandle of ENP by approximately 30,000 acre feet per year on average (an increase of 27%). This will allow the rehydration of the downstream ENP wetlands, relieve some of the adverse high water impacts upstream in WCA-3A, and create positive change for the area's substrate, flora, and fauna, Taylor Slough, and eastern Florida Bay. Rehydration will also increase the abundance of marsh fish and macro-invertebrates that support the historic wading bird colonies.

Tamiami Trail Next Steps (TT:NS): The conceptual design for this project was completed and the Florida Department of Transportation (FDOT) posted the request for proposals (RFP) in March 2020 and awarded the contract in August 2020. Early construction efforts started in April 2021 and design for two of the three segments of roadway was completed by July 2021. In late 2021 through early 2022, several additional elements of the Phase 2 project were refined as the final design was nearing completion. These design changes were the result of continued coordination with the Miccosukee Tribe of Indians and their request to maintain the current roadway setback and associated external parking at the Osceola Camp. Additional design changes to stormwater swale design resulted from continued coordination with the FDEP, as well as with utility companies to provide improvements that would benefit the residents and businesses along the Tamiami Trail.

Florida Power and Light (FPL) will be removing the utility poles along most of the Tamiami Trail roadway within the project limits and installing underground powerlines during the swale system construction. The construction of these buried lines will increase the resiliency of the power grid while decreasing the impacts to Tribal residents and concessions businesses by installing the lines at the same time the FDOT is rebuilding the roadway.

WATER QUALITY

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. In order to achieve this objective, water quality standards (WQS) which provide for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water, are established by states. Applicable State of Florida WQS are the foundation for a wide range of programs under the CWA, including establishing water quality goals for specific waters bodies and are the regulatory basis for water quality-based effluent limits through federal permits. The WQS also serve as a target for CWA restoration activities such as total maximum daily loads (TMDLs). Water quality within the ecosystem has been compromised by a variety of nutrients and pollutants. Excess phosphorus, often evidenced by excessive cattail growth or widespread algal blooms, is a major concern for the central Everglades as well as for the ecosystem's lakes and estuaries, but it is not the only problem. Other nutrients, too little or too much fresh water, mercury, and potentially toxic contaminants such as trace metals, pesticides, and other synthetic organic chemicals, are also of concern. However, most of the state and federal water quality programs described here focus on nutrient reduction (phosphorus and nitrogen).

STORMWATER TREATMENT AREAS (STAs)

STAs are constructed treatment wetlands that remove and store nutrients through plant growth and the conversion of dead plant material into soil. Approximately 68,000 acres of land south of Lake Okeechobee have been converted to STAs, yielding 63,000 acres of effective treatment area for these wetlands. In WY 2021-22 (May 2020 - April 2022), the Everglades STAs treated an average of 1.3 million acre-feet of water and retained 169 metric tons of phosphorus (P) per year, which equates to an 80 percent P load reduction, and produced an average outflow P concentration of 26 micrograms per liter. STAs located north of Lake Okeechobee include the Lakeside Ranch STA, which was completed during the reporting period and will help improve water quality flowing into the lake, and the Lake Okeechobee Water Retention and Phosphorus Removal Project/Taylor Creek and Nubbin Slough STAs, which capture and treat inflows and subsequently release cleaner water back into Taylor Creek, Nubbin Slough, and Lake Okeechobee.

RESTORATION STRATEGIES

One of the State of Florida's largest water quality programs is Restoration Strategies, a consensus plan developed collaboratively by the State of Florida and the US Environmental Protection Agency (USEPA) with an estimated cost to Florida of \$880 million. Under this program, the SFWMD is designing, constructing, and operating a suite of regional water storage, water quality treatment, and conveyance improvement projects that is envisioned to further improve water quality in America's Everglades. The program also includes a robust STA Science Plan of research activities to investigate the factors that influence ambient water Phosphorus (P) reduction and to better understand the sustainability of P removal performance at low P concentrations. The strategies also feature implementation of additional sub-regional source controls to reduce water pollution at the source in areas where P levels in stormwater runoff have been historically higher. Within the two-year timeframe of this report, 14 milestones have been accomplished ahead of schedule. The repairs and modifications to STA-1E, including the improvements to Cells 5 and 7, were completed. For STA-1W Expansion #1, the initial flooding and optimization period was completed. The design for Expansion #2 was completed and construction is on-going. The design for the G-341 Related Improvements was completed and construction of the fifth and final segment of the Bolles East Canal conveyance improvement located in the EAA is underway. In STA-5/6, the internal improvements over an area of 1,100 acres are in the period of initial flooding and optimization. The design for the C-139 FEB was completed and construction is on-going. Through April 2022, total program expenditures by the SFWMD were approximately \$541 million.

EAA REGULATORY BEST MANAGEMENT PRACTICES (BMP) PROGRAM

BMPs are source control efforts to reduce the amount of pollutants (pesticides, fertilizers, animal waste, etc.) in agricultural and urban stormwater runoff. Agricultural BMPs are designed to increase efficiency in nutrient and irrigation water management to balance agricultural production with water resource protection. The SFWMD's regulatory BMP program in the EAA Basin is an example of how BMPs can play a major role in restoration. For over 26 years, the SFWMD's regulatory program has exceeded expectations, most recently with a 59 percent reduction in total phosphorus (TP) loads in WY 2021 compared to the baseline period prior to the BMP program implementation. Results have been consistently above the 25 percent load reduction mandated by Florida Statutes, averaging 57 percent over the long-term. The SFWMD BMP program has prevented approximately 4,282 metric tons of TP from entering the Everglades for the period WY 1996 through WY 2021. Further details on the BMP program during this reporting period can be found in the Final 2022 South Florida Environmental Report – Volume I, Chapter 4 (www.sfwmd.gov/sfer).

NORTHERN EVERGLADES AND ESTUARIES PROTECTION PROGRAM

The Northern Everglades and Estuaries Protection Program (NEEPP) recognizes that the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds are critical water resources of the State of Florida. This program builds upon and consolidates numerous restoration activities into a comprehensive, regional approach. Watershed Protection Plans (WPP), developed pursuant to the NEEPP for each of the three watersheds, identify actions to help achieve water quality and quantity objectives and restore habitat. They also support the FDEP basin management action plans (BMAPs) detailed in the following section. The NEEPP implementation by the coordinating agencies is underway and annual updates can be found in the South Florida Environmental Report (www.sfwmd.gov/sfer).

BASIN MANAGEMENT ACTION PLANS/WATERSHED PROTECTION PLANS (WPPs)

A variety of basin-specific planning efforts identify water quality standards and detail mechanisms to achieve and maintain those standards. TMDLs are scientifically determined maximum amounts of a pollutant that a surface water body can absorb and still meet water quality standards that protect human health and aquatic life. FDEP-adopted BMAPs, supported by the SFWMD and the Florida Department of Agriculture and Consumer Services (FDACS), and WPPs, promote a comprehensive, interconnected watershed approach for identifying upstream measures to improve water quality in, and hydrology to, downstream water bodies. BMAPs are the framework for water quality restoration, containing local and state commitments to reduce pollutant loading through current and future projects and strategies. Reasonable Assurance Plans (RAPs) are a possible alternative to TMDLs and BMAPs for certain surface waters that already have control programs in place that will restore the waterbody so that water quality standards will be met. An update on key planning efforts is highlighted below.

Caloosahatchee River/St. Lucie River/Lake Okeechobee Watershed Protection Plans (WPPs):

The purpose of these plans is to improve the hydrology and aquatic habitats of Lake Okeechobee and downstream receiving waters, including the Caloosahatchee and St. Lucie rivers and estuaries, for the restoration and protection of these Northern Everglades ecosystems. In accordance with NEEPP-mandated timelines, the LOWPP Update was revised in 2020. Future updates to the WPPs will be done in accordance with the 2016-amended NEEPP to ensure that they are consistent with the adopted BMAPs for Lake Okeechobee, the St. Lucie River and Estuary, and Caloosahatchee River and Estuary. During the FY 2021 reporting period, the following NEEPP Watershed Construction Project activities were accomplished for SFWMD-led projects: 4 projects were in planning/design and 18 projects were in operations in the Lake Okeechobee Watershed (LOW); 6 projects were in planning/design, 1 project was under construction, and

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8 projects were in operations in the St. Lucie River Watershed (SLRW); 5 projects were in planning/design, 1 project was under construction, and 3 projects were in operations in the Caloosahatchee River Watershed (CRW). All FDACS' Hybrid Wetland Treatment Technology (HWTT) projects (5 in the LOW and 3 in the SLRW) and Floating Aquatic Vegetative Tilling (FAVT) projects (1 in the LOW and 1 in the CRW) also continued their operations. Further information on WPP reviews and updates during this reporting period can be found in the Final 2022 South Florida Environmental Report – Volume I, Chapter 8A (www.sfwmd.gov/sfer).

Caloosahatchee River and Estuary/St. Lucie River and Estuary/Lake Okeechobee BMAPs:

In 2019, the FDEP adopted dissolved oxygen TMDLs for five Caloosahatchee River tributaries, which established reduction targets for total nitrogen (TN), TP, and biochemical oxygen demand. In response to Executive Order 19-12, to expedite improvement to water quality, all three BMAPs were updated by FDEP in January 2020 and adopted by secretarial order in February 2020 (<https://floridadep.gov/bmaps>). Notably, this was the first 5-year review for the Lake Okeechobee BMAP since NEEPP was amended in 2016. Also, the latest Caloosahatchee River and Estuary BMAP update incorporates the expanded area that includes the state's newly adopted Caloosahatchee River Tributary TMDLs. The update for all three BMAPs included TN and TP effluent limits for domestic wastewater facilities based on facility size and effluent discharge method. These new effluent limits are being incorporated into domestic wastewater permits as those permits come into FDEP for renewal. The FDEP also incorporated a targeted restoration analysis for the NEEPP BMAPs to assist in the prioritization of nutrient reducing projects throughout the watersheds. The state's annual progress reporting on the BMAPs is published in the Florida Statewide Annual Report (STAR), per statutory requirements. The STAR for the 2020 reporting year was published on June 30, 2021 and the STAR for the 2021 reporting year was published on June 30, 2022. (<https://floridadep.gov/dear/water-quality-restoration/content/statewide-annual-report>).

Florida Keys National Marine Sanctuary (FKNMS) Water Quality Protection Program (WQPP): The FKNMS WQPP is a congressionally authorized program that is dedicated to protecting and improving water quality, coral reefs, seagrasses, fisheries, and recreational opportunities within the FKNMS and adjacent boundary waters. Co-chaired by the USEPA and the FDEP in consultation with the NOAA, the WQPP is a collaborative program driven by a steering committee comprised of federal and state resource managers, local governments, elected officials, non-governmental organizations, academia, and local citizens that collaboratively work to identify and address water quality issues impacting marine resources within the FKNMS. During this reporting period, a Canal Restoration Work Program was initiated by the State to establish a definitive timeline for canal restoration in the Florida Keys. The WQPP Steering Committee also developed updated water quality priorities, which include a priority to improve engagement with the Task Force and established a Florida Keys Ecosystem Connectivity working group in cooperation with the FKNMS Advisory Council to improve coordination and understanding of Everglades restoration efforts that may potentially affect water quality in the Florida Keys.

Funding was provided by the USEPA South Florida Program to continue long-term water quality, coral reef, and seagrass status and trends monitoring programs in the Florida Keys, and to support a number of special studies related to other FKNMS and WQPP priorities including modeling connectivity and pollutant transport from south Florida watersheds to the Florida Keys, researching contaminants of emerging concern, evaluating canal restoration technologies, and investigating shallow wastewater injection impacts on groundwater and surface waters of FKNMS. The USEPA also provided \$2.5 million to monitor corals and research Stony Coral Tissue Loss Disease, supported marine debris removal as part of the Clean Seas and Iconic Reefs programs, and funded research and monitoring in Biscayne Bay, sponge restoration in Florida Bay, and water quality monitoring in the St. Lucie and Caloosahatchee estuaries. (http://ocean.floridamarine.org/FKNMS_WQPP/)

Florida Keys Reasonable Assurance Document (FKRAD): The FKRAD was developed in 2008 by FDEP in cooperation with local, state, and federal agencies to set forth and accelerate actions to reduce nutrient loadings and achieve water quality standards within nearshore waters throughout the Florida Keys. The plan includes a variety of wastewater, stormwater, and canal restoration activities designed to improve water quality in areas previously found to be impaired for nutrients and DO. During this reporting period, the FDEP and Monroe County worked collaboratively with area stakeholders to compile additional project

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information and to complete the monitoring program that was initiated in August 2018. This effort focused on nearshore water quality and required quarterly sampling at 65 stations throughout the Florida Keys. Based on these data it was determined that most areas within the FKRAD attain standards for TN and TP, however, some additional monitoring will be required to make a final determination on attainment. Detailed water quality data results from this effort and future recommendations will be included in the next update to the FKRAD, which is anticipated to be completed in September 2022.

Biscayne Bay Reasonable Assurance Planning (RAP) process. Miami-Dade County has committed to improving water quality in the Biscayne Bay watershed by starting to implement the Biscayne Bay Task Force recommendations. In a major step forward in addressing water quality in northern Biscayne Bay, where significant seagrass die-offs, fish kills, and algal blooms have been documented, the Board of County Commissioners approved the development of the first RAP for the Biscayne Bay watershed in March 2022. The County's development of the Northern Biscayne Bay RAP Phase 1 requires participation and agreement from all stakeholders within the designated canal drainage basins, including municipalities within the geographic area, FDEP, SFWMD, BBAP, Biscayne Bay Watershed Management Advisory Board (BBWMAB), the Biscayne Bay Commission, and others. The Northern Biscayne Bay RAP Phase 1 process will provide more local control over the development and implementation of prevention and restoration activities and will make grant funding available from FDEP's wastewater grant program, Biscayne Bay water quality grant program, and others. Phase 1 of the RAP plan will be submitted to FDEP by September 2022 for review and adoption by secretarial order.

OTHER WATER QUALITY INITIATIVES

Dispersed Water Management Program (DWM): Addressing the complex and varying problems in the Northern Everglades watersheds necessitates a multifaceted restoration approach including reducing nutrient loading and excess freshwater inflows and discharges to Lake Okeechobee as well as the St. Lucie and Caloosahatchee rivers and estuaries. In addition to utilizing regional public projects, the DWM program encourages property owners to retain water on their land. Holding water on these lands is one tool to reduce the amount of water flowing into Lake Okeechobee during the wet season and discharged to coastal estuaries for flood protection. Shallow water retention also provides valuable groundwater recharge for water supply, opportunities for water quality improvement and rehydration of drained systems. The focus on water quality and storage is intended to improve hydrology, water quality, and aquatic habitats in both the watersheds and receiving waters. As part of the WPPs, the SFWMD continues to implement various watershed construction projects with both water storage and water quality benefits to improve conditions across the Northern Everglades, which includes both regional and DWM projects. During the reporting period, 35 projects were operational across the Northern Everglades watersheds, including 22 DWM projects and 13 other regional restoration projects that provide storage benefits. Collectively, in WY 2021, these projects provided an estimated storage volume of approximately 129,283 ac-ft, including 101,391 ac-ft from DWM projects and 27,892 ac-ft from the other regional projects. Also, four storage projects were in the planning, design/permitting, or construction phase, which together will provide an additional 59,100 ac-ft of storage once operational. From FY 2020/21 to FY 2021/22, the State of Florida appropriated \$52.7 million to expand the DWM program. Further details on the DWM program during this reporting period can be found in the final 2022 South Florida Environmental Report – Volume I, Chapter 8A (www.sfwmd.gov/sfer).

C-43 Water Quality Treatment and Testing Facility Project (C-43 WQTTP): The SFWMD, in partnership with Lee County, is conducting the C-43 WQTTP to help demonstrate and implement cost-effective, wetland-based strategies for reducing nutrient loadings, particularly nitrogen, to the Caloosahatchee River and its downstream estuarine ecosystems. Planning for the Phase II test cells study is underway. The primary objective of the Phase II study is to build upon lessons learned during Phase I to further optimize efficiencies and improve upon the general understanding of N reduction in constructed wetland systems. The Phase II research demonstration will be conducted at the SFWMD-owned Boma Site and will be fully integrated but separate from the Boma Flow Equalization Basin. Construction of the test cells is expected to begin by the end of 2022 with research to begin in summer 2023. Results from this study will support development of a future full-scale treatment facility.

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C-43 West Basin Storage Reservoir Water Quality Component: In 2019, State of Florida Executive Order 19-12 called for greater protection of Florida's environment and water quality, particularly in relation to the harmful blue-green algal blooms in south Florida. It directed the FDEP to work with the SFWMD to add a stormwater treatment component to the C-43 West Basin Storage Reservoir (WBSR) with the intent of providing additional treatment and improving the quality of water leaving this important storage component of the CERP. This initiative was implemented through the state's C-43 Reservoir Water Quality Feasibility Study which in 2020 determined inline injection of alum, a chemical compound that binds with nutrients thereby improving water quality, had significant benefits and was compatible with the existing C-43 WBSR project design, schedule, and project purpose. Inline injection of alum during reservoir filling is expected to be useful in suppressing potential nuisance blue-green algal blooms within the reservoir and in improving the Caloosahatchee River and its downstream estuary water quality. The inline alum treatment system is being designed and constructed concurrently with construction of the C-43 Reservoir.

Innovative Technologies to Combat Harmful Algal Blooms: Executive Order 19-12 also created a Blue-Green Algae Task Force to protect Florida's water and address the issue of recurring algal blooms and nutrient enrichment of Florida's fresh waterbodies, including lakes, rivers, estuaries, and canals. The recommendations included innovative technologies to detect, prevent, clean up, and mitigate harmful algal blooms in a cost-effective, environmentally safe and effective way. During the reporting period, the FDEP received \$15 million in Florida Legislative appropriations to support their Innovative Technologies Grant Program, which facilitates the allocation of this funding and has further engaged with the State's Blue-Green Algae Task Force to ensure the program is optimizing its evaluation and successes. Currently, the FDEP is evaluating 32 unique projects for mitigating harmful algal blooms. While beyond the scope of this reporting period, the State of Florida continued this commitment by appropriating an additional \$15 million in the budget for FY 2022/23.

