

APPENDIX A

WATER CONTROL PLAN

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Table of Contents

7	WATER CONTROL PLAN.....	7-1
7.1	General Project Purposes, Goals, Objectives, and Benefits	7-1
7.2	Project Relationships	7-3
7.3	Major Constraints	7-3
7.3.1	Protection of the Cape Sable Seaside Sparrow and Other Listed Species	7-3
7.3.2	U. S. Highway 41/Tamiami Trail South of L-29 Borrow Canal.....	7-3
7.3.3	8.5 Square Mile Area (SMA)	7-4
7.3.4	Water Supply Releases to Lower East Coast from WCAs during Low Water Conditions	7-4
7.3.5	Maintenance of Marsh Vegetation in WCAs to Prevent Wind Tides	7-5
7.3.6	WCA-2B and WCA-3B	7-5
7.3.7	WCA-3B Release Capability	7-5
7.3.8	WCA-3A Release Capability	7-5
7.3.9	S-12 Stability and Risk of Overtopping	7-6
7.3.10	Pump Station Mechanical Longevity	7-6
7.4	Operational Strategy to Meet Project Objectives	7-6
7.4.1	Achieving Natural System Goals, Objectives, and Benefits	7-7
7.4.2	Flood Risk Management.....	7-7
7.4.3	Water Quality	7-8
7.4.4	Water Conservation/Water Supply	7-10
7.4.5	Recreation.....	7-12
7.4.6	Fish and Wildlife.....	7-12
7.4.7	Navigation.....	7-14
7.4.8	Overall Plan for Water Management.....	7-14
7.5	Pre-storm/Storm Operations	7-54
7.5.1	Hurricane and Tropical Storm Regulations	7-54
7.5.2	Pre-storm / Storm / and Storm Recovery Operations for SDCS.....	7-55
7.5.3	Operations for Other than Named Events	7-58
7.6	Consistency with the Identification of Water and Reservations or Allocations for the Natural System.....	7-58
7.7	Consistency with Savings Clause and State Assurance Provisions.....	7-58
7.8	Drought Contingency Plans	7-59
7.9	Flood Emergency Action Plans	7-59
7.10	Deviation from Normal Regulation	7-59

7.10.1 Emergencies	7-60
7.10.2 Unplanned Minor Deviations	7-60
7.10.3 Planned Deviations	7-60
7.11 Rate of Release Change	7-60
7.12 Seepage Control	7-61
7.13 Aquifer Storage and Recovery System Plan	7-61
7.14 Consistency with the Adaptive Management Program and Periodic CERP Updates	7-61
7.15 Annexes	7-62
7.15.1 COP AM Uncertainty #16b (Water Quality in NESRS)	7-62
7.15.2 COP AM Uncertainty ID #12b (Tamiami Trail Flow Formula [TFFF] and Drought)	7-71

List of Tables

Table 7-1: Water Supply Deliveries Allowed when Approaching Identified Canal Stages in ENP-SDCS.	7-11
Table 7-2: TFFF coefficients and associated standard error.	7-29
Table 7-3: Operating Criteria.	7-39
Table 7-4: Pre-Storm Drawdown Targets.	7-56
Table 7-5: Pre-Storm Drawdown Sequencing.	7-57
Table 7-6: Recovery Operations.	7-57
Table 7-7: COP AM Uncertainty ID#16b (Water Quality in NESRS) management option matrix.	7-67
Table 7-8: COP AM Uncertainty ID #12b (Tamiami Trail Flow Formula and Drought) management option matrix.	7-76

List of Figures

Figure 7-1: Project Map.....	7-16
Figure 7-2: WCA-1 Map	7-18
Figure 7-3: WCA-1 Regulation Schedule.....	7-19
Figure 7-4: WCA-2A Map	7-21
Figure 7-5: WCA-2A Regulation Schedule	7-22
Figure 7-6: WCA-3A and WCA-3B Map.....	7-24
Figure 7-7: WCA-3A Regulation Schedule	7-25
Figure 7-8: S-339 and S-340 Regulation Schedule.....	7-27
Figure 7-9: ENP and ENP-SDCS Map.....	7-33
Figure 7-10: 8.5 SMA Detail Map	7-36
Figure 7-11: 8.5 SMA Hydroperiod Target and Constraint.....	7-38

Figure 7-12: Monthly count of low water closure days in WCA3 – COP Alt Q, with years when TTFF drought conditions test would be implemented indicated by heavy black outline. Design test implementable only in 1973-1974, 1989-1990, and 1990-1991. 7-73

Figure 7-13: Normalized duration curves of depths at specific gages in WCA3. a) Gage WCA3_3B_71 (top), b) WCA3_3A_28 (middle), and c) WCA3_3A-NE (lower). Curves for WCA_3_3-69 and WCA3-3 gages are similar but not shown. 7-74

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7 WATER CONTROL PLAN

This Water Control Plan (WCP) defines and describes the operational plan for the Water Conservation Areas (WCAs), Everglades National Park (ENP), and ENP-South Dade Conveyance System (SDCS) to meet all the Central and Southern Florida (C&SF) Project congressionally authorized purposes. The Central and Southern Florida Ecosystem Restoration Critical Project, Big Cypress Seminole Indian Reservation Water Conservation Plan Critical Restoration Project (SBC Project), is also represented in the System Operating Manual (SOM)-Volume 4. The SBC Project WCPs for Basin 1, 2 and 4 are not updated as part of this WCP and provided in Appendix G of SOM- Volume 4.

7.1 General Project Purposes, Goals, Objectives, and Benefits

The C&SF Project that is represented in this SOM, includes the WCAs, ENP, ENP-SDCS, and SBC Projects. The local sponsor for the SBC Project is the Seminole Tribe of Florida (STOF). The local sponsor for the remaining portions of the C&SF Project covered in this WCP is the South Florida Water Management District (SFWMD). The U.S Army Corps of Engineers (USACE) operates and maintains the main outlets for Water Conservation Areas (WCAs); (S-10A, S-10C, and S-10D in WCA-1), (S-11A, S-11B, and S-11C in WCA-2A), (S-12A, S-12B, S-12C, and S-12D in WCA-3A), and (S-355A and S-355B in WCA-3B). The local sponsors operate the remainder of the project in accordance with regulations prescribed by USACE.

The congressionally authorized project purposes for the WCAs, ENP, ENP-SDCS component of the C&SF Project include flood risk management, water supply for municipal, industrial, and agricultural uses, prevention of saltwater intrusion, water supply for ENP, protection of fish and wildlife resources, groundwater recharge, recreation, and navigation. The WCP defines water management operations for the system that are intended to meet the project purposes.

This WCP combines the 2012 WCP water management operations for WCA-1 and WCA-2 with the new water management operations for WCA-3, ENP, and ENP-SDCS that were developed in the Combined Operational Plan (COP). The COP is an integrated operational plan for two modifications of the C&SF Project – known as Modified Water Deliveries (MWD) to ENP and the Canal 111 (C-111) South Dade (SD) Projects. The purpose of the COP was to define the water management operations for the WCA-3A and WCA-3B outlets, structures in the L-31N and the C-111 basins constructed as part of the C&SF Project and the recently constructed components of the MWD to ENP and C-111 SD Projects.

The COP is the last step to implement operational changes to convey water from WCA-3A to the ENP using the constructed features of the pre-CERP Foundation projects (i.e., MWD to ENP and C-111 SD Projects). Development and implementation of the COP is the final action required before both the MWD to ENP and C-111 SD Projects can be considered complete. The COP is anticipated to be in place until construction of new CERP infrastructure, including features which would enable increased flow deliveries into the WCAs, ENP, and Florida Bay.

The COP goals, derived from the MWD to ENP and C-111 SD Projects purposes include:

1. Improve water deliveries (timing, location, volume) into ENP and take steps to restore natural hydrologic conditions in ENP given current C&SF infrastructure and features expected to be completed by the time of implementation, to the extent practicable by:
 - a. Changing schedule of water deliveries so that it fluctuates in accordance with local meteorological conditions, including providing for long term and annual variation in ecosystem conditions in the Everglades (Timing) (P.L. 101-229, Section 101b).
 - b. Restoring North East Shark River Slough (NESRS) as a functioning component of the Everglades hydrologic system (Location) (P.L. 101-229, Section 101b).
 - c. Adjusting the magnitude of water released to ENP to minimize effects of too much or too little water (Volume) (1992 MWD GDM, Section 44).
2. Maximize progress toward restoring historic hydrologic conditions in the Taylor Slough, Rocky Glades, & Eastern Panhandle of ENP.
3. Protect the intrinsic ecological values associated with WCA-3A and ENP.
4. Minimize the damaging freshwater flows to Manatee Bay/Barnes Sound through the S-197 structure and increase flows through Taylor Slough and coastal creeks (1994 C-111 GRR, Section 5.2).
5. Include consideration of cultural values and tribal interests & concerns within WCA-3A and ENP.

Water management operations at the main outlets for WCA-1, WCA-2, and WCA-3 are determined through a decision-making process that considers all the congressionally authorized project purposes for the WCAs. The decision-making process to determine quantity, timing, and duration of the potential releases from the WCAs include consideration of diverse information related to water management. This information includes but is not necessarily limited to: C&SF Project conditions, estuary conditions and projected needs (e.g., Biscayne Bay, Florida Bay), WCAs conditions and projected needs, WCA water levels, ENP conditions and projected needs, East Coast Canals (ECC) available capacity, ENP-SDCS available capacity, current climate conditions, climate forecasts, hydrologic outlooks, projected WCAs level ascension and recession rates, and water supply conditions and projected needs. This information helps address uncertainties in meeting the projects objectives due to modeling accuracy or future conditions not originally anticipated in the modeling period of record and supports a more flexible and adaptive decision-making process. If new information becomes available through implementation of the COP WCP and/or the COP Adaptive Management and Monitoring Plan (AMMP) that would necessitate a need to modify water management operations, this information will be incorporated as appropriate in accordance with laws and regulations including the National Environmental Policy Act of 1970 (NEPA).

A limited suite of CERP-related water control structures, which are currently owned and operated by SFWMD, are identified and discussed in this WCP. The SFWMD will operate state-owned structures in accordance with their Florida Department of Environmental Protection (FDEP) issued permits and any future modifications of the FDEP permits. These structures interact with the C&SF system to provide benefits consistent with the project purposes. The WCP includes the state-owned structures only to gather all pertinent operational criteria into one document.

All elevations in this document are in feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD) unless otherwise stated. This document will be updated to the North American Vertical Datum of 1988 (NAVD) upon completion of datum updates throughout the management system and monitoring program.

7.2 Project Relationships

The projects within this document are hydraulically linked to project features within adjacent WCPs, including Lake Okeechobee and Everglades Agricultural Area (EAA) (future SOM-Volume 3), and the ECC (future SOM-Volume 5). The WCAs, ENP, ENP-SDCS and adjacent regions interact together to provide for C&SF Project purposes.

7.3 Major Constraints

This subsection discusses 10 major constraints that affect water management operations throughout the project area.

7.3.1 Protection of the Cape Sable Seaside Sparrow and Other Listed Species

The operational criteria for structures; S-12A, S-12B, S-343A, S-343B, and S-332D have seasonal closures to protect the Cape Sable Seaside Sparrow (CSSS) downstream habitats. These operations are detailed in this chapter and in the USFWS Biological Opinion (BO) issued May 5, 2020, which may be accessed at the following website:

<http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/>

This updated BO relaxes the S-344 and S-332D seasonal operation restrictions, as coordinated with USFWS. The operations for these structures are detailed in **subsection 7.4.8.4**.

Successful recovery of CSSS requires continued collaborative efforts among federal, tribal, and state partnering agencies. The USACE, within its authorities, will continue to work with the USFWS to find other helpful initiatives which could be enacted by partners and stakeholders to aid in this important effort.

7.3.2 U. S. Highway 41/Tamiami Trail South of L-29 Borrow Canal

The “Contract between the United States of America and Florida Department of Transportation (FDOT) for Relocation, Rearrangement, or Alteration of Facilities Modified Water Deliveries to Everglades National Park Project (Relocation Agreement)” dated September 25, 2008, outlines the operational constraints for the L-29 Borrow Canal. The operational constraints are for the L-29 Borrow Canal, between S-333 on the west and S-334 on the east, to ensure the continued safety and stability of the roadway sub-base infrastructure along this segment of Tamiami Trail (U.S. Highway 41).

In coordination with FDOT, USACE has implemented additional constraints that are not explicitly spelled out in the Relocation Agreement. L-29 Borrow Canal may operate between 8.3 feet NGVD and 8.5 feet NGVD for up to 90 days per water year (starting on 1 May and ending on 30 April of the following year), with the opportunity to increase the duration of stages beyond 90 days based on real-time monitoring of the subbase in Tamiami Trail (U.S. Highway 41) and FDOT written approval. The Tamiami Trail (U.S. Highway 41) roadway subbase and roadway will be continuously monitored during

implementation of COP using the monitoring plan in Appendix H of the COP Environmental Impact Statement (EIS).

The requirements of the Relocation Agreement, including any subsequent amendments to this agreement between the USACE and FDOT, shall remain unchanged until full completion of Tamiami Trail Next Steps roadway construction, currently anticipated by 2024.

7.3.3 8.5 Square Mile Area (SMA)

The 8.5 SMA (Las Palmas Community) Project features are designed to mitigate for increased flood risk as a result of increased water levels in NESRS and other areas of ENP resulting from the MWD to ENP Project. The 8.5 SMA Project features are to be operated to maintain the water levels within the project area between L-357W and L-31N at pre-MWD levels and to preserve or enhance the hydro patterns of land located west of L-357W (ENP and the publicly owned natural areas), consistent with the evaluation methodology previously applied for the 2000 General Reevaluation Report and Final Supplemental Environmental Impact Statement (GRR/EIS). The hydrologic modeling and flood risk evaluations conducted to support development of the COP included application of an evaluation methodology which is consistent with evaluation metrics used for the 2000 GRR/EIS authorization. As required by the 2000 GRR/EIS Record of Decision, periodic flooding east of the proposed levee, before and after project implementation, will remain unchanged from conditions in existence prior to implementation of the MWD to ENP Project.

The combination of local conditions, including, but not limited to, proximity to NESRS, comparatively low ground surface elevations, and the high transmissivity of the surficial aquifer system, make the areas along the 8.5 SMA western boundaries challenging to maintain water levels below ground surface elevations and require real-time monitoring and modifications to water management alternatives to ensure flood mitigation success. The 8.5 SMA monitoring plan is in the AMMP (Part C.6 of Appendix C of the COP EIS, Water Quality and Hydrology Monitoring Plan for 8.5 SMA Flood Mitigation). The constructed features of the 8.5 SMA Project available for water management operations include: the canals C-357 and C-358, the 8.5 SMA Detention Area/flow way and the C-111 North Detention Area (NDA), pump stations S-357 and S-331, and structure S-357N. S-357 and S-357N provide primary flood mitigation to the residents of the 8.5 SMA, and S-331 provides secondary flood mitigation benefits only during high water conditions in NESRS. Specific structure operations for 8.5 SMA flood mitigation are detailed in **subsection 0** and **Table 7-3**.

7.3.4 Water Supply Releases to Lower East Coast from WCAs during Low Water Conditions

During low water conditions, it is difficult to draw water from the interior of the WCAs. The regulation schedules for WCA-1, WCA-2A, and WCA-3A include a "floor" or minimum water levels below which water supply releases (municipal and industrial use, agricultural irrigation, and prevention of saltwater intrusion) from these WCAs must be preceded by an equivalent volume of inflow from Lake Okeechobee and/or WCAs. The water levels in these WCAs may continue to recede due to evaporation and seepage. There is no requirement to maintain the minimum elevations. Releases from WCA-3A recommended by the TTF to ENP do not require this preceding water delivery when below the floor water level. The operational criteria for the WCAs are further defined in **subsection 7.4.8**.

7.3.5 Maintenance of Marsh Vegetation in WCAs to Prevent Wind Tides

A major factor in water management for WCA-3A is the maintenance of marsh vegetation. Prolonged high and low water levels are detrimental to the establishment and maintenance of marsh vegetation. If large areas of open water develop as a result of a loss of vegetation, risk of potential hurricane-induced wind tides increases. In Part I, Supplement 33 GDM for WCA-3 (1960), it was noted that one of the factors for establishing the regulation schedule and levee heights was the retention of marsh vegetation that would prevent large wind tides and waves from developing during hurricanes. It was determined through the GDM analysis that a marsh vegetation that could prevent wind tides could be retained with a seasonal regulation schedule varying between 9.0 to 11.0 feet NGVD. After consideration of other factors such as water supply and fish and wildlife resources, a seasonal regulation schedule varying from 9.5 to 10.5 feet NGVD was selected. The regulation schedule varies from high stages in the winter (dry season) to low stages in the beginning of the summer (wet season). Based on the assumption of marsh vegetation preventing wind tides, the levee design criteria in the GDM was to provide two and a half feet of freeboard above the Standard Project Flood (SPF) profile, and about four feet above the period of record stage at that time.

7.3.6 WCA-2B and WCA-3B

Regulation schedules are not used for WCA-2B and WCA-3B due to high rates of seepage from these areas. However, releases from WCA-2A and WCA-3A to WCA-2B and WCA-3B, respectively, can be made. The southeast corner of WCA-3B has a very high transmissivity rate that results in significant accumulation of water in the L-30 Borrow Canal. S-338 may not always be capable of routing WCA-3A releases and seepage from WCA-3B to tide due to structure capacity limitations and downstream-conditions.

7.3.7 WCA-3B Release Capability

The outlet for WCA-3B was originally S-12E. However, S-12E never functioned as intended due to tailwater conditions which were higher than designed. Subsequent construction of the ENP-SDCS has made S-12E a non-functional structure; the gates have been removed and a steel plate has been welded to it to prevent flow through the structure. The G-69 structure was also removed in 2007 as the function of that structure was tied to the L-67 pilot test. The currently available release routes from WCA-3B are: 1) to tide through S-31 and S-26 via C-6) (Miami Canal) , 2) to ENP through S-355A and S-355B into the L-29 Borrow Canal, and 3) to the L 31N through S-337 and S-335. The original design release capability from WCA-3B (through the S-355A, S-355B, S-31, and S-337) is approximately 3,305 cfs. Water levels in the L-29 Borrow Canal influence the S-355A and S-355B tailwater and have the potential to prevent or limit release capacity from the S-355s.

7.3.8 WCA-3A Release Capability

The S-12s are not capable of achieving the original design capacity of 32,000 cfs. Outlet capacity of the S-12s has either reduced over time or was never as large as assumed for the original design routings. The topography adjacent to the S-12s results in very little head differential across the structures under normal water levels. There has been a change in the discharge rating curves for the S-12s over time. The U.S. Geological Survey (USGS) periodically updates the discharge rating curve for each of the S-12s. Experience has shown that actual S-12 releases have been about forty percent less than the design rating curves. The most recent discharge rating curve available should be used for determination of S-12s' release capability.

The original design headwater of the S-12s was 12.4 feet and the peak average elevation for WCA-3A under the SPF event was 13.90 feet (C&SF Part I, Supplement 33). This stage level is reached only one time in the 41-year period of record of simulated COP operations, and the median value of the nearest gage A3-28 (Site 65) (USGS Site ID: 254848080432001) is approximately 9.0 feet NGVD. The result is that the S-12 structures are very rarely operating near their design criteria, and generally the system will be operated in a manner where the S-12s will very rarely demonstrate flows near their design capacity. The as-built crest elevation of the L-29 Borrow Canal and crown elevation of Tamiami Trail (U.S. Highway 41) in the S-12A to S-12D reach has been established to protect against the risk of overtopping from an adjacent flood of elevation 11.5 feet NGVD (corresponds to WCA-3A three gage average stage of 12.45 feet, based on historical regression). See **subsection 7.3.9** for further information.

7.3.9 S-12 Stability and Risk of Overtopping

The stability analysis conducted during design of the S-12s is predicated on a maximum design headwater elevation of 12.4 feet with the differential head across the structure limited to 5.5 feet. The as-built crest elevation of L-29 and crown elevation of Tamiami Trail (U.S Highway 41) in the S-12A to S-12D reach has been established to protect against the risk of overtopping from an adjacent flood stage of 12.4 feet NGVD. The exceedance of these design conditions should be considered an immediate increase in risk to levee stability and would require decisive and prescribed measures to reduce the WCA-3A stage. In addition, application of the FDOT road base impact criteria to this reach of Tamiami Trail (U.S. Highway 41) (estimated crown elevation of 14.95 feet) would result in a not to exceed regulated water stage of approximately elevation of 11.5 feet, adjacent to the roadbed (corresponds to WCA-3A three gage average stage of 12.45 feet, based on historical regression).

The top of the gates at the S-12s (A/B/C/D) is 11.0 feet NGVD. When the S-12s headwater approaches this level, the S-12s may be opened an amount only to prevent water from overtopping the structure gates to protect gate instrumentation.

7.3.10 Pump Station Mechanical Longevity

The mechanical longevity of an individual pump unit can be affected by numerous conditions, some of which are addressed in the pump manufacturer's Operation and Maintenance Manual(s). Other factors affecting pump station longevity have been realized through the experience of site-specific conditions at the pump station location and these factors are addressed through specific procedures at the pump station. Individual pump units at pump stations will be operated to avoid conditions that could lead to mechanical breakdowns of the pump units. This includes, but is not limited to, avoiding repeated cycling of pumps units between "On" and "Off", rotating the use of pump units from different pump stations that service the same body of water, and engaging the use of individual pump units of a pump station or pump stations that service the same body of water in a staggered manner including when it is prior to "On" criteria occurring. The pump station operator should establish specific procedures to maximize pump unit availability.

7.4 Operational Strategy to Meet Project Objectives

The complexity of water management operations is a clear consequence of the multiple, varied, and sometimes-conflicting goals for the regional system (e.g., flood risk management, water supply, environment, navigation). Day-to-day water management operations for the structures within the WCAs and ENP-SDCS will necessitate the use of operating criteria and other related information

contained within this WCP and SOM. The WCP and the SOM Structure Descriptions and Rating Curves (Appendix A of the SOM) contain a compilation of water control criteria, guidelines, diagrams, and specifications that govern the release functions of the pertinent structure(s) for the congressionally authorized project purposes. In general, they indicate controlling or limiting rates of release, levels, and storage space required for the project purposes.

7.4.1 Achieving Natural System Goals, Objectives, and Benefits

Normal operations are expected to achieve the goals and objectives for the system which are detailed above in **subsection 7.1** and as recorded in the COP EIS (until superseded by any future EIS or EA). This section first discusses the individual operational considerations and project objectives and then concludes with the system operational criteria. The operational criteria and overall strategy for the water management operations are expected to accomplish the goals of the C&SF system and COP. As future projects are developed and installed, these changes should interact with the existing system in order to accomplish the restoration goals of the larger C&SF Project.

7.4.2 Flood Risk Management

During high water events, water is passed southward from WCA-1 into WCA-2A; from WCA-2A into WCA-3A; and from WCA-3A into ENP and/or the ENP-SDCS. The water control structures typically pass the water from north to south to allow for a smooth articulation of water through the WCAs and into ENP and/or ENP-SDCS. Releases from the WCAs to tide via ECC can also be made. When the ECC are full, discharging water eastward from the WCAs could cause or aggravate local flooding. This is also possible if the ECC are being utilized for release to tide from the WCAs and a significant rainfall event over the ECC occurs. Therefore, water from the WCAs can only be released to tide via the ECC when rainfall over adjacent areas has not produced large amounts of runoff and canal capacity exists (SOM Volume 5 details the ECC). The release capacity to tide through the structures that connect the WCAs to the coastal canal system is often relatively small compared to the primary structures (e.g., S-10s, S-11s, and S-12s) so favorable conditions for an extended period are required to make meaningful releases through the coastal structures. For example, in WCA-1, S-39 has a design capacity of approximately five percent of that of a single S-10 structure.

7.4.2.1 Water Conservation Areas

The WCAs collect floodwaters which historically flowed from north to south across the broad flat peninsula and the east coast protection levee, along the WCAs eastern boundaries, prevent floodwaters from flowing into the areas that are now developed along the southeast coast of Florida. Levees L-40, L-36, L-35A, L-35, L-37, L-33, L-30, L-31N, and L-31W form the east coast protection levee. The WCAs regulation schedules all have a flood risk management zone that maximize releases out of the WCAs to limit and reduce levee safety concerns.

The S-10, S-11, and S-12 spillways were sized to pass the SPF. The basic purpose of these spillways is to provide a means of controlling flow and providing conveyance for all flood releases up to the Spillway Design Flood (SDF). Rapid removal of flood storage in the WCAs is limited due to the slow movement of water in the densely vegetated WCAs, relative to the potentially high rates of inflows that come from upstream structures combined with rainfall. The relatively flat terrain and dense vegetation often lead to sloping pool conditions in the WCAs and backwater effects. When conditions in the coastal canals permit, some additional releases to tide can be made by SFWMD from the WCAs.

The USACE is currently nearing completion of an updated WCA flood routing analysis study, the Baseline and Modification Model (BAMM). The intent of the BAMM study is to identify and quantify the cumulative changes to design stage and flow conditions within the WCA system (WCA-1, WCA-2, and WCA-3) due to infrastructure and operational changes that have occurred since the originally authorized C&SF design. The BAMM effort includes development of a new regional flood routing model and model simulations of SPF hydraulic routings for each of the WCAs. The BAMM flood routing results will be used by the USACE to conduct comprehensive risk analysis of levees and structures within the WCAs, including hydraulic, hydrological, geotechnical, and structural engineering, if results warrant. The USACE will evaluate any substantial WCA design deficiencies and determine the resulting path forward based on human health and safety and other C&SF Project requirements.

7.4.2.2 ENP-South Dade Conveyance System

The C&SF Project features in South Miami-Dade County maintain optimum stages for the purposes of flood risk management, water supply, reducing seepage from ENP, groundwater recharge, and prevention of saltwater intrusion. The C-111 SD structures (S-196, S-194, S-176, S-177, S-18C, and S-197) were designed to pass 40 percent of the SPF without exceeding design stages, and to control releases during floods in excess of design to prevent damaging velocities at the structures and in the canal. June 2020

7.4.2.3 Lake Okeechobee and the Everglades Agricultural Area

Releases can be made from Lake Okeechobee and the EAA to the WCAs. To maintain EAA canal levels, EAA canal water is typically pumped into STAs prior to delivery to the WCAs. For more detailed discussion, refer to Master Water Control Manual (MWCM) Volume 3, Lake Okeechobee and Everglades Agricultural Area. (future SOM Volume 3)

7.4.3 Water Quality

The State of Florida is responsible for regulating water quality and is responsible for achieving state water quality standards. USACE is responsible for developing water control plans for operation of the C&SF system. SFWMD, acting on behalf of the state, may petition the USACE for operational changes within the C&SF system where it sees that water quality benefits may be achieved in the project area. USACE considers such requests and whether they interfere with achievement of the congressionally authorized project purposes.