FDACS Agricultural Best Management Practices (BMP) Program: Agricultural BMPs are designed to increase efficiency in nutrient and irrigation water management to balance agricultural production with water resource protection. BMPs are practical, cost-effective actions that agricultural producers can take to conserve water and reduce the amount of nutrients (fertilizers and animal waste) and other pollutants entering water resources. BMPs are designed to benefit water quality and water conservation while maintaining or even enhancing agricultural production. Categories of practices include nutrient management, irrigation management, and water resource protection features. The FDACS develops and adopts BMPs by rule for different types of agricultural commodities. Florida law provides for agricultural producers to reduce their impacts to water quality through the implementation of BMPs adopted by FDACS. Details on BMP implementation for each watershed can be found in the Status of Implementation of Agricultural Nonpoint Source Best Management Practices report (<https://www.fdacs.gov/Divisions-Offices/Agricultural-Water-Policy>).

Coral Reef Water Quality Monitoring: The FDEP Coral Reef Conservation Program established an offshore water quality monitoring program for Martin, Palm Beach, Broward, and Miami-Dade counties. Monthly samples are being taken at surface and bottom for all inlets and ocean outfalls, as well as across multiple coral reef sites. The FDEP Water Quality Standards Program (WQSP) is proposing a narrative turbidity criterion to better protect coral reefs as part of its current Triennial Review. The FDEP is also active in discussions with state and federal partners regarding the potential future development of other criteria (numeric or narrative) to better protect Florida's coral reefs.

HABITAT PROTECTION AND RESTORATION

Historically, the natural habitats of south Florida covered an area of about 18,000 square miles. A combination of connectivity and spatial extent created the range of habitats and supported the levels of productivity needed for the historic diversity and abundance of native plants and animals. Successful restoration of the South Florida Ecosystem will require land acquisition and conservation to protect natural habitats and species, as well as conservation and management of the region's estuaries and marine habitats, including coral reefs.

LAND ACQUISITION

The Florida Forever program was established in 2000 by the Florida Legislature to conserve environmentally sensitive land, restore waterways, and preserve important cultural and historical resources. In 2008, the Florida Legislature authorized an additional \$3 billion through 2020.

Florida's Land Acquisition Trust Fund was developed to acquire and improve conservation easements, wildlife management areas, wetlands, forests, fish and wildlife habitats, beaches and shores, recreational trails and parks, urban open space, rural landscapes, working farms and ranches, historical and geological sites, lands protecting water and drinking water resources, and lands in the EAA and the Everglades Protection Area. The fund was designed to manage and restore natural systems and to enhance public access and recreational use of conservation lands. The 2014 Florida Water and Land Conservation Initiative, Amendment 1, was designed to dedicate 33 percent of net revenue from the existing excise tax on documents to the Land Acquisition Trust Fund.

State Land Acquisition during the reporting period:

- SFWMD and FDEP acquired 26,983 acres for Conservation and Restoration Projects

Completed State Land Acquisition:

- 27 projects have been completed.
- 38 projects are underway.

LAND CONSERVATION

Agriculture is Florida's second leading industry and a large portion of agricultural land can be viewed as open space that benefits the natural system through buffering, revitalization of natural habitats, water storage and filtration, and aquifer recharge. The USDA – Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS's goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program.

Agricultural Conservation Easement Programs (ACEP) in Florida: During the reporting period, the USDA-NRCS invested over \$28 million in ACEP funds for the acquisition and restoration of 9,502 acres of land in Florida. Over 80% of this investment was within the Northern Everglades Initiative area.

Fisheating Creek Wetland Restoration Project: The NRCS has acquired permanent conservation easements in the Fisheating Creek Wetland Restoration Project area. The planned restoration activities will reduce the amount of surface stormwater leaving the land, slowing water runoff, and reducing the concentration of nutrients entering Lake Okeechobee and the Everglades. Restoration activities began in 2019, and in 2021-2022, restoration was completed on 8,199 acres. Restoration activities are scheduled to begin on another 14,675 acres in 2023.

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ESTUARY AND CORAL REEF PROTECTION

Biscayne National Park Coastal Restoration Efforts: In 2020-2022, the USACE and the SFWMD continued to move forward with construction and operation of the BBCW Phase 1 project (see CERP, Generation 2 Projects, in this document) and have begun to document improvements in coastal vegetation and estuarine conditions downstream of the completed portions of the project. While year-to-year variability is high, there has been a measurable decrease in both surface water and soil porewater salinity as well as an increase in freshwater levels downstream from the Deering Estate pump station. Mesohaline (water with low to medium saline content) conditions in the 2020 wet season, downstream from the Deering Estate Flow-way, were the highest ever recorded. The Mesohaline Index was substantially higher in Calendar Year (CY) 2020 wet season than in any previous wet season but no improvement in CY 2020 dry season over other dry seasons was evident. Rainfall was exceptionally high in CY 2020 Wet Season; however, this was not the case for CY 2020 dry season. However, the large increase downstream of Deering Estate suggests that a more generous pumping schedule can be beneficial when sufficient fresh water is available to sustain it. The temporary 25 cfs pumps for the L-31E canal and new culverts to distribute freshwater flow should have had direct ecological benefits on the neighboring marsh including new recruitment of freshwater tolerant species directly downstream of the culverts. These moderate increases in freshwater flow are anticipated to provide benefits for the coral reef zone. Coral reefs within BNP are experiencing impacts from Stony Coral Tissue Loss Disease (SCTLD), marine heatwaves, and hurricanes. At this time, it is estimated that live coral cover on park reefs is less than 3%, down over 50% in the last decade (See SCTLD update below.) Larger system-wide benefits of this restoration project and the newly initiated BBSEER project are anticipated as additional freshwater is delivered to the bay through new and existing water management features.

Coral Protection and Restoration Program (CPR): The CPR Program within FDEP's Office of Resilience and Coastal Protection will award \$8 million from the FY 2022-23 budget for over 31 coral projects across the state. Projects will include monitoring and support for stony coral tissue loss disease response, restoration of Florida's Coral Reef and the enhancement of regional water quality with a focus on Biscayne Bay. In addition, the Biscayne Bay Water Quality Improvement Grant will support \$20 million in water quality improvement and nutrient reduction projects for FY 2022-23. Since FY2017-18, over \$60 million has been appropriated to support coral disease research, monitoring, intervention, data management, restoration, and water quality projects.

Endangered Species: The conservation, restoration, and protection of native habitats within south Florida can assist the conservation and recovery of listed species. The purpose of the Endangered Species Act (ESA) is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved..." The diverse efforts of the CERP, including the operational changes to the C&SF Project, will affect habitats in south Florida that ESA-listed species rely upon.

NOAA Fisheries and the USFWS share responsibility to protect plant and animal species under the ESA. Lists of the endangered and threatened species within and adjacent to CERP activities are available at the following websites:

- Florida Atlantic Coast - <https://www.fisheries.noaa.gov/content/florida-atlantic-coast>
- Florida Gulf Coast - <https://www.fisheries.noaa.gov/content/florida-gulf-coast>
- South Florida Listed Species - <https://www.fws.gov/verobeach/>

NOAA Fisheries listed the U.S. distinct population segment (DPS) of smalltooth sawfish as an endangered species under the ESA in 2003, making it the first marine fish species to receive federal protection. In 2014, the non-U.S. DPS component of smalltooth sawfish was also listed as endangered. In the U.S., smalltooth sawfish rely on western Everglades estuaries and Florida Bay, which are designated as critical habitat for the species. Protections provided by ENP have been credited with preventing the species from extinction.

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In south Florida the species also is found in the Charlotte Harbor Estuary, the St. Lucie-Indian River estuarine system, Biscayne Bay, and nearby coastal waters.

Collectively NOAA Fisheries and the USFWS continue to participate in the Task Force and provide information on how restoration efforts may conserve and recover ESA-listed species (including fish, corals, mammals, birds, reptiles, invertebrates, and plants) and the habitats they rely upon.

Coral Reef Conservation Program (CRCP)/Southeast Florida Coral Reef Initiative (SEFCRI): Supported by a cooperative agreement with NOAA's Coral Reef Conservation Program, the FDEP's CRCP coordinates coral reef research, monitoring, and mapping, conducts education and outreach, develops management strategies, and encourages partnerships and stakeholder participation to advance protection of Florida's Coral Reef. The CRCP leads the implementation of SEFCRI, a local action strategy for collaborative action among over 60 government and non-governmental partners to reduce key threats to coral reef resources off Miami-Dade, Broward, Palm Beach, and Martin counties. During 2020-2022, the SEFCRI Team has been implementing priority projects identified in their 2017 Local Action Strategy five-year action plan.

Coral Restoration Efforts: In late 2019, the NOAA announced the launch of *Mission: Iconic Reefs*, a bold initiative to restore seven ecologically and culturally significant coral reefs within the FKNMS, in coordination with the State of Florida. This ambitious, multi-decade effort builds upon years of research and previous restoration efforts and goes beyond traditional outplanting to include a greater diversity of stony coral species, the introduction of algae grazing species, removal of nuisance species and coral predators, and community stewardship in maintaining restoration sites. The outplanting phase is a crucial step in coral gardening efforts, where corals are transported from nurseries and secured back onto reef habitats. During 2020-2021, the Coral Restoration Foundation, Mote Marine Laboratory, and Reef Renewal continued to scale up outplanting efforts, with focused outplanting at the seven Iconic Reefs and additional corals outplanted at 36 other reef locations. Over 85,000 staghorn coral fragments, 26,000 elkhorn coral fragments, and 23,000 boulder coral plugs were outplanted during 2020 and 2021, which represents 14% completion of coral outplanting targets for Phase 1a. Other agency and NGO partners have outplanted corals, including sexually produced offspring from corals susceptible to SCTLD that were rescued in 2019, and corals used to answer pressing scientific questions on restoration science. Novel methods of propagation and outplanting continue to expand, such as the use of vertical rope nurseries placed adjacent to reef habitats, coral domes for reskinning, better attachment methods, use of bamboo and natural (hemp) rope to increase outplanting efficiency and outplanting in unstable habitats, maximizing genetic diversity, and interventions to improve survival and adaptation to stressors. During 2021, pilot efforts were undertaken to improve habitat quality and enhance colony survival through removal of nuisance species, control of coral predators, and culture, grow-out, and translocation of herbivorous sea urchins and crabs. NOAA's CRCP along with the FDEP and the FWC, has also supported a multi-scaled restoration planning effort for Florida's Coral Reef which is being facilitated by The Nature Conservancy. This process will result in a system wide coral reef restoration plan for Florida's Coral Reef in support of goals identified by Florida's coral reef management community through a consensus based process, as well as region and site specific plans that address distinct restoration goals within the various areas of jurisdiction along Florida's Coral Reef.

Marine Debris Removal Efforts in FKNMS: The FKNMS and the National Marine Sanctuary Foundation launched *Goal: Clean Seas Florida Keys* in response to the significant amount of debris left in the wake of 2017's Hurricane Irma. This community-based program engages local tour operators and other businesses in removing derelict lobster traps, fishing gear, construction materials, and other items that pose significant pollution and navigation threats. This program further engages volunteers in shoreline and kayak-based cleanups. Since launching in 2018, the program has removed over 38,000 pounds of debris from sanctuary waters. Divers have committed over 2,760 volunteer hours underwater contributing to this work and have removed almost 50,000 feet of fishing line from the reefs.

FKNMS Resource Planning Efforts: During this reporting period, the FKNMS continued progress on the first comprehensive review of the sanctuary's regulations, marine zones, and management plan since 1997. The draft suite of proposed changes, known as Restoration Blueprint, was released in August 2019 and

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included an extensive opportunity for public comment. Public comment was reviewed and carefully considered in coordination with the FKNMS Advisory Council, Fishery Management Councils, and state partners, among others, and used to inform updates to the proposed regulations, marine zoning scheme, and management plan. NOAA will release a revised draft single alternative in July 2022, which will reflect the comments received during the 2019 public comment period. The updated draft will be open for public review and comments for approximately 100 days and will conclude in October 2022. The FKNMS Advisory Council continued to hold regular public meetings during the reporting period. These meetings are designed to inform members about ecological and sociological issues related to sanctuary resource management, and to update and solicit input from members and their stakeholder groups about the Restoration Blueprint. During this reporting period, the Advisory Council emphasized the importance of water quality and coordinated with the WQPP to create a new working group called the Florida Keys and South Florida Ecosystem Connectivity Team. Established in March 2021, this team provides a platform for stakeholders to become better educated and more involved in Everglades restoration and other regional activities that may impact water quality in the sanctuary. Between March 2021 and June 2022, this team met seven times to discuss myriad topics with a focus on their connection to and potential impacts on marine resources in the Florida Keys.

Our Florida Reefs Community Planning Process: This program was designed to increase public involvement in the future management of southeast Florida's coral reefs by seeking input from community members on the development of recommendations that can become part of a comprehensive management strategy to ensure healthy coral reefs in the Kristin Jacobs Coral Reef Ecosystem Conservation Area (Coral ECA). A follow-up project is currently seeking management recommendations from fisheries stakeholders. Additionally, the FDEP's CRCP is working to incorporate these recommendations into a management plan for the Coral ECA.

Biscayne Bay Habitat Focus Area (HFA): Biscayne Bay and its nearshore reef, including the state BBAP, BNP, and the upper part of the FKNMS (Manatee Bay, Barnes Sound, and Card Sound), were designated a NOAA HFA in the NOAA Habitat Blueprint Initiative in 2014. The implementation plan contains four goals that address the quality of bay and reef habitat for protected and fishery species and the people of the region and the nation. The first three goals are to: (1) improve and protect water quality; (2) increase and protect freshwater inflows; and (3) reduce physical damage to seagrass, coral, mangrove shoreline, and other bay habitats. Applied studies are being used to develop scientific information to shape the most effective approaches to addressing these goals. For example, considerable progress has been made on determining the most effective ways to prevent stimulation of algal blooms by nutrients. Three papers have been published on this topic out of HFA-sponsored efforts. Progress also is being made to learn more about the historic and current presence and habitat of the smalltooth sawfish in Biscayne Bay, which is the topic of another recently published paper. The paper reinforces and expands documentation of the historic presence of smalltooth sawfish in Biscayne Bay and documents the continued or renewed presence of sawfish in Biscayne Bay that has been overlooked. The fourth goal is to acquire information on socio-economics and ecosystem services to help citizens, managers, and policy makers better understand the bay's economic, social, and ecological benefits to human systems and the importance of gaining and maintaining the long-term good health of Biscayne Bay and its reef tract now and into the future. The NOAA HFA grants to a local non-governmental group have been especially effective in addressing this goal.

As part of its Biscayne Bay HFA leadership role, Atlantic Oceanographic and Meteorological Laboratory (AOML) initiated a watershed-scale study of the Coral Gables Waterway, which is open to the bay up to a control structure located several miles upstream from its bay exit. As part of that effort, AOML and associates at Mississippi State University are developing a coupled hydrodynamic-water quality model of the bay. It is an application of the widely-used Environmental Fluid Dynamics Code (EFDC), a multifunctional surface water modeling system that can include water quality components. The model for Biscayne Bay has only been calibrated for the Coral Gables Waterway and the central bay immediately downstream; however, the model footprint extends from at least the 79th St. Causeway in the northern bay to Manatee Bay in the extreme southern bay. The model has the potential to help coordinate the effects of water management decisions that affect two or more parts of the bay simultaneously if calibrated for other areas.

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Florida Keys Aquatic Preserves (FKAPs): Three FDEP managed aquatic preserves fall within the FKNMS: Biscayne Bay– Card Sound, Lignumvitae Key (LKAP), and Coupon Bight (CBAP). During this reporting period, the LKAP Management Plan was revised and revisions to the CBAP Management Plan are underway. The focus of activities during the reporting period included establishing water quality monitoring sites, increasing community awareness and appreciation of the preserves' resources, post-Hurricane Irma response, marine debris removal, and ecosystem monitoring.

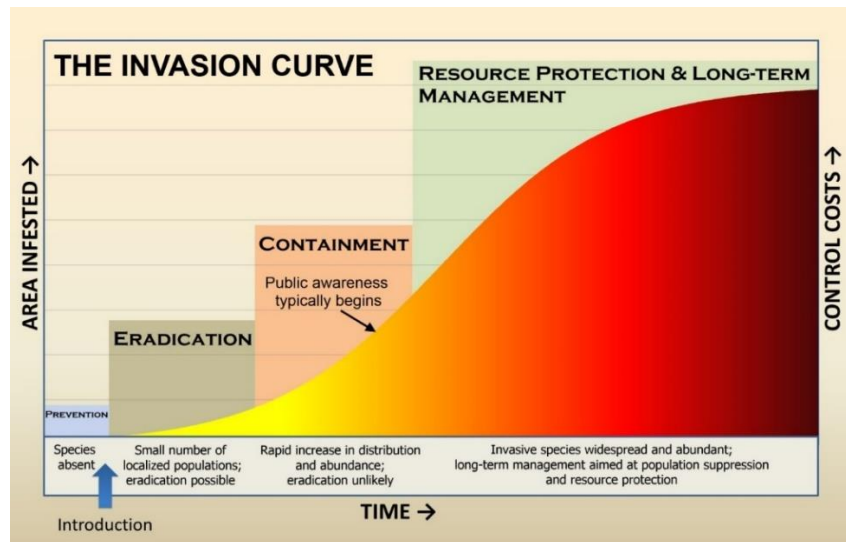
Biscayne Bay Commission (BBC): In 2021, the BBC was created by the Florida Legislature. The BBC is charged with serving as the official coordinating clearinghouse for all public policy and projects related to Biscayne Bay and acting as the principal advocate and watchdog to ensure that bay projects are funded and implemented in a proper and timely manner. To date, the BBC has reviewed the status of water quality in the bay, identified top priority projects to address the health of the bay, and identified resources that each member agency may be able to bring to bear on bay projects.