The consent decree in *United States v. South Florida Water Management District*, Case No. 88-1886-Civ-Moreno (“Consent Decree”), a 1988 lawsuit the United States filed against the State of Florida, commits the State to taking such action as is necessary so that waters delivered to the ENP and Loxahatchee National Wildlife Refuge (LNWR or WCA-1) achieve state water quality standards. The Federal (USACE, ENP, and LNWR) and State parties (SFWMD and FDEP) agreed that the actions set forth in the Consent Decree were necessary to halt or prevent imbalances in natural populations of aquatic flora and fauna and other water quality violations in ENP and LNWR. The Consent Decree is still being implemented and its requirements, among other things, include State construction and operation of Stormwater Treatment Areas (STA). The State constructed STA-1W, STA-2, STA-3/4, and STA-5/6 and USACE constructed STA-1E. The State is operating all 5 STAs.

The consent decree provides for a Technical Oversight Committee (TOC), with a representative from each settling party, to make technically based recommendations concerning research, monitoring,

and Consent Decree compliance. The TOC regularly discusses the status of compliance and potential causes when there are exceedances of consent decree limitations.

Appendix A of the Consent Decree sets flow dependent limits on total phosphorus for water released into ENP Shark River Slough (SRS). Generally, increased water flows across Tamiami Trail results in a lower allowable phosphorus concentration limit. The Long-Term Limit for ENP Shark River Slough has a fixed lower total phosphorus concentrations limit (7.6 ppb annual flow-weighted mean - FWM) and does not prevent or limit flows that exceed base period flows as observed in Appendix A.

Since the Parties entered into the Consent Decree, there have been water quality concerns associated with flows to the Everglades Protection Area which includes ENP, LNWR and the WCAs. The SFWMD, FDEP, and the Environmental Protection Agency (EPA) engaged in technical discussions starting in 2010. In 2012, the State committed to a suite of additional water quality projects, known as Restoration Strategies, to address then existing flows to the Everglades Protection Area and work in conjunction with the STAs constructed under the Consent Decree to meet the Water Quality Based Effluent Limit (WQBEL) established for the STAs. The WQBEL and Restoration Strategies were incorporated into the Clean Water Act National Pollutant Discharge Elimination System (NPDES) permit and associated State Consent Order, which were endorsed by EPA. Work on Restoration Strategies began immediately, and that work is scheduled, pursuant to the NPDES permit and Consent Order, to be completed and fully operational by the end of 2025. Based upon current and best available technical information, the State, USACE and its federal partners believe at this time that the State Restoration Strategies, implemented in accordance with the NPDES permit and Consent Order along with the STAs constructed under the Consent Decree, will be sufficient and are anticipated to achieve water quality requirements for existing flows to the Everglades Protection Area. In the interim, the upstream pollution control remedies being implemented under State law, the Consent Decree STAs, and constructed components of Restoration Strategies are making significant progress in reducing phosphorus levels entering the Everglades Protection Area. Based on the State of Florida's current implementation schedule for Restoration Strategies, confirmation of attainment of the WQBEL for inflows to the Everglades Protection Area will require up to five years of monitoring after the features are fully functional in 2025.

COP represents a significant step in changing C&SF operations to redistribute flows and increase water volume to ENP above existing flows. COP has been formulated and evaluated based on the existing inflows to the Everglades Protection Area, consistent with the assumptions used for the development of Restoration Strategies.

The USACE and its Federal and State partners recognize that achieving long-term hydrologic improvement may temporarily impact water quality, particularly as measured by the current Consent Decree, Appendix A, compliance methodology. Because COP will significantly alter the timing and distribution of flows into ENP, while also increasing the volume of water delivered to SRS, the Federal parties conducted a water quality evaluation to assess the effect of COP on compliance with Appendix A. That analysis shows that COP has the potential in the near term to result in more frequent exceedances of the Appendix A limits due to the following: 1) the redistribution of flows from west to east across Tamiami Trail; 2) higher flow volumes across Tamiami Trail into ENP, an increase from 571k to 733k acre-feet average annual flows (a 28% increase), that will result in lower Appendix A limits; and/or 3) increased volume and duration of flows during low-stage water deliveries through the S-333 and S-12D to SRS, when localized higher phosphorus concentration water predominates. The potential water quality impacts associated with COP are directly influenced by the quality of water

delivered to the upstream areas (WCA-3A) and low water conditions in WCA-3A. Restoration Strategies are expected to address the upstream water quality concerns associated with the nutrient levels in the water delivered to WCA-3A. Components of the CERP Central Everglades Planning Project (CEPP) project (including plugs along the Miami canal, the Blue Shanty flow way, and distributed inflow points at the northern boundary of WCA-3A from the EAA basin) are expected to improve sheet flow and reduce dry out conditions in WCA-3A. Once Restoration Strategies are fully implemented, the WQBEL is achieved, and the CEPP features are completed, the increased flows expected to be delivered to the NESRS should not result in any increased potential for violations of Appendix A.

Consistent with the authorizing legislation for the MWD to ENP and C-111 SD Projects, the COP formulation goals and objectives prioritized restoration of natural hydrologic conditions in ENP over other identified planning considerations, including water quality. To address the potential near-term water quality concerns associated with the increased COP flows to NESRS the multi-agency water quality sub-team evaluated potential water quality mitigation strategies by leveraging sensitivity modeling simulations. Based on review of the modeling results, the analysis conducted by this team found that through the application of water quality adaptive management strategies, water quality could be improved relative to the No Action baseline. The COP AMMP (Appendix C of the COP EIS) developed strategies to help improve water quality delivered to ENP from WCA-3A, however, these strategies may reduce the quantity of water delivered to ENP for a limited duration. These AMMP water quality strategies are also detailed as Annex in **subsection 7.15.1**. Recommendations from the water quality team will be presented to the periodic scientist meeting for WCA-3A prior to implementation of these water quality strategies. USACE shall make the operational decision whether to implement the water quality strategies in consideration of water quality and all the congressionally authorized project purposes.

Many of the water quality concepts outlined in CEPP may also be considered during the implementation and operation of COP. In an effort to address these potential impacts and determine updates to Appendix A to reflect increased inflows into ENP since the Consent Decree was entered, the parties to the Consent Decree have established a process and scope for evaluating and identifying necessary revisions to the Appendix A compliance methodology utilizing the scientific expertise of the TOC. The TOC may consider all relevant data, including the 20 years of data collected since Appendix A was implemented. Ultimately, such evaluations and changes to the Appendix A compliance methodology would be recommended by the Consent Decree's TOC for potential agreement by all parties.

7.4.4 Water Conservation/Water Supply

One of the objectives of the C&SF Project is to retain enough water in storage to meet water supply needs of the project area including municipal and industrial uses, agricultural supplemental irrigation, and prevention of saltwater intrusion. The WCAs can function to store water from rainfall events which may later be released when additional water is needed in the developed areas. At times, water supply releases are also made from the WCAs to the EAA. When there is insufficient water available in the WCAs and sufficient water is available in Lake Okeechobee, water may be transferred from Lake Okeechobee through the WCAs to meet water supply needs.

SFWMD moves water from WCAs into regional canal system to maintain canal stages, which provides recharge to the aquifer for existing legal uses and other beneficial uses. Some of the beneficial uses that have been identified specifically in legislation or later approved plans are water supply for

municipal and industrial use, agricultural irrigation, ENP, and for salinity control and dilution of pollutants in project canals. SFWMD's Water Supply Plans can be found using the following link:

<https://www.sfwmd.gov/portal/page/portal/xweb%20-%20release%203%20water%20supply/water%20supply%20planning>

The surficial aquifer system provides water for six water use categories established by the FDEP (public water supply, domestic self-supply, industrial, and power generation water supply, agricultural and landscape irrigation) along the southeast coast. The surficial aquifer system, including the water table and Biscayne aquifers, underlies approximately 3,000 square miles of Miami-Dade, Broward, and southern Palm Beach counties. It is a surficial, highly permeable, wedge-shaped aquifer that is approximately 200 feet thick at the coast but thins to a few feet thick near its western boundary 35 to 40 miles inland. Seepage and water supply releases from the WCAs prevent saltwater intrusion along the coast and recharge the surficial aquifer system. Due to the high degree of connectivity between the surficial aquifer system and surface water, changes in surface water elevations have a direct impact on groundwater levels and saline water intrusion.

7.4.4.1 Water Supply Operations to the Lower East Coast

In the Lower East Coast, low coastal elevations over highly porous formations, combined with extensive groundwater use, require critical management of surface and groundwater levels to control saltwater intrusion. SFWMD can make water supply releases to the east coast to prevent saltwater intrusion and recharge the surficial aquifer system from the WCA's when sufficient water is available in the WCA's and/or Lake Okeechobee through S-5A(S), S-39, S-38, S-143, S 141, S-142, S-34E, S-31, S-337, S-151, S-333, and S-334. Inland movement of saltwater in tidal canals and streams is basically a function of the relative densities of freshwater and saltwater, the rates of freshwater release, and tidal action. The coastal spillways prevent a saltwater wedge from moving up the canals and maintain a sufficient freshwater head to prevent saltwater intrusion in the aquifer. In order to prevent saltwater intrusion and meet water supply demands in the ENP-SDCS south of S-331, water supply deliveries typically begin when the water levels fall below the stages listed in **Table 7-1**. These stages are not meant to be maintained at these levels because even with water supply deliveries, the water levels in the canals usually decline considerably below these stages. For additional operating criteria, refer to **subsection 7.4.8**. It is anticipated that water supply deliveries to the SDCS will not be needed when S-356 is pumping. If S-356 is pumping and S-334 and/or S-335 are to be utilized to deliver water supply to ENP-SDCS, then S-356 will stop pumping.

Table 7-1: Water Supply Deliveries Allowed when Approaching Identified Canal Stages in ENP-SDCS.

Canal	Reach	Elevation (feet NGVD)
Levee 31N Borrow Canal	S-331/S-173 to S-176	4.0
Canal 111	S-176 to S-177	3.0
Canal 111	S-177 to S-18C	2.0
Canal 111	S-18C to S-197	1.0

7.4.4.2 Water Supply Operations to ENP

One of the objectives of the C&SF Project is to improve water supply deliveries to ENP. The WCAs function to store water from rainfall events which may later be released when additional water is

needed in ENP as identified by the Tamiami Trail Flow Formula (TTFF) and/or routing water towards Taylor Slough. See **subsections 7.4.8.1.3.1** and **7.4.8.2.2**, respectively.

7.4.5 Recreation

Recreation is an authorized project purpose for the C&SF Project. WCA-1 is designated as the Arthur R. Marshall LNWR. WCA-2 and WCA-3 together compose the Everglades and Francis S. Taylor Wildlife Management Area (EWMA), which are managed by Florida Fish and Wildlife Conservation Commission (FWC). There are abundant recreational facilities within the project area, both private and public. The Greater Everglades, which includes ENP, the EWMA, and LNWR provide opportunities for sightseeing, wildlife viewing, photography, hiking, bicycling, boat touring, boating, kayaking, canoeing, camping, fishing, and hunting. ENP receives over a million visitors per year, as does the EWMA, while LNWR receives about 400,000 visitors annually. Recreation in these areas increases tourist activity and provides economic benefits to the communities within and surrounding the area.

Recreation is considered in the decision-making process and may influence water management operations on rare occasions. When water levels are too high or too low, FWC issues recreational closures. When the average of the Site 62 (gage 3-2/"Deer gage") (USGS ID: 261023080443001) and Site 63 (gage A-3)(USGS Site ID: 261117080315201) gages is 9.30 feet NGVD, water stages are on average 1.0 feet below the ground surface over approximately 25% of WCA-3A North. At or below this water level, the risk of muck fires is increased and FWC will close the area to public access. Muck fires burn the soil and can cause extensive damage, in particular the loss of tree islands that provide critical upland habitat for wildlife species. If the water levels reach the criteria for FWC to close the area to public access, then the same water levels (9.30 feet NGVD average of Site 62/63 gages) will be utilized to recommend re-opening the area. However, since the Site 62 and Site 63 gages are approximately 5 miles south of the WMAs and may not reflect actual conditions near the L-5 levee, where most off-road vehicle activity occurs, FWC will assess field conditions prior to re-opening the area. When the average of the Site 62 and Site 63 gages is ≥ 11.60 feet NGVD, essential wildlife behaviors are disrupted, recreation is impacted, and public access may be limited by FWC Executive Order. These closures are further detailed in **subsections 7.4.6.2** and **7.4.8.1.3**, respectively.

7.4.6 Fish and Wildlife

Preservation of fish and wildlife is an authorized project purpose. The WCAs are public hunting and fishing areas and provide exceptional opportunities for high quality wildlife-dependent recreation. Florida Bay and the Gulf Coast region of ENP also provide excellent fishing opportunities. The effects of the regulation schedules on fish, wildlife, and vegetation in the WCAs were and are important considerations in determining seasonal water levels along with recession and ascension rates. The regulation schedules for WCA-1, WCA-2A, and WCA-3A include a "floor" elevation; these are minimum levels that were established to help reduce adverse impacts on fish and wildlife resources. The WCAs also preserve an Everglades wetland environment interspersed with tree islands that provide important habitat for a diversity of plant and wildlife species. These tree islands habitats can be adversely affected by prolonged high and low water conditions.

7.4.6.1 Protected Species and Their Habitat

Forty-five federally listed threatened and endangered species are either known to exist or potentially exist within the Everglades (WCAs, ENP, coastal areas) including the Florida panther, Florida manatee, smalltoothed sawfish, Cape Sable Seaside Sparrow, Everglade snail kite, wood stork, American

alligator, American crocodile, and Eastern indigo snake. In addition, designated critical habitat also occurs in the area including: marl prairie areas in ENP and the East Everglades for the CSSS; all of WCA-3A, all of WCA-1, and portions of SRS for the Everglade snail kite; coastal areas along Florida Bay for the American crocodile; and coastal areas around ENP for the Florida manatee.

State-listed species in the Everglades include the Big Cypress fox squirrel, Everglades mink, Florida sandhill crane, little blue heron, reddish egret, roseate spoonbill, Southeastern American kestrel, and tricolored heron. The Everglades contain some of the largest and most important wading bird colonies in North America. The EWMA provides numerous and abundant nesting opportunities for Florida's wading birds; the Alley North colony in WCA-3A is often the largest colony in the Greater Everglades.

USACE reinitiated Endangered Species Act (ESA) consultation on Everglades Restoration Transition Plan (ERTP) in November 2014, as a result of an exceedance of an Incidental Take Re-initiation Trigger from the November 2010, ERTP Biological Opinion (BO) for the Cape Sable Seaside Sparrow (CSSS). USFWS issued a new BO for ERTP in July 2016, developed in formal ESA consultation with the USACE. As a result of this consultation, USFWS determined that current conditions within CSSS habitat threatened the survival of the CSSS, and as a result, USFWS issued a "jeopardy" BO which explained that unless alternatives to current water operational practices (which then included the 2012 WCP) were explored and implemented, continued implementation of ERTP was likely to jeopardize the continued existence of the CSSS. The revised BO, issued in July 2016, presented a Reasonable and Prudent Alternative (RPA) that would avoid jeopardizing the CSSS. The RPA identified operational modifications and proposed expediting restoration initiatives for some of the structures in the southern portion of the Everglades ecosystem to provide suitable nesting habitat for the endangered CSSS.

The 2016 ERTP BO also acknowledged the efforts to increase flows into NESRS under the MWD to ENP Project and required USACE to implement the COP in 2019. The USFWS and USACE have agreed to amend the BO to reflect the revised anticipated date for COP, currently August 2020.

Formal consultation for COP began with submittal of a Biological Assessment to the USFWS in December 2019 and a BO for COP was received from USFWS on May 5, 2020. The updated operational constraints retain the seasonal closures at S-343A, S-343B, S-12A, and S-12B but relax the seasonal operation restrictions at S-344 and S-332D compared to the 2016 RPA. The operations for these structures are detailed in **subsection 7.4.8.4**.

The BO issued May 5, 2020, may be accessed at this website:

<https://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/>

7.4.6.2 Terrestrial Wildlife

Terrestrial wildlife, such as deer, marsh rabbits, bobcats, and raccoons, are native and common within the WCAs. During periods of high-water levels, resident deer and other terrestrial mammals in the WCAs can be negatively impacted to the point of population reduction.

When water levels in WCA-3A exceed the FWC high water criterion (when the combined average of the Site 62 and Site 63 gages is greater than 11.60 feet NGVD), and impacts to wildlife are imminent, essential wildlife behaviors are disrupted, recreation is impacted, and public access may be limited by FWC Executive Order. Prolonged high-water levels pose an increasing threat to state and federally

listed species; high water conditions that last longer than 60 days are detrimental to wildlife health and habitats, and can have long-lasting impacts.

When water levels exceed the FWC high water criterion and impacts are imminent, FWC Commissioners or the Office of the Executive Director may call an Emergency High Water Meeting. USACE, USFWS, Department of the Interior (DOI), SFWMD, FDEP, Florida Department of Agriculture and Consumer Services (FDACS), STOF, and the Miccosukee Tribe of Indians of Florida (MTIF) may be invited to attend in order to share information, assess the status of the regional water management system, and develop management strategies and options for relief from high water conditions that create deleterious ecological conditions.

7.4.7 Navigation

While the C&SF project is authorized for navigation, there are no authorized project features for navigation within this SOM; however, recreational boating in ENP and the WCAs and associated project canals is very popular. The minimum stages for the conservation pools in the WCAs help reduce adverse impacts on recreational boating during drought periods.

7.4.7.1 Access to Cultural Areas Downstream of S-12A

To provide the MTIF boat access to cultural and religious areas, the MTIF may request S-12A releases up to 100 cfs during periods of time when the structure would have otherwise remained closed (1 October to 14 July). The USACE must request consultation with USFWS to avoid impacts on CSSS subpopulation A. The duration of this release would not exceed five consecutive days. The initial release would be managed as a field test to determine any potential effects associated with the release on CSSS subpopulation A. If no adverse impacts occur, subsequent releases would be coordinated and monitored appropriately.

During the decision-making process to determine whether to implement the request from the MTIF hydro-meteorological data such as, but not limited to, water levels at gage NP-205, rainfall, and rainfall forecasts will be utilized. Other pertinent details related to this decision-making process are in the USFWS BO for COP:

<https://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents>

During implementation of the S-12A up to 100 cfs release for access to MTIF cultural areas, relevant environmental data will be monitored. If NP-205 stage is observed to increase or anticipated to increase above 5.7 feet NGVD, S-12A will be closed. Water levels at gage SPARO, located between S-12A and NP-205, also provides additional insight into the effectiveness of S-12A releases for providing access to cultural areas while still avoiding impacts on CSSS subpopulation A.

7.4.8 Overall Plan for Water Management

This section defines and describes the day-to-day operating criteria and other information for the WCAs, ENP, and ENP-SDCS features to meet all the C&SF Project congressionally authorized purposes.

7.4.8.1 Water Conservation Areas

The WCAs, located south and east of the EAA and west of the urbanized East Coast, comprise an area of about 1,350 square miles (approximately 864,000 acres) (see **Figure 7-1**). The WCAs make up a large portion of the original Everglades. Surface water inflows from the EAA typically enter these areas following treatment from one of the STAs. Flow across the WCAs is generally slow due to flat slopes and relatively dense vegetative cover. The flat ground slopes and dense vegetation often lead to sloping pool conditions as water traverses in general from north to south through the WCAs. The topography and interior canals are slightly different in each WCA resulting in slightly different responses. For example, within WCA-1 the sloping condition can be a bit more extreme as there is a perimeter canal inside the perimeter levees that surround the natural area. During dry periods there is a separation from the canals to the marsh with the marsh being higher as it slowly drains to the perimeter canal. During periods of high discharges into WCA-1 the canal stage can get higher than the marsh and thus push water into the interior areas of the marsh. In WCA-2A and WCA-3A there can be a separation between the marsh and canal systems adjacent to the structures as the water is discharged from the areas as well as when water levels recede during dry conditions.

An interior levee across the southern portion of WCA-2 subdivides it into WCA-2A and WCA-2B. This levee reduces water losses due to seepage into the extremely porous aquifer that underlies WCA-2B, and obviates the need to raise existing levees to the grade needed to provide protection against wind tides and wave run-up. Two interior levees, L-67A and L-67C run diagonally from pump station S-9 in a southwest direction to S-333 subdividing WCA-3 into WCA-3A and 3B. These levees reduce water losses due to seepage into the porous aquifer that underlies WCA-3B.

Regulation schedules contain instructions and guidance on how project water management structures are to be operated to maintain water levels in the WCAs. The regulation schedule prescribes the seasonal and monthly limits of storage which guides project regulation for the planned purposes. The regulation schedules vary from high stages in the late fall and winter to low stages at the beginning of the wet season. This seasonal range permits the storage of rainfall and runoff during the wet season for use during the dry season. In addition, it serves to maintain and preserve the vegetative regime including tree islands in the WCAs, which are essential to fish and wildlife and the prevention of wind tides. Regulation schedules must consider the various and sometimes-conflicting project purposes.

Conceptually, reservoir storage is commonly divided into the inactive zone, the conservation zone, and the flood risk management zone. The distribution of water between the flood risk management and conservation zones varies seasonally in the WCA's. The regulation schedules for WCA-1, WCA-2A, and WCA-3A include a "floor" or minimum water levels (14.0 feet, 10.5 feet, and 7.5 feet NGVD respectively) below which water supply releases (for municipal and industrial use, agricultural irrigation and prevention of saltwater intrusion) from these WCAs must be preceded by an equivalent volume of inflow from Lake Okeechobee and/or WCAs. For example, in WCA-3A, if the water level measured at the Site 3-69W gage fell below 7.5 feet NGVD, water could be transferred from Lake Okeechobee and/or WCA-2A through WCA-3A to meet downstream water supply demands. The water levels in these WCAs may continue to recede due to evaporation and seepage. There is no requirement to maintain the minimum elevations. Releases from WCA-3A recommended by the TTF to ENP do not require this preceding water delivery when below the floor water level.

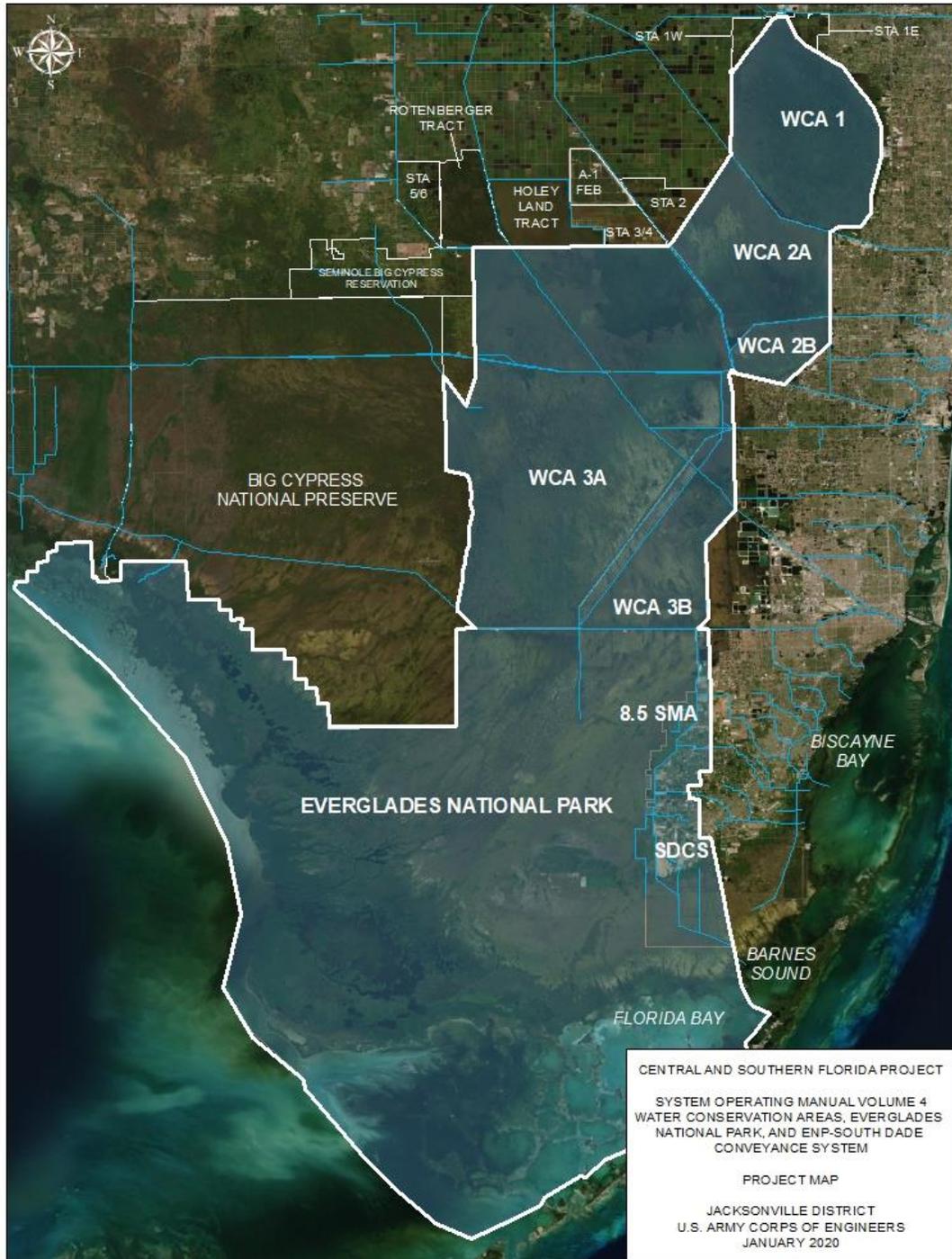


Figure 7-1: Project Map.

7.4.8.1.1 Water Conservation Area 1

WCA-1 resides within the Arthur R. Marshall LNWR (see **Figure 7-2**) boundary which has an area of 221 square miles and is completely contained by L-7, L-40, and L-39. Inflows to the area were previously controlled by pump stations S-5A and S-6 (until 2000 when S-6 pump station flows were routed south for treatment in STA-2 and then released to WCA-2A). These pump stations are designed

to remove 3/4 of an inch of agricultural area runoff from their tributary drainage area per day. S-5A pumps water from the West Palm Beach Canal (C-51) and has a design capacity of 4,800 cfs. S-319 also pumps water from the West Palm Beach Canal with a design capacity of 3,980 cfs to provide flood risk management to the C-51W Basin. WCA-1 inflows (S-5A and S-319) are directed through STA-1E and STA-1W whose releases are now the primary inflows to WCA-1. Releases from STA-1E are through S-362 and G-311. G-311 is designed to pass flows both directions so that S-319 flows could be diverted to STA-1W or through G-300/G-301 to WCA-1. Releases from STA-1W are through G-310 and G-251 into WCA-1. If the STAs cannot handle additional inflow, then untreated water from G-300, G-301, G-338 (SFWMD owned and operated structures) and S-6 may be diverted directly to WCA-1.

WCA-1 is regulated primarily by the S-10s, which consists of three spillways; S-10A, S-10C, and S-10D. The design capacity of the S-10s is 14,800 cfs under SPF stages. Water can also be released to the east into the Hillsboro Canal via S-39. This is a single bay gated spillway with a design capacity of 800 cfs. S-5AS can be used to release water from WCA-1, by way of G-300 and G-301, to the L-8 Borrow Canal and the West Palm Beach Canal and upon coordination between SFWMD and the Lake Worth Drainage District, G-94A and G-94C may be used to release up to 200 cfs to the Lake Worth Drainage District system.

The WCA-1 regulation schedule is shown in **Figure 7-3**. From 1 January through 30 June the indicator water level gage for regulation is 1-8 Canal (1-8C) (USGS Site ID: 263000080120001). During 1 July through 31 December the 1-8C gage is used as the indicator gage, except during rising stages when the 1-8C stage exceeds the average of the interior gages, 1-7 (USGS Site ID: 263180080205001), 1-8T (USGS Site ID: 263050080145001), and 1-9 (USGS Site ID: 262750080175001). In that case, the average interior stage (gages 1-7, 1-8T, 1-9) is used as the indicator stage. The S-10s have no required minimum low flow release. The regulation schedule is intended to produce favorable conditions for wetland fish and wildlife resources, including species listed under provisions of the ESA. This regulation schedule was put into effect to achieve the benefits of allowing higher water levels during wet years in the northern portion of the LNWR; increase the hydroperiod of interior marshes of the LNWR such that dry-out does not occur on an annual basis; increase the proportion of the interior marsh of the LNWR that serves as nursery areas for aquatic organisms; improve the timing of winter stage drawdown in the LNWR to benefit wading birds; restore conditions in the LNWR similar to those found when the areas were used by snail kites for nesting; and allow for the storage of a greater quantity of water within the C&SF system during wet and normal rainfall years.

The fourth and current WCA-1 regulation schedule was implemented in May 1995. In this schedule Zone A1 (15.75-17.5 feet NGVD) is the flood risk management zone from 1 January through 30 June. In Zone A1, releases are made up to maximum capacity at the S-10s and up to maximum capacity at S-39 when agreed between USACE and SFWMD water managers and documented by e-mail, meeting minutes or some other form of written communication. From 1 July through 31 December, attempts are to be made to maintain water levels within Zone A2 of the regulation schedule. In Zone A2, S-10 releases are based on weather forecasts and water level trends and water supply releases are made as needed. In Zone B (14.0 feet NGVD to 17.0 feet NGVD), the water supply zone, water supply releases are made from WCA-1 as needed. In Zone A2 and Zone B, if Lake Okeechobee stage is above WCA-1 stage or no more than one foot below WCA-1 stage, water supply releases must be preceded by an equivalent volume of inflow. In Zone C (below 14.0 feet NGVD), the conservation zone, there would be no net release of water from WCA-1. Below this elevation no further releases will be permitted from the area unless a supply of water from another storage area is transferred to WCA-1.

Experience has shown that it is difficult to draw water out of the interior of WCA-1 when the stage is below 15.5 feet NGVD.

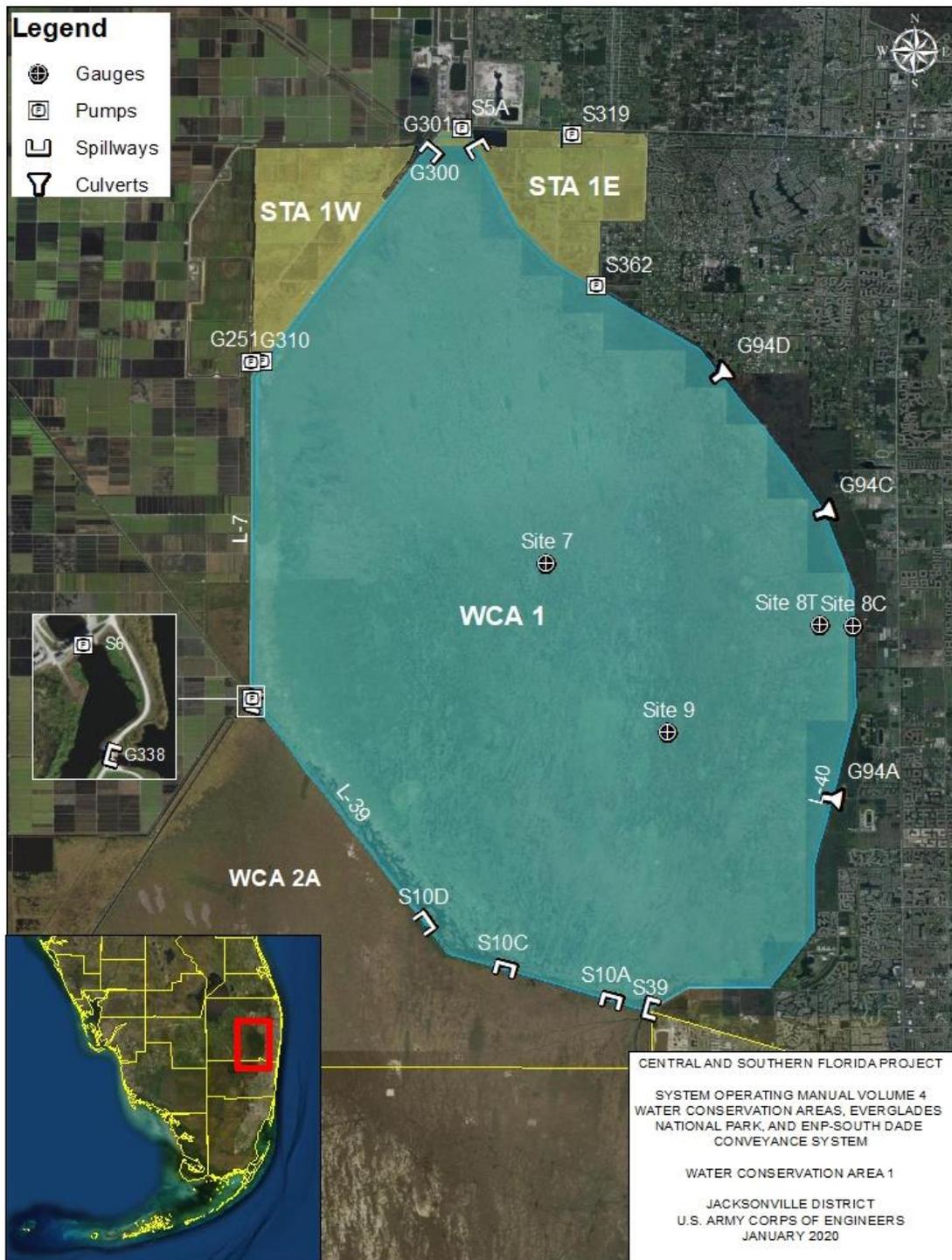


Figure 7-2: WCA-1 Map

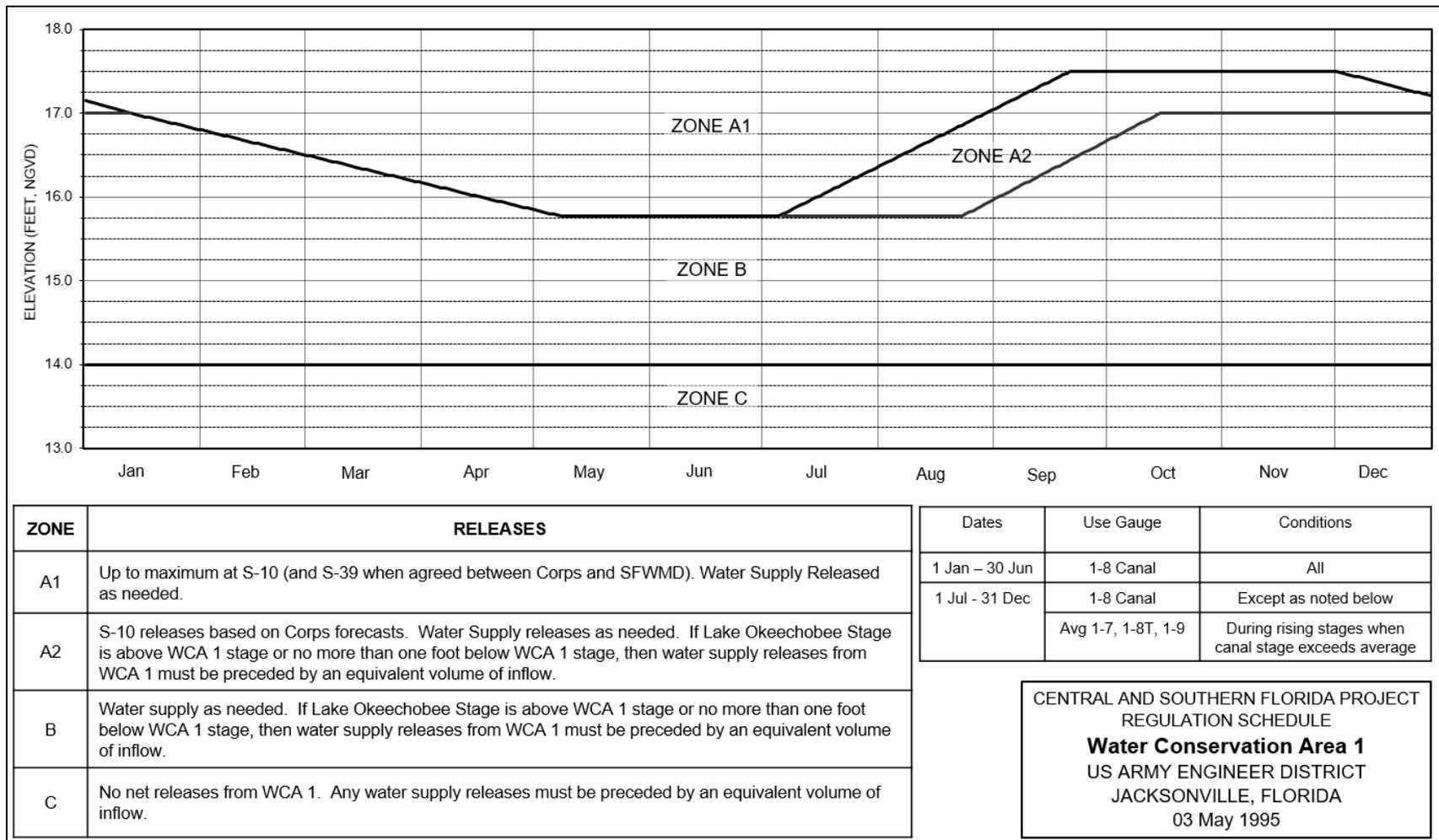


Figure 7-3: WCA-1 Regulation Schedule

7.4.8.1.2 Water Conservation Area 2A

WCA-2A lies between the WCA-1 and WCA-3 (see **Figure 7-4**). The Hillsboro Canal runs between WCA-1 and WCA-2A and the North New River Canal runs between WCA-2A and WCA-3A. In addition to the S-10s, WCA-2A receives inflow from pump station S-7 (following treatment in STA-3/4) and pump stations G-335 and G-436 (following treatment in STA-2). STA-2 releases via pump stations G-335 and G-436 through culvert structures G-336A-F and G-336G into WCA-2A. The S-7 station has a design capacity of 2,490 cfs, and pumps water from the North New River Canal (following treatment in STA-3/4). Pumping begins when the canal level exceeds 11.5 feet NGVD to 12.0 feet NGVD, unless the water level in WCA-2A is low enough to allow gravity flow from the canal through the spillway at S-7; or the water level in WCA-3A is low enough to permit gravity flow through S-150 into WCA-3A. S-6 has a design capacity of 2,925 cfs, and pumps water from the Hillsboro Canal into STA-2. Pumping should begin when canal stages exceed 11.5 feet NGVD to 12.0 feet NGVD.

The main outlets from WCA-2A are the S-11s, which consists of three spillways: S-11A, S-11B, and S-11C. The design capacity of the three structures is 17,200 cfs under SPF stages. Water can also be transferred into WCA-2B through S-144, S-145, and S-146. These structures have design capacity of 210 cfs each. S-143, with a design capacity of 500 cfs, releases water to the east into the North New River Canal through S-34E. S-38, with a design capacity of 500 cfs, releases water into the C-14 canal.

The WCA-2A regulation schedule is shown on **Figure 7-5**. When the WCA-2A stage is in Zone A, flood releases are made up to maximum capacity at the S-11s; up to maximum capacity at S-144, S-145, and S-146; and up to maximum practicable at S-143 and S-38. The L-35B and L-38 Borrow Canals should not be drawn down below 10.5 feet NGVD. Releases from WCA-2A to WCA-2B from S-144, S-145, and S-146 are to be terminated if the WCA-2B stage (measured at Site 99 gage (USGS Site ID: 260810080222001)) exceeds 11.0 feet NGVD. In Zone B, only releases for water supply to the Lower East Coast Service Area for municipal and industrial uses, agricultural supplemental irrigation, and to prevent saltwater intrusion are made. In Zone C, the conservation zone, a minimum elevation in the borrow canals of 10.5 feet NGVD, measured at S-11B HW gage, will be observed. Below this elevation no further releases will be permitted from the area unless preceded by an equivalent volume of inflow. The S-11s have no required minimum low-flow release.

From 1 January through 31 January, the Site 2-17 gage (USGS Site ID: 262240080258001) is the indicator gage for regulation; however, if the Site 2-17 stage recedes to 11.5 feet NGVD, the indicator gage becomes the S-11B HW gage. From 1 February through 30 June the S-11B HW gage is the indicator gage for regulation. Then from 1 July through 31 December the Site 2-17 gage is the indicator gage for regulation.

Water releases from WCA-2B are made via S-141. S-141 is a three-bay spillway structure that controls the water level in WCA-2B, and permits releases from the area to the North New River Canal through S-34E. Whenever the pool elevation in WCA-2B exceeds 11.0 feet NGVD, as measured at Site 99, S-141 will be operated for flood releases through S-34E if canal capacity is available and inflows from S-144, S-145, and S-146 will be suspended. Water levels in WCA-2B are mainly dependent on seepage and rainfall. A regulation schedule is not utilized for WCA-2B due to high rates of seepage from the area.

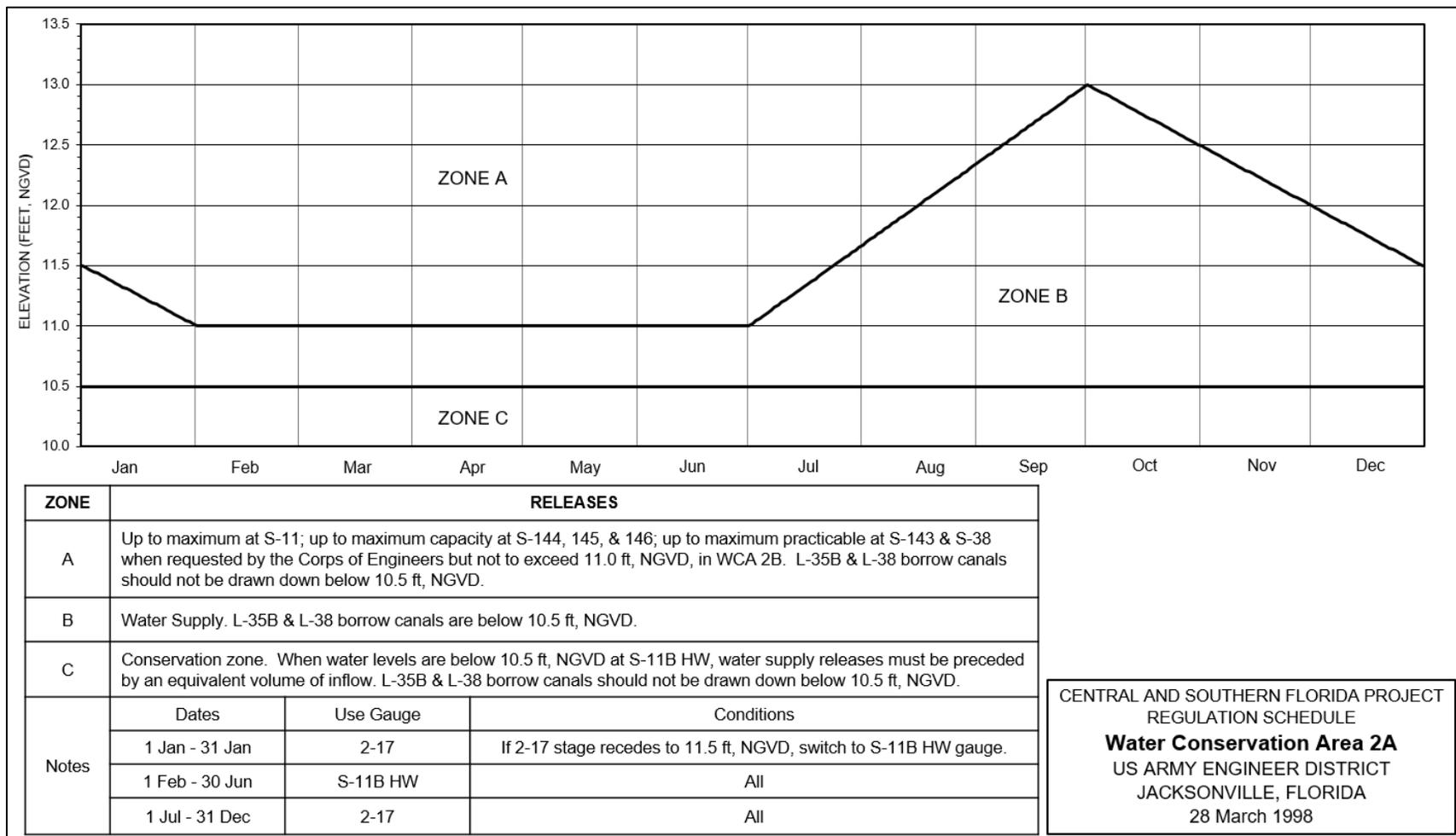


Figure 7-5: WCA-2A Regulation Schedule

7.4.8.1.3 Water Conservation Area 3A

WCA-3A lies south of STA 5/6, Rotenberger and Holey Land Wildlife Management Areas, STA 3/4, STA 2, and WCA-2 (see **Figure 7-6**). The updated 2020 WCA-3A regulation schedule is shown in **Figure 7-7**. The WCA-3A stage is the 3-station average of gages A-3 (Site 63) (USGS Site ID: 261117080315201), A-4 (Site 64) (USGS Site ID: 255828080401301), and A3-28 (Site 65) (USGS Site ID: 254848080432001).

In addition to receiving releases from the S-11s, WCA-3A receives inflow from S-150 and S-190 by gravity and from pumping at S-8, S-9, S-9A, G-404 and S-140. Inflows from S-8 and S-150 consist of STA-3/4 and STA-5/6 treated water. S-9 and S-9A removes runoff from the South New River Canal (C-11W Basin) up to the design capacity of 2,880 cfs and 500 cfs, respectively. Pumping occurs at S-9/S-9A with S-381 open (bladder of the Obermeyer structure is deflated), to maintain the stage in the South New River Canal below 3.6 feet NGVD. When S-381 is closed, S-9A is used to return seepage from WCA-3A. G-404 pumps treated water, up to the design capacity of 570 cfs, from STA-5 to the northwest corner of WCA-3A and provides water supply for the STOF and the EAA. S-140 removes water from the L-28 Borrow Canal up to the design capacity of 1,305 cfs. S-140 pumps are used to maintain canal levels below 10.5 feet NGVD, unless gravity flow into WCA-3A is possible from the S-140. S-190 is a gravity structure on the L-28 Interceptor Canal that maintains optimum upstream water control stages in the North and West Feeder Canals and prevents the over drainage of these canals.

The S-12s (S-12A, S-12B, S 12C, and S-12D), S-333, and S-333N are the main outlets from WCA-3A to ENP for water deliveries. However, both S-12A and S-12B have a closure period (1 October through 14 July, with limited conditional openings during October for S-12A/B and November for S-12B) for the protection of CSSS subpopulation A (further defined in **Table 7-3**). The S-12s consist of four 6-gate spillways with a combined capacity designed to be 32,000 cfs under the SPF stages. However, as noted in **subsection 7.3.8**, the S-12s are not capable of achieving the original design capacity. S-333 is a single-bay gated spillway with a design capacity of 1,350 cfs. In addition to water deliveries to ENP, S-333 also releases from WCA-3A to the ENP-SDCS for water supply and when conditions result in the transfer of S-333 releases to S-334. S-333N is being constructed adjacent to S-333 to move water from WCA-3A to L-29 Borrow Canal. S-333N has a design capacity of 1,150 cfs. S-333N is scheduled to be constructed and operational by August 2020. S-333N will be operated in accordance with FDEP permit 0362076-001 or any subsequent modifications issued to SFWMD.

S-343A and S-343B may release, the design capacity of 195 cfs each, from WCA-3A into the Big Cypress National Preserve when the WCA-3A water stage is in Zone A. These structures have a closure period (1 October through 14 July) for the protection of the CSSS subpopulation A. S-344 may release, the design capacity of 135 cfs, from WCA-3A to the Big Cypress National Preserve when the WCA-3A water stage is in Zone A.

S-142, with a design capacity of 430 cfs, releases from WCA-3A into the North New River Canal through S-34E. S-151 releases from WCA-3A to the C-304 (Miami Canal) in WCA-3B for flood diversion and for the purpose of providing water supply to Miami area canals and the ENP-SDCS. S-151 may release up to the design capacity of 1,105 cfs subject to the headwater at S-31 not exceeding 9.0 feet NGVD.

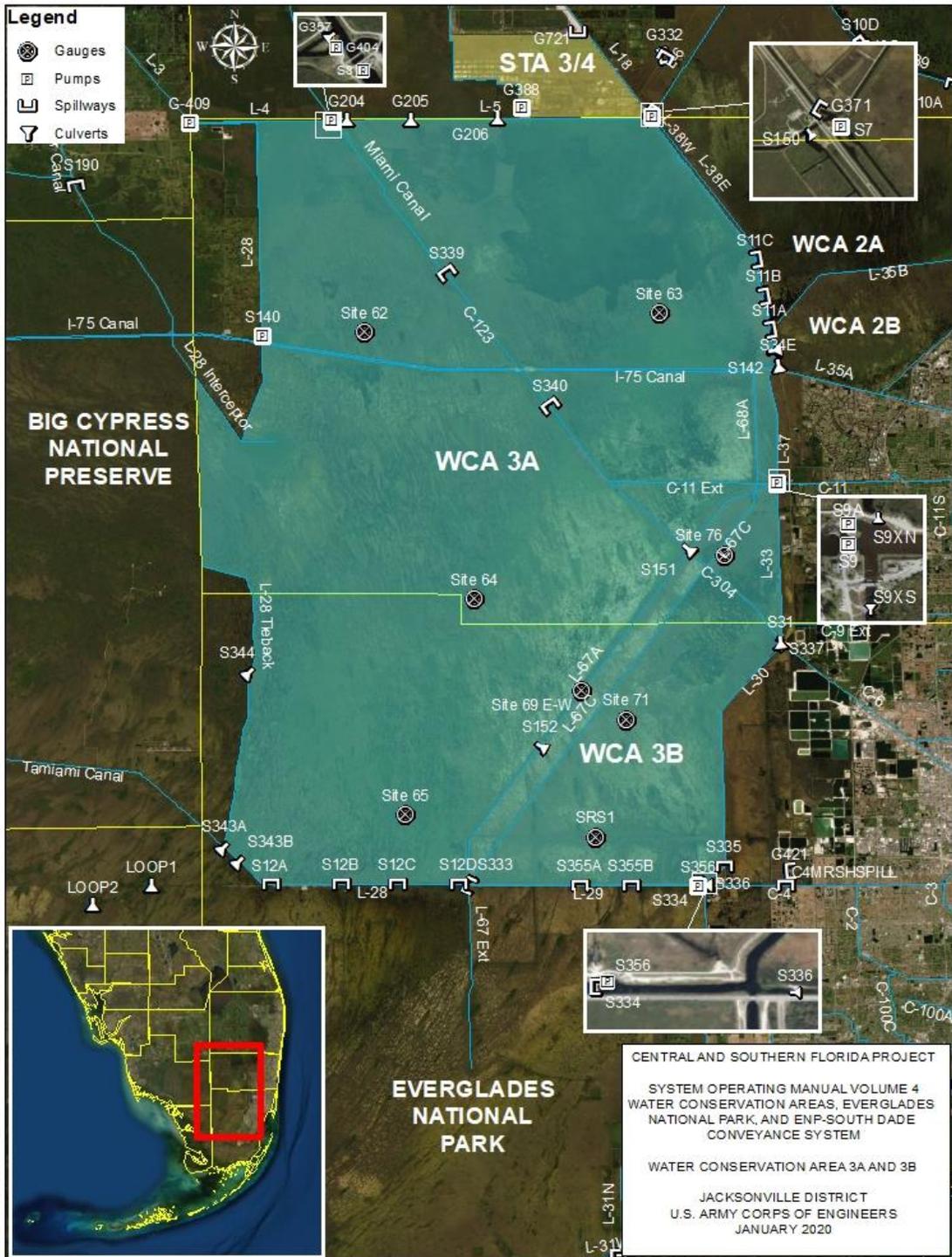


Figure 7-6: WCA-3A and WCA-3B Map

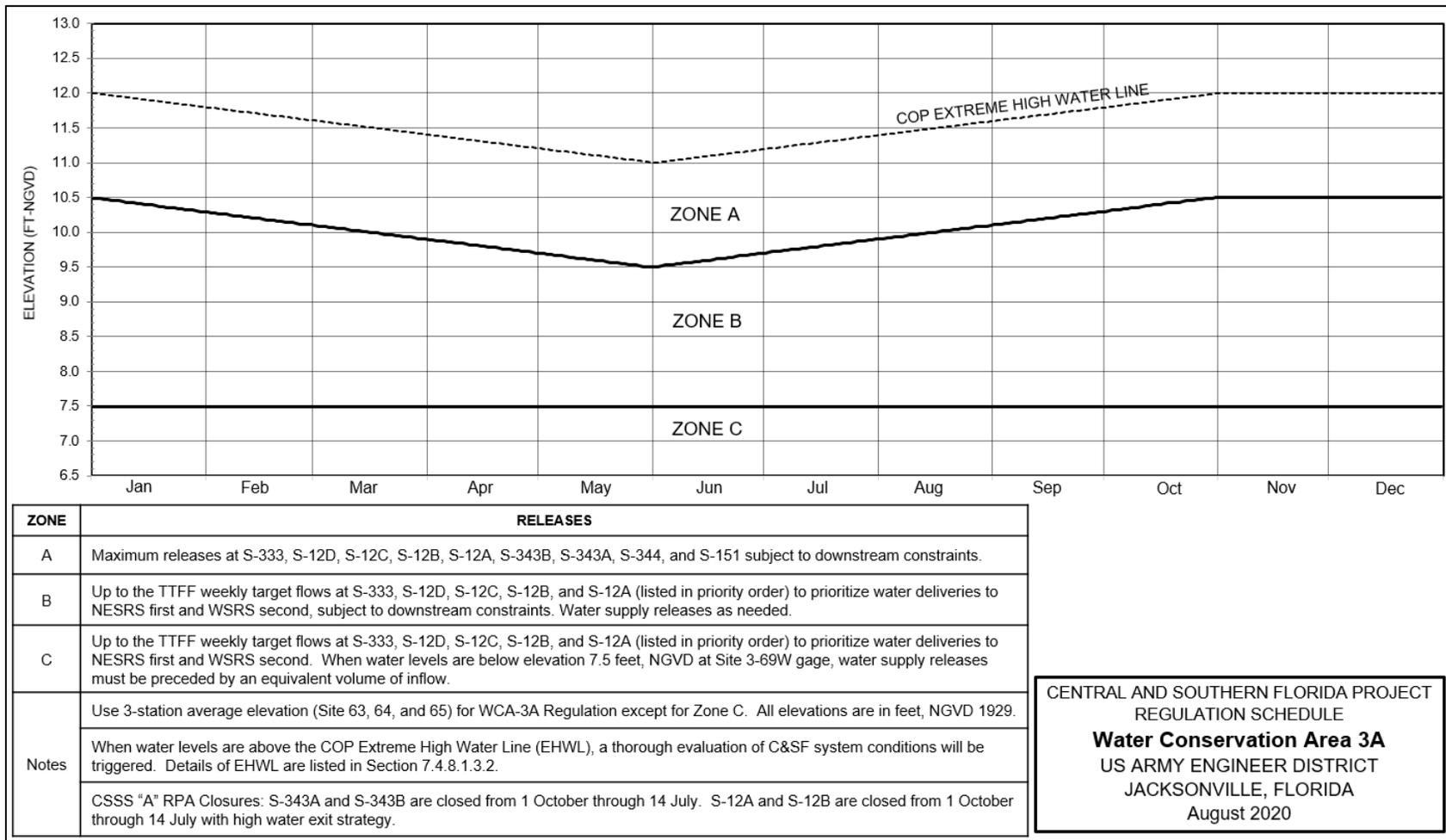


Figure 7-7: WCA-3A Regulation Schedule

S-152 releases water from WCA-3A to WCA-3B and is part of the Decentralization and Sheetflow Enhancement Physical Model (DPM) project. S-152 and the associated 3,000-foot L-67C levee gap are temporary features for the DPM, which is a field-scale test that is being conducted to determine the best plan for future decentralization of WCA-3, as envisioned in CERP. The DPM operational window is anticipated to be from November 2017 through 2021. S-152 releases up to the design capacity of 750 cfs from WCA-3A to WCA-3B under the following restrictions:

- L-67A must be above 7.5 feet NGVD.
- Site 71 gage (USGS ID: 255250080335001) and SRS-1 in WCA-3B must be below 8.5 feet NGVD.
- Water quality constraint criteria per FDEP Permit Number 0304879 (or any subsequent modifications issued to USACE) must be met.
- Closed when S-355A and S-355B are closed due to L-29 canal stage constraints.