Biscayne Bay Watershed Management Advisory Board (BBWMAB). The BBWMAB was established by the Miami-Dade County Commission in 2021 at the recommendation of the Biscayne Bay Task Force. The BBWMAB is responsible for developing a watershed management plan and implementing it upon its approval. The plan is expected to have recommendations for septic tank to sewer conversions, sewage conveyance improvements, nutrient load reduction, marine debris reduction and removal, and coordination by municipalities on regulations, permits, and enforcement pertaining to bay water quality.

INVASIVE SPECIES

Florida has the highest severity of threats posed to native habitats and species by invasive species in the continental United States. Florida’s subtropical climate, major ports of entry, large-scale pet and aquarium commerce, and agricultural and ornamental plant industries contribute to the state’s vulnerability to biological invasions. Invasive species are detrimental to America’s Everglades, causing harm to native species including threatened and endangered species through predation, food web disruption, resource competition, physical changes to habitats, and disruptions to unique ecological processes and functions.

Recognizing the importance of protecting valuable resources by managing the growing threats of these and other invasive species, the Task Force has developed an Invasive Species Strategic Action Framework (Framework). First issued in 2015, the updated 2020 Framework was presented to the Task Force at their October 2020 meeting. The Framework is accompanied by an interagency snapshot budget, a five-year progress report, updated priorities, and case studies. The Framework is organized along the four phases of the Invasion Curve: Prevention, Eradication through Early Detection and Rapid Response (EDRR), Containment, and Long-term Management /Resource Protection. Updates on progress during the reporting period are reported according to these four phases below. The 2020 Framework and associated materials are available on EvergladesRestoration.gov.



In the WRDA 2020, the Congress directs the Task Force to develop a priority list of invasive species that significantly impact the structure and function of ecological communities, native species, or habitats within the South Florida Ecosystem. The Task Force member agencies are directed to manage those species through coordination and collaboration to develop innovative strategies and tools, guide applied research, facilitate improved management, and prevent future introductions of nonnative species. The Task Force accepted recommendations from the Working Group, Science Coordination Group (SCG), and OERI to begin developing the priority list of species at their May 3, 2022 meeting. This work is currently being conducted through a team of invasive species experts, facilitated by the OERI. A progress update on the list development will be provided to the Task Force at their October 2022 meeting.

PREVENTION

Preventing the introduction of invasive species protects the South Florida Ecosystem from the negative ecological and economic impacts of those species and the subsequent high costs associated with long-term control efforts. Prevention requires the ability to identify pathways to stop harmful nonnative species from entering the South Florida Ecosystem.

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Prevention through Public Outreach: The Florida Fish and Wildlife Conservation Commission's (FWC) Exotic Pet Amnesty Program (EPAP) reduces the number of nonnative species released into the wild by allowing pet owners to surrender exotic pets, whether kept legally or illegally, without penalty or cost. Since 2015, the FWC has hosted 21 EPAP events with over 4,200 pets being surrendered at these events and through the Exotic Species Hotline, 682 of which were regarded as "Conditional" or "Prohibited" animals that are restricted from being acquired or kept as pets. Pet owners can surrender unwanted pets at Exotic Pet Amnesty Day events or by calling 1-888-IVEGOT1 for year-round assistance. The FWC and partner agencies also continue to utilize the "Don't Let It Loose" campaign to encourage responsible pet ownership and prevent release of nonnative wildlife into Florida.

Prevention through Regulation: The first opportunity to combat an invasion is to prevent it from starting. Prevention strategies include regulation, border protection, and public engagement. On February 25, 2021, FWC Commissioners unanimously approved rule changes to Chapter 68-5, F.A.C. regarding high-risk nonnative reptiles. The rule changes added 16 species of nonnative reptiles to Florida's Prohibited list and went into effect April 29, 2021. Prohibited species can only be possessed or acquired by qualifying entities for the purposes of research, public exhibition, or eradication/control purposes with some limited exceptions for people in possession of these animals prior to their listing. The 16 Prohibited reptiles include the Burmese python, reticulated python, green anaconda, northern African python, southern African python, amethystine python, scrub python, Nile monitor, green iguana, and all tegus in genera *Salvator* or *Tupinambis*. <https://myfwc.com/wildlifehabitats/nonnatives/rule-development/>.

Pet owners in possession of tegus or green iguanas prior to the rule change effective date were allowed to keep their pets by applying for a no-cost permit and marking their animals with a required Passive Integrated Transponder (PIT) tag, a type of microchip with a unique identification number. A 90-day grace period, that ended July 28, 2021, was included in the rule to provide entities more time to come into compliance with the new requirements. Feedback from stakeholders indicated that the process to acquire a PIT tag for pet green iguanas or tegus can be cost-prohibitive, and a limited number of veterinary clinics offered PIT tag services for nonnative pets. To assist the public, the FWC partnered with zoos, local municipalities, and volunteer veterinarians to host six Tag Your Reptile Day events from May-July 2021. These events provided opportunities for pet owners to come into compliance with the rules by offering free PIT tagging services for pet tegus and green iguanas. In total, 93 green iguanas and 81 tegus were marked with microchips during these events.

EARLY DETECTION AND RAPID RESPONSE

It is imperative to respond quickly and deal with emerging threats while they remain localized. After prevention, eradication through EDRR is the second most cost-effective method to deal with invasive species. EDRR activities include decision tools to determine which species pose high risks to the ecosystem if introduced, agency monitoring and public reporting of sighted invasive species, and response teams that can quickly implement eradication efforts.

Decision Tools

EDRR Decision Framework/Screening Tool: The USGS funded the University of Florida (UF) to develop a response decision support tool (screening tool) that ranks nonnative animal species by how likely they are to successfully invade the Everglades. The tool helps managers decide whether to rapidly respond to a sighting or if additional in-depth risk assessment is needed. During the reporting period, the FWC adapted the tool for statewide use and will continue to work with UF to refine and improve it. To date, the FWC has conducted 15 risk screenings using this tool. A similar risk assessment tool, also developed by UF, is being utilized for potentially invasive plant species in Florida.

CERP Guidance Memorandum: In 2012, the USACE published CERP Guidance Memorandum 062.00 – Invasive and Native Nuisance Species Management (CGM 62). It ensures that invasive species management is included in the planning process and throughout all phases of the project. This guidance has been applied to all CERP projects since it was published. The CEPP is the first project to go to the

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construction phase (July 2020) that has an invasive species management plan, developed in accordance with CGM 62. This is an important milestone that represents a shift in the ability of USACE to proactively address invasive species rather than reacting once a species is impacting a project.

UF Assessment for Invasive Species: The UF developed a predictive tool in 2008 to assess the invasion risk of plant species that are not currently established in Florida's natural areas but are invasive in other places with similar climate and growing conditions. This risk assessment protocol utilizes numerous questions about the species ecology, life history traits, and other characteristics to establish a numerical invasion risk score for Florida.

Monitoring

Monitoring for Invasive Plants: The SFWMD, in collaboration with the NPS, USFWS, and other agency partners, conducts landscape-scale monitoring for priority invasive plants in America's Everglades. The aerial monitoring program currently utilizes several distinct protocols, including systematic landscape-level aerial reconnaissance (Systematic Reconnaissance Flights [SRF]), a sample-based spatially stratified monitoring system, and detailed inventories in planned control areas. The SFWMD completes SRF across the Everglades Protection Area and its buffer lands every five years. Data collected in the 2020 cycle was recently shared with partners. This multi-decade program provides information on the abundance and distribution trends of four priority invasive plants. Monitoring for early detection requires a different, land-based approach. In 2019, the SFWMD adopted the NPS "Everglades Corridors of Invasion" early detection monitoring protocol and expanded the monitoring program to state-managed lands within the WCAs and eastern Everglades. Areas most likely to be locations of new plant introductions such as construction areas, boat ramps, hiking trails and unpaved parking lots are monitored on a three-year cycle. Four species on the Everglades Cooperative Invasive Species Management Area (ECISMA) EDRR list have been discovered during this annual survey.

Monitoring for Animals: The SFWMD, USACE, and UF have established survey routes for new and emerging invasive reptiles and amphibians within the ECISMA footprint through the Everglades Invasive Reptile and Amphibian Monitoring Program (EIRAMP). In addition to identifying new invaders, these routes help to identify and remove established species. To date, EIRAMP EDRR efforts and subsequent monitoring surveys have resulted in the removal of 129 Nile monitors, 3,356 Argentine black and white tegus, 601 Oustalet's chameleons, 996 veiled chameleons, 227 spectacled caimans, 384 Burmese pythons, one Nile crocodile, and several other species.

Metagenomic surveys help detect a variety of species by identifying environmental DNA (eDNA) present in south Florida waters. The USGS collected samples for Burmese python eDNA along the fringes of their range during this reporting period and analysis is currently underway. If the project is successful, it may be possible to document the expansion of Burmese pythons into new areas before they are visually detected.

Public Reporting

Hotline and Web-Based Reporting: The FWC Nonnative Fish and Wildlife Program uses sightings, many by the public, to determine if a new nonnative species may have the potential to reproduce and become established. The 888-IveGot1 hotline and associated smartphone app are instrumental in this regard. From July 1, 2020, through April 15, 2022, the average reporting per day was 8.6 calls with a total of 5,595. The Early Detection and Distribution Mapping SYstem (EDDMapS) is a web-based mapping system for documenting invasive plant and wildlife species distribution. It tracks and verifies sightings from species professionals and members of the public. During the reporting period, EDDMapS had over 9,327 nonnative wildlife records.

Targeted Outreach and Training: The SFWMD and UF are conducting strategic training and outreach to promote citizen scientist involvement in reporting invasive animal sightings in the Everglades. Agency staff and public groups who are typically in wilderness areas are provided training on the "IveGot1" smartphone app. This program has completed 38 training sessions which reached over 1,700 people and expanded to

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reach residents of the Florida Keys during this reporting period. ENP has improved early detection capacity through training for park interpretative staff, law enforcement, and maintenance staff, providing park-wide email invasive species updates, and publishing articles in the South Dade News Leader. These efforts have resulted in the reports and in some cases, removal, of invasive iguanas, agamas, and other species that are early in the invasion curve inside the park.

Combining Education, Recreation, and Monitoring: Nonnative fish roundups raise public awareness about the negative impacts of releasing invasive fish while also providing a snapshot of invasive species in local waters. However, due to Covid 19 concerns, no nonnative fish roundups occurred in 2020 or 2021. The SWCISMA was able to host the 2022 Invasive Fish Roundup at Bass Pro Shops in Fort Myers, FL (Lee County), on the weekend of April 29, 2022. In total, 112 participants registered (73 adults and 39 juniors under 16 years old) and 29 teams arrived for the weigh-in on May 1, 2022. Participants brought in 3,424 individual invasive fish comprising 12 species and weighing a total of 1,886 lbs. Additional Fish Slams by FWC and USGS have been conducted with nearly 100 individuals from 20 organizations participating. To date, over 260 sites have been sampled by Fish Slam partners and 37 nonnative species have been collected with range expansions documented for five of those species. During the 2022 Fish Slam sampling centered in the Cape Coral to Englewood area, a new species of fish was tentatively identified as a Tire Track or Zig-zag Eel (*Mastacembelus armatus*). This finding was the first time a Tire Track Eel was collected from the wild in Florida. For lionfish events, see Long-term Management.

Rapid Response Teams and Activities

Invasive Plant Rapid Response: CISMAs help coordinate collaborative efforts to manage priority EDRR plant species in their regions. CISMAs within the Everglades footprint actively maintain EDRR plant lists specific to their region. Plants are typically categorized as priority for eradication (i.e., known invaders) or “be on the lookout” (i.e., probable risk for introduction). The Florida Natural Areas Inventory works with the CISMAs to maintain the lists. Additional CISMA efforts typically combine dedicated monitoring and control field days with stakeholder training (e.g. identification) and research to improve control tools. Two current examples of regional invasive plant eradication efforts are tropical nutrush in the Kissimmee River basin and Asian black mangrove in Miami-Dade County. Over the past 10 years, the same 20-acre Asian black mangrove infestation at Matheson Hammock and Fairchild Tropical Botanic Garden has been repeatedly treated. To date, tropical nutrush has been documented in Polk, Orange, Osceola, Highlands, and Palm Beach counties. The species in the latter was eradicated through EDRR containment efforts. This species occurs on the shorelines of five lakes in the Kissimmee Chain of Lakes and is most abundant in Polk and Osceola counties. Expansion of this species through the Greater Everglades Watershed is a concern because seeds are likely spread by wildlife and suitable habitat exists throughout the system.

Environmental Quality Incentives Program (EQIP): EQIP, administered by the USDA-NRCS, provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits. Through EQIP contracts, the USDA-NRCS assisted in the removal of invasive plant species, such as Brazilian pepper, cogongrass, and tropical soda apple, on 11,500 acres of private and tribal lands in south Florida during the reporting period.

USFWS Invasive Species Strike Team (ISST): The USFWS ISST controls and manages invasive plants and animals on national wildlife refuges (NWRs). Annual funding is distributed through a competitive Request for Proposals with the bulk of control work being conducted by experienced contractors and through cooperative agreements with education institutions. For the reporting period, \$5.87 million was awarded to NWRs in the Southeast Region for treatment of nonnative invasive plants and animals with Florida refuges receiving \$3.64 million of the funding (62%). NWRs within the Everglades restoration footprint received the bulk of funding targeted for Florida. The Arthur R. Marshall Loxahatchee National Wildlife Refuge (LNWR) received approximately \$1.5 million from the ISST to support management of invasive plants during this period. Over 17,500 acres were swept for invasive plants on Florida NWRs. Invasive plant species targeted for site specific EDRR by the ISST included Bischofia, climbing cassia, cogongrass, Guinea grass, laurel fig, rosary pea, Schefflera, Surinam cherry, tropical soda apple and turkey berry. Invasive animals targeted for control included Argentine black and white tegus, Burmese pythons, feral swine, green iguanas, Nile monitor lizards, and tokay gecko lizards. Around 20 Burmese pythons

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including hatchlings were removed from Crocodile Lake NWR and adjacent conservation and private lands by youth conservation organization interns and partners. In addition, Crocodile Lake established their own detector dog program. Other noteworthy program highlights for the period included the release of 20,000 Brazilian peppertree psyllids, a biological control agent, at LNWR; establishing a partnership agreement with the FWC and the SFWMD permitting each respective agency's python contractors to access (8 south Florida NWRs to survey for and remove large constrictor snakes; and, a coordinated ECISMA partner response to a report of an African red-billed hornbill on the perimeter levee of LNWR. Efforts continue to remove this unusual bird that likely is an escaped pet.

Invasive Animal Rapid Response: During the reporting period, rapid response teams removed high priority nonnative wildlife species that are not yet breeding in Florida. These species include an African spurred tortoise, four ball pythons, two bearded dragons, a Malaysian painted frog, a horntail snail, mangrove monitor, two red tegus, a rhinoceros iguana, four savannah monitors, eight Asian water monitors, a white throated monitor, and a prohibited species – yellow anaconda. The FWC and partners also continued rapid response efforts to contain the spread and reduce the likelihood of incipient population establishment of several high priority species that are detrimental to Florida's ecology. Details on these efforts can be found under Containment (tegu and Nile monitors) and Long-term Management (pythons).

The FWC has collaborated with the USDA Wildlife Services to expand capacity for response to observations of nonnative fish and wildlife across the state. This partnership has resulted in successful removal of two nonnative House Crow in southwest Florida.

CONTAINMENT

Once it is determined that eradication of an invasive species is not possible, containment efforts focus on preventing the spread of the species to new areas to minimize the damage to the ecosystem and reduce long-term control costs. The containment phase focuses on the utilization and often rapid deployment of control tools at containment boundaries and known pathways.

Containment of Invasive Animals

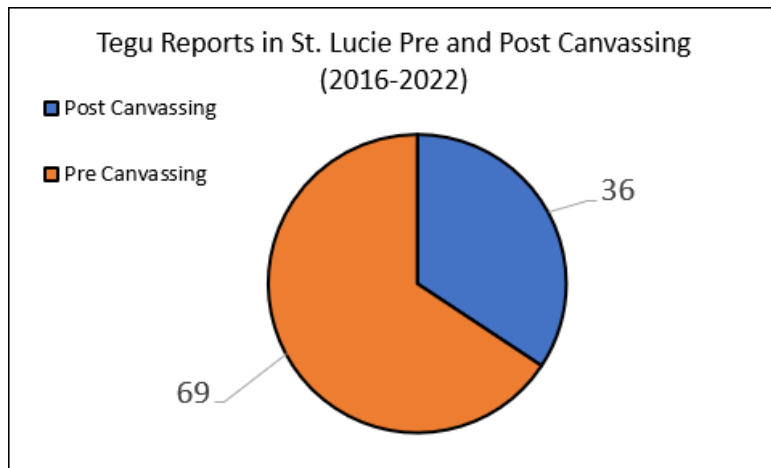
During the reporting period, partners increased coordination efforts and resources to control expanding populations of several invasive animal species. The Argentine black and white tegu is an invasive reptile established in multiple counties in Florida including Miami-Dade where a growing and spreading tegu population is a threat to native wildlife such as crocodiles, sea turtles, ground-nesting birds, and small mammals. The FWC, UF, SFWMD, NPS, USACE, FPL, and USGS are all contributing to trapping and monitoring for tegus in southern Miami-Dade County. During the reporting period, almost 2,000 tegus were removed from this area. Despite increases in management, research, and coordination efforts, the southern Miami-Dade County tegu population continues to expand and is now established within the ENP boundary though still limited to the area along the Park boundary near the Ernest Coe Visitor Center. The total number of tegus captured in ENP in calendar year 2020 was 34, which did include hatchlings for the first time, suggesting that there is reproduction occurring within the park. ENP also removed 49 tegus in 2021 and 12 as of the closing of the 2022 reporting period, and ENP has increased trapping effort within this area to limit expansion into other areas of the park. To help optimize trapping efforts in this area, UF is beginning to model trapping data to provide managers information on tegu abundance, population dynamics, and effectiveness of management efforts.