S-339 and S-340 are structures on the C-123 (Miami Canal) that prevent over drainage of the northern end of WCA-3A, and force water through the marsh. These structures also provide the ability to transfer water to ENP and to Miami-Dade County canals including ENP-SDCS. These structures are normally closed but opened fully in accordance with the Operations Schedule for Canal 123, Structures 339 and 340 (**Figure 7-8**). The Site 62 gage (gage 3-2/"Deer gage") (USGS ID: 261023080443001) is the indicator gage for operation of these structures.

The 2020 WCA-3A Regulation Schedule has three zones: Zone A, Zone B, and Zone C as well as an Extreme High Water Line (EHWL) above Zone A. Zone A is above Zone B and delineated by a seasonally varying line that ranges from a maximum of 10.5 feet NGVD (1 November) to a minimum of 9.5 feet NGVD (1 July). In Zone A, maximum releases at S-333, S-333N, S-12D, S-12C, S-12B, S-12A, S-343A, S-343B, S-344, and S-151 subject to the closure periods and downstream constraints. An FDEP permit (issued to SFWMD) regulates operation of S-333N. When water stages are in Zone B or Zone C, the WCA-3A release targets are computed by the TTFF for S-333, S-333N, S-12D, S-12C, S-12B, S-12A (listed in priority order) to prioritize releases to Northeast Shark River Slough (NESRS) first and Western Shark River Slough (WSRS) second. Zone C defines the "floor" or minimum elevation for WCA-3A (7.5 feet NGVD, measured at Site 3-69W gage) (USGS Site ID: 255300080370001). Below this stage, no further releases for water supply to the Lower East Coast for municipal and industrial uses, agriculture supplemental irrigation or prevention of saltwater intrusion unless preceded by an equivalent volume of inflow (not applied to the TTFF releases). The TTFF is further described in **subsection 7.4.8.1.3.1**. The EHWL ranges from a minimum of 11.0 feet NGVD (1 June) to a maximum of 12.0 feet NGVD (01 November to 1 January) and is further described in **subsection 7.4.8.1.3.2**.

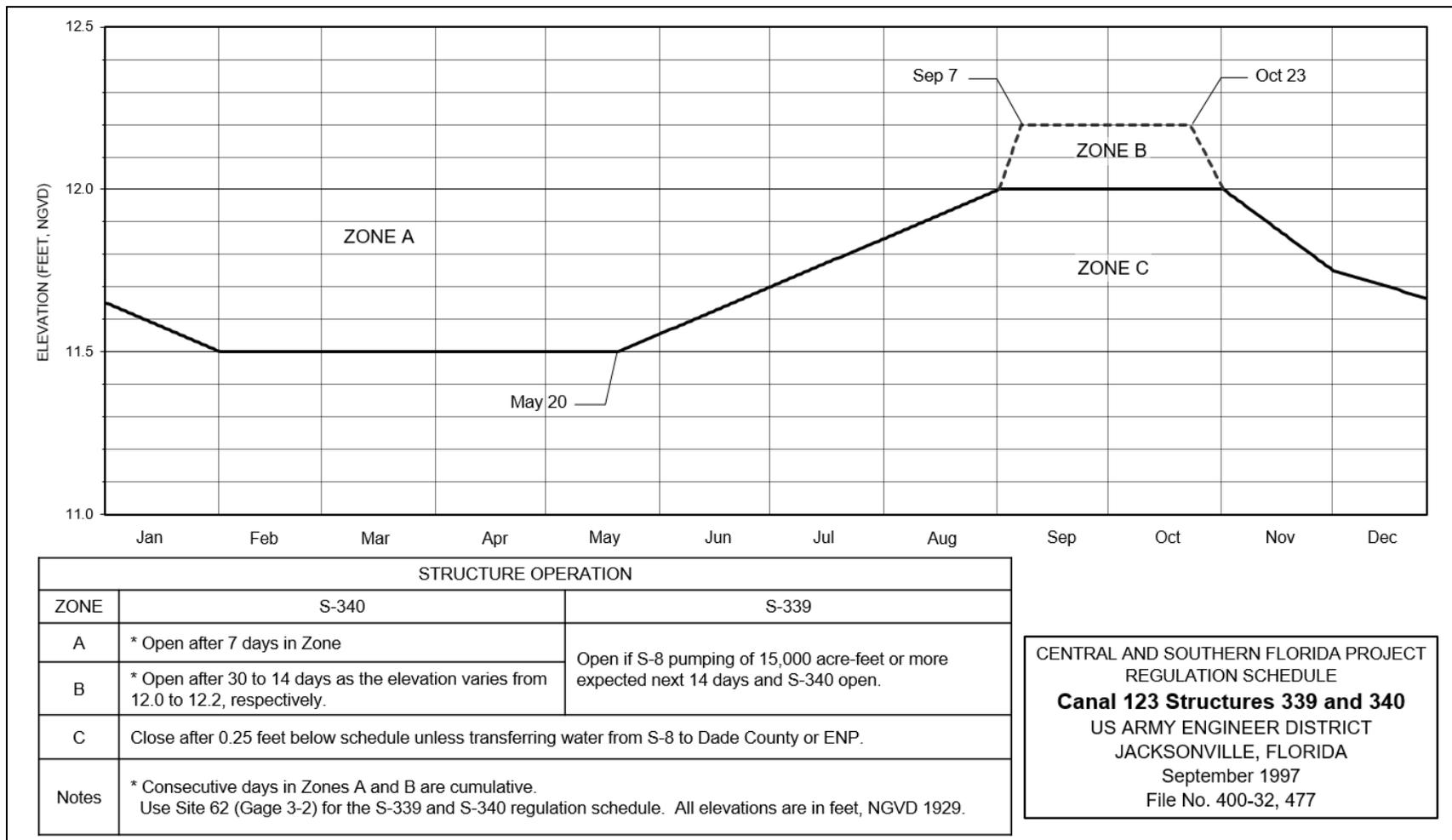


Figure 7-8: S-339 and S-340 Regulation Schedule

7.4.8.1.3.1 Tamiami Trail Flow Formula

The TFFF replaces the Rainfall Plan (RFP) and determines releases from WCA-3A to ENP (when WCA-3A stage is in Zone B or Zone C of the regulation schedule). The TFFF will be calculated and documented weekly. The TFFF is a set of water management operating protocols for WCA-3A key outlet structures to ENP. The operational protocols shifted the system towards enhanced ecosystem and landscape performance yet maintained constraints imposed by flood risk management, water supply and other key systems requirements. The TFFF was developed by COP and leveraged decades of infrastructure improvements.

The TFFF improves upon the RFP, achieves hydrologic targets including:

- Surface water flow deliveries that resemble more natural processes
- Gradual rate changes to deliver surface water flows
- Surface water flow distributed across the entire slough

The TFFF uses a network of stage, potential evapotranspiration (PET), and rainfall gages in WCA-3A and ENP to guide real-time operations to convey water from WCA-3A across Tamiami Trail to ENP to meet ecological, flood risk management, and water supply needs in WCA-3A and ENP. The TFFF uses multiple stage stations for the start of the current week and the previous week's flow in a linear approximation formula to compute a flow target for the coming week. The flow formula and its variables are listed below.

$$Q_t^{sum} = \beta^1 * S_t^{avg1} + \beta^2 * S_t^{nesrs2} + \beta^3 * Q_{t-1}^{sum} + \beta^4 * R_t^{Avg} + \beta^5 * PET_t + \beta^6 * ZA_t$$

where

Q_t^{sum} is the target daily releases (sum of S-12A, S-12B, S-12C, S-12D, S-333, and S-333N in cfs) to be implemented for the current (upcoming) week, t.

S_t^{avg1} is the average of observed stages (feet NGVD) at WCA-3A stages A-3 (Site 63), A-4 (Site 64) and A3-28 (Site 65) for the start of the current week t. The observed WCA-3A stages are based on mean daily value for the end date of the data period (previous week).

S_t^{nesrs2} is the observed stage (feet NGVD) at ENP gage NESRS2 (USGS Site ID: 254315080331500) for the start of the current week, t. The observed NESRS2 stage is based on mean daily value for the end date of the data period (previous week)

Q_{t-1}^{sum} is the daily average of observed releases (sum of S-12C, S-12D, S-333, S-333N, S-12A, and S-12B) that occurred during the previous week t-1 (cfs). If flow occurs at S-334 for water supply to the Lower East Coast and/or to Taylor Slough, the sum of S-333 and S-333N flows need to be adjusted to consider S-333 plus S-333N flows reaching NESRS.,

R_t^{avg} is the areal average for the total weekly rainfall (inches) for the entire WCA-3A, Mullet Slough, and WCA-3B for current week, t,

PET_t^1 is the total weekly potential evapotranspiration (inches) at the 3AS3WX location, and

ZA_t is the Zone A regulation stage (feet, NGVD) value for time step t (beginning of current week).

β s are TFF coefficients (see **Table 7-2** below).

Table 7-2: TFF coefficients and associated standard error.

Parameter	S_t^{avg1}	S_t^{nesrs2}	Q_{t-1}^{sum}	R_t^{avg}	PET_t^1	ZA_t
Coefficient	318.42	-44.62	0.644	24.32	-96.31	-221.79
Standard Error	18.22	18.50	0.016	7.23	28.83	13.67

The TFF is applied at the beginning of the current week t , time at which rainfall and PET for that week are not known, so the application of the formula requires the use of expected or forecasted values. Forecast rainfall, R_t^{avg} , is obtained from the 7-day Quantitative Precipitation Forecast (QPF) issued by the SFWMD's meteorologists. This process offers improved spatial resolution and provides specific knowledge/expertise from District Meteorologists. Any time an update is produced for south Florida weather forecast by the SFWMD's Meteorologists, the 7-day QPF for WCA-3 value is also updated and made available to staff in charge of implementing the TFF. The WCA-3 rainfall area is the aggregation of WCA-3A, WCA-3B and Mullet Slough. The TFF deliveries to ENP are not subject to the WCA-3A minimum elevation criterion that requires WCA-3A releases to be preceded by an equivalent volume of inflow.

Since in most of the cases observed rainfall and PET will not agree with the corresponding forecast, a correction term is applied to the computed target release for the current week t which is obtained as the difference between the recomputed target releases for the previous week $t-1$, using observed rainfall and PET for the preceding 7-day period and using the target release computed at that point in time (i.e., 7 days ago). The application of the weekly correction to the release target makes the approaches to obtain forecast rainfall and PET less critical. The coefficients for rainfall and PET in the TFF indicate that if 1-inch error in any direction (over or underestimate) is made on the selected forecast for rainfall and PET, the impact for that week will be approximately at most ± 120 cfs.

The TFF balances ecological restoration objectives of the MWD to ENP and C-111 SD Projects completed infrastructure by redistributing the existing WCA-3A and ENP water budget, while remaining forward compatible with future expected flow increases into WCA-3A. The decision-making process to determine releases from the WCAs maintains the flexibility outlined in **subsection 7.1**. Release decisions made by USACE that differ from the TFF, which are anticipated to be infrequent, should be unique and will be defined by a desired outcome or time-period. These release decisions will be documented in the periodic inter-agency meetings for the AMMP (meeting frequency 1-2 times per year) and other established meetings (e.g., WCA-3 Periodic Scientists Calls and AMMP technical sub-team meetings) to help inform future AMMP considerations.

While refinement of the TFF to improve upon some of the inherent limitations acknowledged in linear generalization of the optimal signal is possible, these efforts can be pursued in subsequent CEPP operational plan development activities anticipated in upcoming years. Additionally, the COP AMMP (Appendix C of the COP EIS) developed strategies to help improve the performance of the TFF during dry conditions. These strategies are also included as an Annex in the WCP (**subsection 7.15.2**) and may be implemented to modify the TFF target flows to ENP during specific drought conditions. Annex 8 of Appendix H of the COP EIS provides more detail on the development of the TFF.

7.4.8.1.3.2 Extreme High-water Line

The 2020 WCA-3A regulation schedule includes the EHWL to provide operational flexibility for water management operations when extreme high water levels in WCA-3A exist. The purpose of the EHWL is to provide a capacity for regional water managers to effectively respond to extreme high water levels in WCA-3A. The operations described here are not expected to be triggered frequently and are intended to be available as the last resort if needed to help reduce risks to the WCA-3A perimeter levee system, the population of people who would be put at risk if the levee system failed, hurricane evacuation routes, and wildlife and tree islands from extreme high water conditions.

The EHWL is shown in **Figure 7-7** and ranges from 11.0 to 12.0 feet NGVD. When WCA-3A water levels are above the EHWL, this will trigger a thorough evaluation of the C&SF system conditions from Lake Okeechobee and its watershed to the WCAs, EAA, ECC, ENP, and ENP-SDCS, including consideration of other related actions which may be undertaken by the State of Florida. The information from this evaluation along with input provided from ENP will be used by USACE and SFWMD to decide on whether to implement any or all actions authorized by the EHWL. The conditions detailed below outline the additional operational flexibility for water management operations authorized by the EHWL.

Condition 1. When WCA-3A stage is above the EHWL but below 12.3 feet and the SFWMD position analysis (P90) does not project it to rise above Elevation 12.7 feet NGVD within the next 60 days, S-333 may have priority over S-356. S-334 may also be used up to its maximum capacity of 1,200 cfs to send water to tide and the eastern ENP boundary subject to SDCS system constraints. Under this condition, the first priority will be water deliveries to the eastern boundary structures of ENP if capacity is available. S-332B, S-332C, and S-332D will be used to send water to C-111 NDA, C-111 South Detention Area (SDA), and S-332D Detention Area. Second priority will be given to S-336, S-338, S-194, and S-196 to make maximum practicable WCA-3A releases to tide (coastal release structures) subject to downstream conditions.

Condition 2. When WCA-3A stage is above the EHWL but below 12.3 feet NGVD and the SFWMD position analysis (P90) projects it to rise above Elevation 12.7 feet NGVD within the next 60 days, S-333 may have priority over S-356. S-334 may also be used up to its maximum capacity of 1,200 cfs to send water to tide using all remaining coastal release structures including S-197 subject to SDCS system constraints. Extreme High Water Condition 1 priorities remain and will be maximized before sending additional water south to S-197. When in Extreme High Water Condition 2 and S-18C HW is above 2.3 ft. NGVD, S-197 releases may be increased up to a daily average of 1,200 cfs to accommodate additional flows through S-334. The expectation is that routing excess water from WCA-3A to S-197 would occur when S-334 is releasing at least 100 cfs. The total available capacity at S-197 will be decreased to 600 cfs when S-18C HW falls below 2.3 feet NGVD.

Condition 3. When WCA-3A stage is above 12.3 feet NGVD then S-197 may be increased up to 2,400 cfs until WCA-3A stage falls below 12.0 feet NGVD. S-333 may have priority over S-356. S-334 may be utilized up to its maximum capacity of 1,200 cfs subject to SDCS system constraints and through use of all remaining available coastal release structures including S-197. The releases up to 2400 cfs through S-197 are to handle the potential 800 cfs through the canal system from WCA-3A and up to 1600 cfs from the local basin to maintain canals in this area in their low range. Extreme High Water Condition 1 priorities remain and will be maximized before sending additional water south to S-197.

In addition, the WCA-3A releases to the L-29 Borrow Canal and through the SDCS have the following constraints under extreme high water conditions:

1. The L-29 Borrow Canal maximum operating stage is 8.5 feet NGVD subject to the FDOT constraints (refer to **subsection 7.3.2**). S-333 and S-356 releases will be reduced or terminated when L-29 Borrow Canal stage exceeds 8.5 ft. NGVD to lower the L-29 below 8.5 feet NGVD as required.
2. S-333N operates in accordance with the criteria specified in the FDEP CERPRA permit (#0362076-001) issued to SFWMD.
3. When the average stage in L-31N at the HW of S-332B, S-332C, and S-332D can be maintained below 4.4 feet NGVD then;
 - a. When daily combined pumping at S-332B, S-332C, and S-332D is less than 1,125 cfs, S-334 may be used to deliver up to 250 cfs to S-332B, S-332C, S-332D, S-200, and S-199. S-334 releases above 250 cfs shall be passed through S-176 and S-177 to S-18C and S-197.
 - b. When daily combined pumping at S-332B, S-332C, and S-332D is less than 1,000 cfs S-334 may be used to deliver up to 400 cfs to S-332B, S-332C, S-332D, S-200, and S-199. S-334 releases above 400 cfs shall be passed through S-176 and S-177 to S-18C and S-197.
4. When the daily average stage in L-31N using the HW of S-332B, S-332C, and S-332D can be maintained below 4.2 feet NGVD then there is no limit on the S-334 releases (up to 1,200 cfs) as long as the other L-31N canal reaches are maintained within or below their respective ranges.
5. If potential storm or an actual flooding condition in the L-31N Canal basin requires the use of S-356 as a flood risk management reduction measure, then S-334 operation will cease until S-356 HW can be maintained between 5.5 feet NGVD and 5.8 feet NGVD.
6. 8.5 SMA flood mitigation must be maintained and S-333/S-333N releases to NESRS may be suspended if the adherence with the 8.5 SMA flood mitigation criteria is not achieved as further defined in **subsection 0**. The intent of a reduction and a temporary suspension of WCA-3A releases to NESRS is to allow 8.5 SMA to recover from a prolonged hydroperiod that exceeded the flood mitigation criteria. An after-action report will be required anytime WCA-3A releases to NESRS are stopped because 8.5 SMA flood mitigation criteria are not being met.

Operations as per the EHWL Conditions 1, 2 or 3 will end with a transition period not to exceed 14 days or when the WCA-3A stage is at least 0.2 feet below the EHWL, whichever occurs first.

7.4.8.1.4 Water Conservation Area 3B

A regulation schedule is not used for WCA-3B due to the limited inflow and high rates of seepage from the area. Releases from WCA-3B can be made through S-31, S-337, S-355A, and S-355B. See **Table 7-3** for additional S-31 and S-337 operating criteria to avoid fish kills.

WCA-3B inflow and outflow structures shall be operated consistent with FWC guidance below for achieving inundation and recession/ascension targets in WCA-3B to the extent that achieving or trying to achieve the identified goals does not conflict with 1) flood risk management, 2) water supply, or 3) the other operational constraints listed above.

7.4.8.1.4.1 FWC Hydrologic Management Strategy for WCA-3B (Measured at Site 71)

1. Dry Season Low Range Surface Water Depth: 0.06 to 0.96 feet (6.6 feet NGVD to 7.5 feet NGVD).
2. Wet Season High Surface Water Depth: Approximately 2.0 feet (8.5 feet NGVD).
3. 1 January Target Surface Water Depth Range: 1.16 to 2.06 feet (7.7 feet NGVD to 8.6 feet NGVD).

4. Recession Rate Guidelines (1 January – 1 June): Approximately 0.05 to 0.07 feet per week to benefit snail kites, wood storks, and wading birds.
5. Ascension Rate Guidelines (1 June – 1 October): Maximum of 0.25 feet per week and approximately 0.05 feet per week minimum.
6. Tree Island Threshold: Surface Water Depths >2.0 feet for no more than 60 days per year (8.5 feet NGVD).

7.4.8.2 Everglades National Park

COP was developed with the goal of improving water deliveries into ENP and is a step forward in restoring the natural hydrologic conditions in ENP given the current C&SF infrastructure and features. The operations are intended to restore NESRS by improving the quantity and timing of water deliveries (TTF) as well as restore hydraulic conditions in Taylor Slough, Rocky Glades, and the Eastern Panhandle of ENP by utilizing and adjusting the completed C&SF project features.

The physical roadway of Tamiami Trail (U.S. Highway 41) is also undergoing a series of construction phases to enable increased flow to pass under the eastern 10 miles of road adjacent to the L-29 Borrow Canal between S-333 and S-334. Over three miles of bridges have been installed, with a 1-mile stretch on the eastern side and a 2.3-mile stretch on the western side. Federal and State funding has also been allocated to further modify the road base in this area to support L-29 Borrow Canal stages up to 9.7 feet NGVD to facilitate future increased flows envisioned in CERP implementation. **Figure 7-9** shows the ENP, ENP-SDCS map.



Figure 7-9: ENP and ENP-SDCS Map

7.4.8.2.1 Northeast Shark River Slough

The L-29 Borrow Canal conveys water released through S-333 or S-356 to ENP/NESRS. The L-29 Borrow Canal will be maintained up to 8.5 feet NGVD for up to 90 cumulative days per water year (1 May through 30 April), with the opportunity to increase the duration based on written FDOT approval. The number of cumulative days will be measured when L-29 Borrow Canal stage exceed 8.3 feet NGVD. L-29 Borrow Canal stage higher than 8.5 feet NGVD for longer than 90 days will need FDOT written approval.

In order to avoid exceeding 8.5 feet NGVD in the L-29 Borrow Canal, the 5-day QPF will be monitored and stages in the L-29 Borrow Canal will be reduced based on the forecasted QPF. This criterion is further defined in **Table 7-3**. Once the L-29 Borrow Canal reaches a stage of 8.5 feet NGVD, all inflows to the L-29 Borrow Canal (S-333, S-333N, S-355A, S-355B, and S-356) will be suspended and S-334 may be used to ensure the L-29 Borrow Canal stage remains at or below 8.5 feet NGVD.

7.4.8.2.2 Routing Water towards Taylor Slough (Florida Bay)

SDCS operations utilize the C-111 NDA, C-111 SDA, and the S-332D Flow-way to maintain canal stage targets in the lower L-31N canal. Prolonged use of the C-111 SD detention areas, particularly following significant rain events, has the tendency to set up a large stage difference between the marsh in Rocky Glades to the west and the canal stage in the lower L-31N and C-111 Canals. This is expected and is how the system is designed to work, as it is the water level in the detention areas that provides the hydraulic ridge that supports this stage difference. The hydraulic ridge can dissipate quickly following an abrupt cessation of pumping. This abrupt cessation can lead to a rapid reduction in the water level of the ENP marsh near the detention areas. However, drying down of the marsh occurs naturally during the dry seasons. The rate of marsh recession that can occur when pumping is halted after a significant rain event is much faster than naturally induced recession rates, and rapid recession can be particularly harmful to fish communities. The new seasonal operations for S-332B, S-332C, S-332D, S-200, and S-199 support maintenance of the hydraulic ridge and its gradual recession.

Analyses performed during COP indicate that supplemental water deliveries up to 400 cfs may be made from L-30 Canal (upstream of S-335) from 1 August through 14 February. The following S-335 operating criteria provide these flows:

1. Release up to 200 cfs when S-335 HW stages are 5.3 to 6.0 feet NGVD.
2. Release up to 400 cfs when S-335 HW stages are 6.0 to 6.5 feet NGVD.
3. Supplemental releases suspended when the S-335 TW stage equals or exceeds 6.1 feet NGVD or when S-176 HW stage equals or exceeds 4.7 feet NGVD.

Similar releases up to 200 cfs may also be made between 14 February and 1 May when the S-335 HW is above 6.0 feet NGVD.

Additionally, WCA-3A may also be used to maintain the hydraulic ridge along the C-111 detention areas and/or provide deliveries to Taylor Slough. This operation will be limited to 200 cfs when WCA-3A stages are greater than 9.80 feet NGVD average at Site 62 and Site 63 gages. This water level is 0.5 feet above the FWC muck fire closure criteria for northern WCA-3A (9.3 feet NGVD)). These deliveries, if provided, will be coordinated by USACE with SFWMD and ENP. This flow limit will be measured at S-334 or S-337. This operation is intended to support gradual recession rates in the marsh by providing additional water to the S-332B, S332C, S332D, S-200, and S-199 pump stations. When S-332C headwater elevation falls

below 3.8 feet NGVD during the dry season, all pump operations for Taylor Slough deliveries and the maintenance of the hydraulic ridge will cease.

7.4.8.2.3 Water Deliveries to the Eastern Panhandle of ENP via C-111

The purposes of S-18C are to maintain a desirable freshwater head to prevent saltwater intrusion through C-111, pass flood flows up to 40 percent SPF without exceeding design stages upstream, and act as a control point for water deliveries to the eastern panhandle of ENP. Spoil material on the southern side of the C-111 between S-18C and S-197 was removed to improve sheetflow of freshwater from S-18C to ENP and Florida Bay as well as to moderate the frequency of S-197 gate openings. Water flows across the bank along C-111 into the Eastern Panhandle of ENP. Gate operations are remotely controlled to maintain S-18C HW stages between 2.3 and 2.65 feet NGVD.