Utilizing the invasive species management budgets that were developed under CGM 62, the USACE entered into agreements with the UF Croc Docs and the USGS to perform research related to invasive animal control. A 5-year Cooperative Ecosystems Study Units agreement with UF Croc Docs was initiated at the end of FY 2020 with funding provided by several CERP projects (BBCW, CEPP-South, CEPP-EAA, and RECOVER-AAM). The funding will support research (to include removals) on a variety of invasive reptiles and amphibians on CERP project lands. A 5-year Economy Act agreement was established in May 2021 between the USACE and the USGS to address invasive fish, focusing on the current extent of populations, dispersal pathways, life history, and the effectiveness of passive control measures. The

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USACE will provide a synopsis of the year-to-date results of these two agreements in the 2024 Biennial Report.

The USFWS worked with the FWC to canvas areas with relatively newly established populations of Argentine black and white tegus in the Fort Pierce area. This outreach effort resulted in 36 tegu reports, of which 26 (72.2%) were recorded within the first week post-canvassing. Of the 36 reports post-canvassing, 8 (22.2%) were verified through photo/video. For comparison, 69 reports from the public were made before canvassing. So, 34% of all “public” tegu reports in St. Lucie County came following the canvassing initiative.



The FWC continues to conduct systematic removal of other high priority nonnative species across south Florida, including Nile monitors. Nile monitors are present near the LNWR and efforts to contain them out of the refuge are underway to protect native aquatic species from depredation. Between July 1, 2020 – April 22, 2022, the FWC and partners removed 9 Nile monitors, including one reproductive size female, from the nearby breeding population in Palm Beach County.

Containment of Invasive Plants

The FWC, SFWMD, and other agencies continued efforts to contain and control several invasive plant species that have limited but expanding populations in the Everglades region. Several of these species were identified in the last reporting period, including mission grass in central Palm Beach County and feathered mosquito fern in canals of the Northern Everglades. Mission grass containment efforts are challenging due to its prolific seed production and regionally inconsistent treatment across public and private land. The SFWMD continues to treat populations on its land and has reduced the density in most areas that it is present. In the Eastern Everglades, occurrences of a federal noxious weed, wild sugarcane, have been increasing. The SFWMD monitors and treats all known locations annually. Additionally, the FWC continued efforts in controlling the occurrence and expansion of para grass and West Indian marsh grass in WCA-3A and Wright’s nutrush in WCA-3A and the Holey Land Wildlife Management Area.

RESOURCE PROTECTION AND LONG-TERM MANAGEMENT

The final stage of the Invasion Curve is resource protection and long-term management. This phase endeavors to reduce the ecological and financial impact of wide-spread invasive species so they no longer play a dominant role in the ecosystem. This can be accomplished by developing and using control tools to reduce the population densities of a species within a specific area and by strengthening the resilience of natural areas through restoration of native habitats and recovery of ecosystem functions.

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Long-term Maintenance of Invasive Animals

Amphibians and Reptiles: According to the UF, Florida ranks as having the largest number of established non-indigenous amphibians and reptile species in the entire world. At least 56 nonnative amphibians and reptiles have established themselves in Florida, including three frogs, four turtles, one crocodylian, 43 lizards, and five snakes. Burmese pythons are a threat to the native wildlife and ecosystems of south Florida, including several threatened and endangered species, and their presence has led to severe declines in Everglades mammal populations. Other species of nonnative constrictors would likely have similar impacts as Burmese pythons if they were to grow in number in south Florida. For example, due to the rapid response of interagency invasive species teams, Northern African pythons have not invaded south Florida beyond a small area west of Miami. In December 2021, 5 Northern African pythons (NAP) were removed from this area by a citizen. An additional NAP was removed from Tribal lands during the spring 2022 interagency NAP survey.

The State of Florida's Python Removal Contractor Program hires experienced local experts who are compensated for survey time and removal of pythons from public lands. In 2020, the SFWMD and FWC expanded the program to 100 total contractors. From July 1, 2020 through April 21, 2022, this program has removed almost 4,700 pythons from south Florida. ENP suspended their Python Removal Authorized Agent Program in 2020, due to the pandemic and it remains suspended as of the end of this reporting period. ENP allows state python contractors to capture pythons within ENP, BNP and Big Cypress National Preserve. Together, these contractor programs now include most state managed lands, ENP, BNP, and Big Cypress National Preserve.

The FWC hosts Florida Python Challenge events where registered participants removed pythons from public lands for a chance to win prizes. The 2021 event was cohosted with the SFWMD and was held during the summer months for the first time. More than 600 people from 25 states participated in the 10-day competition that resulted in 223 pythons being removed – more than any previous event. The grand prize winner removed two python nests for a total of 41 pythons removed and received a \$10,000 prize for their efforts. (<https://myfwc.com/fishing/saltwater/recreational/lionfish/events/>)

Coordination efforts to control pythons continue to be improved. A broad interagency group finalized the Florida Python Control Plan in September 2021. This plan was developed by 15 agencies and organizations and will improve coordination of python management efforts across jurisdictions and prioritization of across agency needs. Additionally, the USGS, NPS, USFWS, and Conservancy of Southwest Florida are partnering together to radio-track Burmese pythons in Big Cypress National Preserve, Crocodile Lake National Wildlife Refuge, and other areas of southwest Florida. This new partnership marks the first time that pythons will be tracked in such a broad variety of habitats. This effort will improve understanding of python biology across the region and ultimately find ways to control this invasive species more effectively.

The USGS is applying existing Burmese python eDNA methods in systematic surveys of south Florida waterways to monitor possible range expansions. The presence of Burmese python eDNA in the LNWR has been confirmed since 2016. Additional samples were collected to the north and west of the refuge and more comprehensive information will be available in the near future.

During the reporting period, the FWC and UF investigated mammalian lures as a Burmese python attractant. They set up nine rabbit pens for 90 days and recorded 22 python detections, which remained in the area for an average of 80 minutes. Currently, the SFWMD and UF are attempting to isolate rabbit scent and incorporate traps and remote cameras, with the goal of designing an effective but localized management tool.

Marine Species: Lionfish, a popular aquarium fish native to the Indo-Pacific, can now be found from Venezuela to North Carolina. Lionfish have few predators and represent a threat to native fish species, many of which have economic importance (sportfishing) or ecological importance for the health of Florida's Coral Reef. The FWC has prohibited the importation of live lionfish into Florida, intentional breeding of lionfish in captivity in Florida, and harvest or possession of lionfish eggs or larvae in Florida for any purpose

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other than destruction. However, their range continues to expand having recently been found in the brackish waters of the Loxahatchee River, St. Lucie River, some inland canals, the Florida Intracoastal waterway, and Florida Bay within ENP. Lionfish also occur in Biscayne Bay (Biscayne National Park), where they are found in association with artificial structures, although they are not so numerous or widespread there as on the park's nearby reef tract.

The NPS' long-term management efforts for lionfish, having been sustained at appreciable levels for the past 10 years, have helped identify areas frequented by lionfish for targeted removal efforts and aided in the development of best available tools for removal. From July 1, 2020, to June 30, 2021, a total of 935 lionfish were removed from BNP. These 935 lionfish were removed during 157 separate dives on 48 field days, with one lionfish being removed, on average, for every 20 minutes of diver effort. Biscayne divers successfully removed ~89% of sighted lionfish. During the reporting period, lionfish removed from Biscayne ranged in size from 7.5cm to 42.3cm total length (TL), with an average size of 24.6cm TL. From July 1, 2021, to June 30, 2022, a total of 786 lionfish were removed from BNP. These 786 lionfish were removed during 142 separate dives on 35 field days, with one lionfish being removed, on average, for every 21 minutes of diver effort. Biscayne divers successfully removed ~91% of sighted lionfish. During the reporting period, lionfish removed from Biscayne ranged in size from 8.0 cm to 42.5 cm total length (TL), with an average size of 26.2 cm TL. At Dry Tortugas National Park, park staff opportunistically removed fewer than ten lionfish between July 1, 2021 and June 30, 2022. Most removals were at mooring sites to reduce potential visitor risks. During this time, no lionfish were removed from ENP.

The FWC has also engaged the public with lionfish events and outreach meant to inform the public of ways to help slow down the lionfish invasion. During the reporting period, the FWC sponsored 19 tournaments involving almost 600 participants that removed over 22,000 lionfish. The FWC also instituted a recreational harvest program for lionfish that aims to incentivize dive charters to conduct recreational lionfish-specific harvesting trips to increase the number of lionfish removed from Florida waters. Charters conduct a lionfish-specific harvest trip and are eligible for reimbursement if the total lionfish harvest is equal to 8 lionfish (X) total number of divers. Charters are reimbursed at \$50/diver. During the reporting period, this program conducted over 300 trips resulting in almost 10,000 lionfish removed. A similar type of FWC program also exists for commercial fishermen. The Commercial Lionfish Harvest Program provides incentive for commercial divers to harvest lionfish and sell their fish to licensed wholesale dealers. In addition to their lionfish sales, FWC will reimburse commercial participants with \$3 per pound of lionfish with the submission of their trip ticket. This program included 47 participants and has removed over 17,000 pounds of harvested lionfish during the reporting period. The Lionfish Challenge is another event that occurs in the summer to encourage divers to harvest lionfish for a chance to win prizes. During the reporting period, 1,136 registered participants removed over 42,000 lionfish.

Multiple agencies, including USGS, NPS, and FWC, have citizen science programs to report lionfish sightings. These sightings have helped scientists map the lionfish invasion and have identified targeted removal study hotspots. The FWC has also engaged the public with lionfish events and outreach meant to inform the public of ways to help slow down the lionfish invasion. The State of Florida does not have minimum size limits, closed seasons, or bag limits for recreational or commercial harvest of lionfish. Recreational derbies have been successful in removing over 68,000 lionfish from 2021 to 2022, while commercial harvest during this same timeframe has removed over 53,000 pounds of lionfish. Covid concerns canceled many tournaments during the 2020-2022 reporting period.

In collaboration with NOAA's Office of National Marine Sanctuaries (ONMS), FWC, and other state and federal agencies, NOAA Fisheries completed a programmatic environmental assessment on lionfish trap use in the Gulf of Mexico and South Atlantic, including within FKNMS. NOAA Fisheries has issued Exempted Fishing Permits and ONMS has issued permits for lionfish trap testing studies within the sanctuary. NOAA Fisheries has also issued multiple Letters of Acknowledgement for lionfish research and is currently updating the federal list of allowable gear for lionfish harvest. ONMS is also issuing permits to allow spears in no fishing zones within the sanctuary to specifically harvest lionfish.

During the past reporting period, NOAA and USGS raised awareness of a relatively new invasive species causing concern in marine areas, including Biscayne Bay: the Asian tiger shrimp (*Penaeus monodon*). Although not yet determined to be established, sightings have "notably increased" in recent years. Tiger

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shrimp are aggressive predators and can inhabit waters ranging in salinity from 2 to 35 ppt. This range in salinity tolerance is broader than that of the native pink shrimp, therefore tiger shrimp may be able to outcompete native pink shrimp in the lower salinity conditions anticipated in Biscayne Bay with CERP implementation. NOAA SEFSC researchers published a paper on *Penaeus monodon* and its recent appearance in Biscayne Bay.

Long-term Maintenance of Invasive Plants

The status of invasive plant management in the Everglades remains a mix of successes and continued challenges during the reporting period. Past efforts relied on land managers requesting funds for invasive plant management on individual sites, with the amount of money received determining what could be accomplished in a given year. This minimal, often non-recurring, funding model did not result in cost-effective or sustainable success. In the recent past, federal management funding continually decreased. State funding fluctuated, but to a lesser degree. Sustained funding, even when insufficient, allows development of a long-term treatment strategy. For large public conservation lands where infestations are significant, landscape level planning and continuous funding are paramount. One method to overcome the lack of sufficient recurring funds is to form cost- and resource-sharing cooperative agreements between land managing agencies. Such agreements can include the sharing of personnel, equipment, chemicals, biocontrol agents, computer technology, inventory and monitoring data, and educational materials. Cooperators also share the knowledge and skills of available experts and technicians, sponsor joint training, and convene technical workshops and informational meetings. Successful cooperative agreements also help to reduce parochial conflicts and institutional barriers that limit the most efficient use of public management resources.

In south Florida, federal, state, and regional agencies do cooperate and combine resources. The FWC, SFWMD, USFWS, NPS, Florida Forest Service, and Florida Park Service have collaborated on operational management and funding of single and connected conservation lands. This collaboration has resulted in millions of acres of initial treatment and maintenance control of invasive plant species. The FWC continues to receive funding to treat invasive plant species in 57 waterbodies (636,280 acres) and 849 public conservation lands (5,943,751 acres) within the CERP footprint. Major invasive plant control initiatives during the reporting period include invasive grass control in the Kissimmee River floodplain (SFWMD); melaleuca and Old World climbing fern control at the LNWR (SFWMD, USFWS, and FWC), melaleuca control in Big Cypress National Preserve and ENP (NPS), and Brazilian pepper control within the Picayune Strand Restoration Project.

Priority Species: Eighty species of invasive plant species are considered priorities for control by natural resource managers in south Florida. Interagency efforts to achieve maintenance control of invasive plants continue. Old World climbing fern, melaleuca, and Brazilian pepper continue to be system-wide priorities, while aquatic plants such as hydrilla, water hyacinth and several invasive grasses are priorities in the Kissimmee Basin and Lake Okeechobee. Melaleuca, which once impacted large areas of the greater Everglades, is now considered to be at maintenance control levels in WCA 2 and WCA 3. The USFWS, FWC, and the SFWMD are actively engaged in aggressive control efforts in the LNWR where melaleuca and Old World climbing fern are not yet considered in maintenance control levels.

Biological Controls: The USDA-ARS, in collaboration with the USACE and the SFWMD, are strategically releasing agents for the suppression of Old World climbing fern, Brazilian pepper, air potato, and water hyacinth. In 2019, two new biological control agents for Brazilian pepper were approved for release. During the July 1, 2020 – June 30, 2022 reporting period, the USDA-ARS and other partners began mass rearing and releasing one of the agents. Captive rearing methods are still under development for the second agent. The USDA-ARS and UF, with support from the SFWMD, FWC, Miami-Dade County, NRCS, and the Department of Defense (DOD), continue testing of additional insects as potential biological control agents for eight invasive plant species established in Florida.

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Herbicide Controls: Herbicides are pesticides designed to control plants. Herbicides approved for aquatic use or in terrestrial natural areas are a vital component of most control programs and are used extensively for invasive plant management in south Florida. There are over 20 herbicides employed to control invasive plants in south Florida. Commonly used herbicides for control of broadleaf species in wetlands include dichlorophenoxyacetic acid (2,4-D), triclopyr, and imazamox. Glyphosate and imazapyr are non-selective herbicides and are used for a variety of plant types. Fluazifop-p-butyl is used to selectively control perennial grass species. Floating and submerged aquatic plants are controlled using several herbicides with 2,4-D, diquat, fluoridone, endothall, and triclopyr being the most used. Human health concerns regarding glyphosate have resulted in some local governments within the South Florida Ecosystem banning the use of this herbicide. Public land managers have expressed concerns that banning or restricting the use of glyphosate may result in the further spread of invasive plants in natural areas. The continued use of glyphosate for invasive plants in natural areas has been identified within the 2020 Strategic Action Framework as a priority need/gap. In January 2020, the USEPA concluded a review of all scientific data available for glyphosate registration and did not find anything that would change its status as an approved and registered herbicide. The FWC, SFWMD, and NPS continue to use this product safely in their invasive plant control programs.

WATER MANAGEMENT

The CERP and additional restoration efforts are expected to improve the timing, volume, and distribution of water throughout the system primarily by increasing regional storage capacity, removing barriers to flow, and carefully redistributing water within the system to match natural cycles more closely. The increase in regional storage capacity provided by the CERP is also expected to increase water resource benefits for other water-related needs of the region that includes water supply and flood protection as well as recreational and navigation opportunities and protection of cultural and archeological resources and values.

Operational modifications and new infrastructure will store water for both the environment and developed areas. WRDA 2000 established CERP protections that reserved water specifically identified for ecosystem restoration and preserved the levels of service for flood protection and water supply that were in existence on December 11, 2000, the date that the law was enacted and in accordance with applicable law.

Land suitable for development and human habitation will continue to require considerable flood protection, as without such protection most of south Florida would be unsuitable for existing urban and agricultural uses. Given the population growth projections for south Florida, there will be an ongoing need for monitoring and balancing the flood protection needs of urban, natural, and agricultural lands as part of restoration.

FLOOD PROTECTION

C-4 Flood Mitigation Project: The C-4 Flood Mitigation Project includes multiple individual projects to provide flood mitigation in the C-4 Basin. These include impoundments, pump stations, flood walls, and berms as well as conveyance improvements. This includes two forward pump stations on the C-5 Canal (S-25B) and on the C-6 Canal (S-26) and 5-miles of canal bank improvement projects.

Hillsboro Canal Bank Stabilization Project: The Hillsboro Canal is a primary flood control feature serving southern Palm Beach County and northern Broward County. Construction is complete on the first two phases of the Hillsboro Canal Bank Stabilization Project. The project replaced collapsing banks on both the north and south sides with properly sloped, armored, and vegetated banks and removed sediment from the canal that resulted from the collapsing material. This returned the canal to its full hydraulic capacity. The first two phases covered 7.5 miles of canal from the southeast corner of Site 1 eastward to the G-56 coastal structure. The last phase will repair the remaining westernmost 3 miles of the canal pending funding availability.

J.W. Corbett Wildlife Management Area Levee: This project is located within the J.W. Corbett Wildlife Management Area located in western Palm Beach County. The levee system improvement project consists of constructing a new levee within uplands and wetlands in areas which separate J.W. Corbett from the Indian Trail Improvement District's M-O Canal. This project is a cooperative effort between the SFWMD, the FWC, and the Indian Trail Improvement District. The SFWMD has completed the first phase of the project and the second phase is awaiting funding for construction. The project (phase 1) has been completed to the satisfaction of FDEP.

Herbert Hoover Dike (HHD): Lake Okeechobee is a 730-square mile lake that is surrounded by the 143-mile long earthen dam known as the HHD. The dike is currently being rehabilitated due to safety concerns. During the reporting period the USACE has completed work on the 32 federal water control structures, also known as culverts, which are considered to be the greatest threat to the dike due to loss of material into and around them. The USACE has taken action on all 32 of the culverts: one was removed, three abandoned, and twenty-eight were replaced.

During the reporting period, construction was completed on the 6.6-mile extension of the cutoff wall from Belle Glade to Lake Harbor. The five cutoff wall construction contracts totaling 28.3-miles under the Cutoff Wall Multiple Award Task Order Contract (MATOC) continue to make significant progress with substantial completion on-track for December 2022. The final two risk reduction construction contracts for embankment armoring have been awarded with substantial completion on-track for December 2022.

WATER SUPPLY PLANNING

The SFWMD conducts water supply planning for five regions: Upper Kissimmee Basin, Lower Kissimmee Basin, Upper East Coast, Lower East Coast, and Lower West Coast. These long-range plans project water demands for at least a 20-year period and identify potential sources of water for each region and help local governments and utilities in their facility and comprehensive planning efforts. Water supply plans are updated every five years.

Central Florida Water Initiative (CFWI)/Upper Kissimmee Basin: Three water management districts (South Florida, Southwest Florida, and St. Johns River), along with the FDEP, the FDACS, regional public water supply utilities, and other stakeholders, worked collaboratively to develop an update to the water supply plan for central Florida as part of the CFWI. The planning area includes southern Lake, Orange, Osceola, Seminole, and Polk counties. The 5-year update was approved by the three water management district Governing Boards in November 2020 with demand projections for the region out to 2040. The next 5-year update will be completed in 2025. (<https://www.cfwiwater.com/planning.html>)

Lower Kissimmee Basin: The Lower Kissimmee Basin Water Supply Planning area includes portions of Okeechobee, Highlands, and Glades counties. The plan assesses water needs and water sources for the period from 2017 to 2040 and was approved by the Governing Board in December 2019. The next 5-year update will be completed in 2024.

Upper East Coast (UEC): The UEC Water Supply Planning area includes Martin and St. Lucie counties, as well as the northeast portion of Okeechobee County. The 2021 UEC Plan assessed estimated and projected water demands and potential sources for the period from 2019 to 2045. The 5-year update to this plan was approved by the Governing Board in November 2021.

Lower East Coast (LEC): The LEC Water Supply Planning area includes Palm Beach, Broward, and Miami-Dade counties and parts of Monroe, Collier, and Hendry counties. The 2018 LEC Water Supply Plan Update was approved by the Governing Board in November 2018 and assessed estimated and projected water demands and potential sources of water for the period from 2016 to 2040. The next 5-year update will be completed in 2023.

Lower West Coast (LWC): The LWC Water Supply Planning area includes Lee County and portions of Charlotte, Collier, Glades, Hendry, and Monroe counties. The 5-year update is well underway and is scheduled to be completed in November 2022 with demand projections for the region out to 2045.

WATER CONSERVATION

Comprehensive Water Conservation Program: The SFWMD continues to implement water conservation programs to promote the efficient use of water in all use sectors and encourage a permanent conservation ethic throughout our 16-county region. The average per capita water use rate for utilities is trending downward as reported in the SFWMD's water supply plans.

ALTERNATIVE WATER SUPPLY

Reuse: In 2021, a total of 109 treatment facilities provided reclaimed water for beneficial purposes within the SFWMD boundary. These facilities reused a total of 313 million gallons per day (mgd) of treated wastewater. Most of the reclaimed water (190 mgd) was used for landscape irrigation at over 164,083 residences, 181 golf courses, 381 parks, and 90 schools.

The FDEP maintains a large and comprehensive database of permitted reuse systems. Domestic wastewater treatment facilities (0.1 mgd and greater) that provide reclaimed water are required to submit annual reuse reports to the FDEP as well as the applicable water management district.

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These annual reports are the basis for the FDEP's reuse inventory database, from which a Reuse Inventory Report is compiled and published. <https://floridadep.gov/water/domestic-wastewater/content/reuse-inventory-database-and-annual-report>

Alternative Water Supply Program: From July 1, 2019, through June 30, 2021, the State of Florida committed \$80 million for an alternative water supply grant program that provides funding to Florida's five water management districts. This grant program continues to fund more than 90 projects that will provide more than 90 mgd alternative water supplies within 2 years of completion and more than 200 mgd when the projects are fully online. The south Florida region alone stands to gain more than 40 mgd from the \$21.7 million provided for these critical projects. As of December 2021, approximately 597 mgd of water had been made available by 618 projects and within the SFWMD boundary. In addition, there are 40 operational desalination facilities with a total capacity of approximately 287 mgd (all but two utilize brackish groundwater as source water) within the SFWMD boundary. While beyond the scope of this reporting period, as of July 1, 2022, the State of Florida continued this commitment by appropriating an additional \$90 million to alternative water supply development.

PROTECTING WATER RESOURCES

Several mechanisms exist to protect water resources for the natural system. These mechanisms include minimum flows and minimum water levels (MFLs), water reservations, and consumptive use permitting rules, including restricted allocation areas (RAAs). The WRDA 2000 and Section 373.470(3)(c), F.S., require the SFWMD to allocate or reserve water for the natural system resulting from a CERP project before executing a cost-share agreement with the USACE to construct the project. Once MFL, water reservation, or RAA rules are adopted, they are implemented through the SFWMD's consumptive use permitting and water supply planning programs. The current Priority Water Body List and Schedule can be found on the SFWMD's website. (<https://www.sfwmd.gov/our-work/mfl>)

Minimum Flows and Minimum Water Levels (MFLs): Florida law directs the SFWMD to set MFLs to prevent significant harm to water resources. Since 2001, MFLs and recovery and prevention strategies have been adopted for waterbodies covering approximately 6.6 million acres. There are currently nine MFL waterbodies within the SFWMD boundary.

Water Reservations: Water reservations set water aside from consumptive use permitting for the protection of fish and wildlife or public health and safety. There currently are seven water reservations within the SFWMD boundary, covering approximately 356,000 acres. In 2021, the SFWMD adopted water reservations for the EAA Reservoir as well as the Kissimmee River and Chain of Lakes (19 lakes total). The prospective water reservation rule adopted in January 2021 for the EAA Reservoir protects fish and wildlife in the Central Everglades by reserving the reservoir water needed to improve the timing, distribution, and deliveries of water to restore multiple habitat types that provide critical ecological functions. Adopted in March 2021, the Kissimmee River and Chain of Lakes water reservations protect fish and wildlife by preventing allocation of water that is needed to ensure protection of the public investment of approximately \$800 million for restoration of the Kissimmee River.

Restricted Allocation Area (RAAs): RAA criteria are established by rule to protect natural systems from consumptive use impacts and are contained in the Applicant's Handbook for Water Use Permit Applications within the SFWMD. These rules are implemented for a variety of reasons, including where there is a lack of water available to meet the projected needs of a region, as part of an MFL recovery or prevention strategy (e.g., Northwest Fork of the Loxahatchee River MFL), or to ensure water will be available for future restoration projects (e.g., CERP). In late 2021, rule development began to protect water made available by the CERP Loxahatchee River Watershed Restoration Project (LRWRP). The proposed rule amends the existing LEC Regional Water Availability criteria's definition of the North Palm Beach County/Loxahatchee River Watershed Waterbodies to include several LRWRP project components not presently covered. The proposed rule also establishes new criteria for the groundwater associated with the LRWRP's ASR wells at the C-18W Reservoir site.

THE ROLE OF SCIENCE

HOW WE USE SCIENCE TO PLAN

High-quality science is the foundation for the successful restoration of the Everglades. Monitoring, research, and modeling provide management-relevant information that is used for selecting restoration alternatives and making natural resource management decisions. Continuing application of science is occurring in the Restoration Strategies project, the WCA-3 Decompartmentalization Physical Model, CERP planning efforts, and the ongoing effort to examine the impacts of nonnative plants and animals and to find ways to lessen their impacts and prevent future invasions. For example, the USGS Greater Everglades Priority Ecosystem Sciences (GEPES) Program and other USGS sources are investing about \$2 million per year in scientific research related to determining the impacts of and how to control the invasive Burmese python. Science describing the ecological importance of restoring water quantity and flows to the Everglades was pivotal in the decision to build bridging on Tamiami Trail to remove barriers to flow. Science topics will evolve as restoration planning and implementation proceed but are likely to include an increasing emphasis on topics such as: fostering the compatibility of built and natural systems; the long-term impacts of hurricanes and other tropical storms and their interaction with restoration efforts; the benefits of CERP, Restoration Strategies, and Tamiami Trail Next Steps; and the causative factors leading to harmful algal blooms in Lake Okeechobee and the estuaries. Florida Atlantic University's Center for Environmental Studies, with funding from and in partnership with the GEPES Program, created a series of free, online educational videos about harmful algal blooms intended primarily for natural resource managers, but available to anyone (<http://www.ces.fau.edu/usgs/understanding-algae/>). Also, the USGS, USACE, NOAA, and others are conducting scientific research to better understand the factors that lead to harmful algal blooms.

EVALUATING RESTORATION SUCCESS

Indicators: The Task Force sponsors a biennial System-wide Ecological Indicators (SEI) report and the USACE and the SFWMD sponsor a five-year System Status Report (SSR) through the interagency RECOVER program to track the health of the Everglades ecosystem. Both reports evaluate environmental monitoring information to determine if the goals and objectives of Everglades restoration are being met. The SEI report focuses on a broader range of restoration actions using eleven system-wide ecological indicators, while the SSR focuses on the CERP using a larger set of indicators. Both reports build on the RECOVER Monitoring and Assessment Plan (MAP). The goal of the MAP is to document the status and trends of essential and defining attributes of the South Florida Ecosystem. These reports document how the hydrology and ecology of the Everglades respond to restoration, project implementation, and water management operations. This scientific information is fed into the decision-making process, allowing managers and decision makers to use the best available science and adaptive management principles to track and guide restoration success.

Interim Goals & Targets: In 2020, the RECOVER Team produced the 2020 Interim Goals and Interim Targets Report (IG/IT). An assessment of progress towards the IG/IT allows RECOVER to provide feedback to managers and identify where progress is occurring as planned; where early indications of problems may require increased focus or adjustment of projects; and where opportunities for increased benefit should occur both within CERP and in collaboration with non-CERP projects. The 2020 IG/IT Report indicates that over the next five years, ecological benefits will be observed primarily in Lake Okeechobee and the Northern Estuaries regions with benefits in the Greater Everglades not realized until after the CEPP and EAA Reservoir are constructed and operational. The analysis also revealed that conditions within the Southern Coastal System will not significantly improve without additional substantial freshwater deliveries. Similar to the ecological performance, progress toward interim targets also revealed that over the next five years water supply improvements would be felt within the northern portion of the CERP footprint, slight improvements in the greater Everglades, and minimal improvements within the Southern Coastal Systems.

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Performance Measures: Other notable RECOVER accomplishments in 2020 include updates to two key performance measures used to assess restoration success, the Lake Okeechobee Stage Performance Measure and the Northern Estuaries Salinity Envelope Performance Measure. Both performance measures were utilized in 2021 and 2022 to compare potential alternatives for the LOSOM, underscoring the value of RECOVER products beyond CERP. In 2021 RECOVER was included as a regular update on the Joint WG and SCG meeting agendas. Updates on monitoring plans, performance measure, workplans, and reports have been provided. As a result, members were encouraged to provide staff participation in RECOVER and a plan to streamline reporting between the RECOVER, WG, and SCG is underway.

USING SCIENCE AND MONITORING TO IMPROVE RESTORATION EFFORTS

Wading Bird Report: The multiagency annual Wading Bird Report continues to be an essential resource for guiding Everglades restoration strategies and weekly operational decisions, and is an effective tool for communicating important information to the public. Historical nesting data from the pre-drainage Everglades reveal that nest numbers naturally fluctuate considerably among years in accordance with hydrologic conditions. A single year of nesting data is therefore insufficient to understand the health of the Everglades or its populations of nesting wading birds and instead we need to consider long-term nesting patterns. The long-term data provided by this annual wading bird report reveal that several nesting responses have improved in the Everglades over the past 20 years. An estimated 43,860 wading bird nests were initiated in south Florida during the 2020 nesting season. This is a relatively average nesting effort compared to recent years. It is just shy of the 10-year average annual number of nests (46,841 nests) and about 3 times smaller than the banner nesting effort of 2018 (138,834 nests), which was by far the largest nesting effort observed since comprehensive system-wide nesting surveys began in 1996. The Everglades Protection Area (the WCAs and ENP) typically supports the greatest number of nests in south Florida and produced 37,645 nests (86% of all nests in South Florida) during 2020. The next most important nesting area is Lake Okeechobee. In 2020, the lake produced an estimated 1,951 nests, less than a half of the 10-year average (5,319.1 nests), and the second consecutive year of limited nesting on the lake. The relatively moderate nesting effort and success during 2020, especially when compared to the banner nesting season of 2018, highlights the critical role of hydrology and its corresponding effects on wading bird prey (fish and crayfish) availability and nesting responses. In short, wading birds require relatively deep conditions across the landscape prior to the nesting season to promote the production of aquatic prey animals, followed by a relatively dry-season that reduces water levels and increases the accessibility and vulnerability of those prey to birds during nesting.

Coral Disease Outbreak Multi-Agency Response: Since it first emerged in 2014, a severe outbreak of Stony Coral Tissue Loss Disease (SCTLD) has spread throughout the entirety of Florida's Coral Reef. This widespread and lethal coral disease outbreak affects nearly half of Florida's reef-building coral species and has high rates of transmission and mortality. The FDEP, NOAA, FWC, and the NPS continue to co-lead the response of over 80 partner organizations including federal, state, and local governments, universities, research institutions, NGOs, aquariums, and the community at large. This multi-faceted response effort includes: (1) reconnaissance and field data collection; (2) sampling, analysis, and experimentation to better understand the disease dynamics and causes; (3) investigating potentially contributory environmental conditions; (4) identifying management and intervention actions to slow or stop the spread of disease; (5) collection and genetic banking of disease susceptible species; and (6) coral outplanting trials to guide ecosystem restoration planning. While these disease-specific response efforts are ongoing, parallel efforts to ensure the presence of environmental conditions required for coral survival, such as improvement to nearshore water quality through the CERP, will be necessary to ensure the long-term survival and recovery of these resources.

Partner agencies have continued to characterize the distribution, prevalence, and severity of the disease and are continuing work to identify causative agents and linkages with environmental factors. Research into the role of viruses in disease causation and the role of coral-algal symbionts have significantly

expanded understanding of how the disease operates. In addition, partners have been working to understand how the disease moves both at reef and regional levels, finding that disease-exposed sediment can spread SCTLD at local levels and that ballast water and biofilms on ships may be able to transport the disease long distances. An ongoing study in Southeast Florida has found that higher flow from inlets onto nearshore reefs and vicinity of corals to septic tanks increases the likeliness that local corals will develop SCTLD lesions, suggesting that water quality impacts may be important drivers of SCTLD patterns. Similarly, an unrelated laboratory study found that elevated nutrient levels can exacerbate SCTLD on some species, providing further evidence that water quality impacts SCTLD dynamics.

As well as studying the disease, scientists have continued field-based experimental lesion-level antibiotic treatments on corals across Florida's Coral Reef in an attempt to mitigate disease impacts, reduce disease spread, and save high-priority coral colonies. New techniques to treat whole colonies using probiotics (including a combination treatment of antibiotics and probiotics) are also being tested. NOAA CRCP and the National Fish and Wildlife Foundation supported an intervention mission to the Dry Tortugas National Park to support NPS efforts, which nearly tripled the number of corals treated in Florida. In addition, NOAA and the State of Florida have been engaged in an unprecedented effort to rescue susceptible corals from the wild for gene banking and to serve as parent colonies for large-scale propagation and restoration. In partnership with the Association of Zoos and Aquariums, currently over 2,300 colonies are being housed in land-based aquaria across the country. Finally, several projects are underway to experimentally outplant young corals (including many derived from rescue corals) to determine when and where coral reef restoration is appropriate. To date, several thousand corals have been outplanted to support these efforts, and ongoing project monitoring thus far suggests that coral restoration is feasible, even in the face of SCTLD remaining in the system.

At the national level, NOAA co-chairs a coral disease workgroup of the U.S. Coral Reef Task Force that was established in direct response to the outbreak of SCTLD across Florida and the wider Caribbean region. The work group provides support for local response, mitigation, and prevention efforts, and enhances coordination of response activities across affected jurisdictions. NOAA has also established a Strategy for Stony Coral Tissue Loss Disease Response and Prevention which provides a framework and focus for ongoing efforts to slow the spread of the disease across the Atlantic and Caribbean regions. The Framework also focuses on preventing and preparing for the possible spread of the disease into the Indo-Pacific region in support of resilient coastal ecosystems, communities, and economies nationwide. The strategy builds on ongoing efforts to understand, respond to, and mitigate the disease. A national-level implementation plan is currently in the final stages of development and will provide a clear, specific plan of action that can be used to secure funding for key disease research, response, engagement, and prevention activities over the next five years.

Studying Impacts of Hurricane Irma: Following Hurricane Irma, which plowed across the lower Florida Keys on September 10, 2017 and brushed mainland south Florida, a special issue of *Estuaries and Coasts*, the journal of the Coastal and Estuarine Research Federation (CERF), published scientific papers about physical and ecological responses of natural systems to the 2017 hurricanes, Irma, Harvey, and Maria. The July 2020 special issue was organized by local south Florida scientists from SFWMD, NOAA, University of Miami, and Florida International University and contained contributions from these entities as well as the USGS, NPS, Florida Atlantic University, and many others. Thirteen of the 25 papers in the special issue related to Irma's impacts on south Florida.