S-197 maintains water control stages in C-111 and prevents saltwater intrusion during high tides. Typically, S-197 is closed to divert water from S-18C over land to the eastern panhandle of ENP. S-197 releases water only for flood risk management according to S-197 operating criteria (**Table 7-3**). The COP operations are designed to minimize the damaging freshwater flows to Manatee Bay/Barnes Sound through the S-197 structure and preserve the design capacity of 2,400 cfs for rare use only during extreme flooding events.

7.4.8.3 Everglades National Park-South Dade Conveyance System (L-31N & C-111)

The ENP-SDCS water levels are optimized in COP to provide environmental benefits, flood risk management, and water supply, and to prevent saltwater intrusion. Canal stages and structure operations prompting water supply are listed in **Table 7-1**. Normal system operational guidance is provided in **Table 7-3**. **Subsection 7.5** also contains reference to Pre-Storm / Storm / and Storm Recovery Operations for SDCS. **Figure 7-10** shows the ENP-SDCS project map.

7.4.8.3.1 South Dade County

The purposes of the C&SF Project works in South Miami-Dade County were to remove the 40 percent of SPF runoff from the entire 206 square mile effective drainage area, reduce depth and duration of larger floods, provide water control to prevent over drainage in the area, prevent saltwater intrusion, and provide facilities to convey up to 500 cfs to ENP when normal runoff is available. The construction of the ENP-SDCS modified the existing project works in South Miami-Dade County. More detailed discussions of the South Miami-Dade County Project works are contained in Volume 5, East Coast Canals Master Water Control Manual.

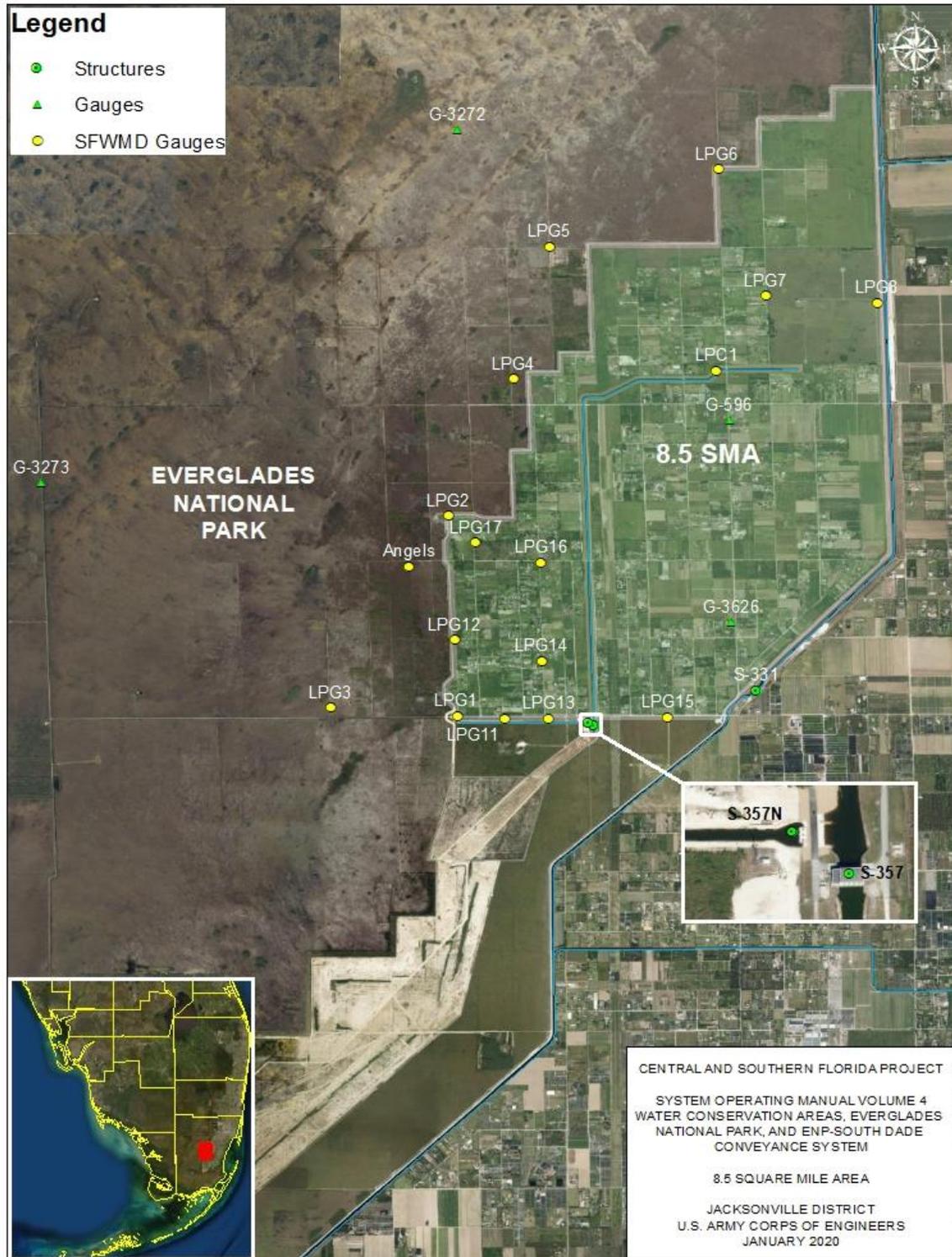


Figure 7-10: 8.5 SMA Detail Map

7.4.8.3.2 8.5 Square Mile Area

The 8.5 Square Mile Area (SMA), also referred as the Las Palmas Community, project features are designed to mitigate for increased flood risk as a result of increased water levels in NESRS and other areas of ENP resulting from the MWD to ENP Project. The constructed features of the 8.5 SMA Project and C-111 SD Project available for water management operations include: the canals C-357 and C-358, the 8.5 SMA Detention Area/flow way and the C-111 NDA, pump stations S-357 and S-331, and structure S-357N (See Figure 7-10). S-357 and S-357N provide primary flood mitigation to the residents of the 8.5 SMA and S-331 provides secondary flood mitigation benefits only during high water conditions. Detailed structure operations are listed in **Table 7-3**.

COP modeling demonstrated all interior areas of 8.5 SMA met the flood mitigation requirements, consistent with the 2000 GRR/EIS. However, modeling also indicated that there are portions of 8.5 SMA along the western ENP boundary that remain very challenging and require real-time monitoring to ensure compliance.

The USACE will monitor rainfall at S-331 and recession rates at indicator gages located within and around the 8.5 SMA (LPG-1, LPG-2, LPG-16, and LPG-17) to ensure flood mitigation (hydroperiod duration targets and constraints) are met. The flood mitigation criteria must be maintained. If the flood mitigation criteria are projected to be exceeded, flows into NESRS may be temporarily suspended to help reduce water levels in the 8.5 SMA. An after-action report will be required anytime WCA-3A releases to NESRS are suspended because 8.5 SMA flood mitigation criteria are not being met.

When both S-357 and S-331 operate at the lowest canal settings and the 8.5 SMA target hydroperiod duration is projected to be exceeded, WCA-3A flows to NESRS may be temporarily suspended until water levels in 8.5 SMA, specifically the area west of C-357 Canal, recede below ground surface elevations. This decision will be based on near-term and intermediate-term (1-3 weeks) forecasted rainfall as well as projected recession rate at the 8.5 SMA indicator gages.

Additionally, WCA-3A flows to NESRS will be temporarily suspended if:

- a. Water levels in 8.5 SMA are projected to exceed 6 inches below the lowest first floor elevation (lowest first floor elevation estimated at 8.5 feet NGVD) of residential properties near to L-357W Levee within 48 hours, OR
- b. The 8.5 SMA continuous hydroperiod duration constraint (**Figure 7-11**) for a rainfall event at LPG-2 or LPG-1 (or future in-kind replacement locations) is projected to be exceeded, OR
- c. The 8.5 SMA discontinuous hydroperiod duration constraint (**Figure 7-11**) for LPG-2 or LPG-1 (or future in-kind replacement locations) is projected to be exceeded.

If flows are suspended into NESRS, the L-29 Borrow Canal water level will be reduced until water levels in 8.5 SMA, specifically the area west of C-357 Canal recede below ground surface elevations. 8.5 SMA flood mitigation criteria were developed in accordance with Part C.6 of Appendix C of the COP EIS (Water Quality and Hydrology Monitoring Plan for 8.5 SMA Flood Mitigation) and the MWD to ENP Incremental Field Test.

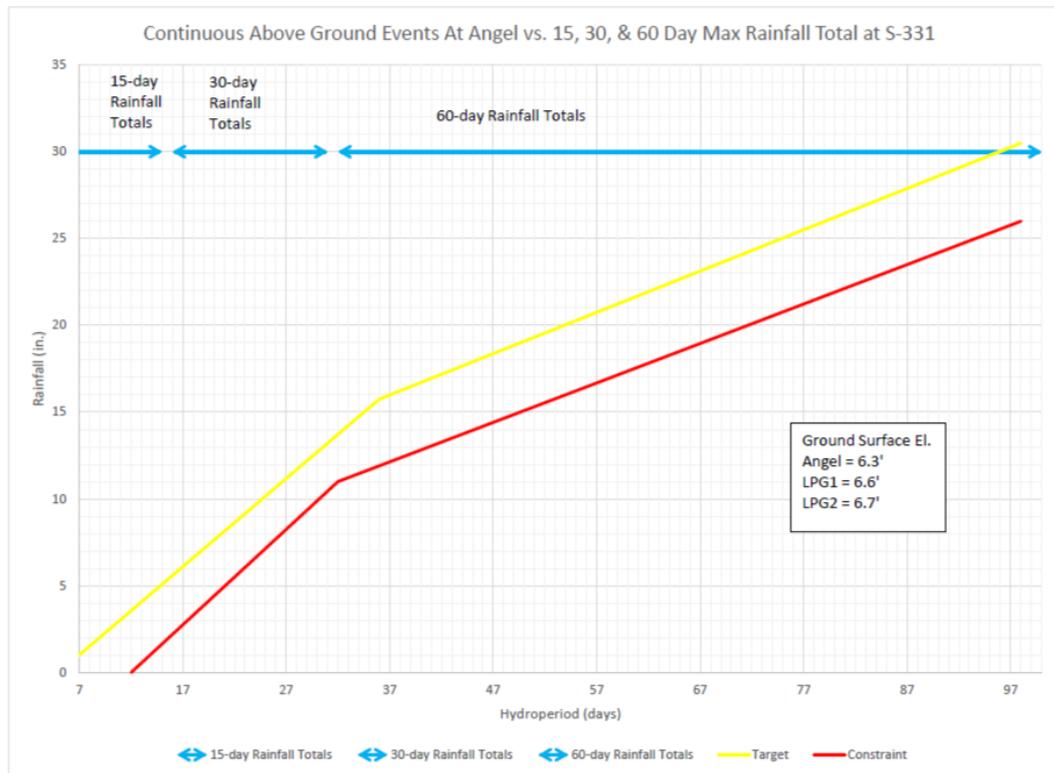


Figure 7-11: 8.5 SMA Hydroperiod Target and Constraint

7.4.8.4 Standing Instructions to Project Operators Summary Table

The Operating Criteria table (**Table 7-3**) lists structures and operating criteria for the WCAs, ENP, and ENP-SDCS according to their respective hydrologic basins or canals from north to south. If there is a perceived conflict between the criteria in **Table 7-3** compared to the criteria described in complementary text of this Chapter or if the table lacks clarity, then the criteria as described in the body of the text shall be consulted and shall control.

The Flood Risk Management (FRM) and Environmental Restoration (ER) operational ranges prescribed in **Table 7-3** were developed from a combination of operational experience, modeling results, analysis of historical data, and the expected performance of existing and proposed features. These ranges are not simple ON and OFF ranges used for pumps or simple OPEN and CLOSE used for gates in some earlier C&SF hydrologic modeling analyses.

When stages are above the FRM&ER HIGH stage criteria, timely action (e.g., gate adjustment or pumping changes) will be made to lower the stage at a rate consistent with the current conditions (e.g., height above the HIGH stage, rate of rise, recent basin rainfall, and expected inflows) and forecasted conditions, seasonal variability, and antecedent conditions. Within the range between the FRM&ER HIGH and FRM&ER LOW stage criteria, the operators have full discretion to adjust pumps or gates or a combination of both to achieve the stage deemed most appropriate for the current and forecasted conditions as long as they remain consistent with prescribed objectives and constraints. Changes in pumps or pumping rate (number or RPM of pumps) can be implemented to rotate pumps or compensate for unavailable pumps. For basins with high rates of surface and groundwater interactions, compliance with the operation range should be based upon the daily average stage. For canal stages being maintained by pump stations,

compliance with the operation range should allow the use of daily averages (0000 to 2400 hours) with the lowest operating stage maintained above the lower limit for each pump.

When the canal stage falls below the FRM&ER LOW stage criteria, timely operational changes will be made to either raise the canal stage back to the operational range or transition into appropriate operational stages above the FRM&ER LOW stage (e.g. water conservation).

Table 7-3: Operating Criteria.

Basin / Canal	Operational Component	Description and Operating Criteria
WCA-1	S-10A, S-10C, S-10D	WCA-1 is regulated by three main outlet structures, S-10A, S-10C, and S-10D with a combined design capacity of 14,800 cfs under SPF stages. The S-10s release water from WCA-1 to WCA-2A based on water levels in WCA-1 and its regulation schedule (Figure 7-3).
WCA-1	S-39	S-39 releases water from WCA-1 to the Hillsboro Canal. Its primary purpose is to provide for water supply needs along the Hillsboro Canal during the dry season. It also can be used to release excess water from WCA-1 when downstream capacity is available. S-39 has a design capacity of 800 cfs.
WCA-2A	S-11A, S-11B, and S-11C	WCA-2A is regulated by three main outlet structures, S-11A, S-11B, and S-11C with a combined design capacity of 17,200 cfs under SPF stages. The S-11s release water from WCA-2A to WCA-3A based on water levels in WCA-2A and its regulation schedule (Figure 7-5).
WCA-2A	S-144, S-145, and S-146	Water can be transferred into WCA-2B via S-144, S-145, and S-146, located in L-35B. These structures each have a design capacity of 210 cfs. When WCA-2A is in Zone A, regulatory releases can be made into WCA-2B until the Site 99 gage reaches 11.0 feet NGVD.
WCA-2A	S-143	S-143 releases water from WCA-2A to supply water needs along the North New River Canal during the dry season and can be used to release excess water from WCA-2A when capacity is available in the North New River Canal and when the water is not needed in WCA-3A and the stage downstream of S-34E is not above 6.0 feet NGVD. S-143 has a design capacity of 500 cfs.
WCA-2A	S-38	S-38 releases water from WCA-2A to supply water needs in the area served by C-13 and C-14 during the dry season. It also can be used to release excess water from WCA-2A when capacity is available in C-13 and C-14 and when the water is not needed in WCA-3A. S-38 has a design capacity of 500 cfs.
WCA-2B	S-141	S-141 releases water from WCA-2B to the North New River Canal. When Site 99 gage elevation > 11.0 feet NGVD, S-141 is open for flood releases through S-34E if canal capacity is available and subject to downstream constraints. A regulation schedule is not utilized for WCA-2B due to high rates of seepage from the area. S-141 has a design capacity of 435 cfs.
WCA-2A/2B	S-34E	S-34E releases water from WCA-2A or WCA-3A to supply water needs along the North New River Canal during the dry season. It also can be used to release excess water from WCA-2A, WCA-3A and/or WCA-2B when

Basin / Canal	Operational Component	Description and Operating Criteria
		capacity is available in the North New River Canal and when the water is not needed in WCA-3. S-34E has a design capacity of 600 cfs.
WCA-3A	WCA-3A Regulation Schedule and TTF	<p>WCA-3A is regulated by the S-12A, S-12B, S-12C, S-12D, S-333, S-333N, S-344, S-343A, S-343B, S-151, and S-152 structures. The primary structures for WCA-3A water deliveries to ENP are the S-12s and S-333. Releases are based on the 2020 WCA-3A Regulation Schedule (Figure 7-7) and TTF (subsection 7.4.8.1.3.1). WCA-3A stage is the three (3)-station average of gages A-3 (Site 63), A-4 (Site 64) and A3-28 (Site 65).</p> <p>There are three zones in the WCA-3A Regulation Schedule: Zone A Zone B, and Zone C as well as an Extreme High-water Line (EHWL). Zone A is above Zone B and delineated by a seasonally varying line that ranges from a maximum of 10.5 feet NGVD (1 November) to a minimum of 9.5 feet NGVD (1 July). In Zone A, up to maximum releases at S-333, S-333N (per FDEP permit issued to SFWMD), S-12D, S-12C, S-12B, S-12A, S-343B, S-343A, S-344, and S-151 subject to downstream constraints and closure periods.</p> <p>When water stages are in Zone B or Zone C, the WCA-3A release targets are computed by the TTF for S-333, S-333N, S-12D, S-12C, S-12B, S-12A (listed in priority order) to prioritize releases to Northeast Shark River Slough (NESRS) first and Western Shark River Slough (WSRS) second. Zone C defines the “floor” or minimum elevation for WCA-3A (7.5 feet NGVD, measured at Site 3-69W gage) (USGS Site ID: 255300080370001). Below this stage, no further releases for water supply to the Lower East Coast for municipal and industrial uses, agriculture supplemental irrigation or prevention of saltwater intrusion unless preceded by an equivalent volume of inflow. The EHWL ranges from a minimum of 11.0 feet NGVD (1 June) to a maximum of 12.0 feet NGVD (01 November to 1 January) and is further described in subsection 7.4.8.1.3.2.</p>
WCA-3A	WCA-3A Tamiami Trail Flow Formula	TTF will provide weekly release targets across Tamiami Trail. (See subsection 7.4.8.1.3.1 and Appendix H of the COP EIS) <i>Note: Replaces WCA-3A Rainfall-based Management Plan.</i>
WCA-3A	COP Extreme High-water Line (EHWL)	COP EHWL ranges between 11.0 to 12.0 feet NGVD (see Figure 7-7 and subsection 7.4.8.1.3.2)
WCA-3A	Water Supply Releases from WCAs	<p>During low water conditions, it is difficult to draw water from the interior of the WCAs. The regulation schedules for WCA-1, WCA-2A, and WCA-3A include a “floor” or minimum water levels below which water supply releases from the WCAs must be preceded by an equivalent volume of inflow. The water levels may continue to recede due to evaporation and seepage. There is not a requirement to maintain the minimum elevation. Monitoring gages for the WCAs floors are:</p> <ul style="list-style-type: none"> WCA-1 - Gage 1-8C at 14.0 feet NGVD WCA-2A - S-11B HW stage at 10.5 feet NGVD WCA-3A - Gage 3-69W at 7.5 feet NGVD <p>Water supply releases from WCA-3A are delivered for water supply to east and south Miami-Dade County to maintain minimum canal levels and prevent salt-water intrusion.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
WCA-3A	S-142	S-142 releases water from WCA-3A to supply water needs along the North New River Canal during the dry season. It can also release excess water from WCA-3A when capacity is available in the North New River Canal. S-142 has a design capacity of 500 cfs.
WCA-3A	S-339	S-339 structure is a sheet pile barrier dam on C-123 (the Miami Canal) about 6 miles north of I-75. It was designed to prevent over drainage of the northern portion of WCA-3A by forcing flows from C-123 Canal out into the marsh, and to transfer water to the ENP, the Metropolitan Miami, and the south Miami-Dade County areas. The structure is closed most of the time, but it is opened fully in accordance with the operations schedule (Figure 7-8). The optimum headwater elevation is 11.0 feet NGVD. S-339 has a design capacity of 1,100 cfs.
WCA-3A	S-340	S-340 structure is a sheet pile barrier dam on C-123 (the Miami Canal) about 2.7 miles south of I-75. It was designed to prevent over drainage of the northern portion of WCA-3A by forcing flows from C-123 Canal out into the marsh, and to transfer water to the ENP, the Metropolitan Miami, and the south Miami-Dade County areas. The structure is closed most of the time, but it is opened fully in accordance with the operations schedule (Figure 7-8). The optimum headwater elevation is 9.3 feet NGVD. S-340 has a design capacity of 1,100 cfs.
WCA-3A	S-344	S-344 releases water from WCA-3A to Big Cypress National Preserve. The structure is open when WCA-3A is in Zone A and closed when WCA-3A is below Zone A subject to the below downstream constraint. Downstream constraint: Loop Rd 1 Gage should be kept below 8.5 feet NGVD to avoid flooding Loop Road. Loop Rd 1 Gage is shown in Figure 7-9. S-344 has a design capacity of 135 cfs.
WCA-3A	S-343A and S-343B	S-343A and S-343B release water from WCA-3A to Big Cypress National Preserve. The structures are open 15 July through 30 September when WCA-3A is in Zone A and closed 1 October through 14 July. The structures are also closed at all times when WCA-3A is below Zone A and are subject to the below downstream constraint. Downstream constraint: Loop Rd 1 Gage should be maintained below 8.5 feet NGVD to avoid flooding Loop Road. S-343A and S-343B each has a design capacity of 195 cfs.
WCA-3A	S-12A/B/C/D	S-12A/B/C/D, all are operated in accordance with WCA-3A regulation schedule and TTFE, except for S-12A and S-12B which have the following seasonal closure criteria for the marl prairie and CSSS subpopulation A. Seasonal Closure Criteria: S-12A and S12-B closed from 1 October through 14 July with the following limited conditional opening: S-12A and/or S-12B will be conditionally opened during October under the following conditions. 1. WCA-3A stage based on 3 gage average of Site 63, Site 64, and Site 65 on 30 September is greater than 10.5 feet NGVD; or

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>2. WCA-3A stage is projected to rise above 10.75 feet NGVD during October, based on consideration of projected inflows and direct rainfall.</p> <p>3. S-12A and/or S-12B will be closed when the WCA-3A stage falls below 10.25 feet NGVD, OR on 1 November, whichever comes first.</p> <p>S-12B will be conditionally opened during November under the following conditions:</p> <ol style="list-style-type: none"> 1. WCA-3A stage on 31 October is greater than 11.0 feet NGVD; or 2. WCA-3A stage is projected to rise above 11.25 feet NGVD during November, based on consideration of projected inflows and direct rainfall. 3. S-12B will be closed when the WCA-3A stage falls below 10.75 feet NGVD, OR on 1 December, whichever comes first. <p>S-12C no closure period. S-12D no closure period.</p> <p>Additional Year-Round Operational Criteria:</p> <p>S-12A Year-round: To provide access to cultural areas, when TTFE results in S-12 target flows, S-12A up to 100 cfs release is available when requested by the Tribe. (See subsection 7.4.7.1.)</p> <p>S-12A Cultural Access Release: S-12A up to 100 cfs release is available when TTFE results in S-12 target flows and is requested by the MTIF. From 1 October through 14 July, the MTIF and USACE must request informal consultation with USFWS to avoid impacts on CSSS subpopulation A. The duration of this release will not exceed five consecutive days. S-12A up to 100 cfs release may only occur when 3-gage average (Sites 63, 64, 65 in WCA-3A) is greater than 8.4 feet NGVD.</p> <p>During S-12A up to 100 cfs release, data such as but not limited to NP-205 stage and area rainfall will be monitored. If NP-205 stage increases or is anticipated to increase above 5.7 feet NGVD, S-12A will close.</p> <p>S-12C/D Year-round: S-12C and/or S-12D release up to WCA-3A Regulation Schedule (Zone A maximum) or TTFE (target flow).</p> <p>S-12s Flow Distribution: S-12 opening sequence to meet Target Flows is prioritized from east to west (S-12D, S-12C, S-12B then S-12A) as each structure reaches their maximum flow capacity;</p> <p>S-12A/B/C/D may be opened if their headwater is greater than 11.0 feet NGVD to pass an amount only enough to prevent overtopping of gates to protect gate instrumentation. For S-12A and S-12B, the USACE will assess upstream conditions and will close S-12A/B gates when headwater levels drop below 10.75 feet NGVD.</p>
WCA-3A	S-151	<p>S-151 releases water from WCA-3A to the C-304 (Miami Canal) in WCA-3B for both flood risk management and water supply. S-151 may make maximum releases to WCA-3B when WCA-3A is in Zone A and when the Site 71 gage is less than 8.5 feet NGVD and S-31 HW is less than 9.0 feet NGVD. S-151 operates together with S-31 and S-337 to permit releases from WCA-3B and WCA-3A for water supply to Miami-Dade County and SDCS.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>S-151 may also be used with S-337 to provide water for environmental deliveries to Taylor Slough or to maintain the hydraulic ridge, subject to criteria further defined in subsection 7.4.8.2.2.</p> <p>S-151 has a design capacity of 1,105 cfs.</p>
WCA-3A	S-152	<p>S-152 releases water from WCA-3A to WCA-3B Per Decompartmentalization and Sheetflow Enhancement Physical Model (DPM) phase 2, S-152 operating criteria listed below:</p> <ol style="list-style-type: none"> 1. May be operated when L-67A Canal stage at S-152 HW exceeds 7.5 feet NGVD. 2. Closed when WCA-3B site 71 or SRS-1 stage equals or exceeds 8.5 feet NGVD. 3. S-152 releases may be reduced or discontinued when S-355A and S-355B are closed due to L-29 Borrow Canal stage constraints. 4. Releases may be reduced or discontinued when water quality constraint criteria per the FDEP Permit are exceeded. <p>Note: This is a temporary structure for the DPM, which is a field-scale test that is being conducted to determine how best to design and formulate plans for future decompartmentalization of WCA-3A, as envisioned in CERP. The phase 2 of the DPM operational window is anticipated to be from November 2017 through 2021.</p> <p>S-152 has a design capacity of 800 cfs, however a maximum release of 640 cfs was observed on Jul 14, 2017 during an emergency deviation.</p>
WCA-3B	S-355A/B	<p>S-355A and S-355B release water from WCA-3B to the L-29 canal. The structures are open whenever hydraulic gradient allows flow from WCA-3B to L-29 Borrow Canal with low risk of backflow from L-29 Borrow Canal to WCA-3B.</p> <p>Constraints on the Operation of S-355A and S-355B.</p> <ol style="list-style-type: none"> 1. The S-355A and S-355B water control structures will be operated to comply with the following constraints: <ol style="list-style-type: none"> a. Releases from S-355A or S-355B or a combination of both shall be limited as required to prevent the L-29 Borrow Canal stage from exceeding the 8.5 feet NGVD L-29 Borrow Canal stage constraint. b. Releases from S-355A or S-355B or a combination of both shall be limited as required to prevent impacts to the existing project purposes of the C&SF Project including but not limited to flood damage reduction and water supply. <p>The S-355A and S-355B water control structures shall be closed if any of the two conditions above are not met, and when there is a potential for reverse flow (from L-29 Borrow Canal to WCA-3B) through the structures. The actual open and close levels of the structures will depend on the water conditions, forecasts, and other system constraints.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
WCA-3B / C 304 / Miami Canal	S-31	<p>S-31 releases water from WCA-3B and WCA-3A C-304 to the C-6 (both parts of the Miami Canal). To prevent fish kills when opening S-31 or S-337, S-151 should be open and passing an equal or greater volume of water than the combined release of S-31 and S-337."</p> <p>S-31 can also be used to release water from WCA-3A under EHWL operations subject to channel capacity in the Miami Canal.</p> <p>S-31 has a design capacity of 700 cfs.</p>
L-30	S-337	<p>S-337 operates together with S-31 and S-151 to permit releases from WCA-3B and WCA-3A and to supply water for Miami-Dade County. The structure is open only when S-151 is also opened equal or greater amount of combined discharge at S-31 and S-337 to prevent fish kills that can occur between S-151 and S-337 and downstream capacity is available.</p> <p>S-337 may also be used to provide water for environmental deliveries to Taylor Slough or to maintain the hydraulic ridge, subject to criteria further defined in subsection 7.4.8.2.2.</p> <p>S-337 has a design capacity of 605 cfs.</p>
L-30	S-335	<p>S-335 releases water from the L-30 canal to the L-31N canal. The structure has an operating range for flood risk management of 6.5 to 7.5 feet NGVD. S-335 is closed when the TW stage equals or exceeds 6.1 feet NGVD.</p> <p>S-335 may:</p> <ol style="list-style-type: none"> 1. Release up to 200 cfs when S-335 HW stages are 5.3 to 6.0 feet NGVD from 1 August through 14 February. 2. Release up to 400 cfs when S-335 HW stages are 6.0 to 6.5 feet NGVD from 1 August through 14 February 3. These additional S-335 operations are suspended when TW stage equals or exceeds 6.1 feet NGVD or when S-176 HW stage equals or exceeds 4.7 feet NGVD. 4. Releases made for this purpose should be considered coincident to any releases being made for water supply to south Miami-Dade County. <p>S-335 releases up to 200 cfs may continue between 14 February and 1 May when S-335 HW is above 6.0 feet NGVD.</p> <p>S-335 has a design capacity of 525 cfs.</p>
WCA-3A	Water Deliveries to Maintain Hydraulic Ridge and provide water to Taylor Slough	<p>To minimize the rapid reduction in the water level of ENP west of the C-111 NDA/SDA water managers may convey water from WCA-3A to maintain the hydraulic ridge along the C-111 NDA/SDA and/or provide deliveries to Taylor Slough. Water deliveries from WCA-3A will be limited to 200 cfs when average stage at Site 62 and Site 63 gages is greater than 9.80 feet NGVD (FWC muck fire closure criteria for northern WCA-3A is 9.30 feet NGVD). These deliveries will be coordinated by USACE with SFWMD and ENP. This flow limit will be measured at S-334 or S-337. This operation is intended to support gradual recession rates in the ENP marsh by providing additional water to the S-332B, S332C, S332D, S-200, and S-199 pump stations.</p> <p>When S-332C headwater elevation falls below 3.8 feet NGVD during the dry season, all pump operations for the maintenance of the hydraulic ridge will cease. S-332BN may be utilized for supplemental water deliveries</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>when S-332D, S-332BW, or S-332C is not available because of a routine maintenance or repair.</p> <p>During the water delivery operations, S-176 HW stage will be maintained between 3.8 and 4.3 feet NGVD.</p>
L-29		<p>L-29 Borrow Canal may operate between 8.3 feet NGVD and 8.5 feet NGVD for up to 90 days per water year* (starting on 1 May and ending on 30 April of the following year), with the opportunity to increase the duration of stages beyond 90 days based on real-time monitoring of the Tamiami Trail (US-41 Highway 41) sub-base (interim FDOT constraint until Tamiami Trail Next Step (TTNS) construction is completed), 8.5 SMA flood mitigation criteria and consideration of increased low-water stages within WCA 3A. Outside the 90-day FDOT limit, L-29 Borrow Canal level will be maintained below 8.3 feet NGVD subject to downstream constraints and L-29 Borrow Canal rainfall event driven criteria below.</p> <p>With regard to these criteria, L-29 Borrow Canal elevation will be measured at the higher of the S-333 TW or the S-334 HW.</p> <p>The L-29 Borrow Canal will be operated to ensure the stability and safety of the Tamiami Trail (U.S. Highway 41) between S-333 and S-334, based upon coordination with the FDOT concerning implementation of the Relocation Agreement dated September 25, 2008. The below requirements shall remain unchanged until full completion of TTNS construction (projected 2024).</p> <p>When the stage in the L-29 Borrow Canal reaches a stage of 8.5 feet NGVD, input from all structures that release water into the canal (S-333, S-355A/B, and S-356) shall be suspended until the level in the L-29 Borrow Canal recedes below 8.5 feet NGVD. If rainfall beyond what was forecasted causes the L-29 Borrow Canal to exceed 8.5 feet NGVD, inflow structures will be operated with the intention of limiting event durations with L-29 Borrow Canal stages above 8.5 feet NGVD to a target maximum duration of 72 hours. The Tamiami Trail roadway subbase and roadway will be continuously monitored during implementation of COP using the monitoring plan in Appendix H of the COP EIS. Continued L-29 Borrow Canal inflows which result in cumulative days with L-29 Borrow Canal stages at 8.5 feet NGVD for longer than 90 days will require written approval from the FDOT, given evaluation of the monitoring data by the USACE, SFWMD, and FDOT.</p> <p>L-29 Event Driven Criteria*: For example, the below NOAA Weather Prediction Center Quantitative Precipitation Forecasts (QPF) ranges will be used to maintain L-29 Borrow Canal below 8.5 feet NGVD.</p> <ul style="list-style-type: none"> 8.4' If the 5-day QPF is for 2 to 3 inches L-29 structural inflows shall be reduced until the stage is below 8.4 feet NGVD 8.3' If the 5-day QPF is for 3 to 4 inches L-29 structural inflows shall be reduced until the stage is below 8.3 feet NGVD 8.2' If the 5-day QPF is for 4 to 5 inches L-29 structural inflows shall be reduced until the stage is below 8.2 feet NGVD 8.1' If the 5-day QPF is for 5 to 6 inches L-29 structural inflows shall be reduced until the stage is below 8.1 feet NGVD.

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>* Stopping flows shall occur per the priority order prescribed for S-356 and S-333.</p> <p>If the 8.5 SMA hydroperiod duration constraint is violated, L-29 Canal stage may be lowered to elevation 7.8 feet NGVD.</p>
L-29	S-333	<p>S-333 releases water from WCA-3A to the L-29 Borrow Canal. The S-333 releases are in accordance with WCA-3A regulation schedule, the TTF, and L-29 Borrow Canal maximum operating limits.</p> <p>S-333 is available to meet TTF, water supply, environmental water deliveries, and the EHWL operations.</p> <p>S-333 may be temporarily suspended from releasing to NESRS when 8.5 SMA hydroperiod duration constraint is violated; S-334 will not be open under these conditions unless S-334 is needed to maintain the L-29 Borrow Canal stage at or below the adjusted constraint of 8.5 feet NGVD to ensure the stability and safety of the Tamiami Trail (U.S. Highway 41).</p> <p>S-333 has a design capacity of 1,350 cfs.</p> <p>S-333N can also be used in place of or in conjunction with S-333 to achieve the S-333 operational intent.</p>
L-29	S-333N (owned and operated by SFWMD)	<p>S-333N is a CEPP project structure and is currently under construction with completion estimated for August 2020. S-333N will release water from WCA-3A to the L-29 Borrow Canal per FDEP permit 0362076-001, or any future modification issued to SFWMD. S-333N may be operated by SFWMD under Emergency Limited Operations for WCA-3A High Water Relief under the following conditions:</p> <ol style="list-style-type: none"> 1. When the average stages at gages Site 62 and Site 63 exceed elevation 11.6 feet NGVD for 72 hours. Releases from the S-356 shall have priority over the S-333N releases. 2. S-333N is closed when the L-29 Borrow Canal stage limits the operations of the S-356, or when the average of the Site 62 and Site 63 gages recedes below an elevation of 11.0 feet NGVD. 3. During operations of S-333N, the following operations shall take place: <ol style="list-style-type: none"> a. There shall be no use of S-334 to divert WCA-3A regulatory releases to the L-31N Canal. b. S-356 will have priority over the S-333N and S-356 will be operated up to its full available capacity prior to opening G-211 and as the water levels recede in WCA-3, G-211 will be closed before the pumping at S-356 is reduced. If water is needed downstream, G-211 may be opened before S-356 is maximized or S-356 may be reduced before G-211 is closed. <p>S-333N HW is in WCA-3A and its TW is in the L-29 Borrow Canal.</p> <p>S-333N has a design capacity of 1,150 cfs.</p>
L-29	S-334	<p>S-334 releases water from the L-29 Borrow Canal for water supply, environmental water deliveries, and flood risk management.</p> <p>Under the Extreme High Water Line operations as detailed in subsection 7.4.8.1.3.2, S-334 may be operated up to its design capacity of 1,200 cfs subject to SDCS flow constraints and through the use of all remaining available coastal release structures.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>Primary Route: L-29, L-31N, and C-111 canals and through S-333, S-334, G-211, S-331, S-176, S-177, and S-18C structures</p> <p>Priority order of outflow structures: S-332D, S-332BW, S-332C, S-332BN, S-338, S-194, S-196, S-200, S-199, S-336, and S-197</p> <p>S-334 may be used to maintain the L-29 Borrow Canal stage at or below the adjusted constraint of 8.5 feet NGVD to ensure the stability and safety of the Tamiami Trail (U.S. Highway 41) between S-333 and S-334, provided S-333 is closed, and subject to downstream constraints. If S-334 is operated in accordance with this condition, S-334 is closed as soon as 8.3 feet NGVD in L-29 Borrow Canal is reached following the post-event recession.</p>
L-31N	S-356	<p>S-356 pump station manages water stages in the L-31N and L-30 canals between S-334 and G-211 by pumping water to the L-29 Borrow Canal. The pump station has an operating range from 5.5 feet NGVD to 5.8 feet NGVD.</p> <p>S-356 usually has priority over S-333. When WCA-3A is above the Extreme High Water Line, S-333 has priority over S-356 and S-356 may be used to control the stage in L-31N between 5.5 and 5.8 feet NGVD to the extent there is capacity in L-29 canal and not to exceed the L-29 canal maximum operating limit of 8.5 feet NGVD. However, S-356 has priority over S-333 when SDCS is in pre-storm, storm, and storm recovery operations.</p> <p>S-356 will be secured when S-334 is making releases under the EHWL operations or when S-334 is used to maintain L-29 canal stage at or below 8.5 feet NGVD.</p> <p>S-356 has a design capacity of 500 cfs.</p>
L-31N	S-336	<p>S-336 releases water from the L-30, L-31N, or L-29 Borrow Canal to supply water to Miami-Dade County and Biscayne Bay when the HW stage at either S-25B or S-22 falls below the optimum stage of 2.0 feet NGVD during dry periods.</p> <p>S-336 may also be used to make flood releases when downstream conditions have conveyance capacity.</p> <p>S-336 has a design capacity of 145 cfs.</p>
L-31N	S-338	<p>S-338 releases water to the east, from the L-31N canal to the C-1W canal. The structure has an operating range from 5.5 feet NGVD to 5.7 feet NGVD.</p> <p>S-338 has a design capacity of 170 cfs.</p>
L-31N	G-211	<p>G-211 is a divide structure for the L-31N canal between S-335 and S-331. The structure has an operating range from 5.5 feet NGVD to 6.0 feet NGVD.</p> <p>G-211 is primarily used to convey water supply and environmental deliveries to south Miami-Dade County. S-356 is the first priority for keeping the reach of the L-31N Canal upstream of the G-211 from exceeding its normal operating range.</p> <p>G-211 has a design capacity of approximately 1,100 cfs.</p>
L-31N	S-331	<p>S-331 pump station manages water stages in the L-31N canal. S-331 has an operating range of 4.5 feet NGVD to 5.0 feet NGVD from 14 February</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>through 31 July and 4.3 feet NGVD to 4.6 feet NGVD from 01 August through 1 January. A transition between the two operating ranges is to be accomplished between 1 January and 14 February.</p> <p>S-331 pumping will cease when TW stage is above 6.0 feet NGVD.</p> <p>S-331 operations are available to assist S-357 in meeting 8.5 SMA flood mitigation requirements. See S-357 operational criteria below.</p> <p>S-331 has a design capacity of 1,160 cfs. The pump station has three diesel units with each rated for 387 cfs at 3.0-foot static head.</p> <p>When S-331 is operating to assist in providing drainage to 8.5 SMA then up to 200 cfs can be routed to S-197 as long as S-18C HW > 2.3 feet NGVD.</p> <p>Flow from S-331 resulting in operation of S-332B, S-332C, and S-332D within 0.2 feet of the top of the range should result in use of available capacity at S-199 and S-200 (in coordination with SFWMD), and then, if needed, releases of up to 200 cfs at S-197. Priority would be to utilize available capacity at S-332B/C/D, S-199, and S-200 prior to opening S-197.</p> <p>S-331 may be used for water supply, water deliveries to Taylor Slough and maintenance of the hydraulic ridge, and environmental water deliveries to Biscayne Bay. Tailwater elevation of 6.0 feet NGVD at S-331 creates an undesirable condition relative to adjacent agricultural and residential areas.</p>
L-31N	S-173	<p>S-173 is a gated-culvert adjacent to S-331. S-173 may be used for water supply, water deliveries to Taylor Slough and maintenance of the hydraulic ridge, and environmental water deliveries to Biscayne Bay, consistent with the S-331 operational criteria.</p> <p>S-173 has a design capacity of 100 cfs.</p>
L-31N	S-194	<p>S-194 releases water from the L-31N canal east to the C-102 canal. The structure has an operating range from 4.1 to 4.7 feet NGVD.</p> <p>S-194 has a design capacity of 190 cfs.</p>
L-31N	S-196	<p>S-196 releases water from the L-31N canal east to the C-103 canal. The structure has an operating range from 4.1 feet NGVD to 4.7 feet NGVD.</p> <p>S-196 has a design capacity of 200 cfs.</p>
L-31N	L-31N Reach between S-331 and S-176	<p>Structure release priorities and operating ranges:</p> <p>Priority 1.</p> <p style="padding-left: 40px;">S-332D 3.8 feet NGVD to 4.8 feet NGVD</p> <p style="padding-left: 40px;">S-332BW 3.8 feet NGVD to 4.8 feet NGVD</p> <p style="padding-left: 40px;">S-332C 3.8 feet NGVD to 4.8 feet NGVD</p> <p style="padding-left: 40px;">S-332BN 3.8 feet NGVD to 4.8 feet NGVD</p> <p>Priority 2.</p> <p style="padding-left: 40px;">S-196 4.1 feet NGVD to 4.7 feet NGVD</p> <p style="padding-left: 40px;">S-194 4.1 feet NGVD to 4.7 feet NGVD</p> <p style="padding-left: 40px;">S-176 4.5 feet NGVD to 5.0 feet NGVD (last in-line within Tier 2 unless S-200 and S-199 pumping capacities are available)</p> <p>If S-331 is operating to assist in providing drainage to 8.5 SMA and/or facilitate the EHWL operations, the operating ranges are:</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>Priority 1</p> <p>S-332D 3.8 feet NGVD to 4.6 feet NGVD S-332BW 3.8 feet NGVD to 4.6 feet NGVD S-332C 3.8 feet NGVD to 4.6 feet NGVD S-332BN 3.8 feet NGVD to 4.6 feet NGVD</p> <p>Priority 2</p> <p>S-196 4.1 feet NGVD to 4.6 feet NGVD S-194 4.1 feet NGVD to 4.6 feet NGVD S-176 4.3 feet NGVD to 4.6 feet NGVD</p> <p>Seasonal ranges for the pump stations are detailed below.</p>
L-31N	S-332B	<p>S-332BN releases water into the C-111 NDA with two 125 cfs-diesel units. S-332BW releases water into the C-111 SDA with one 75 cfs-electric unit and two 125 cfs-diesel units.</p> <p>After S-332B is replaced, it will have four 125 cfs diesel units and two 75 cfs electric pumps; the maximum design capacity for the WCP will be unchanged at 575 cfs, with the additional electric pump station used for operational flexibility. When S-332B is replaced with a permanent pump station, up to 250 cfs can be diverted to C-111 NDA.</p> <p>S-332B operational criteria vary seasonally, as prescribed below:</p> <ol style="list-style-type: none"> 1. Transition period (1 January to 14 February) operating range: 3.8 feet NGVD to 4.8 feet NGVD. 2. CSSS nesting period (15 February through 31 July) operating range: 4.0 feet NGVD to 4.8 feet NGVD. 3. South Miami-Dade Typical Planting Season (1 August to 31 December) operating range: 3.8 feet NGVD to 4.4 feet NGVD.
L-31N	S-332C	<p>S-332C releases water into the C-111 SDA with one 75 cfs-electric unit and four 125 cfs-diesel units.</p> <p>After S-332C is replaced with permanent station, it will have four 125 cfs diesel units and two 75 cfs electric pumps; the maximum design capacity for the WCP will be unchanged at 575 cfs, with the additional electric pump station used for operational flexibility.</p> <p>S-332C operational criteria vary seasonally, as prescribed below:</p> <ol style="list-style-type: none"> 1. Transition period (1 January to 14 February) operating range: 3.8 feet NGVD to 4.8 feet NGVD. 2. CSSS nesting period (15 February through 31 July) operating range: 4.0 feet NGVD to 4.8 feet NGVD. 3. South Miami-Dade Typical Planting Season (1 August to 31 December) operating range: 3.8 feet NGVD to 4.4 feet NGVD.
L-31N	S-332D	<p>S-332D releases water into the S-332D Flow-way with one 75 cfs-electric unit and four 125 cfs-diesel units.</p> <p>S-332D flows above the calendar based CSSS release limits are permitted to maintain canal stages for flood risk management as long as the excess flow is diverted through S-332DX1.:</p> <ol style="list-style-type: none"> 1. 500 cfs (15 July to 31 December) 2. 325 cfs (01 January to 31 January)

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>3. 250 cfs without the use of S-332DX1 or 375 cfs with S-332DX1 release of 125 cfs (01 February to 14 July)</p> <p>S-332D operational criteria vary seasonally, as prescribed below:</p> <ol style="list-style-type: none"> 1. Transition period (1 January to 14 February) operating range from 3.8 feet NGVD to 4.8 feet NGVD. 2. CSSS nesting period (15 February to 31 July) operating range from 4.0 feet NGVD to 4.8 feet NGVD. 3. South Miami-Dade Typical Planting Season (1 August to 31 December) operating range from 3.8 feet NGVD to 4.4 feet NGVD.
S-332D High Head Cell	S-332DX1	<p>S-332DX1 connects the S-332D Flow-way to the C-111 SDA. S-332DX1 is typically closed from 15 July to 31 December to prioritize releases to S-332D Flow-way toward Taylor Slough.</p> <p>S-332DX1 may be open to divert S-332D flows above the calendar based CSSS release limits, in which case the S-332D restrictions do not apply as long as the S-332D flows above calendar based CSSS release limits are diverted through S-332DX1.</p>
L-31N	C-111 North Detention Area (NDA)	<p>No stage constraint; emergency overflow weir crest elevation is 10.0 feet NGVD.</p> <p>S-357 and S-332BN pump water into the C-111 NDA.</p>
L-31N	C-111 South Detention Area (SDA)	<p>No stage constraint; emergency overflow weir crest elevation is 10.0 feet NGVD.</p> <p>S-332BW and S-332C pump water into the C-111 SDA.</p>
L-31N	S-176	<p>S-176 is the divide structure between the L-31N Borrow Canal and C-111 between S-331 and S-177. The structure has a normal operating range from 4.5 feet NGVD to 5.0 feet NGVD*.</p> <p>S-176 may release up to 200 cfs when S-332B/C/D restricted by CSSS habitat or nesting conditions identified in the COP Biological Opinion (consistent with the ERTF 2016 Biological Opinion) provided that S-176 HW can be maintained within its operational range; Additional releases may be used anytime of the year, without causing S-18C HW to exceed 2.9 feet NGVD, to reduce the likelihood of triggering a Level 2 or Level 3 opening at S-197.</p> <p>*When S-331 is used to provide drainage to 8.5 SMA and/or to facilitate the EHWL operations, the operating range may be lowered to 4.3 feet NGVD to 4.6 feet NGVD. For the duration of these S-331 operations, up to 200 cfs can be routed to S-197 as long as S-18C HW > 2.3 feet NGVD. Flow from S-331 resulting in operation of S-332B, S-332C, and S-332D within 0.2 feet of the top of the S-332B/C/D range should result in use of available capacity at S-199 and S-200, and then, if needed, releases of up to 200 cfs at S-197. Priority would be to utilize available capacity at S-332B/C/D, S-199, and S-200 prior to opening S-197.</p> <p>S-176 has a design capacity of 630 cfs.</p>
C-111	S-200 (owned and operated by SFWMD)	<p>S-200 is operated per the current FDEP Permit issued to SFWMD. S-200 is intended to work in unison with the Frog Pond Detention Area and Aerojet Canal features to create a 6-mile long hydraulic ridge along the eastern boundary of ENP. The operating criteria below are from the FDEP</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>permit0293559-011. Based on the stage at S-177 HW, the operating range is:</p> <ol style="list-style-type: none"> 1. Transition from 1 January to 14 February: 3.0 feet NGVD to 4.0 feet NGVD. 2. 15 February to 31 July: 3.3 feet NGVD to 4.0 feet NGVD. 3. 1 August to 31 December: 3.0 feet NGVD to 3.4 feet NGVD. <p>Pumping at S-200 will cease if stage at monitoring station R3110 > 4.95 feet NGVD during the critical portion of the CSSS nesting season from 15 March through 30 June.</p> <p>S-200 has a design capacity of 300 cfs (four 75 cfs electric pumps).</p>
C-111	S-199 (owned and operated by SFWMD)	<p>S-199 is operated per the current FDEP Permit issued to SFWMD. S-199 is intended to work in unison with the Frog Pond Detention Area and Aerojet Canal features to create a 6-mile long hydraulic ridge along the eastern boundary of ENP. The operating criteria below are from the FDEP permit 0293559-011. Based on the stage at S-177 HW, the operating range is:</p> <ol style="list-style-type: none"> 1. Transition from 1 January to 14 February: 3.0 feet NGVD to 4.0 feet NGVD. 2. 15 February to 31 July: 3.3 feet NGVD to 4.0 feet NGVD. 3. 1 August to 31 December: 3.0 feet NGVD to 3.4 feet NGVD. <p>Pumping at S-199 will cease if stage at monitoring station EVER4 (USGS Site ID: 252036080324300) > 2.36 feet NGVD during the critical portion of the CSSS nesting season from 15 March through 30 June.</p> <p>S-199 has a design capacity of 300 cfs (four 75 cfs electric pumps).</p>
C-111	S-177	<p>S-177 is in the C-111 south of S-176. The structure has an operating range from 3.6 feet NGVD to 4.2 feet NGVD.</p> <p>If the rainfall over the past 14 days exceeds 5.5 inches or if significant rainfall is forecasted, then S-177 may be opened to lower S-177 HW to 3.3 feet NGVD. When flows at S-332B/C/D are restricted to achieve the CSSS habitat or nesting conditions, up to 200 cfs may be conveyed through S-177 when S-177 HW is below its operational range.</p> <p>S-177 has a design capacity of 1,400 cfs.</p>
C-111	S-18C	<p>S-18C is used for flood risk management, to maintain a desirable freshwater head against northerly saltwater intrusion, and to provide water to the panhandle of ENP. The structure has an operating Range from 2.3 to 2.65 feet NGVD</p> <p>S-18C has a design capacity of 2,100 cfs.</p>
C-111	S-197	<p>S-197 releases water from the C-111 to tide. The operation of S-197 is based on the S-18C HW (S-18C gates fully open) and releases are based on the Levels below:</p> <ol style="list-style-type: none"> 1. Level 1. When S-18C HW > 2.7 feet NGVD, open S-197 up to 200 cfs; close when S-18C HW < 2.5 feet NGVD. Flow may be adjusted from 0 to 200 cfs within the range. When transition from Level 2, wait 24 hours and reassess. 2. Level 2. When S-18C HW > 2.9 feet NGVD, operate S-197 up to 800 cfs; reduce to Level 1 when S-18C HW < 2.4 feet NGVD.