One paper described the storm's influence on Biscayne Bay water quality, from response through recovery, following changes in nutrient concentrations and phytoplankton community composition. A Florida Bay study pointed out the similarity of the series of events following Irma, including a post-hurricane fish community change to the pelagic species bay anchovy, to the series of events that followed Hurricane Andrew almost 30 years prior. In both cases, a hypersaline event, seagrass die-off, and an algal bloom preceded the hurricane's passage. Long-term monitoring programs provided the background for assessing Hurricane Irma's impacts on seagrass communities of Florida Bay and the FKNMS. The assessment indicated a post-hurricane decline in seagrass cover in coastal Florida Bay and Lower Florida Keys bayside and no declines elsewhere. A before-after study of hurricane impacts on stony corals, based on impacts to

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the black sea urchins that keep algal overgrowth of corals in check, was thwarted by low urchin population sizes in study locations both before and after Irma's passage, and pointed to the need to study sea urchin populations in the FKNMS more broadly. Another study followed behavior of fourteen tagged juvenile bull sharks in the shallow Shark River Estuary in relation to the approaching storm. Eleven moved out of the estuary within days or hours ahead of the storm's passage, but three may have tried to leave too late and probably died. Rate and extent of decline in barometric pressure was one likely cue prompting directed downstream movement. The effect of Irma on the freshwater lens of a Florida Keys island was detailed in another study, which observed immediate storm surge replacement of fresh water with salt water and recovery of the former freshwater lens within 8 months. Other studies measured effects of hurricane surge and winds on sediment deposition, erosion rates, mangrove defoliation, and delayed death on Florida Bay islands and southwest coast mangrove forests. Investigators noted that recovery of mangrove fringes and forests depends on regrowth of surviving canopy, development of existing understory, and recruitment and survival of new propagules. However, locations with high tree mortality are at risk of peat collapse and land loss. Additionally, marine debris in BBAP associated with Hurricane Irma continues to be removed and properly disposed of.

Results of these studies and those following previous storms will help scientists and resource managers to better understand and prepare for changes that may accompany future storms in the context of sea level rise and other long-term trends in oceanic conditions, climate, and animal movements and behavior.

Studying Impacts of Hurricane Eta

Hurricane Eta made landfall in the Florida Keys and South Florida as a tropical storm before turning toward Florida's west coast on November 8, 2020. Tropical Storm Eta traveled over South Florida for two days and rain continued for three more days as the storm moved slowly into the southeastern Gulf of Mexico before turning northward toward the west coast of Florida. The rainfall brought on by Tropical Storm Eta followed wetter than normal months. Across the region, rainfall totals during October were 200% to 300% higher than the historical average.

The 2022 South Florida Ecological Report summarized the following impacts from Hurricane Eta (October 31-November 13, 2020). Water stages within WCA-3A peaked in mid-November and returned to median levels by April 2021. At the start of nesting season, levels were too deep for optimal wading bird foraging and the recession rate just exceeded the optimal rate for wading birds; however, large flocks were noted in this region from January through May when depths fell below ground. The hydrologic conditions present within WCA-3A during wading bird nesting season for water year 2020 were generally optimal as a result of higher-than-average seasonal water levels and supported sustained foraging. Early indications are that wading bird nesting numbers were very near the record number that was produced at the Alley North colony in water year 2018, which produced a limited number of nests in the subsequent water years, 2019 and 2020.

Water levels exceeded the tolerance for tree islands until the end of January 2021. Tree islands in this region experienced extended periods of flooding in this water year but all the islands dried down by mid-May.

In Northeast Shark River Slough, water levels continued to climb peaking in mid-November well above the 37-year median which was the fifth year in a row and only the fifth time in the last 20 years that stage at this location has exceeded that mark. Depths remained above the historic median for the remainder of the water year. Deep water conditions in the northern reaches of Shark River Slough kept any foraging to the fringes of the slough, however downstream at the coastal margins and in the western marl prairies observed very large flocks throughout the year. Initial reports indicate near record numbers of nesting wading birds at coastal colonies within ENP were comparable to the record-breaking water year 2018 counts. Deep conditions within Shark River Slough did inundate some of the tree islands, a rare flooding event for those islands.

In Taylor Slough and Florida Bay, the surplus of rain was due to tropical activity during the late wet season and early dry season that left a large buffer of fresh water in the upstream areas that was continuously

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delivered to Taylor Slough and Florida Bay as the dry season progressed. As a result, the summed flows from the 5 main creeks discharging the Florida Bay area experienced peak flows in November instead of the usual October peak, and that peak flow in November (128,000 ac-ft) was the second highest monthly flow since Water Year 2001.

Integrated Biscayne Bay Ecological Assessment and Monitoring (IBBEAM): IBBEAM is part of the CERP RECOVER MAP and is a multi-entity project of NOAA/NMFS, the University of Miami, and the NPS. Salinity and biological data collected by IBBEAM in the southwestern Biscayne Bay nearshore area between Shoal Point and Turkey Point are being used in the BBSEER planning effort to develop PMs to screen project design alternatives for their ability to help reach BBSEER goals.

The BBSEER goals for the nearshore area are “to improve the quantity, timing, and distribution of freshwater to estuarine and nearshore subtidal areas, including mangrove and seagrass habitat, of Biscayne Bay, Biscayne National Park, Card Sound, Barnes Sound, and Manatee Bay, to improve salinity regimes, and to reduce damaging pulse releases.” Improved salinity regimes are identified within the Nearshore Salinity PM report as estuarine conditions with an increased presence of lower salinity or mesohaline (5-18 psu) habitat to support characteristic estuarine species of south Florida coastal waters. Multiyear time series from IBBEAM and Biscayne National Park enabled characterization of salinity regimes and the biological communities of seagrass and mangrove shoreline areas they support. Relationships between biological indicators and salinity are captured with Habitat Suitability Models that can be used in scenario testing to select and refine optimal BBSEER project design scenarios. The Biscayne Bay Salinity Model (BBSM), developed for southern Biscayne Bay (Rickenbacker Causeway South to Manatee Bay) by the University of Miami and upgraded by the NPS, is being used to help translate simulated freshwater discharge from hydrologic models (RSMGL and others) into salinity patterns in the bay downstream from the flow. The RSMGL model of the SFWMD provides the freshwater inflow to the coastal wetlands and nearshore bay under various scenario conditions. Other performance measures such as pore water salinity are under development to help reach goals of improved emergent vegetation growth and soil accretion in coastal wetlands. The Biscayne and Southern Everglades Coastal Transport model of the USGS, operated by Florida International University researchers as part of the CERP RECOVER MAP, is contributing to defining and simulating performance measures for the coastal wetlands. The BBSEER Modeling Team has begun to incorporate performance measures into model output for project-design scenario testing.

TASK FORCE & OFFICE OF EVERGLADES RESTORATION INITIATIVES (OERI)

The intergovernmental Task Force, according to WRDA 1996 and WRDA 2020, is the only forum that provides strategic coordination and a system-wide perspective to guide the separate restoration efforts being planned and implemented in south Florida.

The duties of the Task Force are to:

- Coordinate the development of consistent policies, strategies, plans, programs, projects, activities, and priorities for addressing the restoration, preservation, and protection of the South Florida Ecosystem;
- Exchange information regarding programs, projects, and activities of the agencies and entities represented on the Task Force to promote ecosystem restoration and maintenance;
- Facilitate the resolution of interagency and intergovernmental conflicts associated with the restoration of the South Florida Ecosystem among the agencies and entities represented on the Task Force;
- Coordinate scientific and other research associated with the restoration of the South Florida Ecosystem;
- Provide assistance and support to agencies and entities represented on the Task Force in their restoration activities; and
- To develop a priority list of invasive species that significantly impact the structure and function of ecological communities, native species, or habitats within the south Florida ecosystem. The Task Force member agencies are directed to manage those species through coordination and collaboration to develop innovative strategies and tools, guide applied research, facilitate improved management, and prevent future introductions of nonnative species.

The U.S. Department of the Interior's OERI leadership and staff will continue to support and work directly with the federal, state, local government, and tribal representatives on the Task Force. The OERI will also administer, manage, and support the priorities, activities, meetings, and the required reporting responsibilities of the Task Force, its Working Group, the Science Coordination Group, and any designated advisory bodies.

The OERI, on behalf of the Task Force, produces Everglades restoration documents including many that are congressionally mandated. These documents include the South Florida Ecosystem Restoration Strategy, the Biennial Report, the Integrated Financial Plan, and the Cross-Cut Budget. The OERI also helps coordinate the System-wide Ecological Indicators Report, which is an integral component of the Task Force's Biennial Report. During the next reporting period, the OERI will also collaborate with the USACE in preparation of the 2025 Five Year CERP Report to Congress. On May 3rd 2022, the Task Force tasked the OERI to lead the efforts to implement WRDA 2020 direction to develop a priority list of invasive species. This effort will build on the knowledge gained during the development of the Task Force's Invasive Species Strategic Action Framework (2015, 2020).

The Task Force met twice during the reporting period (October 2020, May 2022). During the reporting period, the Working Group and SCG conducted four joint meetings on Everglades restoration activities. As part of its response to COVID-19, all the Task Force and Joint Working Group/SCG meetings were successfully held using the Zoom Webinar platform. For those who were unable to join via the Zoom Webinar, there was also a live webcast of the meeting available on the EvergladesRestoration.gov website.

Organization

Four sovereign entities (federal, state, and two Tribes) are represented on the Task Force. Fourteen members sit on the Task Force itself, representing seven federal departments, three state agencies/offices, two American Indian Tribes, and two local governments.

The Florida-based Working Group and the SCG assist the Task Force with its responsibilities. Their members include additional federal, state, and local agencies. The Task Force and Working Group establish regional and issue-based teams as needed to address pressing or area-based restoration concerns. The OERI supports and implements all Task Force, Working Group, SCG, and team efforts.

PARTNERSHIPS & ACTIVITIES

Intergovernmental Coordination

The Task Force and its subgroups with the support of the OERI, conduct meetings for the purpose of intergovernmental coordination. The Task Force meets regularly to report on progress, facilitate consensus, and identify opportunities for improvement. The Task Force includes public participation in all its coordination activities

Invasive Species

Recognizing the importance of protecting valuable resources by managing the growing threats of invasive species, the Task Force developed and updated the Invasive Species Strategic Action Framework (Framework) in 2020. This effort brought together experts from federal, state, Tribal, and local governments and established consensus goals, objectives, and priorities. As part of its response to the COVID-19 situation, the OERI also successfully utilized the Microsoft Teams platform to provide timely information and seamlessly update documents with team members. The 2020 Framework includes an updated base document, assessment of progress made since 2015, updated priorities, new program-level case studies, and an interagency “Snapshot Budget” for invasive species. The case studies are available on EvergladesRestoration.gov.

In 2019, Congress recognized the importance of invasive species management for restoration to succeed and new legislation referred to as the Suppressing Looming Invasive Threats Harming Everglades Restoration (SLITHER) Act was developed and then included in the WRDA 2020 (Section 504, “Invasive Species Risk Assessment Prioritization and Management”). This legislation amended section 528 of WRDA 1996 and added specific duties to the Task Force related to invasive species. In WRDA 2020, section 504, Congress directs the Task Force to develop a priority list of invasive species that significantly impact the structure and function of ecological communities, native species, or habitats within the South Florida Ecosystem. The Task Force member agencies are directed to manage those species through coordination and collaboration to develop innovative strategies and tools, guide applied research, facilitate improved management, and prevent future introductions of nonnative species. The Task Force accepted the recommendation from the Working Group, SCG, and OERI to begin developing the priority list of species at their May 3, 2022, meeting. The OERI is currently facilitating a team of experts to develop initial products and will provide an update at the Task Force’s Fall 2022 meeting.

STAKEHOLDER ENGAGEMENT

Stakeholder Workshops: During the reporting period, the OERI on behalf of the Task Force employed its stakeholder workshop process to enhance public engagement in the CERP. A Task Force Sponsored workshop was held on BBSEER on Nov 17, 2020. Task Force Sponsored workshops were also held on the IDS on September 17, 2020 and September 29, 2021. At the May 19, 2021, WG/SCG meeting, the WG voted unanimously to provide blanket approval for the Sep 29, 2021, IDS and all future Task Force sponsored IDS workshops.

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EvergladesRestoration.gov: During the reporting period, the OERI launched the redesigned EvergladesRestoration.gov website. The new design allows for Task Force members, restoration experts, and those new to Everglades issues to easily access information. The website houses all Task Force documents as well as the primary reports of restoration partner agencies. The restoration program section of the website is organized by the same categories utilized in this Biennial Report. Additionally, information relative to the overall restoration effort, such as the status of the projects being implemented, the latest news on restoration, and announcements on upcoming events, can be found either on the website itself or through links shown on the website.

Appendix A

System-wide Ecological Indicators

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SYSTEM-WIDE ECOLOGICAL INDICATORS

The South Florida Ecosystem Restoration Task Force has established a suite of 11 system-wide ecological indicators to assess current ecosystem health and provide a means to track system-wide ecosystem response to restoration. This suite of system-wide ecological indicators and the green-yellow-red “stoplight” graphics were developed as a communication tool to provide a big picture view of the ecosystem’s health and response to restoration.

The system-wide ecological indicators and stoplight illustrations provided herein represent a summary of broader and more detailed science assessments than available in companion reports, including the 2022 System-wide Ecological Indicators for Everglades Restoration, and the South Florida Water Management District’s (SFWMD) 2022 South Florida Environmental Report.

These system-wide ecological indicators were chosen for their collective ability to comprehensively reflect ecosystem response to restoration in terms of space and time (Table 1). For example, periphyton responds to change very rapidly at both small and large spatial scales, while crocodilians respond to changes at short, intermediate, and long temporal scales and intermediate and large spatial scales. As indicators, they cover different aspects of the ecosystem.

The process of choosing these indicators is well-documented. In a special issue of the scientific journal Ecological Indicators (Volume 9, Supplement 6, November 2009), we outlined how each indicator was developed. In previous biennial reports, we also described the process for selecting the indicators and an explanation of how the indicators relate to other factors being monitored.

Table 1. System-wide Ecological Indicators
• Invasive Plants
• Lake Okeechobee Nearshore Zone Submerged Aquatic Vegetation
• Eastern Oysters
• Crocodilians (American Alligators and Crocodiles)
• Fish & Macroinvertebrates
• Periphyton
• Wading Birds (White Ibis & Wood Stork)
• Southern Coastal Systems Phytoplankton Blooms
• Florida Bay Submersed Aquatic Vegetation
• Juvenile Pink Shrimp
• Wading Birds (Roseate Spoonbill)

The ecological indicator sections provided below are brief and describe only composite results for the previous reporting period (Water Year 2020), the intermediate reporting year (Water Year 2021) and the current reporting period (Water Year 2022). Readers looking for more detailed information on regional status and changes in these indicators will find it within the full report (2022 System-Wide Ecological Indicators Report available at Evergladesrestoration.gov).

In response to feedback from the Working Group and Science Coordination Group, the information on the indicators is being provided in a more concise manner focusing on the following:

- Why is this indicator important/what does this indicator tell us about Everglades Restoration?
- How do we expect this indicator to respond to Everglades Restoration?
- Which projects need to be implemented (or which geographic areas need to be restored) to see changes to this indicator?
- Given the projects that have been implemented what changes would you expect to see now?
- What was the response of this indicator in this reporting period? (WY 2021 and WY 2022)?

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A new column was added this reporting cycle: Movement toward restoration target over the last 10 years to place the current status within the longer-term trends.

Key Points from System-wide Ecological Indicators

- On a system-wide scale all of the indicators are below or well below restoration targets; however, over the last 10 years only one, Lake Okeechobee Nearshore Zone Submerged Aquatic Vegetation, has been getting worse.
- Improvements have occurred in areas where restoration projects have been implemented or in years where high rainfall and increased water in the ecosystem highlighting the need and value of restoration.
- Water Years 2021 and 2022 highlighted the benefits that increased operational control has afforded by the growing list of water management infrastructure projects have towards achieving a broad spectrum of Everglades Restoration goals.
- Invasive exotic plants continue to be a challenge, but large portions of the restoration footprint have reached “maintenance control” of priority invasive plant species. However, in some areas, populations previously under control have resurged, largely due to inadequate resources for management.

Hydrologic Context for Water Years (WYs) 2021 and 2022

The following discussion provides a basic introduction to the south Florida water cycle and a basic description of conditions during the reporting period that includes WYs 2021 (May 1, 2020 to April 30, 2021) and 2022 (May 1, 2021 to April 30, 2022). A more detailed discussion of south Florida hydrology is available in the 2022 System-wide Ecological Indicators for Everglades Restoration report.

The Everglades has a unique hydrologic, or water cycle. Throughout most of the continental United States, water levels generally rise and fall in tune with the four seasons. There, water levels typically peak during the spring as snow melts and front-driven storms move through, and ebb in the fall at the end of the hot summer. In contrast, the water cycle of subtropical south Florida and the Everglades is fueled by only two seasons—wet and dry—leading to a reversal of the typical seasonal high and low water levels. Water levels in the Everglades peak in the fall at the end of the wet season, and ebb in the spring when large expanses of wetlands dry out, at the end of the dry season.

Summer Wet Season

The wet season typically begins in mid to late May and is characterized by hot and humid weather, daily buildup of spectacular cloud formations and resultant heavy thunderstorms that are often localized and short in duration. Other larger systems—including early season storms enhanced by lingering springtime instability in the upper atmosphere, mid-latitude cyclones and tropical storms—periodically spike the Everglades with regionally expansive rains.

In response to these meteorological inputs, the Everglades becomes flooded with an ankle to waist-deep, slow-moving pool of water throughout summer and fall, leaving only the high-ground tree islands and hardwood hammocks above water. The term sheet flow is used to describe this shallow and spatially expansive wetland plain that, unlike a lake or bog, flows like a stream, only much more slowly, almost imperceptible to the human eye. Spanning from horizon to horizon, this sheet of water flows south through a maze of tree-island-dotted ridges and sinuous low-lying sloughs, giving rise to the name River of Grass coined by Marjory Stoneman Douglas in 1947.