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>3. Level 3. When S-18C > 3.3 feet NGVD, operate S-197 up to 2400 cfs; reduce to Level 2 when S-18C HW < 2.4 feet NGVD. Operating intent is to transition down to lower flows while holding S-18C HW < 2.4 feet NGVD.</p> <p>When S-331 is operating to assist in providing drainage to 8.5 SMA then up to 200 cfs can be routed to S-197 as long as S-18C HW > 2.3 feet NGVD. Priority would be to utilize available capacity at S-332B/C/D, S-199, and S-200 prior to opening S-197.</p> <p>When in Extreme High Water Condition 2 and S-18C HW is above 2.3 feet NGVD, S-197 releases may be increased up to a daily average of 1,200 cfs to accommodate additional flows through S-334 which exceed the SDCS flow constraints for S-332B, S332C, and S-332D. The total available capacity at S-197 will be decreased to 600 cfs when S-18C HW falls below 2.3 feet NGVD.</p> <p>S-197 has a design capacity of 2,400 cfs.</p>
C-357 (8.5 SMA)	S-357	<p>S-357 pumps water from the C-357 and C-358 canals to the C-111 NDA. The pump station has a normal operational range of 3.5 feet NGVD to 6.0 feet NGVD. Both S-357 and S-331 pump stations will need to be operated in tandem in order to manage the increased seepage from NESRS into 8.5 SMA while providing the required flood mitigation. S-357 and S-331 will be operated according to the below criteria.</p> <p>1a. Angels < 6.0 feet NGVD, C-357 will be maintained between 5.5 feet NGVD and 6.0 feet NGVD.</p> <p>1b. $6.0 \leq$ Angels < 6.4 feet NGVD, C-357 will be maintained between 5.0 feet NGVD and 6.0 feet NGVD.</p> <p>1c. Angels \geq 6.4 feet NGVD, C-357 will be maintained between 4.5 feet NGVD and 5.5 feet NGVD.</p> <p>1d. Angels \geq 6.7 feet NGVD and LPG-2 \geq 6.6 feet NGVD, C-357 will be maintained between 4.0 feet NGVD and 5.0 feet NGVD until LPG-2 < 6.4 feet NGVD. If the target hydroperiod in Figure 7-11 is not being met, C-357 may be lowered to 3.5 feet NGVD to 4.5 feet NGVD.</p> <p>1e. Angels \geq 7.2 feet NGVD, and LPG-2 is projected to remain \geq 6.6 feet NGVD for 7 days or more (based on forecast and current recession rate), C-357 will be maintained between 3.5 feet NGVD and 4.5 feet NGVD until LPG-2 < 6.4 feet NGVD. If the target hydroperiod in Figure 7-11 is not being met, C-357 may be lowered to 3.0 feet NGVD to 4.0 feet NGVD and S-331 may be lowered to 3.5 feet NGVD to 4.0 feet NGVD.</p> <p>2. LPG-2 \geq 7.0 feet NGVD for more than 24 hours, C-357 will be maintained between 3.5 feet NGVD and 4.5 feet NGVD until LPG-2 < 6.4 feet NGVD. If the target hydroperiod in Figure 7-11 is not being met, C-357 may be lowered to 3.0 feet NGVD to 4.0 feet NGVD and S-331 may be lowered to 3.5 feet NGVD to 4.0 feet NGVD. If the target hydroperiod in Figure 7-11 is not being met after 7 days at these C-357 and S-331 operating levels, S-357 may be lowered to 2.5 feet NGVD to 3.0 feet NGVD and S-331 may be lowered to 2.8 feet NGVD to 3.5 feet NGVD.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
		<p>3. When G-3273 > 7.5 feet NGVD and LPG-2 recession rate is less than 0.75"/day following the rainfall event, S-357 HW will be lowered to 2.5 feet NGVD to 3.0 feet NGVD and S-331HW will be lowered to 2.8 feet NGVD to 3.5 feet NGVD until LPG-2 can be maintained between 6.2 feet NGVD and 6.6 feet NGVD.</p> <p>Operating intent is to transition S-331 to normal operations prior to S357 returning to normal operations, based on consideration of the target hydroperiod duration shown in Figure 7-11. Expanded 8.5 SMA monitoring locations at LPG-16 and LPG-17 were fully instrumented and ground-surveyed in September 2019, and this information will be used by the USACE and SFWMD to incorporate adjustments to the C-357 and/or S-331 transition criteria at LPG-2 while maintaining in-kind performance for the hydroperiod duration criteria.</p> <p>S-357 has a design capacity of 575 cfs</p> <p>When both S-357 and S-331 operate at the lowest canal settings and the 8.5 SMA target hydroperiod duration is projected to be exceeded, WCA-3A flows to NESRS may be temporarily suspended (based on forecasted rainfall) until water levels in 8.5 SMA, specifically the area west of C-357 Canal recede below ground surface elevations. WCA-3A flows to NESRS will be temporarily suspended if:</p> <ol style="list-style-type: none"> a. Water levels in 8.5 SMA are projected to exceed 6 inches below the lowest first floor elevation (lowest first floor elevation estimated at 8.5 feet NGVD) of residential properties near to L-357W Levee within 48 hours, OR b. The 8.5 SMA continuous hydroperiod constraint (Figure 7-11) for a rainfall event at LPG-2 or LPG-1 (or future in-kind replacement locations) is projected to be exceeded, OR c. The 8.5 SMA discontinuous hydroperiod constraint (Figure 7-11) for LPG-2 or LPG-1 (or future in-kind replacement locations) is projected to be exceeded. <p>8.5 SMA flood mitigation criteria were developed in accordance with Part C.6 of Appendix C of the COP EIS (Water Quality and Hydrology Monitoring Plan for 8.5 SMA Flood Mitigation) and the MWD to ENP Incremental Field Test.</p>
C-358 (8.5 SMA)	S-357N	<p>S-357N releases water from the C-358 canal to the C-357 canal. S-375N assists to meet the authorized level of flood mitigation to the residents of the Las Palmas Community (8.5 SMA). The structure has an operating range of 3.0 feet NGVD to 5.0 feet NGVD during wet conditions and 4.0 feet NGVD to 6.0 feet NGVD during dry conditions. If the target hydroperiod in Figure 7-11 is not being met, all gates at S-357N may be lowered to their lowest setting or fully opened to maximize flow to C-357 during hydrologic/operational conditions when these operations are demonstrated to be effective in increasing recession rates at LPG-1 and LPG-2.</p> <p>S-357N will be limited to 100 cfs during normal operations with the ability to utilize up to 325 cfs design capacity to assist 8.5 SMA flood mitigation.</p>

Basin / Canal	Operational Component	Description and Operating Criteria
C-111E	S-178	<p>S-178 releases water from the C-111E to the C-111 upstream of S-18C. The structure is typically open year-round but may close if S-178 HW falls below 2.0 feet NGVD.</p> <p>S-178 remains full open for tropical storms and hurricanes</p> <p>S-178 has a design capacity of 500 cfs.</p>
S-332D Flow Way	S-328	<p>S-328 releases water from Cell 1 of S-332D Detention Area into the adjacent segment of the L-31W Canal. The structure is opened when S-332D flows are 250 cfs (2 diesel units) or greater and when hydraulic gradient allows flow towards the L-31W Canal. The intent is to have the water go through the S-332D detention area towards Taylor Slough through S-205 first before opening S-328.</p> <p>S-328 has a design capacity of 500 cfs.</p>
C-200 Canal	G-737 (owned and operated by SFWMD)	<p>G-737 is downstream of S-200 in the Frog Pond Detention Area. The structure is operated per FDEP permit (issued to SFWMD).</p> <p>G-737 may be opened when there is a positive (westward) head across the structure; upstream S-200 pump station operations adhere to the CSSS seasonal constraint at R3110.</p> <p>G-737 has a design capacity of 125 cfs.</p>
L-31W Canal	S-205	<p>The S-205 weir is located on the east side of the L-31W Canal at the south end of the S332D Flow-way. It is composed of an approximately 500-foot fixed-crest weir at 6 feet NGVD and an integrated weir with a 96-foot adjustable flashboard riser section (adjusts between 4.25 feet NGVD and 6 feet NGVD). The flashboards will remain in place year-round unless extreme conditions occur and require removing the flashboards to increase flows west toward L-31W canal.</p>

7.5 Pre-storm/Storm Operations

It is important to emphasize that the C&SF Project is multi-purpose in design, and that pre-storm operations may not prevent flooding, such as experienced after Hurricane Irene in October 1999 or the no name storm in October 2000. The condition of the groundwater system at the time of a storm event is significant and is highly dependent on the amount and extent of rainfall that has already occurred prior to subsequent events. Further, there are areas of Miami-Dade County and South Florida in general, which are at low elevations and for which no amount of drawdown can prevent flooding for large rainfall events. The water levels discussed in this document are target levels and may not be attainable with the antecedent conditions, available capacity, and time available.

These regulations describe operating criteria for Hurricanes/Tropical Storms as well as other significant events that could cause flooding impacts if operations are not adjusted.

7.5.1 Hurricane and Tropical Storm Regulations

The hurricane season is from June through November. When there are tropical depressions, tropical storms, and/or hurricanes in the Atlantic/Caribbean Basin, the National Hurricane Center (NHC) issues

tropical cyclone public advisories, forecast advisories, forecast discussions, and strike probability forecasts every 6 hours. It should be noted that the large bands of heavy rain associated with tropical storms and hurricanes often extend considerable distance beyond the areas of tropical or hurricane force wind.

These regulations may be supplemented by, but not superseded by, SAJ All-Hazards Plan. The All-Hazards Plan should be consulted for related emergency preparation and actions and can be found here: <https://intranet.usace.army.mil/sad/saj/EM/Pages/Home.aspx>. The SFWMD maintains a Comprehensive Emergency Management Plan (CEMP) which provides overall guidance using an all-hazard approach for managing disasters and emergencies. The CEMP describes the policies, strategies, operational goals, and objectives through which SFWMD will mobilize resources and conduct response and recovery activities after a large-scale disaster. Sections within the emergency operations structure with specific emergency responsibilities or support roles are required to develop and maintain SOPs to carry out assigned responsibilities. Separate from emergency operations SOPs, all SFWMD divisions are responsible for establishing Suggested Operating Procedures (SOPs) that should include (but are not limited to) identifying emergency tasks specific to their organization's mission critical functions and assigning individual responsibilities for these tasks, and vital systems and records.

When a hurricane or tropical storm alert is initiated, USACE personnel from the South Florida Operations Office (SFOO) will inspect the S-10s, S-11s, and S-12s and make sure they are operating properly. The USACE, Jacksonville District, Water Management Section will provide the desired gate settings to the SFOO personnel to be used during the alert period. Generally, these structures will be fully opened prior to the storm impacting the area and readjusted, if needed, as soon as safety allows after the storm has passed. SFWMD and USACE will meet frequently to discuss on-going operations and ways to avoid and minimize flooding impacts.

7.5.2 Pre-storm / Storm / and Storm Recovery Operations for SDCS

This section provides criteria (pre-storm operations) to be used in preparing the SDCS/Miami-Dade County for forecasted storm events. The SDCS is composed of L-31N, L-31W, and C-111 canal system and control structures. Currently, for the ECC System, the canal system and control structures to the east of L-31N, the SFWMD implements canal drawdown operations based on impending rainfall events. The goal for the SDCS is to implement a similar set of canal drawdown operating criteria which seek to balance the needs of the natural system with the authorized purposes of the C&SF Project, which is multipurpose in scope and includes flood risk management and water supply.

The SFWMD employs meteorologists who monitor the tropics and evaluate tropical cyclone products issued by the NHC and the Weather Prediction Center (WPC). The meteorologists advise the SFWMD Operations Office of tropical systems which require enhanced monitoring over the next 120 hours as well as of specific tropical cyclones with the potential to bring tropical storm strength winds within the next 72 hours. The SFWMD Operations Office has defined operational procedures to be implemented depending on the timing or amount of advance warning prior to the onset of tropical storm force winds. The SFWMD operational procedures are delineated based on time prior to onset of Tropical Storm force winds; the specific operating procedures for these time frames will be described in further detail in this document. Time frames are briefly summarized as follows:

1. 72 to 48 hours prior to the impact of tropical storm force winds is the earliest level of preparation when the system is evaluated, and initial adjustments made to operations depending on the forecast and nature of the storm. Coordinate with USACE and local drainage districts.
2. 48 to 24 hours prior to the impact of tropical storm force winds, continue pre-storm operations and coordination with USACE and local drainage districts.
3. 24 to 12 hours prior to the impact of tropical storm force winds, bring telemetry-controlled sites to final pre-storm configuration, establish alternate emergency control station if necessary.

The remaining levels of preparation are 12 to 0 hours prior to the impact of tropical storm force winds; during the event; and recovery after the event. It is important to note that some storms form close to land and make landfall with less than 48 hours of advance warning (e.g., Tropical Storm Emily, 2017).

7.5.2.1 Notification and Briefing Process

The USACE District Engineer and SFWMD/USACE Executive level will be briefed prior to initiation of pre-storm operations. This may occur up to five days prior to the projected storm arrival or as soon as the cone of uncertainty issued by the NOAA National Hurricane Center shows south Florida to likely be in the path of a storm. SAD will be notified on operations outside of the WCP that are initiated and/or emergency deviations that are initiated (see section 7.10 for deviation procedures).

7.5.2.2 Drawdown Implementation

Between 24 and 72 hours prior to forecast arrival of tropical storm force winds:

The initiation of the pre-storm drawdown criteria (**Table 7-4**) will be triggered for the SDCS when Miami-Dade County is within the cone of uncertainty as developed by the NHC. These pre-storm drawdown levels are not less than the level at which water supply deliveries are made during dry periods, that is 1.5 feet below optimum canal levels, except the reach north of G-211, which is 1.0 foot below current, normal operating levels. These levels are target levels and may not be attainable.

Table 7-4. Pre-Storm Drawdown Targets.

Canal	Reach	Target Level for Draw-down (feet NGVD)
L-31(N)	S-335 to G-211	5.0
L-31(N)	G-211 to S-331	4.0*
L-31(N)	S-331 to S-176	4.0
C-111	S-176 to S-177	3.0
C-111	S-177 to S-18C	2.0
C-111	S-18C to S-197	No change
C-357	S-357 HW	3.5

*If the water surface elevation measured at 8.5 SMA LPG1 or LPG2 is 5.5 feet NGVD or below, then 4.0 would be the target; otherwise, 3.5 feet NGVD at the headwater of S-331 will be the target.

In an effort to achieve the specified drawdown targets, a sequence of operational actions is recommended as described in **Table 7-5**. The goal is to achieve one target before preceding the next sequence, however, it may not be possible to achieve the target level and operations will proceed as based on the best available information at the time. If practical with the existing conditions and time available the L-31(N) reach from S 331/S 173 to S-176 will be lowered using only S-332B, S-332C, and S 332D.

Table 7-5. Pre-Storm Drawdown Sequencing.

Sequence	Canal	Reach	Target Draw-Down Level (feet NGVD)
1	L-31(N)	S-331 to S-176	4.0
1	C-111	S-176 to S-177	3.0
2	L-31(N)	G-211 to S-331	4.0*
2	L-31(N)	S-335 to G-211	5.0

* If the water surface elevation measured at 8.5 SMA LPG1 or LPG2 is 5.5 feet NGVD or below, then 4.0 would be the target, otherwise, 3.5 feet NGVD at the headwater of S-331 will be the target.

12 to 24 hours prior to forecasted arrival of tropical storm force winds.

Continue operations as previously described, but with the following considerations:

1. **S-331:** Pump when downstream conditions allow.
2. **S-332B/C/D:** Continue Pumping. Operations are controlled from S-331, which is manned during storm events.

Recovery (conditions immediately after the storm ends or if the storm forecast changes such that Miami-Dade County is no longer likely to be affected).

Operations during Recovery consist of 1) Maximizing releases at water control structures to minimize flooding and 2) make the transition back to the operational regime in place prior to the storm. (**Table 7-6**)

Operations may also be returned to the operational regime that was in place prior to implementing pre-storm operations as soon as the Miami-Dade County is no longer within the cone of uncertainty.

Plan for Worst Case: Recovery will be necessary if storm conditions result in significant rainfall in the Miami-Dade County area. The target for operations would be to return to the operational regime in place prior to the storm. However, use of water control structures under emergency flood risk management mode will begin or continue until recovery is complete. The following operations are suggested to continue to operate in emergency flood risk management mode:

Table 7-6. Recovery Operations.

Structure	Status
S-331	Pump when downstream conditions allow
S-197	Open depending on conditions
S-332B/C/D	Continue Pumping. Operation is controlled from S-331 control building which is manned during storm events.

It is not possible to describe the sequence of operational actions during recovery prior to a particular storm event. The sequence of operational actions will depend largely on the rainfall distribution and rainfall amounts resulting from the storm.

Back to Normal Mode (operational regime in place prior to the storm)

The following conditions must be met before ceasing emergency flood risk management and resuming normal operation regime:

1. The Department of the Interior (DOI) will advise USACE of any overflow problems or adverse impacts to the CSSS Subpopulation F that may be occurring for USACE to use in their decision regarding pumping reductions at S-332B and S-332C.
2. Otherwise, stages in canal reaches must be within the specified operating ranges in place prior to the change in pre-storm or storm operations to resume normal mode.

When these conditions are met, the normal mode, as defined by the operational regime in place prior to the storm, may be resumed. This section may be modified depending on additional information, as it becomes available.

7.5.3 Operations for Other than Named Events

SFWMD will monitor antecedent conditions, groundwater levels, canal levels, and rainfall. If these conditions indicate a strong likelihood of flooding, SFWMD will advise USACE of intent to initiate pre-storm operations and will work together to define the pre-storm operations. USACE will advise ENP and USFWS of the conditions, consult with the MTIF and inform them and SAD of the decision to implement pre-storm drawdown or otherwise alter system wide operations from those contained in the table.

In addition, the Chairman of the MTIF or his designated representatives will monitor the conditions in WCA-3A and other tribal lands and predicted rainfall. If the MTIF determines these conditions indicate jeopardy to the health or safety of the MTIF, the Chairman will make a recommendation to USACE to change the operations in WCA-3A. USACE will review the data and advise SAD and appropriate agencies of the conditions, and the District Commander will personally consult with the Chairman prior to making a decision whether to implement changes to the WCA-3A operations.

7.6 Consistency with the Identification of Water and Reservations or Allocations for the Natural System

The operating criteria in this WCP are consistent with the operating criteria used to identify the water made available for the natural system during wet, average, and dry periods and also consistent with the water reservations or allocations for the natural system made by the State in accordance with section 601 of WRDA 2000.

7.7 Consistency with Savings Clause and State Assurance Provisions

WRDA 2000 provides the framework for all structural and operational changes to the C&SF project as a result of CERP implementation. Since COP does not implement CERP, the Savings Clause Provisions do not apply.

7.8 Drought Contingency Plans

Regional Drought Contingency Plans (DCP) are written to provide a decision-making process to implement water-conservation measures during droughts, review the operational flexibility of the regional system in a drought, and address the potential problems associated with an extreme drought. The DCP for WCAs, ENP, and ENP-SDCS can be found in Appendix B of this SOM.

The SFWMD has established rules and regulations that establish priorities and define procedures for water conservation and restricting water use during conditions of water shortage

SFWMD's Water Shortage Plan is codified in Chapter 40E-21 (Water Shortage Plan) and Chapter 40E-22 (Regional Water Shortage Plan), Florida Administrative Code. This plan is required under Subsection 373.246(1) Florida Statutes. The purposes of the plan are to protect the water resources of the SFWMD from harm; to assure equitable distribution of available water resources among all water users during times of shortage, consistent with the goals of minimizing adverse economic, social and health-related impacts; to provide advance knowledge of the means by which water apportionments and reductions will be made during times of shortage, and to promote greater security for permitted water users. The Water Shortage Plan includes rules that outline priorities and define procedures for restricting water use during water shortages under direction of the SFWMD's Governing Board. The Water Shortage Plan published by the SFWMD is part of the DCP and can be found using the following link:

https://www.sfwmd.gov/sites/default/files/documents/40e-21_0.pdf

Water shortage activities are managed through the SFWMD's Emergency Operations Center. The SFWMD's Comprehensive Emergency Management Plan (CEMP) follows the framework of the National Incident Management System (NIMS). The use of NIMS is a nationwide effort that is federally mandated for local, state, and federal agencies per Homeland Security Presidential Directive 5.

7.9 Flood Emergency Action Plans

The Flood Emergency Action Plans outlines operating criteria for projects that require flood damage reduction operations. The plans include an explanation of existing and proposed operating criteria, release scheduling procedures during a flood, use of storage, downstream notification procedures, and special safety concerns. Although there are currently no Flood Emergency Action Plans in the region, it is anticipated that future CERP projects will include these plans.

7.10 Deviation from Normal Regulation

Deviations from the WCP are occasionally needed to avoid or reduce negative impacts related to water management operations. Deviations are temporary variations from the WCP based on engineering judgment, engineering experience, and prevailing circumstances, and require USACE, South Atlantic Division (SAD) approval. Any deviations must follow ER 1110-2-240, be consistent with the project authorization, and be within existing authorities. USACE can request deviations or the non-federal sponsor, MTIF, STOF, and other agencies can request deviations from normal operating criteria. The USACE, Jacksonville District, Water Management Section is responsible for handling the deviation requests and transmitting them through the District Commander to the Division Commander (USACE, SAD) for final decision. Deviation requests usually fall into one of these categories: emergencies, unplanned minor deviations, or planned deviations. Water control plan deviations shall consider USACE

Environmental Principles in accordance with authorization and approved purposes and comply with NEPA, the Endangered Species Act (ESA), and related laws and regulations.

7.10.1 Emergencies

Examples of emergencies that may result in a need to deviate from normal operating criteria include drowning and other accidents; failure of the operation facilities; chemical spills; treatment plant failures; and other temporary pollution problems. Water control actions necessary to abate the problem should be implemented immediately unless such action would create equal or worse conditions. USACE, Jacksonville District must be informed of the problem and the emergency operating changes as soon as practicable. A written confirmation showing the deviation and conditions will be furnished to USACE, Jacksonville District by the operating agency after the incident. USACE, Jacksonville District will communicate with USACE, SAD. In addition, USACE will inform the non-federal sponsor, the State of Florida (FDEP and SFWMD), the DOI, the MTIF, and the STOF as appropriate.

7.10.2 Unplanned Minor Deviations

There are unplanned instances that create a temporary need for minor deviations from the normal operating criteria, although they are not considered emergencies. Construction accounts for the major portion of these incidents requiring minor deviations. Examples of activities that may require short-term deviations include construction of utility stream/canal crossings, bridgework, and major construction contract. Changes in releases are sometimes necessary to carry out maintenance and inspection of facilities. Requests for changes in release rates generally involve time periods ranging from a few hours to a few days. Each request is analyzed on its own merits. In evaluating the proposed deviation, consideration is given to upstream watershed conditions, potential flood threat, the existing condition of the lake/reservoir/storage area, and possible alternative measures. In the interest of maintaining good public relations, requests for minor deviations are generally granted, providing there are no adverse effects on the overall regulation of the project for the authorized purposes. Approval for these minor deviations normally will be obtained from USACE, SAD by telephone. Written confirmation explaining the deviation and its cause will be furnished to the USACE, Jacksonville District Water Management Section by the operating agency. USACE, Jacksonville District will communicate with USACE, SAD. In addition, USACE will inform the non-federal sponsor, the State of Florida (FDEP and SFWMD), the DOI, the MTIF, and the STOF as appropriate prior to approval.

7.10.3 Planned Deviations

Each circumstance should be analyzed on its own merits. The requesting agency will provide sufficient data on flood potential, lake/reservoir/storage area and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes, letter to USACE, Jacksonville District. USACE, Jacksonville District will analyze each proposed deviation and will request approval from USACE, SAD. In addition, USACE will inform the non-federal sponsor, the State of Florida (FDEP and SFWMD), the DOI, the MTIF, and the STOF as appropriate prior to approval.

7.11 Rate of Release Change

Generally, a daily step change of 500 cfs is the maximum amount of change desired at the S-10s, S-11s, and S-12s. Gradual transitions are intended to support the health of wildlife. Risks that should be considered in association with gate changes include but are not limited to wildlife, water quality, flood, and exotic species.

During the initial transition from dry season flows to wet season flows at S-333, for a change of flow greater than 100 cfs an attempt should be made to use two to four incremental adjustments through the day to ramp up flows to the target release instead of a single change from 0 cfs to limit disturbing the sediment near the structure.

7.12 Seepage Control

There are many areas throughout the project area that are highly porous and overlie the Biscayne Aquifer. Seepage into the canals can reduce the conveyance capacity but the normal operations specified in **subsection 7.4** take into account seepage control.

7.13 Aquifer Storage and Recovery System Plan

This section is not applicable because the project area does not include an Aquifer Storage and Recovery System.

7.14 Consistency with the Adaptive Management Program and Periodic CERP Updates

Adaptive management has been recognized as a critical element of CERP since promulgation of the enabling legislation (WRDA 2000). Congress authorized the use of an adaptive management approach for CERP, to allow the Plan to proceed in the face of existing uncertainties and incomplete scientific data. Adaptive Management for the Plan is defined as the “continuous improvements to the Plan to respond to new information, new or updated modeling; information developed through the assessment principles contained in the plan; and future authorized changes to the Plan in order to ensure that the goals and purposes of the Plan are fulfilled.”

The adaptive management strategy for CERP is intended to guide the implementation of the Comprehensive Plan. It will be used to assess the responses of the south Florida ecosystem, and to determine whether these responses match expectations, including anticipated performance levels. An essential element of adaptive management is the development and conduct of a scientifically rigorous assessment program to analyze and understand responses of the system to implementation of the Comprehensive Plan which includes monitoring component to address biological, hydrological, and water quality parameters. In accordance with the programmatic regulations, Restoration Coordination and Verification (RECOVER) is required to prepare a technical report, at least once every five years, that presents an assessment of whether the goals and purposes of the Comprehensive Plan are being achieved, including whether the interim goals and interim targets are being achieved or are likely to be achieved. Based upon results of the monitoring and assessment efforts, operational changes may be recommended to improve individual project performance and/or Comprehensive Plan performance. Although the MWD to ENP Project, C-111 SD Project, and COP are not part of CERP, COP developed an AMMP (Appendix C of the COP EIS) and its primary objective is to identify the monitoring necessary to inform decision-makers, COP partner agencies, and the public on achieving project success. The monitoring identified in the COP AMMP will be used by decision makers, COP partner agencies, and the public to inform water managers on opportunities to better balance meeting multiple COP objectives while avoiding constraints.

COP’s planning process was based on knowledge of the Greater Everglades; understanding of the problems and opportunities; and the evaluation of alternatives and estimation of the potential project performance. However, while the WCP and EIS are based on a wealth of knowledge, some uncertainty inevitably exists in such a complex system. Such uncertainties include fine-tuning the computer models used to accurately predict performance and meet constraints under real world conditions, determining

how to best optimize actions to meet the needs of competing objectives and use the water available safely to the best advantage (e.g., flood risk management versus flows into ENP), and how to address and adapt COP to changes in both the environment (e.g., sea level rise) and due to human activities (e.g., additional operational structures implemented through CEPP). The COP adaptive management process is a tool to help address such remaining uncertainties.

AMMP uncertainties that require WCP revisions and updates shall consider USACE Environmental Principles in accordance with authorization and approved purposes and comply with NEPA, the Endangered Species Act (ESA), related laws and regulations, and SAD approval. The use of any AMMP should be followed by analysis and documentation of the lessons learned.

Section 7.15 below identifies two uncertainties that were evaluated during the development of COP and outlines specific operational guidance that may be utilized by water managers.

7.15 Annexes

This subsection addresses two uncertainties that are part of the AMMP (Appendix C of the COP EIS). These uncertainties are placed here since they define specific operational guidance that may be utilized by water managers. The table and figures in this section maintain the original Appendix C naming conventions.

7.15.1 COP AM Uncertainty #16b (Water Quality in NESRS)

Water quality concerns at S-333 and S-12D and downstream ecological response: Will there be downstream biogeochemical effects associated with modifying inflows and hydrologic conditions in ENP, that result in detrimental effects on nutrient movement, availability, and ecological responses? This includes consideration of hydrologic effects on nutrient loading, nutrient release from soils, transport, and water-quality related ecological indicators, such as periphyton tissue nutrients, cattail expansion, and algal bloom events.

COP Objective or Constraint: COP Objectives 1a, 1b, 1c, 3.

Region(s): Northeast Shark River Slough (NESRS)

Associated Features: S-12s, S-333, S-334, S-356; timing, location, and volume of deliveries

Driver or uncertainty type: Operational driver. Water quality at S-333 tends to degrade when water levels at the structure are low, resulting in spikes of nutrient, specifically total phosphorus concentrations, when these waters are delivered to NESRS. This affect is also observed at the S-12 structures with declining impacts on total phosphorus from west (S-12D) to east (S-12C). Spikes in total phosphorus delivered to NESRS result in excess phosphorus loads (above levels protective of the marsh) and thus a potential for the cascade of nutrient impacts described in this uncertainty.

What is expected to be learned by addressing this uncertainty (i.e., how will COP benefit from addressing this uncertainty)? By observing ecosystem response for this uncertainty, impacts on downstream resources in the NESRS marsh will be illuminated. If the operational deliveries for S-333 are addressed through alternative management options/strategies that are protective of the ecological values of NESRS, then COP will benefit with higher potential for improved ecological conditions within NESRS.