Winter Dry Season

As the weather turns milder in October, the regular buildup of afternoon thundershowers and tropical storms ends, ushering in the dry season in mid to late November. As the dry season ensues, water levels continue to drop without much additional rainfall and more land emerges. Water first recedes from the highest elevation pinelands and other tree islands. Drainage of the marl prairies follows next, leading to an eventual retreat of water into the lowest-lying sloughs and marshes. The rate of recession may be slowed or even

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temporarily reversed by sporadic winter rains that are typically brought on by the descent of cold continental air masses from the north. Lower winter evaporation rates also hinder the rate of recession, though it rapidly picks up again in spring as daylight hours and air temperatures increase evaporation.

South Florida is generally considered a wet area by merit of its abundant average annual rainfall, a total of 52.7 inches in the SFMWD region, with a 70/30 percent wet/dry season split. Despite the often flooded wetland views, drought and wildfire play vital roles in maintaining the region's unique assemblage of flora and fauna. The ecological health of the Everglades is intimately tied to seasonal and interannual fluctuations of the water cycle. It is also significantly impacted by a combination of:

- Natural processes
 - Rainfall
 - Evaporation
 - Overland flow
 - Groundwater infiltration
- Climatic oscillations
 - El Niño/La Niña
 - Climate change
- Water management manipulation associated with operation of the Central and Southern Florida Project (C&SF) project and other drainage works for the purpose of:
 - Flood protection
 - Urban and agricultural water supply
 - Environmental protection

Each WY is different in the Everglades, and the hydrologic cycle is characterized by large inter-annual variation—in other words, seldom do we experience average years.

The previous two WYs illustrate this variation well and are summarized next.

Water Year Summaries

Water Year 2021 (May 1, 2020 to April 30, 2021)

Water Year 2021 classified as above average in terms of rainfall, recording 46 and 14 inches of wet and dry season rainfall, respectively, for a total of 60 inches. The summer wet season started early with a June-like rain total in May (8 inches) and ended late with above average rains in October and a surprise storm in November. Of note, the early start was not enough, or rather in time, to prevent a destructive incineration of an archipelago of hardwood hammocks in the southeast Corner of Big Cypress National Preserve called the Moon Fish Wildfire. Within a week of the fire ending the May rains swept through. Near normal rainfall persisted for core four months of the summer wet season (June through September) and were supplemented by a “wet season” like October. But the real exclamation point came in November in the form of Tropical Storm Eta, filling the Everglades and Big Cypress Swamp to levels last seen in September 2017 from Hurricane Irma, only shifted forward two months to a time when water levels are usually well past their October peak. The late season highwater set the stage for or prolonged and steady winter recession that proved to be a boon to wading bird communities in terms of foraging and nesting. Despite expectations of a wet dry season from the bumper crop of summer and late fall rain, the Big Cypress Swamp dropped into drought by April's end. Although no similar wildfires occurred, Water Year 2021 proved an important restoration point: No matter how wet the wet season or the beginning of the dry season, without timely April and May rains the Big Cypress Swamp is especially prone to dropping into deep, unnatural drought due to perimeter and interior canals that stifle the spread of sheet flow and hasten its spring demise.

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Water Year 2022 (May 1, 2021 to April 30, 2022)

Despite the previous year's bountiful rains, Water Year 2022 started slow thanks to subpar rains in May – extending drought conditions into June and even July in some area. Despite the slow start, the four core months of the summer wet season (June through September) and October all charted in with average rainfall. For a second year in a row, November provided an unexpected boost with twice its normal rainfall amount. Again, despite the surplus of water at the dry season's start, the Big Cypress Swamp was poised to drop into deep spring drought, imperiling the habits that so vitally depend on natural fire breaks staying wet, when a string of continental fronts at the middle and end of April and start of May boosted the water table just when it needed it most. South Florida received over 10 inches less annual rainfall and 4 inches less dry season rain than the prior year, but it is as much an issue of timing as it is the total amount. Water Year 2021 classified as low normal in terms of rainfall, recording 36 and 12 inches of wet and dry season rainfall, respectively, for an annual total of 48 inches.

Of interest, despite the apparent disparity between Water Years 2021 and 2022, as judged by their annual rainfall of 60 and 48 inches, respectively, the first classifying in the “above normal range” and the second in the “low normal” range, the two years acted similarly in some respects, and defied the norms of previous years in several respects. The “old normal” of too much water in Water Conservation Area 3A, not enough water in downstream Everglades National Park, and a deep spring plunge of the water table below the cypress roots in the Big Cypress didn't materialize for either year. Instead, three bridges along the Tamiami Trail opened the door for increasing the flow of water into Northeast Shark River Slough and downstream Florida Bay. As a result, Shark River Slough in the Park stayed flooded with around a foot of water into May Water Year 2022; whereas similar sloughs in Water Conservation 3A dropped below the one-foot depth threshold by March. Also, in reprieve from previous years, timely spring rains helped keep drought in check in the Big Cypress Swamp.

Water Years 2021 and 2022 highlighted the benefits that increased operational control afforded by the growing list of water management infrastructure projects have towards achieving a broad spectrum of Everglades Restoration goals. Recent notables include Lake Okeechobee's strengthened levee, bridging and now raising the Tamiami Trail grade along Northeastern Shark River Slough, and opening of the C-44 Reservoir, improved seepage control along the L-31 just to name a few, with many more projects and planning initiatives in various stages underway including the Biscayne Bay Southeastern Everglades Restoration (BBSEER) and the Western Everglades Restoration Plan (WERP). Modernization of the water management infrastructure combined with availability of real-time data to inform operations took a major step forward over the past two years.

The Everglades and Big Cypress Swamp are flood and fire adapted ecosystems in which every square inch of flora and fauna depend on a regular return interval and dosage of both flood and fire. Or as the saying goes – so goes flood and fire, so goes the swamp. As proven these past two years, operational stewardship is vital to getting both right.

Monthly Rainfall in South Florida for Water Years 2021 and 2022

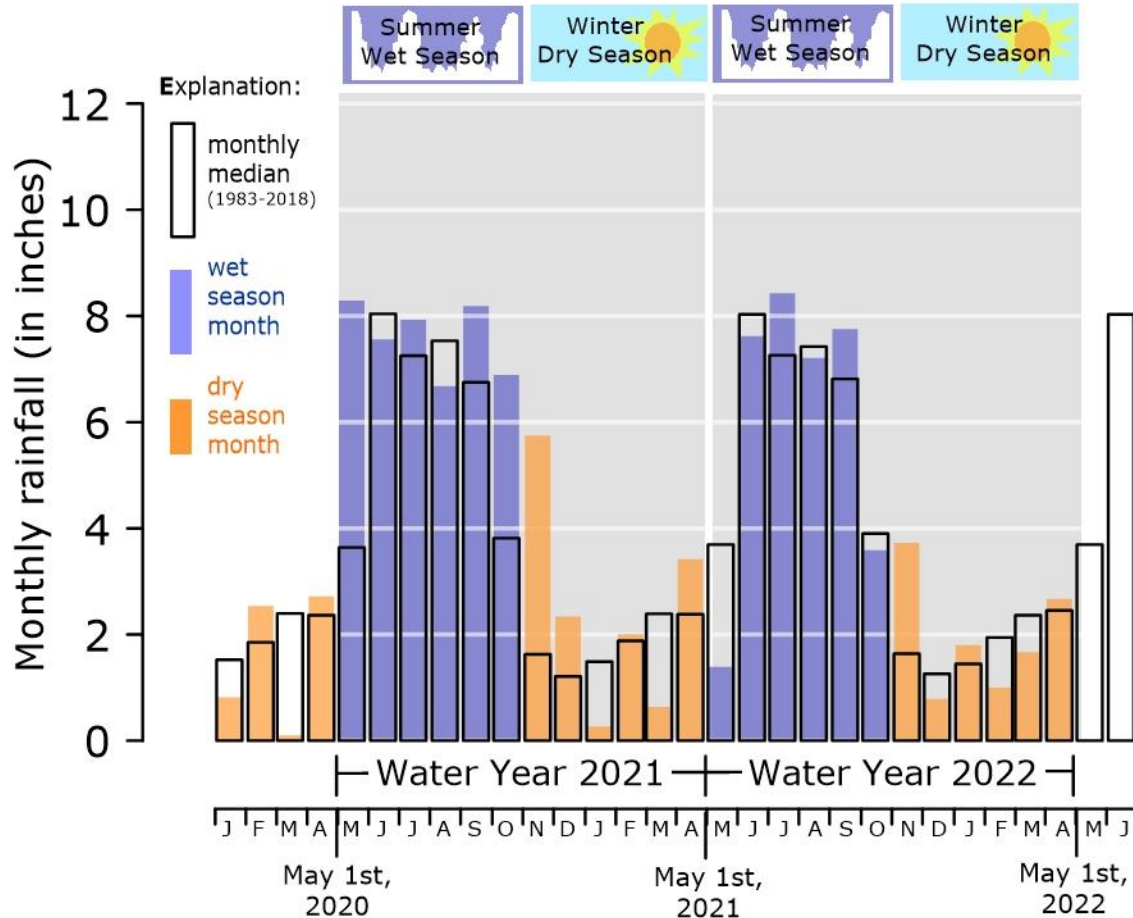


Figure 1. Summary of monthly rainfall in WY 2021 and WY 2022 throughout the South Florida Ecosystem. The graph was produced using daily rainfall data provided by the SFWMD. SFWMD meteorologists compute a daily rainfall value for the fourteen major basins and district-wide from rain gauge measurements. See <http://www.gohydrology.org/p/about.html> for more information.

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SYSTEM-WIDE ECOLOGICAL INDICATORS

Helpful Hints for Reading the Indicators

Within the system-wide indicator tables, the “Current Reporting Year” column contains indicator information at the end of WY 2022 (May 1, 2021 to April 30, 2022). The Previous Water Year is WY 2021 (May 1, 2020 to April 30, 2021). The ‘Previous Reporting Year’ column contains information for WY 2020 (May 1, 2019 to April 30, 2020). Status is shown using green, yellow, and red stoplight colors as explained below. This reporting period we added a 10-year trend arrow in response to requests for additional information on if the indicator was generally getting better or worse regardless of the current status.

Ecological Indicator	Previous Reporting Year WY 2020	Previous Water Year WY 2021	Current Reporting Year WY 2022	10 Year Trend
Invasive Exotic Plants	C	Y	Y	→
Lake Okeechobee Nearshore Zone Submerged Aquatic Vegetation	R	R	R	↓
Eastern Oysters - Modified (Northern Estuaries only)	R	R	R	→
Crocodylians (American Alligators & Crocodiles) - Modified (LNWR, WCA-3, ENP)	C*	R	R	→
Fish & Macroinvertebrates (WCA-3 and ENP only)	R*	R	R	→
Periphyton	Y	Y	C	→
Wading Birds (White Ibis & Wood Stork)	R	R	C	↑
Southern Coastal Systems Phytoplankton Blooms	Y	Y	Y	→
Florida Bay Submersed Aquatic Vegetation	Y	Y	Y	→
Juvenile Pink Shrimp - Modified (no system-wide sampling)	B	B	B	
Wading Birds (Roseate Spoonbill)	R	Y	R	→


Stopsight Color Legend

- RED (R) Substantial deviations from restoration targets creating severe negative condition that merits action. Well below restoration target.
- YELLOW (Y) Current situation does not meet restoration targets and may require additional restoration action. Below restoration target.
- GREEN (G) Situation is within the range expected for a healthy ecosystem within the natural variability of rainfall. Continuation of management and monitoring effort is essential to maintain and be able to assess “green” status. Meets restoration target.
- BLACK (B) No data or inadequate amount of data were collected due to reductions in funding.
- CLEAR (C) Sampling or analysis incomplete or delayed so stoplight not available.

*Indicates lack of March/April 2020 data because of COVID-19.

Please see the 2022 System-wide Ecological Indicators for Everglades Restoration for more details including yearly values by area, improvements to calculations, and a list of publications and reports associated with all the indicators.


Invasive Plant Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	Sampling could not be completed because of COVID-19 restrictions	Y	Y	

- Invasive plant species can cause substantial negative impacts to Everglades ecosystems, directly impeding restoration success. This Invasive Plant Indicator is used to assess the status of invasive plant species and progress in their control.
- The indicator involves numerous invasive plant species across different jurisdictions and regions. Two primary drivers affecting all invasive plants is their population status (presence and abundance) and success of control efforts. Sustained and closely coordinated control efforts will result in reductions in invasive plant populations and their impacts on native ecosystems.
- Restoration activities may affect invasive plant populations positively or negatively, depending on the characteristics of individual species and their responses to changing conditions as restoration progresses. For example, longer hydroperiods may reduce recolonization rates of Brazilian pepper in Everglades tree islands while increasing habitat suitability for Old World climbing fern.
- All agencies implement invasive plant management programs. However, landscape-level control is hampered by limited resources, remote infestations, and in some cases inadequate control methods.
- Management approaches that integrate numerous control techniques are proving useful. For example, integrating herbicide treatments, fire, and biological controls through Everglades restoration, specifically the CERP Biological Control Implementation Project, is improving overall management outcomes for some invasive plant species.
- Systematic monitoring programs for established priority invasive plant species are in place for the Greater Everglades module, Big Cypress NP, Lake Okeechobee, and Kissimmee River floodplain. Similar monitoring programs are needed for remaining regions of the restoration footprint.
- The SFWMD and NPS conduct routine early detection surveys along fixed routes within Everglades and Biscayne NP, Big Cypress NP, and District/FWC-managed lands south of Lake Okeechobee. Several high priority early detection plants have been discovered and more than eleven new county records have been documented.
- While the overall distribution of many species has increased, large portions of the restoration footprint have reached “maintenance control” of priority invasive plant species. In some areas, populations previously under control have resurged, largely due to inadequate resources for management.
- Key regions where invasive plant populations remain problematic include:
 - Kissimmee River floodplain
 - Picayune Strand
 - A.R.M. Loxahatchee National Wildlife Refuge
 - Everglades National Park (northeastern region)
 - Big Cypress National Preserve
- Continued improvements in invasive plant management through strategic partnerships, coordinated planning, construction, and operational phases of restoration will reduce ecological impacts and promote more cost-effective control.
- CERP Guidance Memorandum 062.00 (CGM 62, 2012) ensures invasive species management is included in the planning process. CEPP is the first project to incorporate the guidance, including an invasive & nuisance species management plan developed by USACE. All future CERP projects will follow this proactive approach of planning and budgeting for invasive species management, in accordance with CGM 62.

On a system-wide scale the Invasive Plant Indicator remains below the restoration target.

LAKE OKEECHOBEE NEARSHORE ZONE SUBMERGED AQUATIC VEGETATION (SAV) INDICATOR

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	R	R	R	

- Submerged aquatic vegetation (SAV) provides habitat for fish and wildlife, stability for sediments, and improves water quality. A healthy SAV community directly corresponds to healthy Lake Okeechobee conditions. The SAV community is directly influenced by water levels and light conditions so restoration activities that maintain optimal lake stages (height of the water above mean sea level) and decrease turbidity are key.
- SAV coverage should expand with completion of Everglades Restoration projects that provide watershed storage and subsequently improve Lake Okeechobee stages. Without these projects, rapid inflows from a channelized watershed will continue to drive high lake stages, especially during wet conditions, inhibiting growth and development of SAV and essentially drowning emergent vegetation. Everglades Restoration that creates storage capacity in the watershed will also prevent dry conditions that drive lake stages down and expose SAV beds, converting open water areas to emergent marshes and/or terrestrial habitats. Additionally, it will stabilize lake stages, thereby reducing interannual variability which should help SAV flourish beyond the 50,000-acre RECOVER annual restoration target (interim goal of >35,000 acres) and allow for more frequent favorable water levels that benefit lake ecology.
- While several Everglades Restoration projects, specifically Comprehensive Everglades Restoration Plan (CERP), will affect lake stages to some degree (e.g., C-44, C-43, and Everglades Agricultural Area (EAA) reservoirs), only one upstream project, the Lake Okeechobee Watershed Restoration Project (LOWRP), will directly affect inflows to the lake and lake ecology. Through installation of Aquifer Storage and Recovery wells and wetland restoration in the watershed, lake stages are expected to remain within desired ranges more frequently, particularly under dry conditions.
- Over the long-term, additional storage will be needed in the watershed as originally envisioned in LOWRP and CERP. Such improvements to lake stages should increase coverage of SAV to established targets. The Kissimmee River Restoration project, authorized in 1992 (pre-CERP), may have incidental nutrient load reduction benefits to Lake Okeechobee and provide seasonal changes to inflow patterns, but will not significantly alter inflow volumes to the lake. This project is expected to reduce total phosphorus loads to Lake Okeechobee by 30 metric tons.
- To date, no projects have been completed that will directly impact lake stages. The C-44 Reservoir and associated Stormwater Treatment Area (STA) has been completed but this eastern watershed storage project was formulated to improve estuary conditions with minimal and/or indirect impacts to lake stages. Watershed storage and downstream storage remains minimal to non-existent, and stages continue to deviate wildly from desired ranges, particularly during wet and dry events.
- SAV areal coverage declined 77% from WY 2021 to WY 2022, going from just over 16,000 acres of total SAV to approximately 3,700 acres. This was the lowest areal coverage since WY 2007 when three successive hurricanes reduced the spatial extent of SAV to less than 2,000 acres. Most of the decrease was due to the loss of the non-vascular *Chara spp.*, which declined by 97% while the vascular species declined by 54%. This loss of SAV coverage essentially negated the significant recovery of over 20,000 acres that occurred in WY 2020 after the seiche, rapid water level rise, and combined wind and wave energy from Hurricane Irma in WY 2018 resulted in a decline to just over 5,000 acres of total SAV in WY

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
2019. The recovery was aided by lake levels being within or below the optimal lake stages for nearly a full year, improving light penetration and encouraging reestablishment of SAV. In contrast to this recovery period, water levels for nearly a full year prior to the WY 2022 SAV growing season were above or at the top of the threshold of optimal levels.

- The interim goal of >35,000 acres of total SAV has only been achieved once in the past decade (WY 2013) and although WY 2014, WY 2015, and WY 2016 were within 2,000 acres or less of the interim goal, SAV coverage has been less than 30,000 acres in six of the past ten water years, averaging just over 24,000 acres, or just 69% of the >35,000 acres.
- WY 2021 and WY 2022 achieved only 47% and 11% of the interim goal, respectively. Additional water storage north of the Lake is needed to store water during wet times to reduce high lake stages and later be released into the lake to reduce the impacts of low stages during dry times, thus maintain optimal lake stages more frequently.

The Lake Okeechobee SAV indicator remains well below the restoration target.

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
Eastern Oysters Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	R	R	R	

- Eastern oysters are a natural component of estuaries in south Florida that provide water quality benefits, habitat and food for many species, shoreline stabilization, and important commercial, recreational and economic resources for coastal communities.
- Eastern oysters are frequently used as indicators of water quality because they are a dominant species in the estuarine community, they create habitat, and their sedentary nature allows for generation of cause-and-effect relationships between environmental conditions and oyster population health and abundance.
- Abrupt changes in estuarine salinity and temperature are principal environmental stressors on oysters. If more natural freshwater flows are restored to the estuaries, oyster population health and abundance will increase and stabilize. Additionally, successfully restored flows will allow for reestablishment of oysters at estuarine locations that are currently uninhabitable.
- Projects that reduce detrimental freshwater flows, while maintaining minimum flows, will substantially improve conditions in estuaries on both coasts of south Florida.
- The Broward County Water Preserve and C-43 West Basin Storage may help to reduce the severity of large freshwater releases to the estuary which will benefit Eastern oysters.
- Eastern oyster status in the Northern Estuaries (Caloosahatchee River Estuary, St. Lucie Estuary, Loxahatchee River Estuary and Lake Worth Lagoon) was well below the restoration target in WY 2021 and WY 2022.
- In WY 2021, oyster populations in the St. Lucie and Caloosahatchee River estuaries were exposed to a large release of freshwater in the fall of 2020 which resulted in less-than-optimal conditions, resulting in mortalities and reduced abundance.
- In WY 2022, large summer releases resulted in salinities below optimal, but did not cause large mortalities. Conditions at some upstream locations allowed oyster densities and juvenile recruitment rates to improve but most remained below restoration targets. Oyster status was well below the restoration target for WY 2019 and WY 2020 in the Northern Estuaries (Caloosahatchee River Estuary, St. Lucie Estuary, Loxahatchee River Estuary, and Lake Worth Lagoon).
- Over the last 10 years, the monitored estuaries have remained below most restoration targets, without a strong or consistent trend towards improvement or further decline.

The oyster indicator remains well below the restoration target.

Crocodylians (American Alligators & Crocodiles) Indicator


STATUS	PREVIOUSLY REPORTED (WATER YEAR 2019)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE - (LNWR, WCA-3, ENP)	R	R	R	

- Crocodylians (alligators and crocodiles) are iconic, keystone species of the Florida Everglades. As essential ecosystem engineers, crocodylians create both high ground (nests) and low areas (alligator holes, trails) that promote species diversity in the ecosystem.
- American crocodylians are ecological indicators in the Everglades whose survival and population dynamics are directly connected to regional hydrology and estuarine salinity.
- Crocodylian responses are tightly linked to patterns of freshwater flow through the Everglades and to the southern estuaries that influence water depth, salinity regimes, and ultimately resource availability.
- We expect positive responses in crocodylian growth, survival, body condition, and estimated abundance in marsh areas where Everglades Restoration projects (i.e., Modified Water Deliveries, Tamiami Trail bridge, C-111 South Dade and C-111 Spreader Canal Western projects) are now beginning to restore multi-year hydroperiods, more natural fluctuations in water depths, and more natural water deliveries to critical estuaries and ecosystems.
- We continue to observe declines in alligator abundance in the Everglades system where key projects such as the Central Everglades Planning Project (CEPP) have not yet been completed, particularly in areas that are consistently drier earlier in the year, such as in northern WCA3A. Consecutive dry years have negative impacts on alligator abundance, and alligator body condition is related to range in water depth and fall water depths. Projects such as CEPP will improve conditions for alligators, thus positively affecting abundance and body condition.
- Long-term monitoring of American crocodiles has demonstrated that metrics such as body condition, relative density, growth, and survival respond positively to patterns of increased freshwater flow and reduced salinity on short, medium, and long-term intervals. This new knowledge provides us with insights that allow us to better assess crocodile responses to areas where freshwater flow and salinity patterns are the target of restoration efforts, such as northeastern Florida Bay.
- Although the overall spotlight color for crocodylians for WY 2021 and WY 2022 is red and is well below the restoration target, we have seen an improvement in Northeastern Shark River Slough likely because of restoration efforts associated with Modified Water Deliveries and the Tamiami Trail Bridge project.
- Over the last 10 years the crocodylian indicator has remained well below the restoration target with the overall index score remaining fairly constant. In some areas some of the metrics continue to decline; however, in areas such as Northeastern Shark River Slough where restoration actions have been taken, we are starting to see improvement in alligator populations. In addition, we expect that lower salinity values in areas like Northeastern Florida Bay will have a positive influence on crocodile abundance and body condition.
- Both alligator and American crocodile nesting surveys within Everglades National Park, which are not explicitly considered in the indicator, show a long-term increasing trend in distribution and numbers of nests within Everglades National Park.

The crocodylian indicator remains well below the restoration target.

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
Fish & Macroinvertebrates Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	R* *qualified by lack of April 2020 data (COVID-19)	R	Data being processed	

- Fish and macroinvertebrates are important indicators in the Everglades because their abundance provides food for wildlife like wading birds and alligators.
- Fish and macroinvertebrate densities are correlated with hydrologic variation across their life stages.
- Positive or negative trends in fish and macroinvertebrate densities relative to hydrological changes are correlated with the restoration of the Everglades ecosystem.
- With the completed of restoration projects associated with CEPP (Central Everglades Planning Project) we expect to observe increases in the density of most fish in areas where hydrological conditions have been historically drier than target conditions because they should become wetter (e.g., ENP Shark River Slough and Taylor Slough), whereas we expect little change or even a decline in numbers in other places that have been ponded with too much water (e.g., SE WCA-3A).
- The time between drying events is a key driver of fish and macroinvertebrate density and species composition. We anticipate improvement in this indicator where projects that deliver more freshwater have been implemented.
- Water quality (total phosphorus concentration) can also impact the fish and macroinvertebrate indicator. Maintaining historical concentrations of total phosphorus in areas receiving new water deliveries will thus also improve this indicator.
- Invasion and growth of non-native fish populations, most recently predatory freshwater eels, are presenting new challenges to the restoration benefits and the assessment thereof, and will require increased attention in future assessments.
- Over the past 10 years responses of the fish and macroinvertebrate indicator have not moved closer to targets because recent water management actions do not appear to have reduced drying over the majority of the southern Everglades and because non-native fish species are expanding.

Fish and macroinvertebrates remain well below the restoration target

Periphyton Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	Y	Y	Data being processed	

- Periphyton abundance, nutrient content, and diatom algae species composition provide an important indication of the oligotrophic status of the Everglades. These three metrics are combined to provide an indication of how hydrologic management influences the inflow and downstream transport of novel and legacy phosphorus.
- The multi-metric is a combination of periphyton biomass, phosphorus concentration, and the proportion of calcareous diatom species comprising the periphyton community.
- We expect a reduction in biomass, an increase in phosphorus concentration, and a reduction in calcareous diatoms at locations experiencing above-ambient phosphorus loads. A modified index is used for the Arthur R. Marshall Loxahatchee National Wildlife Refuge where an increase in biomass and calcareous diatoms indicates a departure from ambient conditions.
- If inflowing water total phosphorus concentrations are lower than ambient marsh concentrations, we expect that the Central Everglades Planning Project will improve the quantity, quality, and calcareous composition of periphyton communities.
- On a system-wide scale the periphyton indicator remains below the restoration target in central and northern WCA-3A and WCA-2A because these areas have not recovered from a history of higher than ambient phosphorus loading and have not received the benefits of restoration projects that have not yet been implemented. Some areas of Arthur R. Marshall Loxahatchee National Wildlife Refuge are in a caution state likely due to runoff of canal-derived carbonates into the typically ombrotrophic, acidic ecosystem. Downstream/coastal regions of the Everglades National Park are below the restoration target because they are receiving accelerated coastal supplies of phosphorus in the absence of full-scale restoration implementation.
- Over the last 10 years there has not been consistent directional change at the system-wide scale because in some places there are positive changes where freshwater flows are being restored and negative changes where those restored flows are mobilizing legacy nutrients. These local changes are mostly isolated to the northern and eastern boundaries of ENP.


See the 2022 System-wide Ecological Indicators for Everglades Restoration for more details including yearly values by area, improvements to calculations, and a list of publications and reports associated with this indicator.

*A full system-wide status assessment for periphyton and the stoplight color for WY 2022 cannot be provided yet because of delays in the microscopic identification of diatoms due to a slow-down of activities related to COVID-19 restrictions but should be available by early Fall 2022.

The periphyton indicator remains below the restoration target.

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
Wading Birds (Wood Stork & White Ibis) Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	R	R	Data being processed	

- Historical accounts and data indicate that large breeding colonies of wading birds were a defining characteristic of the pre-drainage Everglades. Wading bird nesting is strongly driven by hydrology, as water depths and distribution are important for the production of aquatic prey animals and accessibility of those prey for foraging wading birds. This makes wading birds an important integrative indicator of the general state of Everglades restoration
- Changes in hydrology and water availability across the Everglades region is expected to improve wading bird nesting conditions by increasing prey production and foraging quality and quantity. Expected changes in hydrology should result in earlier nesting by Wood Storks, a shorter interval between White Ibis “supercolony” nesting events (i.e. notably large breeding events), a higher ratio of tactile to visual foragers, and a higher proportion of wading bird nesting concentrated in coastal areas of Everglades National Park.
- Everglades Restoration projects that restore freshwater flows to the productive southwest estuarine region are seen as key to restoring wading bird nesting.
- It is difficult to associate wading bird nesting responses on a system-wide basis with any particular project, though those that contribute the most to restoration of hydrological flows typical of the pre-drainage period are those that would be highest priority.
- Data for WY 2022 are still being collected, processed, and collated and are not available for the 2022 report. Nesting wading birds responded in a typical fashion to hydrologically driven food production and availability that is consistent with the overall trophic restoration hypothesis that improved water conditions will improve prey abundance and availability for wading birds), under the currently unrestored conditions
- The wading bird indicator remains well below the restoration target. Early nesting, coastal nesting, and proportions of tactile feeding waders probably will respond only within a limited range until the Everglades Restoration projects that affect wading bird food production and availability at large spatial scales are implemented.
- However, over the past 10 years, we have seen general improvement in several wading bird metrics, all of which are consistent with predicted responses to future restored hydrology. In general, good years for wading birds are related to high water level events occurring before the breeding season (for example, high rainfall in summer or fall months from tropical storms). This supports expectations that restoration actions that result in higher water levels in the Everglades will be beneficial for wading bird nesting.

The wading bird indicator remains well below the restoration target.

Southern Coastal Systems Phytoplankton Blooms Indicator


STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	Y	Y	Y	

- Phytoplankton blooms, commonly called algal blooms, are an indicator of water quality. In the context of Everglades Restoration, the bloom indicator is cautionary, helping to ensure that restoration actions cause no indirect harm to coastal ecosystems via water quality degradation.
- We expect that implementation of Everglades restoration projects, in conjunction with State-led water quality improvement projects being implemented to meet water quality standards may improve water quality conditions because restored plant communities and soils are expected to increase nutrient uptake and retention in Everglades wetlands and estuarine seagrass beds. Additionally, conditions that result in seagrass die-offs that can trigger algae blooms will occur much less frequently after restoration.
- Unlike other indicators where we expect to see continual improvement, our expectation with the algal bloom indicator is that the frequency of red, yellow and green scores will not change due to Everglades Restoration. Thus, this indicator is needed to ensure that Everglades Restoration “does no harm” to coastal water quality.
- There was degradation in algal bloom indicator scores in the Southern Coastal System (SCS) region (Ten Thousand Islands to Biscayne Bay) in 2021 with the region receiving a red rating overall. This may be in part, because WY 2021 was abnormally wet with higher levels of precipitation potentially increasing the watershed nutrients derived from plants (especially mangroves) and soils that were transported to coastal waters.
- Algae blooms have continued to occur in central Florida Bay each year during this reporting period in areas where the seagrass die-off occurred in 2015.
- The southwest Florida shelf and the 3 subregions in Biscayne Bay continue to show signs of decline. All 4 sub-regions have had persistently poor indicator scores since 2005. Additional nutrients derived from anthropogenic sources in developed areas likely were transported to downstream estuaries (e.g. to northern and central Biscayne Bay). Biscayne Bay has also recently experienced hypoxia and associated fish mortality events. This suggests the need to act soon to improve water quality in Biscayne Bay. Miami-Dade County has assembled a Biscayne Bay Task Force to develop methodologies to improve water quality in Biscayne Bay

The Southern Coastal Systems Phytoplankton Blooms Indicator is well below the restoration target.

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Florida Bay Submersed Aquatic Vegetation Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	Y	Y	Y	

- Submersed aquatic vegetation (SAV) is fundamentally important to the ecology of Florida Bay, providing critical habitat, sequestering nutrients, stabilizing sediments and sustaining high biological productivity. The status of SAV health is an important indicator of the overall health of the bay and the progress of ecological restoration.
- Although the 10-year general trend for SAV was on an improving trajectory for several years, in recent years Florida Bay SAV has suffered through several negative impacts- a drought and hypersalinity event in 2014-15, a die-off event in 2015-16, a hurricane and two tropical storms in 2017-18 and a (resultant) large and persistent algal bloom in the central bay in 2021-2. These uncontrollable events have contributed to declining status indicators for several areas of the bay.
- Data that contributes to calculation of the SAV indicator for 2021-2022 are limited during the current reporting period due to COVID-19, research area closures and other logistical factors that prevented sampling. Data from the few sites that are available were used to make a modified, qualitative assessment of SAV status.
- Abundance and Diversity indexes show that SAV status is variable across Florida Bay. The overall cover and density of Turtlegrass (*Thalassia testudinum*), remains below levels observed prior to the die-off, and during 2021-22 showing improvement in the western bay and losses in the central bay. Two of the basins in the eastern bay maintained good status while a single site at Duck Key showed a decline in quality to fair. A single basin in the southern bay showed improvement from poor to fair. No sites in the transition zone were able to be assessed.
- Based on the limited data and prior trends in indicator status the overall bay status continues to be Fair, as does the overall trend in recovery.
- Natural weather patterns as well as enhanced restoration flows to Florida Bay during 2021-22 raised water levels in Taylor Slough and increased freshwater flows to Florida Bay which should be favorable for near-term seagrass recovery. Everglades stages were consistently higher than recent historical averages resulting in a bay salinity regime that was fresher than average. Salinities in all sectors of the bay were predominantly within the historical interquartile (25%-75%) salinity range, and well below the 25th percentile for long periods, with no evidence of hypersalinity.
- In a return to normal levels of sampling it is expected that SAV status will show some improvement based on favorable hydrologic conditions.

*Provisional assessment based on limited data.

The Florida Bay Submersed Aquatic Vegetation indicator is below the restoration target.

Juvenile Pink Shrimp Indicator


STATUS	PREVIOUSLY REPORTED WATER YEAR 2018	WATER YEAR 2021	CURRENT WATER YEAR 2022
SYSTEM-WIDE	B	B	B

Funding for system-wide sampling was suspended in WY 2012; therefore, no data were available for the system-wide assessment of the juvenile pink shrimp indicator condition at the end of WY 2022.

See the 2022 System-wide Ecological Indicators for Everglades Restoration for results in Biscayne Bay where sampling did occur.

2022 BIENNIAL REPORT

Wading Birds (Roseate Spoonbill) Indicator

STATUS	PREVIOUSLY REPORTED (WATER YEAR 2020)	(WATER YEAR 2021)	CURRENT (WATER YEAR 2022)	Movement toward restoration target over the last 10 years
SYSTEM-WIDE	R	Y	R	

- Roseate Spoonbills nesting in Florida Bay forage in the coastal mangrove zone north of the Florida Bay where they feed mostly on small (<13cm) prey fish species. This area was negatively affected by upstream water management practices that altered hydroperiods, reduced freshwater flow and made the area much more saline resulting in reduced productivity of spoonbill prey that ultimately led to major declines in nesting activity.
- Restoration activities designed to restore the proper quantity, timing and distribution through the Everglades should stabilize hydroperiods, reduce salinity, increase prey productivity and result in greater nesting success and increased nesting activity.
- The Biscayne Bay, Southeastern Everglades Ecosystem Restoration (BBSEER) and the proposed Southern Everglades Project are proposed largescale projects whose stated goals are to restore more natural flow quantities, timing and distribution to this area that should result in increased biological productivity, thereby benefiting this indicator.
- Projects that have affected this area are the C-111 Spreader Canal Western Phase, the Combined Operations Plan (COP) and the completion of the Modified Water Deliveries Project (Mod Waters). These projects appear to have had an incremental positive impact by increasing freshwater flow and lowering salinity in normal to high rainfall years but fail to ameliorate high salinity during draught years. Any changes in hydroperiod have been masked by the ongoing differential sea level rise in southern Florida.
- Overall, the spoonbill nesting metrics (number and success of nests and prey fish composition) have been hovering just below the transition from red to yellow for the last decade with the nesting metrics showing a declining trend and the prey fish metrics an increasing trend.
- In 2022 the spoonbill nesting metrics fell to the lowest point in the last decade.
- Currently spoonbills require low water to concentrate their prey and sea level rise has made such events rarer.
- The increase in the prey fish metric, however, may make prey more available without requiring these low water events. It is hoped that the proposed large-scale projects mentioned above will increase prey to such a point that spoonbills will successfully nest without requiring such low water conditions.

The Roseate Spoonbill indicator is well below the restoration target.

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For more information on the South Florida Ecosystem Restoration Program
or to view this document online, please visit EvergladesRestoration.gov