Expectations or hypotheses to be tested to address the uncertainty, and attribute(s) that will be measured to test each:

- Increased flow will not alter current periphyton system-wide indicator report status
- Additional flows will not result in an increase in algal bloom events (frequency, spatial extent, duration, and/or magnitude) in Florida Bay and Lower Southwest coast relative to current conditions
- No acceleration in cattail distribution expansion rate relative to current conditions
- No alteration of current spatial distribution of soil and vegetation nutrient pools relative current conditions
- Discharging through S-333 and S-12D at headwater conditions proposed by COP (stage above headwater trigger more often and for longer duration) will not result in degraded water quality and/or adverse ecological response in the marsh.

*Note For practical operations, several stage triggers shall be established for conditions when stages are declining and separately for conditions when stages are rising. Continued data collection will be used to refine these triggers. The current guideline is conditions should be closely monitored by the water quality team when the S-333 HW stages are descending towards 9.2 feet NGVD. When the ascending S333 HW stages are above or closely approaching 9.2 feet NGVD, and following review of the actual water quality data by the water quality team confirming the improved condition, the water quality data will not need to be as closely tracked.

What is expected to be learned by measuring this attribute?

- Through monitoring flow and nutrients, COP will learn about nutrient response to structure configuration (i.e., S-333 and S-334 flowing or S-333 and S-334 closed; S-333N versus S-333 operations) and operations. While the pre-COP testing generally addressed the water quality questions regarding S-356 pumping (no negative impacts noted), the S-356 pumping and nutrient response should continue to be monitored/evaluated.
- Monitoring of periphyton in the downstream marsh will allow COP to learn about changes in the periphyton nutrient content or algal blooms as demonstrated in the CERP RECOVER System Status Report (see CERP RECOVER 2014, 2019).
- Monitoring of macrophytes, such as cattail, will allow COP to learn about changes in rates of sensitive macrophyte expansion/retraction relative to current rates or presence/absence.
- Monitoring of the spatial nutrient front will allow COP to learn about movement of the spatial nutrient front or changes in nutrient rates of release from soils along soil and/or vegetation transect relative to existing conditions.

What is the time frame in which changes to this attribute are expected to be measurable?

- Flow and water quality monitoring at existing frequency. Discrete total phosphorus changes can be nearly immediately detected, but determination of any statistically significant change from historic levels could take 3 to 10 years, depending on the change magnitude.
- Periphyton (TP content, biomass, composition): 3 months to 1 year
- Cattail expansion: 3 to 5 years

- Soil nutrient front: 3 to 10 years

Is this attribute complimented by other monitoring programs within and/or outside of COP?

- COP should take advantage of existing monitoring which includes monitoring performed by the South Florida Water Management District, United States Geological Survey, Everglades National Park, and cooperators.

When during COP's life cycle should this monitoring begin and end?

- It has already begun and should continue 10 years after complete implementation of COP.

Methodology for testing each expectation or hypothesis (including frequency of monitoring) and for reporting: A baseline monitoring period of 3 years for soil nutrient content (1 every year) to measure long-term nutrient trends and 3 years of bi-annual (wet/dry season) periphyton tissue nutrients in areas of concern (e.g. downstream of S-12D, NESRS NC Transects) to measure early indication of nutrient changes is recommended to adequately establish existing conditions. Monitoring of soil nutrient content annually and bi-annual periphyton tissue nutrients beginning with implementation of S-356/G-3273 Relaxation Increment 1 test and carried through operation and management is necessary to document any changes in nutrient distribution resulting from incremental increases in deliveries past Tamiami Trail with each constructed feature.

Triggers/thresholds that indicate good performance or need for adaptive management action in response to COP:

Structure monitoring:

- Need for adaptive management action: increases in nutrients above existing conditions indicates potential for adverse impacts to downstream ecology;
- Good performance: maintaining or reducing nutrient levels represents good performance

Periphyton:

- TP content
 - Need for adaptive management action: if TP content in periphyton tissue increases above baseline;
 - Good performance: if TP content in periphyton tissue remains or declines below baseline
- Biomass
 - Need for adaptive management action: if biomass decreases below baseline;
 - Good performance: if biomass remains or increases above baseline
- Composition
 - Need for adaptive management action: if species composition shifts to more cyanobacteria relative to baseline;
 - Good performance: if species composition shifts to more desmids and diatoms relative to baseline

Cattail:

- Need for adaptive management action: if cattails expansion rate increases above rates observed during the base period;
- Good performance: if cattails expansion rate reduces or remains the same as baseline

Soil:

- Need for adaptive management action: if soil nutrient front expansion rate exceeds the baseline rate;
- Good performance: if soil nutrient front expansion rate remains or reduces below baseline rate

Management options that may be chosen based on test results: Adjust operations to change spatial and/or temporal distribution of water; model refinement and coupling to improve ability to forecast effects of operations and adaptive operational changes. The overarching goal is to avoid delivering water with elevated concentrations of TP to NESS, while minimizing the effect on the overall volume of water delivered to ENP. Specific operational options include:

1. Maintain discharges below 150 cfs through the combined S-12D and S-333 when S-333 headwater stage is below a level historically associated with elevated phosphorus concentrations (in the range of 9.2 ft or below for the S333 HW stage); this action will cease when either a) or b) occur:
 - a) S333_H stage increases to 9.2 ft. or higher or
 - b) S333_H stage increases 1 ft. above the May 15th stage.
2. Shift a fraction of the S-12D discharges to S-12C, and/or
3. Reduce dry-season recession rates by reducing outflow volumes in WCA-3A through S-12s and S-333 between December and May in water years with December stage lower than 10 feet NGVD29 (3 gage average in WCA-3A) to maintain higher stages in L-29 coming out of the dry season and reduce frequency and/or duration of low stage conditions associated with elevated phosphorus.

* Note that implementation of option 3 will require close coordination between USACE, SFWMD, and ENP senior leadership to apply and will be re-evaluated by interagency staff at a frequency not to exceed every 4 weeks. The intent of the adaptive management measures, if implemented, is that any temporary reduction in volumes delivered to the ENP due to the water quality adaptive management strategies will be limited in duration. Because stages in WCA 3A and ENP affect the weekly flow volumes calculated by the TTFF, short-term flow reductions would be naturally corrected by the weekly TTFF delivery calculation. Any reduction in deliveries would not need to be explicitly accounted for or replaced by deliveries independent of the TTFF weekly calculation. If implemented for longer durations, the adaptive management measures do have a greater potential to reduce the volume of water delivered to ENP, which is not the intent of the measure and one of the reasons for periodic re-evaluation. If it becomes clear that TTFF deliveries will need to be reduced over an extended period (more than 4 weeks), the interagency team will need to carefully weigh the risks of receiving water with elevated TP concentrations versus overdrying Shark Slough and other downstream areas. When reductions in volumes delivered to the ENP exceeds 4 weeks due to the implementation of the water quality adaptive management measures, significant alterations to annual deliveries to the ENP will be documented, and the adaptive management implementation will include a plan to mitigate impacts, if observed.

Additional options that have not been tested and will require additional analysis, NEPA review, and deviation to the WCP for implementation include:

1. Avoid first flush events through S-333 following low stage-low flow periods at the S-333 headwater,
2. Avoid discharges greater than 150 cfs through S-333 for a period of one to two week to allow water levels at the S-333 headwater to increase above a stage historically associated with elevated phosphorus concentrations,
3. Utilize the S-333N discharge structure in place of S-333 assuming the low stage impact on phosphorus concentrations has a lower magnitude of increase.

Decision-making Process: Once the WCA 3A stages are declining towards 9.2 feet NGVD and before reaching 9.2 feet NGVD at the S-333 Headwater during the dry season to wet season transition and/or when the WCA 3A three gage average is at 10 feet or below on December 1, a water quality group consisting of the DOI, the SFWMD, the FDEP and other agencies with expertise in water quality (led by the USACE) will initiate discussions to evaluate conditions for potential recommendations to implement the above strategies. This group shall then further coordinate these recommendations to determine suitability for implementation. The duration of any water quality adaptive management measures shall initially be evaluated at an interval not to exceed four weeks (can be shorter duration). Additional increments, if implemented, shall also be evaluated at least every four weeks. These strategies will only be implemented on a case-by-case basis and will include evaluation of the near real time water quality conditions provided by the SFWMD (preliminary water quality data from the S-333, S-152, S-12's and other appropriate structures), weather forecasts, water supply conditions, etc. Recommendations from the water quality team will be shared with the USACE water managers and then brought forth to the periodic scientist meeting for WCA 3A prior to implementation of these water quality strategies. USACE, after receiving input, shall make the operational decision whether to implement the water quality strategy in consideration of water quality and all authorized project purposes.

Table 7-7 summarizes the monitoring recommendations and provides funding estimates.

Table 7-7: COP AM Uncertainty ID#16b (Water Quality in NESRS) management option matrix.

Uncertainty Tracking ID#	Attribute or Indicator	Specific Property to be Measured and Frequency	Timeframe to detect change of attributes	Region or Specific Area (Locations to Monitor)	Decision Criteria: Trigger(s) for Management Action	Estimated Additional Annual Cost	Management Action Options Suggestions
UNC #16b – Water Quality in NESRS	TP concentration at structures plus additional water quality measures	Flow, TP nutrient concentration, turbidity and other water quality measures in water flowing into park	3 to 10 years	ENP- Northeast Shark River Slough, at structures S-12D, S-333	<ul style="list-style-type: none"> • Need for adaptive management action: increases if nutrients above existing conditions indicates potential for adverse impacts to downstream ecology; • Good performance: maintaining or reducing nutrient levels represents good performance 	Existing	<p>Adjust operations to change spatial and/or temporal distribution of water; model refinement and coupling to improve ability to forecast effects of operations and adaptive operational changes.</p> <ol style="list-style-type: none"> 1. Maintain discharges below 150 cfs through the combined S-12D and S-333 when S-333 headwater stage is below a level historically associated with elevated phosphorus concentrations; this action will cease when either a) or b) occur: <ol style="list-style-type: none"> a) S333_H stage increases to 9.2 ft. or higher or b) S333_H stage increases 1 ft. above the May 15th stage. 2. Shift a fraction of the S-12D discharges to S-12C, and/or 3. Reduce dry-season recession rates by reducing outflow volumes for WCA-3A through S-12s and S-333 between December and May in water years with December stage lower than 10 feet NGVD29 (3 gage average in WCA-3A) to maintain higher stages in L-29 coming out of the dry season and reduce frequency and/or duration of low stage conditions associated with elevated phosphorus.

Uncertainty Tracking ID#	Attribute or Indicator	Specific Property to be Measured and Frequency	Timeframe to detect change of attributes	Region or Specific Area (Locations to Monitor)	Decision Criteria: Trigger(s) for Management Action	Estimated Additional Annual Cost	Management Action Options Suggestions
Same as above	Periphyton <ul style="list-style-type: none"> • TP content • Biomass • Composition 	Periphyton in downstream marsh, bi-annual	3 months to 1 year	ENP- Northeast Shark River Slough, downstream of S-12D, NESRS NC Transects	<ul style="list-style-type: none"> • TP content <ul style="list-style-type: none"> ○ Need for adaptive management action: if TP content in periphyton tissue increases above baseline; ○ Good performance: if TP content in periphyton tissue remains or declines below baseline • Biomass <ul style="list-style-type: none"> ○ Need for adaptive management action: if biomass decreases below baseline; ○ Good performance: if biomass remains or increases above baseline • Composition <ul style="list-style-type: none"> ○ Need for adaptive management 	Existing	Same as above

Uncertainty Tracking ID#	Attribute or Indicator	Specific Property to be Measured and Frequency	Timeframe to detect change of attributes	Region or Specific Area (Locations to Monitor)	Decision Criteria: Trigger(s) for Management Action	Estimated Additional Annual Cost	Management Action Options Suggestions
					action: if species composition shifts to more cyanobacteria relative to baseline; ○ Good performance: if species composition shifts to more desmids and diatoms relative to baseline		
Same as above	Cattail expansion	Local mapping of cattail in downstream marsh	3-5 years	Same as above	<ul style="list-style-type: none"> • Need for adaptive management action: if cattails expansion rate increases above rates observed during the base period; • Good performance: if cattails expansion rate reduces or remains the same as baseline 	Existing	Same as above
Same as above	Soil nutrient front	Soil nutrient content in downstream marsh, annual	3-10 years	Same as above	<ul style="list-style-type: none"> • Need for adaptive management action: if soil nutrient front expansion rate 	Existing	Same as above

Uncertainty Tracking ID#	Attribute or Indicator	Specific Property to be Measured and Frequency	Timeframe to detect change of attributes	Region or Specific Area (Locations to Monitor)	Decision Criteria: Trigger(s) for Management Action	Estimated Additional Annual Cost	Management Action Options Suggestions
					exceeds the baseline rate; <ul style="list-style-type: none"> • Good performance: if soil nutrient front expansion rate remains or reduces below baseline rate 		

7.15.2 COP AM Uncertainty ID #12b (Tamiami Trail Flow Formula [TFFF] and Drought)

Is there an opportunity to deliver water to NESRS in a specific manner such that the delivery enhances stages in Shark River Slough, and perhaps freshwater flows to Florida Bay by delivering more water during the dry season without harming the ecological condition of WCA-3?

COP Objectives or Constraints: The COP objectives 1a, 1b, 1c, 3.

Region(s): NESRS, WCA 3, southern Shark River Slough, and Florida Bay

Associated Features: S-333, S-12 C and D (outflow of WCA 3/inflow to Shark River Slough portion of ENP), as well as S-11A-C, S-8, and S-140 (inflows into WCA 3).

Driver or uncertainty type: Hydrology/Operations

What is expected to be learned by addressing this uncertainty (i.e., how will COP benefit from addressing this uncertainty)? We are presented with the opportunity to learn whether the style of water delivery can produce measurable responses in southern SRS, and whether these responses can contribute meaningfully to reducing salinity concentrations in the chronically hypersaline portion of central Florida Bay.

Expectations or hypotheses to be tested to address the uncertainty, and attribute(s) that will be measured to test each: Statement of hypothesis: Can delivering additional flows into NESRS during a transition from the wet season to the dry season result in measurably increased water levels in SRS without increasing detrimental low water impacts to WCA-3 ecological conditions and water supply?

What is expected to be learned by measuring this attribute, i.e., how will COP benefit from knowledge gained about this attribute?

- If the seasonal timing of delivery to NESRS can be altered to reduce salinity concentrations in central Florida Bay, then water managers will have developed a new tool for protecting Florida Bay during period of moderate water scarcity.

What is the time frame in which changes to this attribute are expected to be measurable?

- During a design test, results should be identifiable during a six-month period, starting November and ending in May of the following year.

Is this attribute complimented by other monitoring programs within and/or outside of COP? If so, provide reference to other monitoring. Note the monitoring paid for by others in the COP Management Options spreadsheet.

- Yes, our continuous monitoring of structure flows, water surfaces in terrestrial marshes, and salinity concentrations in coastal embayments will be used to measure the effects of the field test.

When during COP's life cycle should this monitoring begin and end?

- Continuous monitoring of structure flows, water surfaces in terrestrial marshes, and salinity concentrations in coastal embayments will continue throughout both COP and CERP activities. Water surface and structure flow monitoring will not end during the COP process.

Methodology for testing each expectation or hypothesis (including frequency of monitoring) and for reporting: The design test was developed in response to concerns presented during development of the TFFF to better mimic the performance of ALT-O. Within the broader context of dynamic review of the COP TFFF planned through the COP Adaptive Management process and prescribed in the COP Adaptive Management and Monitoring Plan, parameters for a design test are proposed to test the hydrological and ecological response during a transition from the wet season to the dry season. The criteria for considering a test are:

Testing only occurs during the period between November 1st and May 30th. Testing only occurs after we've had at least 80 days of seasonal closure in WCA 3 in the dry season prior to the test, indicating a dry antecedent condition with likely multi-year impacts requiring special considerations (this occurs only 3 times in the 41 year period of record used in COP simulations – **Figure 7-12**). Testing may occur as we move into additional seasonal closures in WCA 3, and testing is considered anytime P35 in ENP is projected to move below 1.0 ft belowground, or P33 is projected to move below 0.5 ft belowground.

Testing will be stopped if any of the following drought intensity thresholds are reached:

- 0.8 ft belowground in northern WCA-3A (WCA3_NE and WCA3-3 gages)
- 0.5 ft belowground in southern/central WCA-3A (WCA3_3A-28 and WCA3_69 gages)
- 0.8 ft belowground in WCA-3B (WCA-3B_71 gage)

These thresholds correspond to the 93th-98th percentile low stage levels of these gages as defined by Alt Q and Alt O of the COP simulation models (**Figure 7-13**). The triggers are rarely reached in the simulations of COP performance and are important because soil consuming peat fires become a risk when water levels are more than 1.0 ft belowground, and risk rises significantly after 1.5 ft belowground threshold is crossed (Smith et al. 2003). Simulations indicate that these thresholds are unlikely to be a concern during the November –January period that would typically be the “early” portion of the design test but would become critically relevant during March – typically the peak of drought intensity in the system.

When the criteria for the design test have been met, the test period will allow general flexibility to increase the TFFF prescribed deliveries up to 400 cfs above the TFFF recommended flows for significant portions of the period, also allowed to introduce nonlinearities in lowest flow conditions (sometimes lower flows than suggested by the TFFF – during the driest of conditions, sometimes tripling-quadrupling very low - 25-100 cfs flows – perhaps during the early onset of the wet season). The ultimate design decisions should be described during the operational period based on comparison of modeled analogous conditions. Although our modeling provides the basis for the design of this field test, the actual implementation of the test must be done in the specific context that occurs, with specific physical limits and constraints imposed upon the test. Because there are strong limits on our ability to accurately forecast rainfall, the designed test is limited in duration to 6-8-week intervals and must be re-evaluated to ensure safe operating conditions every 6-8 weeks.

**MONTHLY COUNT OF LOW WATER CLOSURE DAYS in WCA3A
COP ALTQ**

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Year													
1965	0	0	0	0	17	15	0	0	0	0	0	0	32
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	1	31	6	0	0	0	0	0	0	38
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	24	31	13	0	16	5	0	0	0	89
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	20	31	30	1	0	0	0	0	0	82
1974	0	0	25	30	31	24	0	0	0	0	0	0	110
1975	0	0	15	30	31	30	1	0	0	0	0	0	107
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	13	20	0	2	4	0	0	0	0	39
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	31	30	20	0	0	0	0	0	81
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	7	19	31	22	0	0	0	0	0	0	79
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	4	20	14	30	17	0	0	0	0	0	85
1990	0	0	9	30	31	20	0	0	0	0	0	0	90
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	8	24	0	0	0	0	0	0	0	32
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	3	3	0	0	0	0	0	0	6
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	60	195	326	223	41	20	5	0	0	0	870

Figure 7-12: Monthly count of low water closure days in WCA3 – COP Alt Q, with years when TTFF drought conditions test would be implemented indicated by heavy black outline. Design test implementable only in 1973-1974, 1989-1990, and 1990-1991.

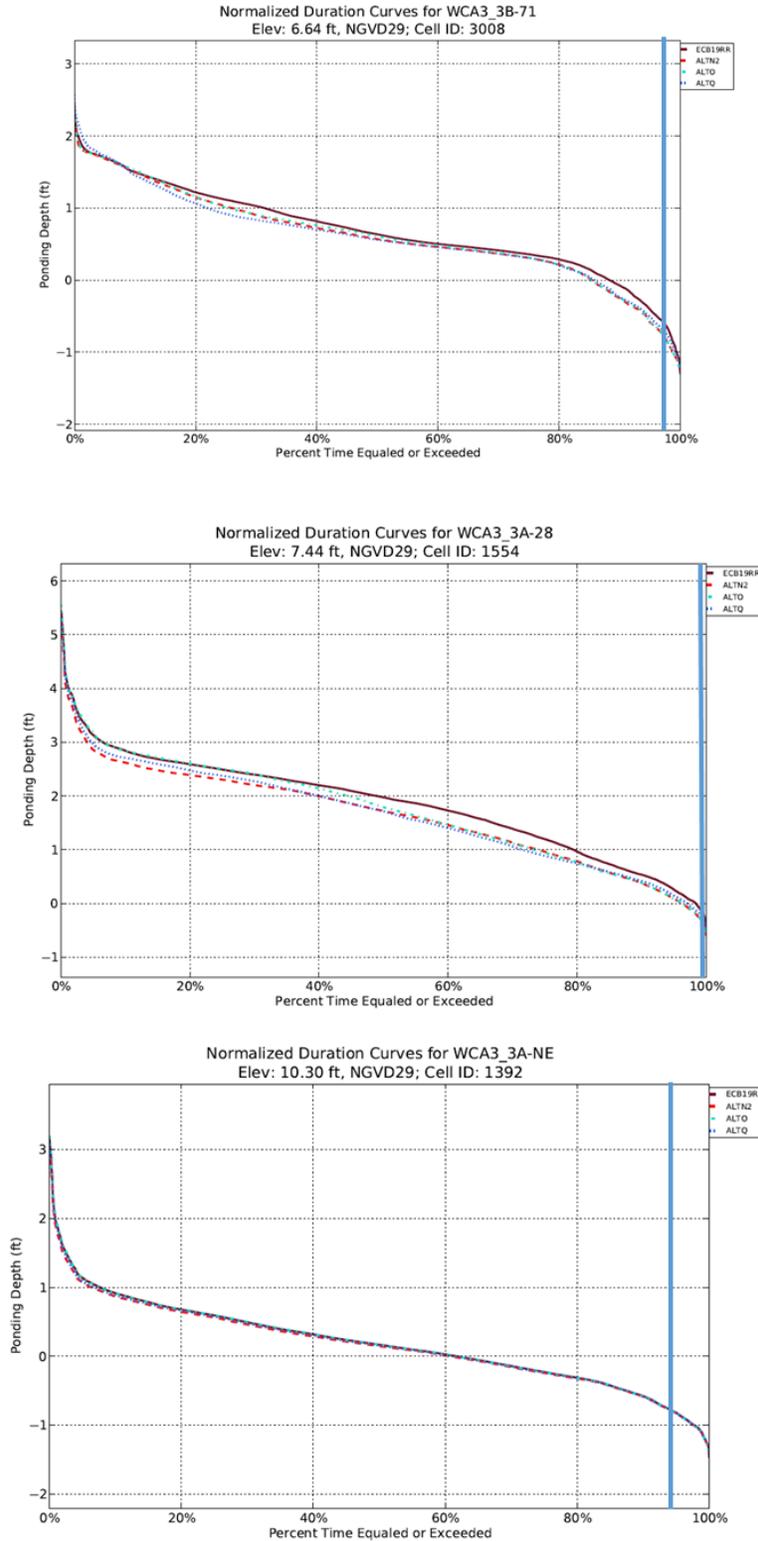


Figure 7-13: Normalized duration curves of depths at specific gages in WCA3. a) Gage WCA3_3B_71 (top), b) WCA3_3A_28 (middle), and c) WCA3_3A-NE (lower). Curves for WCA_3_3-69 and WCA3-3 gages are similar but not shown.

Review of representative years from the modeling indicates that that the field test may increase expected deliveries by 32,000 – 80,000 acre feet over the entire November-May period above the level of delivery by the Tamiami Trail Flow Formula identified in Alt Q (which delivered 75,000 acre ft in 1973-74, 50,000 acre ft in 1989-90, and 180,000 acre ft in 1990-91 respectively during the November 1 – May 30 period). These additional deliveries correspond to the differences in deliveries observed in Alt O and Alt Q during these three specific years identified in **Figure 7-12** (1973-1974, 1989-1990, and 1990-1991), and the anticipated effect of the design test may result in a minor-negligible effect on WCA-3A, in addition to a minor benefit realized by the SRS portion of ENP. A comparison between alternatives O and Q indicate that maximum effect of the design test would reduce stages in WCA 3A 0.1-0.5 ft over roughly 35% of WCA 3A. Stage level reductions no more than 0.3-0.5 ft occur within the first 0.5 miles upstream of the L29 canal, 2-4 miles upstream of the L-67 canal, while 0.1-0.3 ft stage reductions occur 0.5-3 miles upstream of the L29 canal and 4-10 miles upstream of the L67 canal respectively. Since our ability to predict rainfall volumes over a seasonal drydown is a significant uncertainty, water managers may stop the test if less than 2 inches of basin-wide average rain of WCA3 in any month and forecast rains present a significant risk of drying WCA-3A beyond the constraint thresholds outlined above.

Triggers/thresholds that indicate good COP performance or need for adaptive management action. These are described in the methodology of the test provided above, since the constraints and thresholds are central to the methodology of the design test.

At each PDT+ meeting the team will identify if a field test is possible in the upcoming wet-dry season transition (based upon closures in WCA-3A during the previous season and anticipated water levels in WCA3). If suitable conditions appear likely, the managers will be notified of intent to further investigate whether conditions warrant initiation of the field test, and a series of monthly meetings will be used to formulate the specific field test strategy. Results from the test will be summarized in a report and delivered to resource managers no later than 6 months after the completion of the field test, to ensure availability of this information in advance of the next dry season. The report will document the proposed design, the actual operations utilized, the hydrologic and ecologic effects on ENP and WCA3 (in terms of depth duration effects at key gages identified above).

Management options that may be chosen based on test results.

Option 1: Adopt operational strategy that provides a moderate increase to TFFF inflows into Central and Southern Shark River Slough during seasonal transitions.

Option 2: Based on consideration of constraints and forecast conditions, maintain adherence to the COP TFFF based delivery strategies.

This uncertainty is further defined in a management option matrix below in **Table 7-8**.

Table 7-8: COP AM Uncertainty ID #12b (Tamiami Trail Flow Formula and Drought) management option matrix.

Uncertainty Tracking ID#	Attribute or Indicator	Specific Property to be Measured and Frequency	Timeframe to detect change of attributes	Region or Specific Area (Locations to Monitor)	Decision Criteria: Trigger(s) for Management Action	Estimated Additional Annual Cost	Management Action Options Suggestions
UNC #12b – Tamiami Trail Flow Formula (TTFF) and Drought	Seasonal timing of delivery of flows to NESRS	Daily averages of stage	Event driven when criteria for conducting test occur. Duration of test should be 6 months.	S-333, S-12 C and D (outflow of WCA3/inflow to Shark River Slough portion of ENP), as well as S-11 A-C, S-8, and S-140 (inflows into WCA3).	<ul style="list-style-type: none"> • If test can be successfully implemented without unexpected violation of constraints (e.g., causes water quality concerns), then the test operational strategy (with the drought intensity threshold constraints) will become part of the regular water control plan operational strategy. • If unexpected violation of constraints occur that appear unresolvable (e.g., water quality concerns or excessive drying of WCA-3A), then operations will return to using the Tamiami Trail Flow Formula as described in the Water Control Plan. 	Existing unless additional model runs are required	<p>Option 1: Adopt operational strategy that provides a moderate increase to TTFF inflows into Central and Southern Shark River Slough during seasonal transitions.</p> <p>Option 2: Based on consideration of constraints and forecast conditions, maintain adherence to the COP TTFF based delivery strategies.</p>

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